China-UK Global Health Support Programme

Final Reports Compilation of Implementing Agencies

Content

OP101 National Institute of Parasitic Diseases (NIPD) of the Chinese Centers for Disease Control and Prevention (China CDC)

Output 101 Global Health Core Research: Sub-project in Disease Prevention and Control
Final Report

Abstract

To achieve the Millennium Development Goals and the post-2015 agenda of sustainable development, there is a pressing need for China as a newly-developing country to improve the capacity of engaging in global health governance. This project will distill, synthesize and disseminate P.R. China's experiences and lessons learnt from long-term, multifaceted control programmes targeting malaria and schistosomiasiss relevant to LMICs and make efforts in transferring Chinese experiences and technologies into low- and middle-income countries (LMICs). Ultimately, this will lay the foundation for the development of an expert team with global vision, and promote Chinese professionals and institutions to engage in global health along with more domestic and international partners, including seven institutions from P.R. China, four from LMICs and four from OECDs.

The whole project contains three levels, including (i) summarize and distill the experience and technology towards the malaria and schistosomiasiss elimination in China; (ii) analysis the feasibility of the experience on tropical diseases control and prevention to LMICS in Asia and Africa; and (iii) establishing a multi-lateral collaborating relationship. Spread and popularize the experience through joint cooperation in multiple ways such as to jointly publish papers.

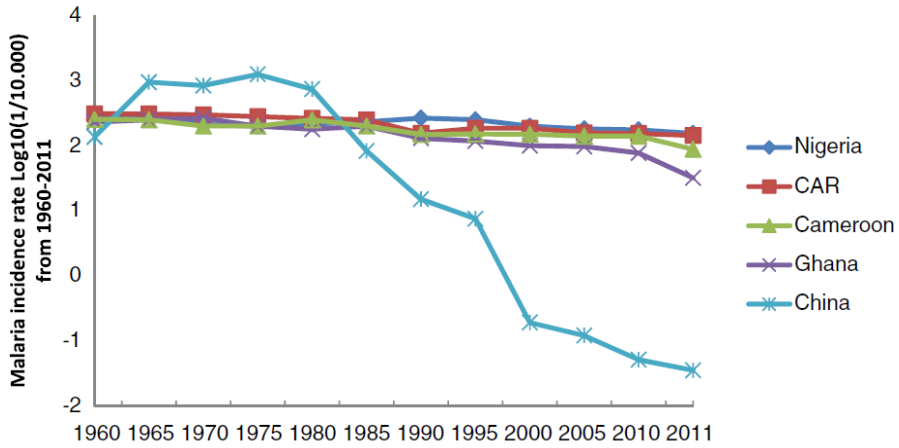
1. Background

Globalization has had a much more profound impact on human health recently. In particular, trans-border infectious diseases have been recognized as a global threat and an important non-traditional security issue. In respect to the fact that global health is closely related to social development and justice, international communities should be obligated to eliminate health inequality under the framework of the Millennium Development Goals (MDGs) and the post-2015 agenda of sustainable development. Therefore, two main tasks of global health are to achieve health development and maintain health security. Malaria and neglected tropical diseases (NTDs), such as schistosomiasis are both under the heading of tropical diseases. Malaria, as the most important tropical disease in the world, exists in 109 countries and areas and puts an estimated 3.3 billion people at risk. According to data in the World Malaria Report 2012, there were an estimated 219 clinical million malaria episodes in 2010 and an estimated 660,000 deaths. Africa is the most affected continent with nearly 90% of all malaria deaths, with sub-Saharan Africa being particularly affected. The United Nations (UN) set a target of zero malaria deaths by 2015. In addition, other tropical diseases such as

schistosomiasis mostly occur among neglected and marginalized communities in remote rural areas, urban slums or conflict zones. A total of 239 million people are infected with schistosomes, and 85% of these people are concentrated in sub-Saharan Africa. . In recent years, as the global economic growth enhanced the status of public health, the control and prevention of NTDs has gradually received the world's attention. In 2013, the World Health Assembly (WHA) proposed a deadline for the elimination of 10 major tropical diseases. The main challenges faced by malaria and schistosomiasus control and prevention for Asian and African developing countries are the poor physical infrastructure, weak prevention and control systems, imperfect health information systems, a marked shortage of professional staff, lack of drugs/diagnostic kits/ molluscicides/insecticide, and the huge funding gap, all these insufficiencies together make it difficult to carry out effective prevention and control work in many locations.

Tropical diseases used to pose a serious burden in P.R. China. At the beginning of systematic control and prevention activities in the 1950s, the annual incidence of malaria was close to 30 million cases, with mortality up to 1%; schistosomiasis affected an estimated 12 million people. After six decades of unremitting prevention and control work, remarkable achievements have been made.

China used to have the similar incidence with other developing countries on malaria and schistosomiasis. However, take malaria as an example, when comparing the malaria incidence between some African countries and China, the gap in recent 30 years becomes more and more obvious (Graph 3).



Graph 1: 1960-2011 Incidence of malaria in Africa and China

Therefore, to further distill the experience and technology of the prevention and control experience on malaria and schistosomiasis and spread the successful experience to African and Asian countries. The benefits would not be limited to releasing the disease burden of neighbor countries in Asia and African countries, but also will promote the elimination process of malaria and schistosomiasis as well as the increased capacity to cope with the diseases to achieve the Millennium Development Goals and the post-2015 agenda of sustainable development through south-south cooperation.

2. Design and management

2.1 Research goal

The main purpose of this project is to summarize the experiences and lessons learnt from programmes targeting malaria and schistosomiasis in China. And further lay the foundation

for the development of an expert team with global vision and provide technical support to promote Chinese professionals' and institutions' to be more engaged into global health governance.

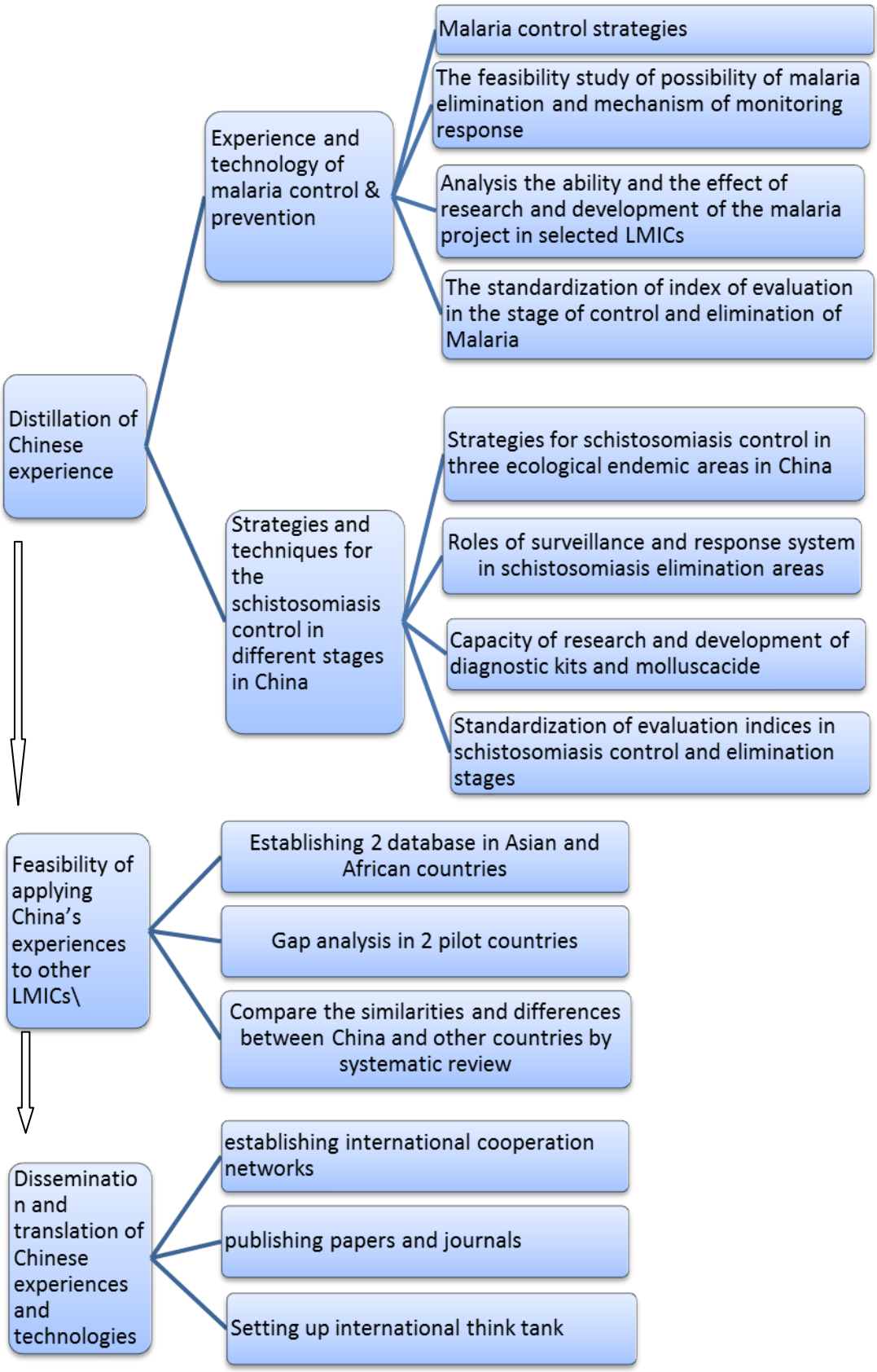
A. Distillation and synthesis of Chinese experiences on prevention and control of tropical diseases: To distill and synthesize pragmatic strategies, technologies and products by comparison of Chinese technologies, experiences and lessons on malaria and schistosomiasis in different areas at different control stages with those employed in other LMICs.
B. Feasibility and applicability of Chinese experiences in the control of tropical diseases in other LMICs: To explore the feasibility and applicability of Chinese experiences in control of tropical diseases by analyzing the epidemiological situation, control strategies, products and technologies between China and LMICs in Africa and Asia, and to provide technical advice for future pilot studies in LMICs.
C. Dissemination of Chinese experiences in control of tropical diseases: To establish a close partnership for the translation and dissemination of Chinese experiences in control of tropical diseases by forming an international collaborative network, publishing papers, books and training materials and establishing an international think-tank for tropical disease control and prevention.

2.2 Research methods

Through putting the 4 sub-projects together with the core objective in place and the following four major questions will be addressed:

- What are the key factors determining success, and the challenges faced in China?
- What criteria and evidence can we use to translate Chinese experiences to LMICs?
- Which lessons can be learned by other LMICs given the different histories and social and environmental contexts?
- Can these lessons help other LMICs to avoid mistakes and improve the effectiveness in scaling up health interventions?

The interactions between the aforementioned 4 sub-projects are illustrated in the diagram of the proposed research activities with three procedures (Figure 4).



Graph 2. Interactions diagram between the 4 sub-projects with three aspects

Sub-project 1: Distillation and synthesis of strategies and techniques for malaria control

and elimination in China

1. Cost-effectiveness analysis on malaria control strategies in different settings
2. The feasibility study of the possibility of malaria elimination and surveillance response system in the elimination stage
3. Analyze the capacity and the effectiveness of research and development in the malaria control programmes in selected low and middle-income countries
4. The standardization of index for evaluation in the stages of control and elimination of malaria

Sub-project 2: Distillation and synthesis of strategies and techniques for schistosomiasis control in different stages in China

1. Strategies for schistosomiasis control in three ecological endemic areas in P. R. China.
2. Roles of surveillance and response system in schistosomiasis elimination areas
3. Capacity of research and development of diagnostic kits and molluscacide
4. Standardization of evaluation indices in schistosomiasis control and elimination stages

Sub-project 3: Feasibility of applying China's experiences in tropical diseases control or elimination to other LMICs

1. Data collection
2. Field visits
3. Systematic Analysis
4. Assessment modeling

Sub-project 4: Dissemination and translation of Chinese experiences and technologies on malaria and schistosomiasis

1. Establishment of international cooperative networks
2. Writing and publishing papers, monographs, and training materials
3. Publishing relevant academic journals
4. Building international expert database of tropical disease

2.3 The expected results and outcomes

The expected results of the project include: (i) the improved global network for tropical diseases, (ii) the capacity of China's participation in global health. (iii) 的 distillation and synthesis the experiences and techniques for control of tropical diseases in China, (iv) the applicability and disseminate of Chinese experience and techniques.

2.3.1 Expected results

1) Improve global network for tropical diseases: To perfect the current site/ magazine and strengthen the construction of the network, for instance: publishing an English magazine and the establishment of a global network of tropical disease control, and guiding the postdoctoral researchers from Asia and Africa.

2) Enhance the capacity of China's participation in global health technology: Through holding the workshop of tropical diseases prevention and control, training and setting up a team of China's tropical diseases prevention and control experts which will consist of no less than 20 people with global vision.

3) Pave the way for the research of tropical diseases in Africa and Asia：Through the promotion of research, for example, publishing books, policy briefings, etc. The paper should include the strategies and measures (2 issues), disease control reports and risk

surveillance reports, etc.

2.3.2 Expected Outcomes

1) Extraction and conclusion of experience and techniques for control of tropical diseases in P. R. China

Strategies and approaches for diseases control: To consider and assess experience on disease control in different stages, different regions and different diseases, such as the control and elimination of malaria, control and intervention of schistosomiasis, etc.

Surveillance and response system: To consider and assess the experience and lessons of P. R. China to establish and operate the surveillance and response system to control the transmission of malaria and schistosomiasis.

Development of drugs and diagnostic tools: To assess experience on development, production and implementation of anti-malaria drugs, long persistent mosquito nets, molluscacide and tools for schistosomiasis diagnosis.

2) Assessment of applicability

Assessment of applicability of Chinese experience and techniques in middle and low income countries will be conducted through comparative studies among P.R. China and pilot countries selected from Asia and Africa. Field visits, training courses, international conference or seminars, training post doctorate students etc., will be conducted during this phase.

3) Dissemination of Chinese experience and techniques

Dissemination of Chinese experience and techniques will be conducted through the following activities, such as organizing training course, establishing scientific journals or international websites, using Chinese drugs and diagnostic kits in pilot countries, encouraging experts to participate in global health conferences, dispatching experts working in international organizations, publishing articles and books etc.

2.4 Project management

The team is consists of 70 professional and technical personnel from seven countries and 13 university, institute and institute of the centers for disease control and prevention including 38 PhDs and 25 Researchers or professors. Their professions include epidemiology, Biostatistics, health management, environmental medicine, medical informatics, health economics, medical genetics, pathogen biology, medical immunology, diagnostics, computer science, geoinformatics and pharmacology.

A total of 15 partners from LMICs, OECDs, and domestic institutions are involved in this project. Four LMICs' partners such as (1) Ifakara Health Institute (IHI), Tanzania, Blue Nile National Institute for Communicable Diseases (BNNICD), Sudan, The National Institute for Medical Research (NIMR), Tanzania, The National Center for Parasitology, Entomology and Malaria Control, Cambodia. Four OECDs' partners including the London School of Hygiene & Tropical Medicine (LSHTM), The Swiss Tropical and Public Health Institute (Swiss TPH), the Duke Global Health Institute (DGHI), USA, and the Natural History Museum (NHM), UK. Five domestic partners from university and disease control institutions participated in the project, including Sci-tech Industrial Park, Guangzhou University of Chinese Medicine, Anhui Institute of Schistosomiasis Control, Sichuan Center for Disease Control and Prevention, Shandong Institute of Parasitic Diseases, and Yunnan Institute of Parasitic Diseases. In addition, two domestic companies participated in the project as well, including

Beijing Holley-Cotec Pharmaceuticals Co., Ltd., Hubei Jinhaichao Science and Technology Co.,Ltd. All of the partners has provided the support letters or signed the agreement on taking agreed duties.

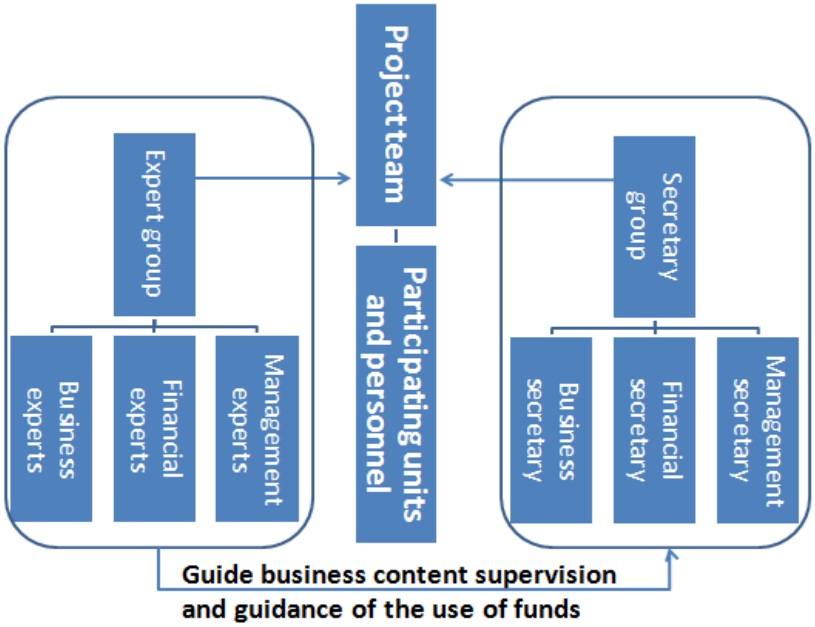
One principal investigator (PI) of the team will be set and in charge of the entire project design, organization, implementation, monitoring and summary. 6 co-investigators will be committed and to co-manage the project, whose specific role will be assisting the project leader with the design, organization, implementation, monitoring and summary of the project. The total project consists of 5 sub-projects, distillation and synthesis of strategies and techniques for malaria control and elimination, distillation and synthesis of strategies and techniques for the schistosomiasis control in different stages, feasibility of applying China's experiences on tropical diseases control/elimination to other countries and dissemination and translation of experiences and technologies on neglected malaria and schistosomiasis in China.

Correspondingly, 4 subproject investigators will be set and responsible for the design, organization, implementation, monitoring and summary of subprojects.7 co-subproject investigators will be committed to assist the design, organization, implementation, monitoring and summary of subprojects. 12 major attendees and 30 backbones will be mainly involved in the implementation and conclusion of subprojects.

This Project will be strictly in accordance with the <GHSP project management approach>.To ensure smooth development of the project, the Project Expert Advisory Group and Secretary Group were established. The Project Expert Advisory Group will be responsible for the consultancy of profession and administration, and participate in technical guidance and monitoring; the Secretary Group will responsible for organization and coordination, and assist the Project Expert Advisory Group. Expert advisory group consists of 9 experts, including one team leader, two deputy leaders, three professionals, two financial experts and one management experts. The Secretary Group consists of five members, including one team leader, one management secretary, two Professional secretaries and one financial secretary.

The mechanism of semiannual project progress reporting, inspection, and supervision has been followed. Interim evaluation, the annual assessment and final examination and a series of work systems, periodic reporting project progress were functioned to coordinate and solve problems and difficulties.

Department of financial management worked in accordance with regulations of public institution and the related legal rules. They were also responsible for the organization and development of the project financial management. Formulate relevant financial management system by taking characteristics of the project into consideration. And perform financial accounting and management specification on a regular base and inspect the use of project funds, supervise the project to complete tasks in line with the budget and schedule.



Graph 3. Management graph

3. Main results and findings

3.1 Malaria Control Strategy and Technique

3.1.1 Phases Study on China malaria control strategies and techniques

The workshop on historical data and documents collection which had covered more over than 60 years was to summarize malaria transmission patterns and malaria control and elimination strategies as different phases. Malaria control and prevention in China had experienced different periods. Many investigations and surveys were carried out to understand the malaria profile and to determine epidemiological factors at the beginning establishment of P.R. China. It followed a malaria outbreak and effectively epidemics inhibition during sixties and seventies in last century. After that was a great malaria cases reduction and sustainable low transmission rate.

A. Malaria investigation Phase (1949-1959)

Although malaria was highly prevalent nationwide, the information on parasite species, vectors, epidemiology, and geographic/demographic distributions were not well addressed in this time period. More than half areas in Yunnan, Guizhou, Guangxi,Guangdong had a high or hyper-high transmission. Some part of northern and central China had once malaria outbreak or prevalence. Many professional institutes were established in succession at national and provincial levels, and malaria prevalence was investigated in some endemic areas for professional training and pilot studies.The first five-year National Malaria Control Programme (NMCP) was issued with two epoch-making events: malaria was designated as a notifiable disease and a malaria-reporting mechanism was implemented nationwide.

The whole country was divided into four different zones on the basis of *Plasmodium* species,vectors and extensive epidemiological surveys. Zone 1 was the tropical and subtropical areas covering the southern parts of Yunnan, most parts of Guangdong (including Hainan Island), Guangxi, and southeastern Fujian. In Zone 1, *P. falciparum* was the predominant species. Zone 2 included Guizhou, Hunan, Jiangxi, Hubei, Zhejiang and Shanghai, northern Yunnan, parts of Tibet, Guangxi, Guangdong, Gansu, Shanxi and Henan. *P. vivax* was the main species, and the season of malaria transmission was from May to

November, with a peak from August to October. Zone 3 covered Shandong, Liaoning, Jilin, Heilongjiang, Beijing andTianjin,most parts of Hebei and Shaanxi,parts of Shanxi,Henan, Jiangsu,Anhui and Xinjiang. Only vivax malaria was prevalent in this zone, with the transmission season lasting from June to November (with the peak from August to October). Zone 4 consisted of malaria-free areas including the cold high-altitude areas, dry desert, plateau, etc.

B. Outbreak and pandemic transmission phase (1960–1979)
A pandemic transmission of vivax malaria occurred in the central China, including Jiangsu, Shandong, Henan, Anhui and Hubei provinces, because of the interruption of malaria control activities attributed by a natural disaster in the beginning of 1960s and political unrest in 1967. In addition, malarial outbreaks caused by population movements were recorded in Hainan, Zhejiang, Fujian and Yunnan,etc. During the 20years, more than 18,000,000 malaria cases were accumulatively reported from each of five central parts of China, including Henan, Jiangsu, Shandong, Anhui and Hubei provinces. Annual deaths suffered from malaria numbered in the hundreds,with the highest total of approximately 2050 in 1963. *Plasmodium falciparum* transmission rate was greatly heavier during this phase with a small-scaled *Plasmodium vivax* outbreak in southern part of China.The intervention implementation in Shandong, Henan, Jiangsu and other provinces strengthened radical treatment in resting phase during the transmission season.

Specific strategies were formulated to control outbreaks and pandem- ics, mainly based on the species of vector in particular areas.Vector con- trol interventions, such as insecticide treated net (ITN), combined with case management were the primary strategies implemented in the southern areas, where *An. minimus* was the predominant vector. The northern parts of China, where *An. sinensis* was the key vector, adopted integrated measures, including environment improvement, a radical treatment that administration with primaquine plus pyrimethamine/quinine, and prophylactic chemotherapy with pyrimethamine in high-transmission settings.

C. Under control phase (1980-1999)
In this phase, malaria prevalence was declining gradually, with the exception of the year 1989 to 1994, with a rein-creased malaria morbidity rate due to population movement towards southern area.The case reduction rates were reported of approximately 30–43% during 1982–1988 and approximately 15–25% during 1990–1996. Vivax malaria was the predominant species and was widely distributed in the endemic areas in the period. Falciparum malaria has been limited to Yunnan and Hainan provinces since 1995. The number of death due to malaria dramatically decreased, with less than 70 deaths reported annually.

Control measures were tailored to different malaria profiles and specific vectors. At the beginning of this phase, case management combined with vector control interventions were adopted in the areas where vivax malaria was prevalent by *An. sinensis*. ITNs or IRS followed by case management were applied in the areas where *An. anthropophagus* or *An. minimus* was the main vector. Environment modifications for breeding sites reduction were added in the areas with *An. dirus*. Residual foci elimination and case surveillance were carried out in areas with relatively low transmission, where the prevalence was less than 5 per 10,000 population. Especially in this phase, the concept and target of malaria eradication were initially proposed in 1983. Subsequent technical guidelines and protocols related to case management, vector control, surveillance, and training were developed.

D. Low transmission phase (2000–2009)
Malaria transmission presented a rather low incidence rate whereas combined with some unstable pattern area. In particular, since 2001, a re-emergence unpredictably occurred in central parts of China along the Huang-Huai River, including Anhui, Henan, Hubei and Jiangsu provinces. Anhui Province alone accounted for more than 50% of the country's total cases. Even so, Yunnan Province maintained its rank in the top three for numbers and incidence rates. Vivax malaria accounted for a majority of cases. *Plasmodium vivax* incidence rose in central China caused national malaria morbidity up to 0.49 per ten thousand in 2006, which declined until the year 2009 to 0.11 per ten thousand and then kept in a rather low level after that. The annual malaria deaths cases were less than 100.

Specific strategies were adopted in particular malaria resurgence area towards central part of China, including prophylaxis drug oral taken and radical treatment of *Plasmodium vivax* during high transmission season. Supported by the first round of the Global Fund to Fight AIDS, Tuberculosis and Malaria programme (GFATM), comprehensive measures were intensively implemented involved in various aspects of malaria control which included early diagnosis and appropriate treatment, focal vector control interventions, malaria management among mobile populations, health education and promotion, and surveillance, monitoring and evaluation, which had successfully contributed to the rollback of re-emergence in central China and generally eliminate falciparum malaria in Hainan and finally inhibited the whole country's malaria transmission.

3.1.2 Feasibility study of possibility of malaria elimination and surveillance response system

A. Feasibility analysis
Based on the population with incidence lower than 1/100,000, the meta analysis and systematic review were used to analyze the epidemiological pattern and effect factors of malaria transmission in China.Malaria is one of the most important parasitic diseases. After establishment of new China, malaria control had made a dramatical progress with strongly support from goverments in each level. The number of malaria was decreased from more than 24 million in1970s to around ten thousands in 1990s. The malaria endemic areas were also shrinked dramatically. Falciparum malaria was eliminated in most part except Yunnan and Hainan province. Although malaria re-emerged in central part of China after 2000, it was well contained with the implementation of "national stategic plan for malaria control 2006-2015". By 2009, malaria incidence was under 1/100,000 in 95% of counties out of 24 provinces (with malaria transmission) . There were only 87 counties with malaria incidence over 1/100,000. In line with Millennium Development Goals and national social-economic development, Chinese government launched malaria elimination program in 2010, target to elimination malaria by 2020.

B. Study on surveillance and response mechanism
Based on the feasibility analysis of survelliance and response system in different areas, the regional surveillance and response system was developed. Counties were categorized into four types in national wide. Type 1 having local transmission and incidence ≥1/10,000 (75 counties), Type 2 having local transmission and incidence (687 counties), Type 3 no indigenous cases reported in the past years but still with risk of transmission (1432 counties), and Type 4 which are malaria free. In order to ensure malaria elimination, as well as strenghthening case detection and focus disposal, "1-3-7" strategy was developed and adopted

for malaria surveillance and response in malaria elimination phase.That is case reporting after diagnosis with in one day (24hours), case investigation and confirmation within three days as well as the appropriate public health response to prevent further transmission within seven days, in brief: 1-3-7.Because of the implementation of this strategy, the local malaria transmission was interrupted effectively in most part of China, which was accelerated malaria elimination process. As several countries both in Asia and other regions are planning to start their national malaria elimination program, this success scenario could be considered in the program design.

3.1.3 Comparative analysis on research and development capacity for malaria in selected low and middle income countries

To analyze market gap of anti-malaria drugs through literature review, data collection of six low and middle income countries in Africa and Asia. To understand the related product supply & demand situation and quality information for development direction and the possible output technology and products to Africa.

Worldwide resistance of Plasmodium falciparum to chloroquine (CQ) and the rapid spread of resistance to sulphadoxine-pyrimethamine (SP) prompted the introduction of artemisinin combination therapy (ACT) by the World Health Organization (WHO).

A. Africa region

The efficacy AL and AS + AQ was reasonably high and the drugs were safe when used for treatment of uncomplicated P. falciparum infections in Tanzania mainland, Zanzibar, Uganda and Comoros. A large proportion of rural families continuing to prefer private facilities and outlets over public facilities. Much of the local initiatives have been targeted to licensed facilities and outlets, with minimal attention given to the unregulated sector. Although currently there is no evidence of artemisinin resistance in Africa, previous experience with the spread of CQ- and SP-resistant parasites from Asia to Africa suggests that the spread of artemisinin resistance to other parts of the world is likely. The demand for tracking parasite sensitivity to artemisinin and its derivatives has become more important. More surveillance and monitoring of anti-malarial efficacy and safety should be performed to detect future changes in parasite sensitivity to ACT.

B. Asia region

The emergence of artemisinin resistance in Southeast Asia, including Cambodia, Myanmar, Thailand, Vietnam and Laos, manifested as delayed clearance of P. falciparum after treatment with artemisinins. Recent studies have shown that artemisinin resistance is associated with non-synonymous single-nucleotide polymorphisms (SNPs) in a P. falciparum gene with kelch propeller domain (K13). Therefore, more surveillance and monitoring of tracking parasite sensitivity to artemisinin and its derivatives in Myanmar and Thailand, the demand of developing new drug and combination therapy of malaria becomes more important.

These six countries need: 1) The discovery of molecular genetic markers of artemisinin resistance; 2) Technique and product for surveillance and monitoring of anti-malarial efficacy and safety; 3) New drugs and combination therapy; 4) Trained health professionals; 5) Licensed private vendors in rural settings.

3.1.4 Standardization of evaluation indicators in malaria control and elimination phases

To realize the goal of eliminating malaria in China, standardize the evaluate work of eliminating malaria throughout the country, according to the national malaria elimination action plan (2010-2020), standard of malaria control and elimination and the technical guidelines for malaria elimination (2011 edition), and through in-depth investigation, expert

consultation, conference, etc., the evaluation schemes for malaria elimination (2013 edition) was developed.

According to the implementation of the evaluate schemes for malaria elimination (2013 edition), in order to further standardize the national evaluation of eliminating malaria, simplify the indicators and improve the evaluation effect, the evaluate schemes for malaria elimination (2014 edition) was formulated, and all provinces formulated the specific implementation plan. By the end of 2015, 74.17% of the country's endemic counties passed the evaluation of eliminating malaria.

The evaluation scheme includes three parts of eliminating measures, on-site inspection and security measures. Eliminating measures include five contents of fever patient blood test, case report and treatment, case verification, case investigation, and the disposal of foci. Onsite inspection includes three contents of microscopy skills, knowledge of diagnosis and treatment of malaria and blood smears check. Safeguard measures include two contents of planning and agency personnel. The standardization of each indicator, the quantitative values and evaluation method could be referred by the different low-middle-income countries.

3.2 Strategies and technique of schistosomiasis control in China

3.2.1 The history of schistosomiasis control and evolution of the control strategies in the People's Republic of China

Based on large scale evaluation of successful experience for schistosomiasis control in P.R. China, control strategies in different endemic areas were concluded: The schistosomiasis control in P.R. China could be divided into three phases emphasizing on different control strategies according to the economic situation and technology at that time

A. Elimination strategy emphasized on snail control (1950s–early 1980s)
During this period, a nationwide control programme aiming at the elimination of schistosomiasis was initiated. Snail control with environmental modification and molluscicide was the major strategy used to prevent infection and reduce prevalence. In addition, other control measures such as self-protection were provided as complementary methods. However, the effects were somehow limited by the poverty and scarce health

B. Morbidity control strategy based on chemotherapy (mid 1980s–2003)
After the recommendation from WHO expert committee of taking chemotherapy as the main strategy for schistosomiasis control in 1985, Chinese government adjusted the strategy and objective for schistosomiasis control from transmission interruption and/or elimination to morbidity control. Hence, P.R. China carried out large scale chemotherapy to population at risk and livestock concurrently to reduce infection rate and transmission. Health education was implemented to decrease the water contamination among population at risk and improve their compliance to receive screening and treatment. Snail control was also carried out complementarily at the same time. The chemotherapy-based strategy facilitated morbidity control and contributed to the decrease in number of schistosomiasis cases. However, the consolidation task is arduous with the implementation of this strategy since the areas where snail habitats were still extensive, and the reinfections in human beings and livestock were very common.

C. Integrated control strategy aimed at transmission interruption (2004–until now).
To overcome the problem of re-infection in both humans and livestock, a new integrated

control strategy focusing on interrupting the infection of eggs from feces of cattle and humans to snails was introduced in the new round of national control activities launched since 2004. Except routine control approaches such as chemotherapy, molluscicide treatment of snail habitats, and health education, other major interventions including agriculture mechanization (phasing out the cattle for ploughing and other field work), prohibiting pasture in the grasslands along lake and rivers, raising livestock in herds, building safe grassland for grazing, improving sanitations through supplying safe water, building lavatories and latrines, constructing marsh gas pools, and providing fecal matter containers for fishermen's boats, etc., were integrated into schistosomiasis control. Even at the pilot stage, the results showed that this strategy could decrease the prevalence of schistosomiasis to a very low level after several transmission seasons.

3.2.2 Strategies for schistosomiasis control in three ecological endemic areas in China

The project team analyzed three types of epidemic regions by literature review and systematic review. The three types are Marshland, Plain, and Hilly endemic areas.

A. Marshland

Take the city of Jingzhou for example. The region of Jingzhou belongs to Marshland endemic areas, and the city of Jingzhou is one of the most serious schistosomiasis epidemic areas in China and the original place of this disease among 5 provinces of middle and lower Yangtze River, as well. Since the year of 2004, based on national key projects on control of schistosomiasis and Hubei province plan of "county promoting comprehensive treatment" in 2006, general control and prevention measures has been taken by controlling sources of infection, including agriculture mechanization (phasing out the cattle for ploughing and other field work), improving sanitations through supplying safe water, building lavatories and latrines, health education, Oncomelania control, etc. These measures made outbreaks effectively controlled and decreased infection rates of both human being and farm cattle. In the year of 2008, both infection rates have been reduced to less than 5% in 2 counties. There is no outburst epidemic situation and acute schistosomiasis in three consecutive years, which achieved the objectives of control of schistosomiasis. The results showed that the measures of controlling the sources of infection are promising in the regions of marshland.

B. Plain (Inland Waterways)

Take the county of Nanling for example. The schistosomiasis endemic areas of this county were intensively distributed in the range of rivers and channels. In these regions, landscape is flat, climate is mild, soil is fertile, plantation and breeding industry are developed, and it is densely populated. Waterways and channels are intertwined as a water network, extending to farmlands and habitats, which is the main source of water for local residents.

The measures of controlling the sources of infection are able to control schistosomiasis in the inland waterways, among which the key is to manage the excrements from human being and animals. Hence, taking measures, such as agriculture mechanization (phasing out the cattle for ploughing and other field work), prohibiting pasture in the grasslands along lake and rivers, raising livestock in herds, building safe grassland for grazing, improving sanitations through supplying safe water, building lavatories and latrines, constructing marsh gas pools, not only has a reliable foundation, but also is feasible and effective.

C. Hilly and mountainous areas

Chinese hilly areas are mainly distributed in the plateau regions of Yunnan province and Sichuan province, in which its environment is complex and economy is underdeveloped.

These areas were one of most difficult and focused places in control and prevention of schistosomiasis. Since 1980's, after numerous discussion on this topic, though mass chemotherapy combining with snail eradication could greatly reduce infection rates of human and animals, it still could not control those new infections, which means mere chemotherapy is hard to inhibit transmission. In the year of 1985, World Health Organization put emphasis on health education, chemotherapy, improvement of hygiene facilities, and safe water. Therefore, based on real situations of hilly areas, health education and the measures of controlling snails and cercaria also should be developed, while extending the scale of chemotherapy. Although the environment in hilly areas is complex and it is hard to develop working tasks, the measures of controlling snails and cercaria are promising to reduce new infections and super infections. Meanwhile, in main endemic areas, especially in the regions of tableland and valley, pre-chemotherapy should be covered more than 70%. After condition under control, chemotherapy could be selective for the purpose of lowering cost. In the regions of flatland where there are less animal hosts, scale of chemotherapy could be decreased, but controlling snails should be strengthened. In the regions of canyon where there are many animal hosts that are the main sources of infection, because of sales of animals, sources of animal infection diffused largely. These regions should strengthen surveillance of sources of animal infection to ensure the enough scale of chemotherapy.

3.2.3 Effects on schistosomiasis surveillance and response mechanism in eliminated regions

Based on the retrospective study on schistosomiasis in 9 provinces, the historical status of endemic counties both achieved the criteria of transmission control and interruption was reviewed and analyzed. In general, the progress of schistosomiasis control efforts in China was systematically reviewed as well as the determinants which influenced the epidemiological situation of schistosomiasis.

A. Geographical distribution

In China, schistosomiasis was prevalent in 5 provinces, namely, Zhejiang, Shanghai, Guangdong, Guangxi and Fujian. Before transmission was interrupted in these provinces, snail elimination was the main strategy to avoid re-infection after treatment, complemented with diagnosing and treatment of patients to reduce the disease burden. After reaching the criteria of transmission interruption, consolidation of achievements made and surveillance became the priority. Under the leadership of the Chinese Communist Party, the central and local governments, schistosomiasis control was part of the social-economic planning focusing on surveillance with the principle of clear-up cases and prevent from importing, addressing both the symptoms and root causes, always keep-in-mind and consolidation and improvement.

B. Evaluation

Since 2004, snail investigation has been carried out in 1.286×9 m2 areas in the 5 provinces of which molluscicide has been conducted in 2.69×109m2 areas. The total area of snail breeding sites decreased from 1,350,900 m^2 in 2004 to 752,500 m^2 with no infected snails found. From 2004 to 2015, a number of 3,858,394 cases and 424,300 heads of livestock were diagnosed with no locally infected cases. However, there were 235 imported cases including 28 acute schistosomiasis cases. In conclusion, after the interruption of schistosomiasis transmission in the 5 provinces, there are no locally infected patients, livestock or snails through consecutive surveillance. According to the national standard for schistosomiasis control and elimination (GB15976-2015), schistosomiasis is considered to be eliminated in these 5 provinces.

C. Experiences analysis

Experiences are distilled as follows. 1. enhancing the leadership and improving the working mechanism; 2. inter-cooperating among sectors and implementing integrated interventions; 3. strengthening surveillance to prevent from transmission; 4. keeping joint control projects mechanism among provinces to consolidate the achievements; 5. improving surveillance by improved health education and training programs, among which, the smooth operation of a sensitive and effective surveillance system ensure the success.

D. Compare research between China and other LMICs

Compared between the schistosomiasis epidemic and control status in Cambodia, though the epidemic specie is shistosoma mekongi, which only found in two provinces in Cambodia, Stung Treng and Kratie, effecting scale is not broad but suffering serious epidemic in history. Data in 1995 shows the prevalence in total population is 49%, 70% among which are school children. Since 1997, measures of focusing on Massive Drug Administration (MDA) were taken and the epidemic was effectively controlled after several years. Till 2006, the prevalence was decreased to lower than 1%. In this period, the measure taken was similar with China's control strategy in five provinces; however, the situation was not fully reversed as lacking of efficient administration and surveillance system. With credit to the epidemic environment and risk of shistosomiasis was not altered, the shistosoma mekongi cases were still reported frequently, e.g. in 2007, 4 cases were found and in 2008 8 cases were found. Suggestion to this area is to further strengthen the leadership of schistosomiasis control, to establish surveillance system and to develop a multi-sector working mechanism.

3.2.4 Roles of control techniques and products in schistosomiasis control

Based on reference collection and analysis, the role of diagnostic tools including parasitological methods and immunoassays and molluscicides in different control strategies were analyzed：

A.Diagnosis techniques

Over the sixty years, diagnosis play important roles in the process of schistosomiasis control in P.R. China. Reference related with schistosomiasis diagnosis was collected and 109 of them were analyzed deeply to review the development and application of parasitological, immunodiagnostic and molecular diagnostic technology for *S. japonicum* in P.R. China.

The morbidity control stage: During the 1950-1980, there were a large number of people affected by schistosomiasis, and hence high infection prevalence and infection intensity were very common. The etiologic diagnostic techniques including direct stool smear examination, sedimentation, concentration and hatching, combined with a questionnaire approach, were almost compulsory in the identification of individuals for mass chemotherapy because of high infection intensity and toxicity of available effective drugs, e.g. antimonials, for treatment. The development and release of praziquantel for clinical use in the 1970s was a milestone for schistosomiasis control. The dramatical decrease of praziquantel cost in the 1990s made mass drug administration (MDA) possible, resulting in significant reduce of prevalence and intensity of infection. In the implementation of 10-year World Bank Loan Project (WBLP) for schistosomiasis control initiated in 1992 (Chen et al., 2005) in P. R. China aiming for morbidity control, diagnostic strategies varied according to prevalence strata and chemotherapy strategies. For instance, in areas of high endemicity (prevalence ≥15%), all individuals between 6 and 60 years old without examination were given yearly treatment. In areas of medium endemicity (15%>prevalence>3%) and low endemicity (prevalence <3%), residents or special populations were screened by Kato-Katz method or a serological test. The

positives will be given praziquantel treatment.

The infection control stage: The prevalence and infection intensity of schistosomiasis decreased significantly but varied in different endemic areas. The diagnostic strategy also differed according to the situation. Apart from inquiry examinations conducted in villages with prevalence higher than 10%, serological methods were implemented annually, every two years or every three years for residents aged 6-65 years in villages with an estimated prevalence of 5-10%, 1-5%, 0-1%, respectively. Once infected snails were detected, serological survey would be conducted no matter the estimated prevalence of schistosomiasis in the same year (Zhou et al., 2007, Minstry of Health, 2005).

The transmission control stage: The whole country is now moving forward to transmission control, i.e. nationwide prevalence <1% based at the village level. A system with primary immunodiagnostic screen followed by Kato-Katz tests for the antibody-positive individuals was the main diagnostic strategy. However, the Kato-Katz 'missing rate' increases significantly. Although multiple Kato-Katz thick smears per sample, or increasing the frequency of stool sample collection, would boost diagnostic sensitivity, this approach could not be used at a large scale due to the workload and increased costs as well as the risk of waning compliancy. Conducting multiple methods for the same stool sample at the same time would also increase the sensitivity of the diagnostic strategy. Conducting Kato-Katz thick smear method and miracidium hatching technique continuously was integrated In the revised national surveillance system since 2011. An analysis shows that the parasitological final positive rates for individuals testing positively serologically have increased significantly.

The stage of transmission interruption and elimination

The most urgent need at this time is reliable assessment of control efficacy and the determination of target populations for chemotherapy in different areas as well as certification of elimination using sensitive and specific assays. Various molecular methods such as PCR, real-time PCR and LAMP could be conducted in well-equipment hospitals and laboratories; the latter can even be used in the field. Detecting CAg at a previously unimaginable sensitivity and specificity makes it possible to detect infections due to only a few worm pairs. However, further technical improvements may be needed to make the test more convenient, simple and applicable for large-scale field operations.

The diagnostic tools and strategies have undergone shifts according to the endemicity of schistosomiasis and development of diagnostic techniques. As the tools or strategies used in stages of morbidity control, infection control or transmission control were not appropriate to the transmission interruption stage, further studies should be considered to improve or develop assay systems in combination with the sensitivity and specificity

In addition, based on field survey and information searching, there are eight immunoassays widely used in field for schistosomiasis control in P.R. China. IHA, ELISA,DDIA or DIGFA are the common assays. Among of them, five got the license from SFDA and the annual productive capacity of companies could be reached 3 million to 10 million person. Once the demands increased, they can improve their producing line and enlarge their production capacity.

B. Technologies for *Oncomelania* control

Oncomelania control is crucial to China's schistosomiasis prevention and control, is also the important measure for medium and long-term planning in China. Of three snails control

methods, the snail control engineering of ecological reconstruction needs large one-time investment with slow effect, but it is persistently effective, saves resource and improves local environment. It is worth further promotion due to certain economic benefits with the combination of forest and water compound ecological construction engineering.

From 1949 to the middle of 1980, medicines for snail and environmental renovation were taken as main strategies for schistosomiasis prevention and control in China. The molluscacides contain previously applied copper sulfate and calcium arsenite, subsequently used niclosamide, sodium pentachlorophenol, bromine acetamide, smoke acyl aniline and so forth. Niclosamide was remarkably effective to kill snail that snails mortality was 89.2% ~ 96.8% with the dose of 0.5g/（L m^2）, its newest dosage forms are still used in the field (fig. 1. Meta analysis) .

The area of snail reduced by 97. 52% during the period; Guangdong, shanghai, fujian and guangxi provinces (municipalities and autonomous regions) and a large number of counties (cities) have reached the standard of basic elimination of Schistosomiasis successively. From the middle of 1980 to 2004, the laboratories had developed a variety of plant medicinesto control snail, such as the plant agent of saponins and flavonoids for snail control, the molluscacides were not popularized and applied owing to poorer effectiveness than niclosamide and bromine acetamide. Since 2004, the development of snail-control drugs was progressing significantly, the novel medcines for snail control containing chlorinated salicylamide (LDS), the plant agent of LuoWei, cyanogen amine calcium (RongBao) and so on have been developed. The efficiency for killing snails was similar or slightly higher (3.2% ~ 12.1%) comparing with the same dose of niclosamide ethanolamine salt. The new type plant agent have great popularization potential that it was superior to niclosamide ethanolamine salt in toxicity to fish and inhibiting snails climbing up. That ensured the smooth implementation of the control strategy.

To sum up, it was found that the biological methods for snail control with resource saving, environment friendly and benefit mode are effective measures for snail control and the fundamental implementation of schistosomiasis prevention and control according with the concept of sustainable development. At present, the biological methods by preying on snails, controlling snails microbially and competing with snails are still in the stage of experiment due to lack of exploring the mechanism of snail control and large scale application in the spot. Chemical drugs for snail control are extensively adopted with quick effect at present, but new chemical drugs or dosage form needs further development owing to its high price, serious environmental pollution, certain toxicity to humans and animals and consolidate its effect by killing snails repeatedly. Now the plant agent for killing snails has become key direction in the screening of snails-killing drugs because of its high efficiency, low toxicity and degradation easily. At present, the novel medicine –“NuoWei” extracted from plants has been widely used in different endemic areas of Schistosomiasis. The application of biological technology such as gene engineering provided scientific direction for drug screening, promoted the development and application of new type of high-efficiency and low-toxicity biomimetic drugs. Nowadays, there are still a large area of *oncomelania* snail distribution and breeding environment for snails are very complex in China, single control measure is difficult to achieve the goal of eliminating snails. Therefore, we should comprehensively implement snail control technology that adjusts measures to local conditions and investment according different environment of epidemic area with Schistosomiasis.

3.2.5 Standardization of evaluation criteria in schistosomiasis control and elimination stages

A. History of Standardization of evaluation criteria for schistosomiasis control

During process of controlling and eliminating schistosomiasis, Control and Elimination Criteria for Schistosomiasis has been revised for six times, which played an important role at various stages. The first Criteria raised in the year of 1958 acted an instructive role in the primary-level work, even though lacking of strong scientific standard due to historical background and limited technology. The second version of Criteria did not use the transmission index but more relative value to measure working effect in 1977. Although the third version of Criteria played a big part in promoting controlling schistosomiasis in the endemic areas of waterways in 1980 and required no new infection and no snail in three consecutive years, yet Criteria could not be adapted in the marshland and hilly endemic sites. When revised in 1985, the fourth version of Criteria raised the standard of eliminating sources of infection but relaxed restrictions of snails, due to widespread application of praziquantel. Based on the epidemiological theories and concepts, an improved Criteria was enacted. The Criteria divided objectives of controlling schistosomiasis into epidemic control, transmission control and stop, and the Criteria contained related technical indicators and standardized measures of prevention, as well. Department of Health organized experts to revise the Criteria, because of reemergence of outburst of schistosomiasis, several clauses, however, have problems in terms of nature of science, objectivity, feasibility, and operability.

B. Experience of revising schistosomiasis control and elimination criteria

Revising assessment methods, indicators of elimination phase, and epidemic control, transmission control and stop acted a major part in practice and thus promoted process of control and elimination of schistosomiasis. The revised Criteria experienced literature review, retrospective survey, expert argumentation, and index improvement. Firstly, after reviewing relative articles, problems regarding the nature of science and feasibility in the revised Criteria were analyzed, and then content and index were realized that they should be edited in the aspects of transmission dynamics theories. Secondly, through retrospective survey, after controlling and inhibiting transmission, infection rate would maintain in a lower level, but situations of snails deteriorated. By investigation, experts suggested that the nature of science and operability of index reflecting situations of snails should be improved, it is necessary to ameliorate the system of surveillance, and terminology and assessment methods should be standardized. Finally, index of evaluation and system of assessment for different goals of control of schistosomiasis were improved, and revision was done. The Criteria made following changes. The first change is the name edited as Control and elimination and schistosomiasis and the term eradication was replaced by elimination. The second is revision of index of snails in the phase of inhibiting transmission and more requirements of surveillance system. The third is adjustment of appendix.

C. Lessons from revising criteria for schistosomiasis control and elimination

A Criteria, which is fitting current situation of schistosomiasis characteristics, with feasibility and nature of science, is definitely conducive to the process of control and elimination of schistosomiasis. Revising the Criteria requires not only practice experience in building laboratories and emphasizing snails on eliminating schistosomiasis, but also theoretical basis including developing system of surveillance and threshold of schistosomiasis transmission. In the phase of elimination, a sensitive surveillance should be constructed, which ought to be able to detect changes of epidemics, killing new epidemic in the cradle. It will be a vital part of eliminating diseases and consolidating achievements. Reviewing the history of revising the Criteria could help staff working in the China and other underdeveloped countries know better

the patterns of schistosomiasis diseases and promote the global process of eliminating schistosomiasis.

3.3 The feasibility of applying China's experience in tropical disease control or elimination to other LMICs

The feasibility of the application of Chinese experiences on tropical diseases control into the selected African countries was demonstrated. By collecting the historical papers and field visiting of Tanzania and Cambodia, the feasibility was analyzed and established relating model for applying Chinese experience.

3.3.1 Data collection

A. Malaria data collection of Tanzania

Since 1972, after the independence of Tanzania, the Ministry of Health and Social Welfare (MoHSW) and National Malaria Control Program (NMCP) formulated strategies on malaria control. Meanwhile, as international organizations and foundations initiated health promotion projects, therefore, the malaria epidemic data was relatively comprehensive and was collected through literature review and data bank searching.

B. Schistosomiasis data collection of Asian countries

To collect schistosomiasis data in Cambodia and in other Asian countries, the schistosomiasis expert group held a working meeting by the occasion of the 15th Meeting of Regional Network on Asian Schistosomiasis and Other Helminthes(RNAS+), participants were from institutes and international organizations of the Philippines, Indonesia, Cambodia, the Laos, Japan, Korean, Vietnam. By over 20 reports of Network member countries, the schistosomiasis epidemic status and control information in 10 Asian countries were collected.

3.3.2 Field visiting

2 teams of experts visited Tanzania and Cambodia for meeting with local administrators and technical staff to: understand the malaria and schistosomiasis epidemic control status and administration modes, the related social, political, economic and health status. After the visit, the objectives and needs of tropical disease control and elimination were analyzed, the gaps of control intervention were proposed, which laid a foundation for planning the pilot project.

A. Investigation for malaria pilot project in Tanzania

To understand the malaria epidemic and intervention status and to fix the proposal for China-Tanzania malaria pilot project, the malaria expert group visited Tanzania for the malaria control workshop and made field investigation with local partner Ifakara Health Institute (IHI), National Malaria Control Program, and international partners from Duke Global Health Institute (DGHI), WHO Regional Office, in Sep.2014 in Dar es Salaam.

Based on the results of baseline survey, the working group and partners determined the pilot area and the contrast area; fixed the work plan and budget; updated the proposal for Tanzania malaria control pilot project for 2015-2017. According to the proposal, the pilot project adopts the T3 strategy of WHO as the intervention measure. Currently, the project has been admitted as GHSP OP4 and launched in 2015.

B.Field visit for schistosomiasis epidemic and intervention model in Cambodia

schistosoma mekongi is epidemic in the Stung Treng and Kratie province in Cambodia along the Mekong River. Surveillance data in 1995 showed that the prevalence was 49% and 70% of which were school children. Start from 1996, the Mass Drug Administration was taken as the

main intervention and the prevalence decreased into lower than 1%. Since then, few cases were reported, e.g. 4 cases in 2007 and 8 cases in 2008 were reported.

To understand the schistosomiasis intervention and administration mechanism as well as the social, political, economic and sanitation environment in Cambodia, and to explore the feasibility of applying China's experience into other LMICs, the schistosomiasis expert group visited Kratie, epidemic region in Cambodia for field visit and workshop on schistosomiasis control in Mar. 2015. The official of Cambodian Ministry of Health and experts on Schistosomiasis attended the workshop.
Both parties discussed on the control and administration mechanism in China and Cambodia, afterwards, they visited 3 epidemic villages for understand their living facilities, habits and way of production. The three villages located in the bank of Mekong River, which was the most intensive area for schistosomiasis epidemic. The villagers were farmers and fishermen whose water resource is from Mekong River, which increased their risk of infecting schistosomiasis. Currently, local intervention strategy contains Epidemiology survey, MDA, surveillance and case management, combining with health education and latrine reconstruction project. However, as the high mobility of population, the intervention confined on people is not enough, measures on control of intermediate host should be taken into consideration.

3.3.3 Systematic Review

In order to understand the social, economic and political factors that could potentially influence national disease control and prevention measures, the disease epidemic trend and the prevention and control of tropical diseases. The opportunities and challenges to apply the experience of prevention and control strategies, techniques and products of tropical diseases from China to African and Asian LMICs. In June 2014, NIPD conducted investigations and interviews named "the opportunities and challenges of China to transfer malaria and schistosomiasis experience to African countries" to 141 professionals in the fields of global tropical diseases.

The outcome indicated that: 1) LMICs need support in manpower, technique, medical policy research, finance and information management urgently. Public health aid and training is the most efficient way to provide support instead of simply providing financial support or holding international meeting etc. 2) the challenges that China will face is not limited to the widely accepted reasons such as communication barriers and cultural differences but also lacking of experiences in coping with those epidemics as they might has different significance and transfer in different ways. Additionally, the political factor could also a challenge as the African countries have different legal policy. 3) In the areas including disease surveillance, laboratory techniques, diagnostic tools development, media control, China has gained recognition in these areas and the future is promising. 4) Besides, the existing challenges that from local such as social factors, economic factors, political factors, the weak health systems. However, those can be considered both as a challenges and chance of promotion and development of Chinese experience in African countries.
An essay named "The Opportunities and Challenges for China to Participating in Controlling and Eliminating Schistosomiasis and Malaria in Africa: Results from an Interview Survey" has been formed and will be published soon.

3.3.4 Analysis on the mechanism of disseminating Chinese experience

In order to summarize the prevention and control experience in china and make them applicable to LMICs and improve the effectiveness of the interventions and also with the

expectation to apply the experience to more regions, two Chinese experience promotion patterns were concluded.

A. From point to scale--magnify the influence by disseminating strategy and experience
a. Established a model by the pilot project in Tanzania
Collaborated with Ifakara Health Institute (IHI), postdoctoral fellow (Samson Kiware), launched *Bioinformatics system and mathematical models for improved understanding of malaria control and elimination,* provided the standardized tool for mosquito-borne biology and built the information system and mathematical model for china to implement interventions in Africa on malaria prevention and control in the future.
b. Experience transfer by China's vector control techniques
Collaborated with Theodor Bilharz Research Institute (TBRI), postdoctoral fellow Mohamed Habib conducted a research named *Identification of Biomphalaria species, potential hosts for schistosomiasis mansoni, in Southern China and determining their spatial distribution*. This research put Chinese experience of oncomelania control techniques into practice in *Schistosoma mansoni* epidemic in Egypt, which has a significant impact on transferring China's malaria control techniques into a feasible model to apply to Africa.
c. Feasibility Analysis through China-Africa cooperation
Cooperated with Dr. Ernest Tambo from the University of Pretoria in South Africa, conducted the research named *China–Africa Cooperation Initiatives in Malaria Control and Elimination*, which reviewed the history of China-Africa cooperation in prevention and control malaria, analyzed the challenges and opportunities of the control and prevention of malaria in Africa, and raised the scope and mechanism of China-Africa collaboration on malaria control.

B. Capacity building-- to disseminate the techniques and products for disease prevention and control
In order to promote China's professional ability to translate Chinese experience of tropical diseases, the postdoctoral fellow (Peiling Yap) from Swiss tropical and public health institute (Swiss TPH) was introduced to NIPD to carry out the *neglected tropical diseases prevention and control work experience training materials and platform Development, Development of would materials and working platform on the control experiences of neglected tropical diseases)*. According to the Swiss TPH's decades working experience in Africa, combining the characteristics of Chinese professional and technical personnel, a set of training materials were developed. The training can effectively promote the transforming ability of professional experience after the test.

3.4 Dissemination and translation of Chinese experiences and technologies on malaria and schistosomiasis

To accelerate the dissemination of China's disease control strategy, experience, techniques and products through different media, effects, e.g. establishment of China-Africa working mechanism on tropical diseases, exchanged techniques, accelerated the transfer of China's technology and disseminated China's experience, was made by implementing the following activities:

3.4.1 Established international collaborating networks

A. Upgraded the current networks-- Regional Network for Asian Schistosomiasis and Other Helminth Zoonoses(RNAS+), Chinese Network on Drug, Diagnosis and Vaccine Innovation (China NDI), these two network's websites were maintained and updated regularly. (http://www.rnas.org.cn:8080/rnas/, http://www.asiandi.org)

B.As the collaboration with African countries deepening, China NDI together with African Network for Drugs and Diagnostics Innovation (ANDI) applied the grants from WHO by project- *Development of easy to use and affordable biomarkers as diagnostics for Types II and III diseases*, and was admitted in 2015 as one of the 4 innovative research projects.

C.Made partnership with 7 international institutes (mostly are from developing countries) and signed MoUs, including Ifakara Health Institute (Tanzania), Theodor Bilharz Research Institute (Egypt), Blue Nile National Institute for Communicable Diseases of University of Gezira (Sudan), Center for Sustainable Malaria Control of University of Pretoria (South Africa), Universite des Montagnes(Cameroon), Duke Global Health Institute (USA), and The London School of Hygiene & Tropical Medicine (UK).

D.Initiated the Institutional-based Network of Cooperation between Africa and China on Schistosomiasis (INCAS), and signed the MoU on establishing the network during the 2nd Ministerial Forum of China-Africa Health Development (October 6, 2015, South Africa) between National Institute for Medical Research, Mwanza Centre (Tanzania), College of Health Sciences, University of Zimbabwe(Zimbabwe), Faculty of Sciences, University of Yaound é I (Cameroon), Institut National De Recherche En Sant é Publique (Mali), Blue Nile National Institute for Communicable Diseases University of Gezira-Wad Medani (Sudan).

3.4.2 Symposium on Surveillance and Response System on Tropical Diseases Elimination

Symposium on Surveillance and Response System on Tropical Diseases Elimination was held in June, 2014. During the symposium, experts on tropical diseases together reviewed the research progress on surveillance and response system leading to tropical disease elimination, discussed the impact of surveillance and response system on promoting the tropical diseases elimination, and explored the possibility of bilateral and multilateral cooperation aiming at tropical diseases elimination and corresponding mechanism. Moreover, experts specially discussed the construction of Sino-Africa schistosomiasis network, malaria elimination strategies and cooperation. Meanwhile, on the occasion of 140th year's anniversary for the discovery of Clonorchis sinensis infection, strategies on the disease control and elimination were also discussed in this regard. Experts from 20 originations in 18 countries across the world participated in the meeting including universities, institutes and NGOs. Meanwhile, domestic experts from 10 organizations in China including universities, institutes and CDCs also presented in the symposium. Working through multi-disciplinary will be of great significance to promote learning trend and prevention measure of global tropical diseases.

3.4.3 Published international journals and books

A. English journal

The online open access Journal, *Infectious Diseases of Poverty* was published cooperated by the international publisher BioMed Central. It aims to publish original and empirical work, e.g. scoping reviews or original articles, on trans-disciplinary research and discuss public health issues which affect mainly poor populations. It has published 5 volumes consisting of 171 research papers and review from more than 50 countries. It provides a scientific forum for global researchers to discuss questions and communicate ideas about the prevention and control of tropical diseases and disseminates Chinese experience and technology on it. The first impact factor of this journal in 2014 reached 4.11.

Website: http://idpjournal.biomedcentral.com/

B. Books

Under the support of the project, the special issue *Malaria Control and Elimination Programme in the People's Republic of China* was published by Advances in Parasitology. The issue contains 12 papers on Historical status of malaria at national and provincial levels, working plan and preparation activities for the NMEP in China, pilot experience for malaria elimination at county and provincial levels, preparation for malaria resurgence in post-elimination phase at local level, distillation and transfer Chinese experiences on transition from malaria control to elimination. Furthermore, the special issue on Schistosomiasis experience will also be published by June 2016.

3.4.4 Establishment of Global Health Branch of China Preventive Medicine Association

In order to build a team of experts from global health and other related fields, foster a group of high-quality staff in the field of global health management, and promote effective communications with relevant international organizations, National Institute of Parasitic Diseases drafted a plan for the establishment of Global Health Branch of China Preventive Medicine Association, held the first preliminary meeting, asked for advice to experts, professors, and government officials, and then revised the overall plan in the year of 2015. This series of actions will make China play a bigger role in the international stage and greatly influence the world. The defense for establishment of this branch will be held approximately in March, 2016.

This branch will be built as a new platform of global health in our nation, integrating experts from different fields and levels, developing research and practice in management and diplomacy of global health, and helpfully exploring the development of global health. The establishment of this branch will mark a further connection with international practice by China Preventive Medicine Association, a more efficient use of resource, experience, and platform, and a promotion of overall capability.

3.4.5 Establishment of Strategic Consulting Expert Database of Tropical Diseases

In order to comb information of experts from global health and tropical-related fields and acquire professional consulting service timely, Strategic Consulting Expert Database of Tropical Diseases was established through the way of collecting and organizing contact information of past partners and professional information as materials for the database, and the technique of website development platform. This database contains the functions of information input, search, management, and output.

Information of expert includes contact information, field, work unit information (title, unit name, department, address, nation, province, city, and website link). In this database, expert's resume and his or her photo can be uploaded and saved, and search function supports compound, fuzzy, and "AND/OR/NOT" conditional query in each field. So far, this database has been launched and continually updating information.

4. Results and Influence

4.1 Results

4.1.1 Synthesized Chinese experience on control and elimination of malaria and schistosomiasis

Since 1949, this is the first time the Chinese experience on control and elimination of malaria and schistosomiasis be synthesized in the past 60 years and translated into English for experts and scholars in global health community. The experiences were categorized by time, geographical types and strategies.

To summarize the first and second part of this project, China's experience on malaria control

is --mobilizing the population to be group screened and treated, control the vectors and infection source as mosquitos, in epidemic season to reduce malaria burden; China's experience on malaria elimination is—under the support of government, mobilize multi-sectors to for effective and sustaining surveillance and response with upgrading surveillance techniques and tools to clear the final malaria sources and stop the transmission. China's experience on schistosomiasis control is—under the support of government, adapting the strategies to local settings, group treated, effectively reduce the coverage of Oncomelania to reduce transmission; China's experience on schistosomiasis elimination is—under the support of government, collaborating with multi-sectors to implement the strategy of integrated control strategy of focusing on control of infection source,reducing infection of human and animals, to stop transmission of schistosomiasis.

4.1.2 Analyzed the malaria and schistosomiasis control demands in LMICs

The malaria and schistosomiasis control demands and challenges in LMICs were investigated and be listed by priorities from global health perspective, which helps to design the disease control strategy catering to the needs of LMICs. The following chart demonstrated that the prior needs of malaria control in African countries are capacity building, techniques and products, collaborating with Chinese experts.

Challenges	Votes/Sample Size
Human Resource	85.71%
Diagnostic Tools	71.43%
Medic	57.14%
Financial Support	57.14%
Drug	57.14%
Expert	42.86%
Distant Health Center	42.86%
Sustainable Government Commitment	28.57%
Leadership	14.29%
Management	14.29%
Education	14.29%
Experience	14.29%
Health System	14.29%
Surveillance System	14.29%
Health Behavior	14.29%
Transportation	14.29%
Government Structure	14.29%

Chart 1 Survey on malaria control challenges in Africa

4.1.3 Defined the strategies and techniques could be introduced from China to LMICs

After the development mechanism of China Medical Team, proposed the mechanism and method that could be introduced from China to African epidemic countries and laid foundation for next step of pilot studies. The mechanism could be: disseminating China's experience, techniques and products by starting small while magnify its influence; "One province to one country", by make partnerships between China's provinces and African countries, to expand the development effectiveness.

4.2 Influences

4.2.1 Malaria and schistosomiasis were listed into the Four key collaborating items of China-Africa health development

By the implementation of this project, China's experience on malaria and schistosomiasis was highly valued by China's NHFPC (Ministry of Health). In Oct. 2015, on the 2nd Ministerial Forum of China-Africa Health Development in South Africa, Ms. Li Bin, the commissioner of NHFPC, indicated that for the next step collaboration between China and African countries, control of malaria and schistosomiasis, maternal health, reproductive health will be the key areas to address.

4.2.2 NIPD, China CDC became a leading center for tropical diseases in Asia, and have influence internationally

Facilitated by this project, NIPD actively engage itself to global health practice, not only expand its professional scope, e.g. renamed from WHO Collaborating Centre for Malaria, Schistosomiasis and Filariasis to WHO Collaborating Centre for Tropical Diseases; but also appointed by China Ministry of Science and Technology (MoST) as National Center for International Research of Tropical Diseases; started partnership with 14 institutes of Africa and signed MoUs respectively; initiated the Institutional-based Network of Cooperation between Africa and China on Schistosomiasis (INCAS); granted the WHO Health R&D Demonstration Project with African Network for Drugs and Diagnostics Innovation (ANDI) by the proposal --Development for easy to use and affordable biomarkers as diagnostics for types II and III diseases, became a tropical disease control center with influences globally.

4.2.3 Stepped out for transferring China's experience on malaria and schistosomiasis to other developing countries and sought a stage for the sustainable development of China's tropical disease control expertise

Except for exploring the China-Africa cooperation priorities and mechanism, NIPD also transformed itself by role and by function. In China's tropical diseases eliminating period, it sustained China's expertise on tropical disease by transferring it into feasible experience to other LMICs. This provided an adoptable mechanism for the sustainability of other disciplines in China.

4.3 The limitations of the project

4.3.1 Limited time for field work

During the research process, experts from developing countries were invited to China to offer information about current situation of disease prevention and control. The chance to conduct field work was also limited, which means there is little chance to acquire thorough information from those LMICS. More cooperation with local health workers should be done to have a better understanding of partners and the environment of the working fields.

4.3.2 Limited range of research and collaboration

In terms of the feasibility study, only one Asian and one African Country were selected for study. Even though both of them are the typical examples, however, they cannot represent other Asian and African countries. The future work should base on the outcome of this project and expand the study to a wider area to improve the transferability of the prevention and control experience of China.

4.3.3 China's experience has not been fully tested

The current test in Tanzania is only limited to review, instead of the activities in the real world. The applicability of China's experience in endemic countries need to be tested in real practice.

Annex Financial Report (Omitted)

OP102 Global Health Institute of Fudan University (FGHI)

Output 102 Global Health Core Research: Sub-project in Reproductive Health/Maternal and Child Health
Final Report

Abstract
Global health Support Programme (GHSP) has been launched by Ministry of Commerce of People's Republic of China, in collaboration with Department for International Development (DFID) of United Kingdom Government, which is a China-UK partnership contributing to improved global health policy and outcomes. In Dec. 2013, Fudan Global Health Institute became the PIA to take charge of conducting "Consulting Service for Research on Reproductive Health / Maternal and Child Healthcare in Global Health in China" (GHSP-CS-OP1-02). Until now, this this project has been basically finished.

1. Research design and methodology
Research goal: To generate the experience and lessons of China's policy development and implementation in promoting maternal and infant health and child nutrition, to explore the dissemination strategies, and to develop country specific proposals for other low and middle income countries in order to improve maternal and infant health and child nutrition there. During the knowledge generation and dissemination process, the institutional research and dissemination capacity are expected to be improved and institutional partnerships are to be further promoted.

This project included 8 work packages: WP1 Project coordination and management, WP2 research capacity development, WP3 Policy process study and historical analysis, WP4 Safe motherhood, WP5 PMTCT, WP6 Child nutrition, WP7 international dissemination study, and WP8 knowledge management. The main method used in this project included, literature review, key informants interview, focus group interview, expert consult, stakeholder meeting, field survey, etc.

8 institutes participated this project, included: Fudan Global Health Institute, Duke Global Health, Liverpool school of tropical medicine, Peking University, Haoi School of Public health, Laos's national institute of public health, Ghana University and Guangxi Zhuang Autonomous Region.

2. Outputs and Outcomes

2.1 Project implementation

At the beginning of this project, a series of implementation mechanism was established to make clear the job allocation, budget allocation between partners. 7 cooperation agreements were signed based on this mechanism. During the process of implementation, project management meeting was held once a year, and all the partners were required to attend. Moreover, regular meeting was held once a month in FGHI to make sure the timely communication and negotiation. Besides, we established a file sharing system using the cloud storage technology, and develop the internal regulation of sharing.

2.2 Capacity building

At the beginning, a baseline survey on capacity evaluation was carried out by web for all the project participators, to find out the capability defects which might be met during the implementation of OP102, and to develop the training need and program.

After that, 3 training workshops were carried out, including 1) training on systematic review methods, 2) Training on the mixed evaluation methods on empirical studies, and 3) Training on practical knowledge in global health practice. Around 100 persons attended these workshops, and the training material were collected (see appendix).

Besides, 4 core members attended a one-week training program on writing in England, and 4 academic articles were drafted as the outputs of this trip.

2.3. Summarization of the experience in the implementation of the project on maternal and children security and children nutrition

China's experience was extracted mainly through case study. We determined three cases as maternal and children security, interruption of disease transmission from mother to infant and the improvement of children's nutrition based on the existed literatures. Implementation experience which made the major contribution to the improvement of the health outcome was summarized and listed through literature study, informant interview and expert meeting. Eight implementation experience and 2 lessons were eventually summarized after verification with the informants and stake holders and accepting helpful suggestions from the partner countries.

8 implementation experience: **for safe motherhood**, 1) Linking Pregnant Women to Health Facilities for Childbirth: Transforming the Role of Traditional Birth Attendants in Rural China, 2) Multiple Measures to Alleviate Financial Burden of Facility-Based Childbirth, 3) Sending specialists to county referral centers：an effective way to improve obstetric services in rural areas. **For the PMTCT**, 1) Multi-department linked prevention system for PMTCT of HIV, syphilis and hepatitis B virus, 2) Top-down strategies to increase coverage of neonatal hepatitis B vaccination. F**or the child nutrition**, 1) Poverty alleviation program is a fundamental way to alleviate and eliminate child malnutrition, 2) implementing child nutrition promotion program in poor rural areas is an effective way to improve child nutritional status.

And 2 lesions: 1) the strength of government supervision to the market affected healthcare directly under the market economic system, 2) the significant impact of the changes of China's government-oriented health care system on health services utilization of rural population.

2.4. Applicability study on implementation of China's experiences in other countries

This study aims to analysis the gaps among Vietnam, Laos, Ghana, and China on country context, to identify the priority problems related to maternal and child health and child nutrition in three countries, and to develop the country implementation proposals on the potential intervention chosen from the synthesized China implementation experiences based on the individual demand of health and policy.

2.4.1 Country proposal of Ghana

Based on three guiding principles learned from the successful Chinese experience at reducing maternal mortality, including coordinated effort from all stakeholders, monitoring and evaluation, and accountability mechanism, this proposal, named "**Supportive Supervision to Strengthen Maternal and Child Health in Ghana**", aims to create and test a system of supportive supervision for MNH in Ghana. In other words, the goals of this project is to establish the internship bases for MCH training in district hospitals in Ghana and to make fully application of them under the supervision of experts.

2.4.2 Country proposal of Vietnam

Hanoi School of Public Health adopted experiences of three Chinese cases to develop three country proposals which are consistent with national health strategy of Vietnam.

1) Implementation plan for enhancing the sustainability of breastfeeding hospitals. The borrowed experiences are: clearly stated government actions, establishment of supportive system for breastfeeding education and breastfeeding, supervision of milk market and baby-friendly hospitals, and enhancing re-assessment of baby-friendly hospitals.

2) Role of village health workers network to promote institutional based childbirth in rural areas in Vietnam. Vietnam propose to implement the similar intervention to replace the TBAs of well-trained ethnic village midwives to advocate women to use the institutional childbirth services in order to expand the coverage of healthcare services to community or village level.

3) HIV prevention from mother to child in Vietnam: Barriers to access and utilization of services and measures. The evidence from China shows that it is feasible and effective to implement the integrated services for preventing mother-to-child transmission of HIV/AIDS, syphilis and HBV for pregnant women. The research team of Vietnam aims to identify the barriers to PMTCT related services and to implement the pilot integrated PMTCT model borrowed from China in one selected site.

2.4.3 Country proposal of Laos

The proposed research on **"Health workers' capacity in skilled birth attendance at Vientiane Capital health centers: the health challenges"** will explore the knowledge and practices on skilled birth attendance of health personnel working at remote health centers under responsibility of Vientiane Capital Health Department. The study will also try seeking information on their knowledge on maternal health and their routine work in the provision of health care services to expecting and postnatal mothers.

The NIOPH in Laos proposes the program of improving the nutrition of children in underdeveloped areas based on the experiences of China. The main interventions in this

project includes: to hold to carry out health education activities and trainings in various approaches for improving health education; to advocate community to support this program; to engage primary health workers to disseminate the knowledge on child feeding; and to develop the cross-sectional collaboration and administration network for supporting this program.

2.5. Knowledge management and dissemination

Seven research papers were produced as the scientific outcome of this program. Eight policy briefs were written based on the principle of conciseness and convenience to disseminate the phased outcomes to the targeted audience. A book was produced based on the technological research reports formed through this project, acting as a communication carrier of case studies to the public. Besides literal communication, we also organized several meetings for dissemination and the literal material of these meetings were collected in the meeting document compilation.

3. Reflection

3.1 Chinese Experience

The so-called "Chinese Experience", is to explore and formulate a set of effective practical measures toward the specific problems during certain contextual and historical background in different development background. From this study, a large number of review on the existing literature and report indicate that the Chinese experience safe motherhood and children nutrition mainly includes: the setting of development goals, the practical implementation pathway, and the effective method for good performance. This study is just a summarizing of those conventionally acknowledged measurement with Chinese character.

These two major determinants should be taken consideration when apply Chinese experience to other countries. From the contextual situation of the three partner countries, Vietnam is most similar to China in terms of culture and institutional framework, Laos is also similar in the political infrastructure, but far left behind in reform and opening-up compared with China and Vietnam. This is why the researcher from Laos worried about the applicability of Chinese experience in Laos. Ghana has quite different institutional and cultural background to China, especially the gaps in health human resource, therefore, Ghana want to firstly learn the Chinese implementation mechanisms for strengthening primary health worker’s capability.

3.2 Limitation

- Due to the limitation in time, funding and staff professional background, the results of this study show only part of China MCH experiences and lessons, and cannot show the whole picture.
- Lack of sufficient relevance in evidence between the measurement and effect.
- Inadequacy on interdisciplinary study.

Chapter 1 Background

China had achieved profoundly the improvement of health for its people with limited financial and human resources over the past 60 years since the founding of the People's Republic in 1949. These achievements were due largely to the development and implementation of appropriate health policies emphasizing primary healthcare, infectious disease control and strengthening grass-root healthcare networks, as well as the development and implementation of other astute public policies such as education, nutrition, water and sanitation as well as poverty reduction. While China's health development has changed significantly, global health challenges have also been evolving rapidly. In recent years, Chinese government agencies and international philanthropic organizations/communities have recognized that experiences/best practices and lessons learned from China's health development over the past six decades could be relevant and very useful in supporting the achievement of Health-related MDGs and post-2015 sustainable health development in low- and middle income countries, as China is playing a more and more important role in supporting these countries' socio-economic development. In the meantime, there are demands to strengthen the capacity of Chinese institutions engaged in global health activities by utilizing Chinese resources and experiences.

Against this background, Ministry of Commerce of People's Republic of China, in collaboration with Department for International Development (DFID) of United Kingdom Government, has recently launched "Global Health Support Programme (GHSP)", which is a China-UK partnership contributing to improved global health policy and outcomes. The programme will help China improve its contribution to global health and achieve the potential of its collaboration.

GHSP is implemented from 2012 to 2017, with a total budget of £12 million. Four outputs will be achieved through a series of planned activities：1）Increased ability to distil, disseminate and apply Chinese experience in improving health outcomes and strengthening health systems; 2）Improved understanding amongst Chinese officials and researchers of best practice in international health development cooperation (including bilateral and multilateral); 3）Enhanced ability of Chinese officials and researchers to contribute to global health policy and governance; 4）Pilot partnerships to apply China's experience and international best practice in development cooperation in low income countries (including at least one Asian country).

To achieve the outputs above, GHSP will select several programme implementing agencies (PIAs) to take the following responsibilities. In Dec. 2013, Fudan Global Health Institute became the PIA to take charge of conducting "Consulting Service for Research on Reproductive Health / Maternal and Child Healthcare in Global Health in China" (GHSP-CS-OP1-02).

The objectives for this project are to analyze, synthesize and distil China's experiences and lessons in lowering the maternal mortality rate (MMR) and infant mortality rate (IMR) over the past 6 decades, and propose their significance and relevance to low- and middle-income countries.

The research is expected to be conducted to address a number of following key issues and questions in tendering research area, through collaborations with at least one of

Asian/African low- and middle-income countries, and at least one of OECD countries such as UK:

- What has China succeeded in improving health outcomes through delivery of health care services in tendering research area over the past 6 decades? What criteria and evidence can we use to support these claims? What are the key factors of the successful experience? Which successful experience can be learned by other low- and middle-income countries given the histories and contexts are so different? What criteria and evidence can we use to support these claims?
- What lessons has China learned from improving health outcomes through delivery of health care services in tendering research area over the past 6 decades? Why are these lessons relevant and useful to other low- and middle-income countries? Can these lessons help other countries to avoid mistakes and improve their effectiveness in scaling up health interventions?

In addition, comparative studies on tendering research areas between China and other low- and middle–income countries must be part of scope of the work to decide which experience can be learned by other low- and middle-income countries.

These selected tenderers are also expected to organize appropriate activities to disseminate their research findings and results through a number of channels, such as presentations at national and international conferences, organization of dissemination workshops, publications of peer-reviewed articles, etc. In addition, they will also be required to provide advice or feasible programme work plans for the future pilot partnerships to apply the Chinese experiences and good practices in low- and middle income countries supported by GHSP, based on the evidence generated from the analysis, synthesis and distil of existing research in relevant areas.

The expected outputs include: 1) Increased research capacity in global health, especially in distilling Chinese experience in improving health outcomes and strengthening health systems, from global sharing perspective. 2) Establishment of research partnerships, particularly with low- and middle income countries. 3) Research reports and policy briefings. 4) Publications of peer-reviewed articles at international journals, books and book chapters. 5) Research dissemination events with researchers and public health officials from Africa or Asia or even other continents, such as organizing seminars and workshops.

Chapter 2 Research Design and Methodology

1. Research Questions and Research Goals

This project focuses on the Policy process, implementation experience, historical lessons and international dissemination of maternal and infant health and child nutrition in Chin. How has the Chinese government made such remarkable progress in MCH and child nutrition during the process of achieving Millennium Development Goals? What experiences and lessons could other low and middle income countries learn from China in promoting maternal and child health and children nutrition?

1.1 Research goal:

To generate the experience and lessons of China's policy development and implementation in promoting maternal and infant health and child nutrition, to explore the dissemination strategies, and to develop country specific proposals for other low and middle income countries in order to improve maternal and infant health and child nutrition there. During the knowledge generation and dissemination process, the institutional research and dissemination capacity are expected to be improved and institutional partnerships are to be further promoted.

1.2 Specific objectives:

(1). To review and analyze China's policy process. To review the development and evolution process of China's national plans of action relevant to MDG 4, MDG 5 and child nutrition. This will enable identification of the relevant targets, strategies and content set at the national level, the interpretation of the policy at provincial level, the roles of actors and stakeholders and their relationships, the regulation approaches during the implementation process, as well as the monitoring and assessment mechanisms, and accountability mechanism, in the "Two China's national plans of action" since 1990 (research goal). To generate experience from the policy process of maternal and infant health and child nutrition as well as its implementation in achieving the MDGs. To disseminate these experiences such as multi-sectorial collaboration, scientific regulation approaches, effective assessment and accountability mechanisms to other low and middle income countries to promote evidence-based decision-making and policy implementation (policy objective).

(2).To synthesis and generate the implementation experience. To generate implementation experience through systematic reviews on China's intervention strategies for safe motherhood, prevention of mother-to-child disease transmission (PMTCT) and child nutrition in poor, remote mountainous and ethnic areas (research goal). To summarize and disseminate experience of overcoming structural barriers and health system barriers during maternal and infant health policy process to improve health inequalities in other low and middle income countries (policy objective).

(3). To collect and summarize the lessons. To collect the historic records of China's MCH in the past 6 decades, especially to identify any turning points or milestones at different historical stages. To explore how the relationship of the policy issues, policy strategies and political wills can impact on health (research goal). To summarize the historical lessons from China's long-term practices for maternal and infant health and child nutrition to help other low and middle income countries to avoid detours and improve the efficiency of policy processes (policy objective).

(4). To explore and develop strategies and proposals for dissemination. To explore and

develop country specific proposals including effective dissemination strategies and outreach programs of Chinese experience on maternal and infant health and child nutrition, based on the context analysis of Laos, Vietnam, and Ghana (research goal). To provide support for Laos, Vietnam and Ghana to accelerate progress towards MDG4 and MDG5 through improving policy processes and implementation of effective safe motherhood and child nutrition strategies to address health equity (policy objective).

Other objectives:

(5). To strengthen the capacity of research institutes to summarize and disseminate experience of China maternal and infant health.

(6). To improve the understanding of health practices on maternal and infant health in other low and middle countries among research institutes.

(7). To promote partnerships and sustainable cooperation between South-North and South-South institutes.

(8). To help other low and middle income countries to develop evidence-based policy and effective implementation plan based on the research findings.

2. Main Research Methods

The research methods listed in this section are based on the research questions mentioned in Background section, the research objectives outlined in the Goal and Objective section (Table1). In addition, research methods and technical approaches will be continuously improved through research capacity building, during the project implementation process.

Table 1 Research questions, research objectives and methods

Research Questions	Research Objectives	Research Methods
Why is China able to be on track for achieving MDGs in terms of maternal and infant heath and child nutrition?	**1. To review China's policy process** **1.1** To review the development and evolution process of China's national plans of action relevant to MDG 4, MDG 5 and child **1.2** To understand the interpretation of the policy at provincial level, the roles of actors and stakeholders and their relationships, the regulation approaches during the implementation process, as well as the monitoring and assessment mechanisms, and accountability mechanism, in the "Two National Plans of Action" since 1990.	- Review and analysis of published and grey literature on development and implementation of National Plan of Action on Women and Children - Key informants interview and Stakeholder analysis; - Focus group discussions; - Stakeholder validation meeting
What kinds of experience can China share with other Low and Middle income countries in maternal and infant health and child nutrition?	**2. To generate implementation experience** **2.1** To generate implementation experience through the case study of 'safe motherhood' in poor, remote mountainous and ethnic areas; 2.2 To generate implementation experience through the case study of 'prevention of mother-to-child disease transmission (PMTCT)' in poor, remote mountainous and ethnic areas; 2.3 To generate implementation experience through the case study of 'child nutrition' in poor, remote mountainous and ethnic areas.	- Systematic review on both quantitative and qualitative study and evaluation programs - Time Series analysis using secondary data - Documentary analysis; -Focus group discussions; -Stakeholder analysis and interviews;
What kind of lessons can other countries learn from China in maternal and infant health and child nutrition?	**3. To summarize lessons from China's practice over 6 decades historically** **3.1** To collect and critically analyze the historic records of China's MCH in the past 6 decades, especially concerned with identifying any turning points or milestones at different historical stages; 3.2 To explore how the relationship of the policy issues, policy strategies and political wills can impact on health.	- Historical archives trace - Oral history method - Key informants' validation meeting
How to disseminate the Chinese experience to other Low and Middle income countries?	**4. To develop country proposals for international dissemination of Chinese experience** 4.1 To conduct context situation and gap analysis between China, and other low-middle income countries; 4.2 To identify the priorities of MCH to uptake Chinese experience; 4.3 To develop the strategies for international dissemination; 4.4 To develop country specific proposals for Chinese experience sharing with Laos ,Vietnam and Ghana	- Documentary analysis; - Stakeholder analysis and interviews; -Nominal group focus group discussion -Focus group discussions; -Delphi method

3. Work packages and deliverable outputs

Project contents are divided into 8 work packages. Each institute will be responsible for one work package generally. The project work packages structure are shown in Figure 1. The contents, outputs and deliverables are presented in Table 2.

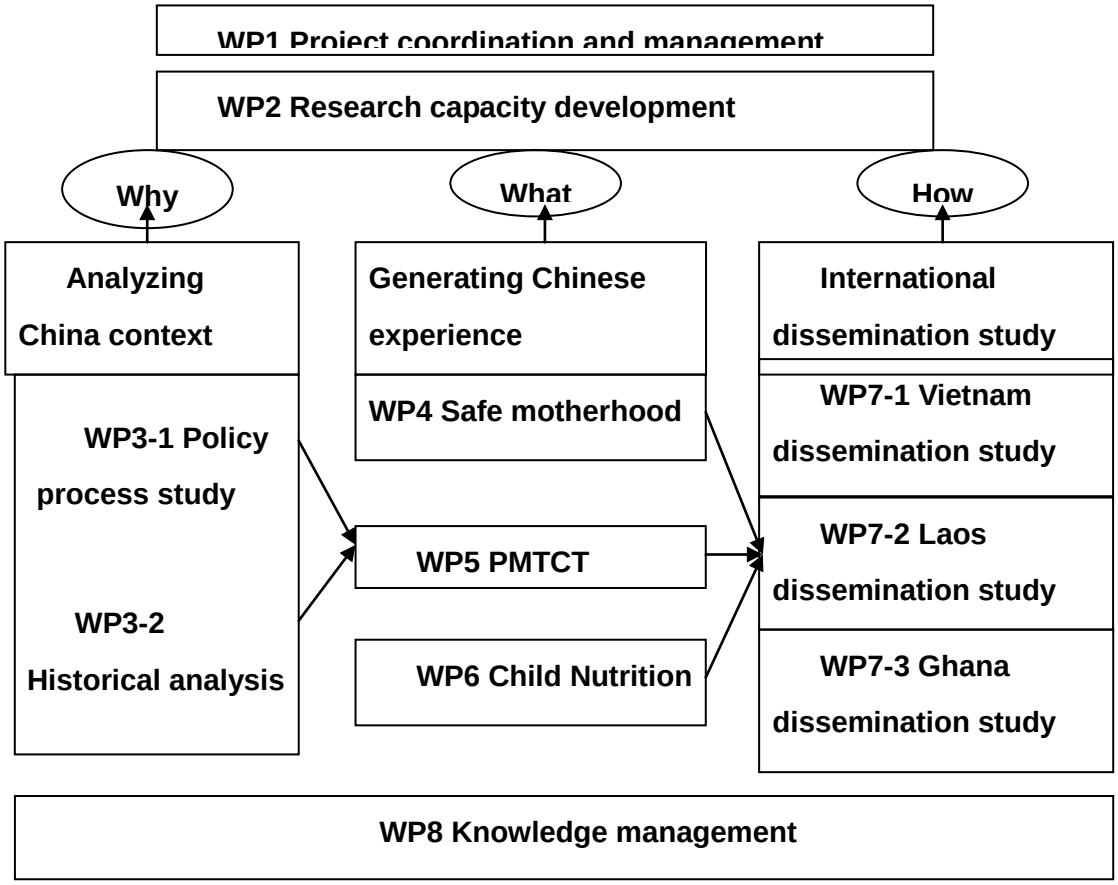


Figure 1 Work package structure

Table 2 Output list for each WP

WP	Item	Titles for Output
WP2	training materials	Training Materials on Systematical Review
		Training Materials on Mixed Evaluation Methodology
		Training Materials on useful knowledge for GH practice
WP3	Report	WP3 Research Report
	Book	China's development in promoting maternal and child health and child nutrition: case study
	Article	Implementation of the targeted policy on maternal and child health: a case study from China
WP4	Report	WP4 Research Report
	Article	Projects efforts to improve maternal health status at national and provincial level in China：a review of interventions
WP5	Report	WP5 Research Report
	Article	Increasing coverage of Hepatitis B vaccination in China: a review of interventions and implementation experiences
	Article	Effect and influential factors of the prevention of mother-to-child transmission of HIV/AIDS program in China: a systematic review and policy implication)
	Article	.the effect evaluation of HIV/AIDS, HBV and syphilis PMTCT
WP6	Report	WP6 Research Report
	Article	A systematic review of interventions supporting breastfeeding in China
WP7	Report	Context Analysis on Viet.
	Report	Context Analysis on Laos
	Report	Context Analysis on Ghana
	Protocol	Protocol and Guidelines for uptaking
WP8	Dissemination material	Knowledge management strategy
Others	Policy brief	Policy brief in English and Chinese
	Others	Capacity building
		Developing collaboration relationship

Chapter 3 Goals Achieved

From Dec. 2013 through Dec. 2015, this project has already finished the goals as expected, and the main technical indicators as follows.

Table 3 the finished outputs for each WP

WP	Item	Titles	Finished	Explanation
WP1	Report	Reports for each process		
WP2	training materials	Training Materials on Systematical Review	Done	
		Training Materials on Mixed Evaluation Methodology	Done	
		Training Materials on useful knowledge for GH practice	Done	
WP3	Report	WP3 Research Report	Done	
	Book	China's development in promoting maternal and child health and child nutrition: case study	Almost done	Draft for published
	Article	Implementation of the targeted policy on maternal and child health: a case study from China	Almost done	Submitted
WP4	Report	WP4 Research Report	Done	
	Article	Projects efforts to improve maternal health status at national and provincial level in China：a review of interventions	Done	Submitted
	Article	Towards Universal Access to Skilled Birth Attendance: The Process of Transforming the Role of 1 Traditional Birth Attendants in Rural China	Done	
WP5	Report	WP5 Research Report	Done	
	Article	Increasing coverage of Hepatitis B vaccination in China: a review of interventions and implementation experiences	Done	Submitted
	Article	Effect and influential factors of the prevention of mother-to-child transmission of HIV/AIDS program in China: a systematic review and policy implication)	Done	Submitted
WP6	Report	WP5 Research Report	Done	
	Article	A systematic review of interventions supporting breastfeeding in China	Almost done	Internal review
	Article	Social Determinants of stunting among children under 5 years of age in China	Almost done	Internal review
WP7	Report	WP7 Research report	Done	
	Report	Context Analysis on Viet.	Done	
	Report	Context Analysis on Laos	Done	
	Report	Context Analysis on Ghana	Done	
	Report	Context Analysis on China	Done	
	Proposal	6 proposals for 3 partner countries	Done	
	Guideline	2 guidelines	Done	
WP8	Dissemination material	4 materials	Done	
Others	Policy Brief	8 policy briefs	Done	editing

WP	Item	Titles	Finished	Explanation
	others	Capacity building	Including 13 faculties, 8 master students an 2 PhD students	Including 5 disciplines.
		Developing collaboration relationship	7 partners	5 universities, 1 research institute and 1 hospital

Chapter 4 Detail Output and Outcomes

1. Project management

The project team consisted of researchers from 8 institutions in 6 countries with the participation of several secondary disciplines, bringing great challenge to project management. Under this circumstance, a series of implementation mechanism was established to ensure the smooth development of the activities and the achievement of the project goal.

1.1 Allocation between partners

There were 8 institutions who participated in this project and 60% of the project funding needed to be managed together by 7 of the participating institutions. It was necessary to develop an effective and efficient negotiation process which involved task assignment, process supervision and outcome promotion. We provided our project partners with explicit division of responsibilities and tasks. Fudan University, as the leading institution in this project, was responsible for project management (WP1), policy process research (WP3), case research on safe motherhood (WP4), PMTCT (WP5) and the coordination in the implementation process of other work packages. The Liverpool School of Tropical Medicine was responsible for the capacity building of the researchers (WP2), which was regarded as the working foundation of the whole project. School of Public Health, Peking University was responsible for the case research on children nutrition (WP6). Researchers from Vietnam, Lao and Ghana were responsible for the trans-nation communication strategy for developing countries (WP7). Duke Global Health Institute was responsible for knowledge management (WP8). The Maternal & Child Health Hospital, Guangxi Zhuang Autonomous Region was responsible for the on-site coordination of case research. Each participating institution committed its responsibilities in the project through 7 cooperation agreements, making clear the rules for the funding utilization and the requirements for the project outcome.

1.2 Project meeting system

The implementation promotion mechanism in this project mainly involved two meeting systems. The first one was the project management meeting which was held once a year. The project management meeting aimed to provide a platform for the discussion of the overall coordination and cooperation systems of the project and all the participating institutions were required to attend. The major content of this meeting included annual progress report, training program, validity verification of the achievements and applicability discussion.

The second one is regular meeting generally held once a month, serving as a promoter for ordinary tasks. The domestic participating institutions were required to attend a regular meeting every month which lasted 2-3 hours. Consensus was reached on the agenda before the meeting. During the meeting, the participants checked the working progress, assigned new tasks, discussed the problems and confusion and pushed forward the accomplishment of the goal for each work package. Meeting minutes, formed based on the agreement which was reached through the meeting and the deadline for outcome submission, would be sent to all the project members no matter present or not. The requirements mentioned in the meeting minutes were then strictly followed. The regular meeting guaranteed the efforts and outcome of the project team members considering the condition that many of the participating researchers took upon many other tasks.

The meeting minutes, considered as the outcome of the mentioned two meeting systems, were the basis of the recording and supervision of the project schedule and may serve as milestones in the implementation of this project.

1.3 Establishing the information sharing system

The research team was intent to using information technology to improve the working efficiency. Because that the team members are from various departments, besides the monthly based routine meeting, they

need efficient daily communication and files sharing. Particularly, during the moment when the mile-stone output were formulated, large amount literature and documents should be exchanged and shared. In such circumstance, on the one hand, we set up a working group by mobile phone to communicate instantly, on the other hand, we established a file sharing system using the cloud storage technology, and develop the internal regulation of sharing. By this system, the key documents, important meeting record and relevant material are saved in the online folder for sharing within the team members, which improve the efficiency of the project work greatly.

1.4 Communication system with foreign partners

The participants in this project included institutions from the U.K., the U.S., Ghana, Laos and Vietnam, which communicated mainly through email and project management meeting as well. To guarantee the communication efficiency, the director for each work package was required to be responsible for all the items related to the management within the work package and 3 contact persons were appointed to be responsible for the communication on technical items. However, problems may still emerge due to email system malfunction and network problems in developing countries.

2. Capacity building

This part of work mainly aimed to improve the capabilities on the personal, organizational and systematic level so that high-value research would be carried out, disseminated and utilized and long-term cooperative relationship would be established between different organizations.

2.1 Evaluation on the basic research capabilities of the project participants

In order to take a grasp on the basic research capabilities of the project participants, we carried out an online survey for the director and staff members of each work package, student investigator and the institutional partners through which we can learn more about the advantage and disadvantage of this evaluation. This simple survey offered the baseline information about the research capabilities of the project participants, discovered the capability defects which might be met during the implementation of OP102 and collected suggestions on methods to narrow the gap including offering professional training. The online survey was accomplished by May, 2014, attracting 34 project participants.

According to the survey results, we summarized the training methods which might be helpful to improve the participants' research capabilities and the training contents which won the support from all the project members, including systematic review methods, case study methods, article composition for international journals, communication on the research results and methods to influence the policy makers. We also found the training demands which can be met within the work packages including qualitative study methods and article retrieval.

Table 4 Partial results of the online survey on research capabilities

Training content	Form 1. Training after project management Response rate （number of response）	Form 2. Round table discussion Response rate （number of response）	Form 3. One-on-one tutoring Response rate （number of response）	Other forms Response rate （number of response）
Systematic review	54.17% (13)	12.5% (3)	33.33% (8)	0% (0)
Literature and policy text study	41.67% (10)	41.67% (10)	16.67% (4)	0% (0)
Methodology on qualitative study	41.67% (10)	29.17% (7)	25% (6)	4.17% (1)
Policy brief writing	54.17% (13)	29.17% (7)	16.67% (4)	0% (0)
Article publication on international peer-review journals	37.5% (9)	8.33% (2)	54.17% (13)	0% (0)
Learning knowledge in other related fields	58.33% (14)	20.83% (5)	16.67% (4)	4.17% (1)

2.2 Design and implementation of project training

Based on the results from the baseline evaluation, 3 types of training coursed were designed and implemented (Table 5).

Table 5 Three types of project training courses

Training Course	Lecturer (in forms of lecturing and round table discussion)
Training on systematic review methods （2014.2.12）	
Qualitative research synthesis	Dr. Helen Smith from Liverpool School of Tropical Medicine.
Case study: a rapid literature review of factors affecting implementation	Dr. Helen Smith from Liverpool School of Tropical Medicine
Training on the mixed evaluation methods on empirical studies (2014.9.17-19)	
Systematic review	Dr. Helen Smith from Liverpool School of Tropical Medicine
Qualitative study: interview and data analysis	Professor Xu Qian and Fei Yan from School of Public Health, Fudan University

Comprehensive evaluation methods	Associate Professor Weibing Wang from School of Public Health, Fudan University
Writing of research papers and policy brief	Dr. Helen Smith from Liverpool School of Tropical Medicine
Training on practical knowledge in global health practice (2015.3.20-21)	
Here and Beyond：Africa Culture	Lecturer Gurina from School of Nursing and Midwifery, Mzuzu University, Malawi
Impression and experience about Ethiopia	Xiuzhen Zhang, Captain of the Chinese Medical team in Africa, President of Maternal and Children's Care Center in XuChang
Diplomatic protocol and discipline	Genfa Liu, Deputy director of the Department of Foreign Communication and Training, China Executive Leadership Academy Pudong
Consular protection for Chinese citizens abroad	
Comprehensive control and treatment strategy for malaria in Africa	Professor Ying Wang from the Tropical Medicine Institute, Third Military Medical University
Working practice and thoughts about China's Ebola Treatment Unit (ETU) in Liberia	Hao Wu, Director of the Medical Department, First Hospital Affiliated to Third Military Medical University

In addition, one-on-one tutoring on research paper writing was held in Manchester University, the U.K. in November, 2014. Each work package sent 4 graduate students to receive the one-week-long training. Doctor. Helen Smith offered one-on-one tutoring for the students in terms of thesis conception, Outline writing and data collection framework.

Table 6 The one-on-one tutoring on research paper writing

Work Package	Training Student	Thesis Title
WP3	Lijia Dong	Child health development in China: a policy analysis of The National Plan of action
WP4	Shasha Wang	Strengthening health facilities to improve quality of care at national and provincial level in China: a review of interventions
WP5	Shengnan Wang	Increasing coverage of Hepatitis B vaccination in China: a review of interventions and implementation experiences
WP6	Fangyuan Yin	A systematic review of interventions supporting breastfeeding in China

2.3 Achievements on research capability building

Table 7 shows the number of participants in each training course. We carried out post-training evaluation and the results were summarized in the WP2 report displayed in the Appendix.

Table 7 Number of participants in each training course

Training Time	Topic	Attendees	
		Within the project team	Out of the project team
2nd February, 2014	Systematic review methods	18	4
17th -19th September, 2014	Mixed evaluation methods on empirical studies	22	10
20th -21st March, 2015	Practical knowledge in global health practice	14	17

3. Summarization of the experience in the implementation of the project on maternal and children security and children nutrition

3.1 Information source of China's experience

China's experience was extracted mainly through case study. We determined three cases as maternal and children security, interruption of disease transmission from mother to infant and the improvement of children's nutrition based on the existed literatures. Implementation experience which made the major contribution to the improvement of the health outcome was summarized and listed through literature study, informant interview and expert meeting (Table 8). Eight implementation experience and 2 lessons were eventually summarized after verification with the informants and stake holders and accepting helpful suggestions from the partner countries.

Table 8 Information source of China's implementation experience

Work Package	Type and quantity of material				Number of people interviewed	Expert Meeting	Other Sources
	Research Paper	Policy Document	Unpublished Document	Books			
WP3	42	111	1	18	2	1	39 （ statistical yearbook）
WP4	55	28	1	2	4	1	18 （ statistical yearbook）
WP5	72	58	29	12	10	3	2(technical guideline)
WP6	95	33	0	2	22	1	

3.2 The policy process of enhancing the maternal safety and children nutrition

3.2.1. Development before 1900s

Our research reviewed the more than sixty years process of MCH since the foundation of People's Republic of China, based on historical materials and statistical yearbooks. The result showed that MCH is of high priority before the 1990s, and many policies and technology in favor of women and children were employed. The major measures included promoting the new method midwifery, advocating family planning, putting rural health as priority, linking the MCH with agricultural production and economic development, etc. With these measures, compared with the figure before 1949, the MMR reduced from 1500/100000 to 94.7 in year 1990, and the IMR reduced from 200/1000 to 39.8 in year 1989.

3.2.2. Development during 1900s

The MCH in global wide get significant development during 1900s. The World Declaration on the Survival, Protection and Development of Children reached international agreement on the development of children; the World Population and Development Conference proposed the new concept of reproductive health, and the fourth World Women Conference stressed the women's social status and empowerment for enhancing the reproductive health. In all of the international conferences, China's government have made the formal commitment on improving MCH. Meanwhile, China conducted many international cooperative project with the support on bi-lateral and multilateral funding, from which China got necessary financial support, incorporated the advanced equipment and technology, enhanced the grass-root MCH system, and establish the implementation mechanism with China's feature. All of set up strong foundation for the achievement of MDG.

(1) China's international commitments and national action plans

During 1990s and the beginning of 21st century, China signed a series of international declaration such as, World Declaration on the Survival, Protection and Development of Children and promulgated the Law on the Protection of Minors, Law on Maternal and Infant Health Care, introduced the "Two program" and other planning policy documents. The commitment and national action plan has further strengthened the government's role in MCH, and proposed the development goals and implementation guideline, which significantly improves priority of MCH in governmental agenda.

(2) Take usage of international assistance to strengthen the capacity grass-root MCH services

Since year 1978, China has actively utilized international assistance to strengthen MCH, with particular

emphasis on learning and absorbing advanced international experience to improve MCH service capacity in primary level. For example, the comprehensive MCH program by World Bank Loan, the program strengthening grass-roots MCH and family planning services, the MOH - UNICEF safe motherhood programs, baby-friendly hospitals activity, etc. Many of the experience accumulated in the implementation of these project have been transferred into domestic MCH policy, and a large number of professionals were trained.

(3) Strengthen coordination and supervision, and promote multi-sector cooperation
1990, the Chinese State Council level, from top to bottom in all levels of government has established a special committee on women and children, against women and children as a cross-sector deliberative bodies. Women and Children Work Committee at all levels to coordinate and promote related sectors (such as planning, advocacy, finance, health planning and other) women and children development program implementation, and carry out supervision and implementation process for the policy objective of the government to further strengthen the protection of rights and interests of women and children in Women and Children functions of health promotion, and more effective mobilization of various resources in order to achieve policy objectives.

(4) Systematic Monitoring and Evaluation mechanism
Towards the specific indicators in the national action plan, the government in various level have established the systematic monitoring and evaluation mechanism including annual appraisal, mid-term evaluation (5 years), and final evaluation in each policy cycle. The relevant departments of the government are required to regularly submit progress monitoring data and target implementation progress, and analyze the submitted monitoring data to assess the implementation effect. The result of evaluation should usually be released to the society, which pose incentives and pressure to the government, and urge them to mobilize more resources investing in the work of MCH.

3.2.3. The strong strategy for achieving the development goals in the new century

After entering the new millennium, the China's Government had made to the solemn commitment for the United Nations Millennium Development Goals. In order to be able to reach the MDG Four (reducing child mortality) and MDG five (improve maternal health) in 15 years, the China's government promoted the hospital delivery strategy in a strong and efficient way. As a result, remarkable achievements have been made in a short time. The major experiences are as follow:

(1) Special Actions Focused on Major and Difficult Problems
For some difficult problems such as maternal mortality, Chinese government set up special project, putting aside particular resources, aiming at make significant breakthrough within limited time, which in turn drives the conducting of routine work. For example, the "Reducing Maternal Mortality and Eliminating Neonatal Tetanus ("Jiang Xiao" Project) initiated in 2000 is a typical national projects for specific targets, which reduced the MMR and neonatal tetanus significantly.

(2) Effectively implementing the project by governmental regulation
Government regulation is also effective mean of implementing the MCH policy. For example, the government set price ceiling on hospital delivery to reduce the financial burden of rural pregnant women; regularly send experts to remote rural areas to improve the capacity of local MCH services; the medical at all levels shall be responsible for the first diagnosis of HIV infected pregnant women, and incorporate them into the high-risk management, follow the principle of confidentiality. These are all the means of appropriate government regulation to achieve policy objectives.

(3) Put priority to safe motherhood through the accountability mechanism
Accountability is one of the strongest governmental measures. The local government in China usually set

up the accountability mechanism for key indicators such as MMR, IMR, etc. Those government leaders of the regions with poor performance on these key indicators will face the pressure of accountability, and therefore ensure safe motherhood given priority attention.

3.3 The list of effective intervention in China Safe Motherhood

3.3.1. Institution-based childbirth policy as the key strategy

In order to achieve MDG5 and the goal of Safe Motherhood, Chinese government has taken a series of initiatives and measures that adopted "institution-based childbirth" policy as the core strategy. These initiatives were made based on China's national conditions and also consider the relevant international experience. It was an evidence-based process with gradual improvement of women and babies' health. The Safe Motherhood initiatives used "three-circle model" as the intervention framework. At the community level, extensive community mobilization and elimination of economic barrier were taken to promote the institution-based childbirth. The intervention also focused on the linkage of communities and health facilities through the transformation of the role of rural traditional birth attendants. At health institution level, the strategy of sending specialists to county referral centers to enhance the quality of service delivery. Three key strategies were summarized as the following:

Linking Pregnant Women to Health Facilities for Childbirth: Transforming the Role of Traditional Birth Attendants in Rural China

During the implementation of this institution-based childbirth, "Transforming the Role of Traditional Birth Attendants" was a key strategy in the rural areas. Based on the close relationship with village pregnant women and their families, traditional birth attendants (TBAs) became village maternal and child health workers. Their new roles include identifying and reporting the new pregnancies, conducting risk assessments of pregnancies, mobilizing and escorting local women to institution-based childbirth, providing basic prenatal care and postnatal home visits, providing 'New-Method' home delivery in emergency conditions, etc. The village maternal and child health workers functioned as the bridge between the health system and rural pregnant women.

Multiple Measures to Alleviate Financial Burden of Facility-Based Childbirth

Financial burden is always a significant factor for hindering rural pregnant women choosing institution-based childbirth. Since 1990s, China' central and local government has put forward multiple measures. China's successful experience in alleviating the financial burden of hospital delivery in rural area mainly included price regulation- reducing hospital delivery expense by the administrative approach; medical aid- guarantee the safety for the pregnant women in poverty; incorporation into the health insurance- the long-term mechanism; government subsides- equitable and direct financial support; complimentary measures- user friendly service provision. These strategies have been proved as effective application of combined measures and the gradually proceeding strategy which led to formulize a stable and sustainable institution.

Sending specialists to county referral centers：an effective way to improve obstetric services in rural areas

Shortage of qualified human resources in the health field has been a long term problem in remote rural areas of China. To address this problem, the strategy of "sending specialists to the county referral centers in rural areas" was explored and developed in the China's Safe Motherhood Program "Project to Lower the Maternal Mortality Ratio and Eliminate Neonatal Tetanus" (PLMENT). According to different policies at provincial and regional levels, specialists were regularly dispatched to work in the designated county from one to three months. Specialists were required to join in the routine work of county level institutions, improve the service capacity of obstetric departments, and increase the rate of successful EmOC services. The incentive mechanism for specialists sent to the rural county referral center was also considered. It mainly included receiving financial subsidies and priority in career promotion, annual award or job contract extensions. This strategy played a key role in improving the status of human

resources in health care and obstetric services in the rural areas. It also helped to address the imbalanced distribution of obstetric human resources between urban and rural areas and achieve the goal of safe motherhood.

3.3.2. Multi-department linked, top-down strategies for Prevention of mother-to-child transmission (PMTCT)

Since 2000, the Chinese Government initiated the PMTCT pilot project through cooperation with international organizations. The "Notification of the State Council on Strengthening AIDS Prevention and Treatment" was issued at the end of 2003 announcing China's "Four Frees and One Care" policy, which further advanced the AIDS prevention and control and brought the PMTCT to national level. Relative regulations and measures were introduced after that, such as the "Notification of the General Office of the Ministry of Health on Implementing PMTCT of HIV/AIDS in Comprehensive Prevention and Treatment Demonstration Area", and the "Notification of the General Office of the Ministry of health on implementing PMTCT of HIV/AIDS". In 2006, the State Council of China officially announced the first legislation directly aimed at controlling HIV/AIDS: "Regulations on HIV/AIDS Prevention and Treatment of China", signifying the official institutionalization of "Four Frees and One Care" policy, which continuously increased the coverage of PMTCT projects. In 2010, China integrated the PMTCT of HIV, syphilis and hepatitis B virus, while Chinese Health Ministry published "Implementation plan for PMTCT of HIV, syphilis and hepatitis B virus", and achieved the national coverage of the integrated PMTCT for HIV, syphilis and hepatitis B virus in 2015. Here are two key approaches:

Multi-department linked prevention system for PMTCT of HIV, syphilis and hepatitis B virus

China has expanded the coverage of HIV PMTCT through effective conceptual design, government commitment and policy guarantee. Since 2010, China began an integrated PMTCT service of HIV, syphilis and hepatitis B virus, which significantly lowered the transmission rate of HIV, syphilis and hepatitis B virus and greatly enhanced the detection rate of the three diseases amongst pregnant women. The success experience of integrating the prevention of these three diseases lies in the construction of a government-lead, multi-department linked work system, as well as the dynamic integration of PMTCT and the daily work within the maternity-and-child healthcare system, providing thorough health administration for pregnant women.

Top-down strategies to increase coverage of neonatal hepatitis B vaccination

Since 1980's, China has implemented effective top-down strategies including free of charge for vaccination, integrating vaccination with promoting hospital delivery, out-reach immunization services for remote rural areas, migrant population registration and universal health education and prenatal health care services. The timely birth dose (TBD) rate of Hepatitis B vaccination increased extraordinarily while the HBV infection rate has declined.

3.3.3. Poverty alleviation program helps to improve child nutritional status among children living in undeveloped areas

China effectively addressed child malnutrition problem by bringing child nutrition promotion into the overall national development strategy. The government has developed many national-level policies and programs (i.e. poverty alleviation program) which help to improve child nutritional status in poor areas. Two important success factors need to mention when implementing nutrition promotion programs, are the harmonious coordination between health sectors, agriculture sectors, financial sectors, education sectors and women's federations, and the smooth cooperation between institutions from national-level, province-level and local government. The top-down guidance and supervision ensured the quality of the program, while the bottom-up information gathering and transmission system helped create a better condition for program assessment. Here we list two key practices of China:

Poverty alleviation program is a fundamental way to alleviate and eliminate child malnutrition

China's government took child nutritional status as an important indicator to evaluate the outcome of local poverty alleviation program when they develop and implement poverty alleviation policies. In order to support the long-term socio-economic development in poor areas, the government introduced a series of supporting policies that include tax reduction policy, universal education and health policies, improving transportation and living environment policies, so as to avoid problem of re-poverty. Children of poor household living in the poorest regions were classified as top priority when implementing the program. To alleviate inequities of child malnutrition and health, the government started to issue nutrition package to children living in poor rural areas, and take various actions to improve food consumption ability and strengthen child health capacity of poor rural households.

Implementing child nutrition promotion program in poor rural areas is an effective way to improve child nutritional status

In order to solve the challenge of child malnutrition in poor areas, the Chinese government has organized the implemented 'Child Nutrition Promotion Projects in Poverty stricken areas (nutrition package project)' since 2012. Nutrition package is a kind of oral nutritious supplement which offer a variety of vitamins, minerals and protein. The project target specifically at children aged from 6 months to 24 months as well as their caregivers. There are 3 key interventions of this project, the first is to issue nutrition package to children in poor areas, the second is to provide children's caregivers with scientific feeding knowledge and to develop various forms of health education when issuing nutrition package, the third is to carry out large-scale social mobilization based on community. Taking nutrition package can simultaneously solve the problem of inadequate calorie and protein intake as well as micronutrient deficiencies. Besides, each nutrition package costs only 0.7 Yuan (about 12 cents). This cost-effective project has achieved very good results on improving the nutritional status of infants and children in poverty-stricken areas.

3.3.4. Reflections and Lessons leant from the process of social and economic transformation

The economic development model, administrative management system and social governance have changed dramatically along with the reform and opening-up policies in China over the past three decades. These macro-level factors have had a major influence on the policies of maternal and child healthcare in China. Here are two examples worth sharing.

The strength of government supervision to the market affected healthcare directly under the market economic system

Taking of the breastfeeding as an example, in 1990s, Chinese government built up a good social environment to promote breastfeeding by setting the national goals and baby friendly hospital initiatives (BFHIs), also establishing maternal education system and enhancing supervision. One of the most successful program was the baby friendly hospital initiative, which was highly regarded in the international community. This initiative increased breastfeeding rates in China remarkably over that period.

However, the change of social environment circumstance under urbanization has had negative influence on breastfeeding for lactating women since 21st century. The reform of government agencies made it ambiguous for the main responsible organization, which led to a severe impact from the marketing of breast milk substitutes. The effective measures along with BFHs gradually diminished, and breastfeeding rate declined sharply. The decreased breastfeeding rates indicate that sustainable promoting measures along with effective supervision should be in place to promote breastfeeding in economic transformation countries.

The significant impact of the changes of China's government-oriented health care system on health

services utilization of rural population

Taking China's rural cooperative medical service as an example, the rural cooperative medical service, which was a kind of medical insurance in nature, was formally established in the 1950s in China and its coverage expanded to 90% of all the administrative villages between late 1960s to mid-1970s. During this period, rural cooperative medical service offered low-level and wide-range health care insurance coverage and basically solved the problem of medical services and drug supply shortage which had long troubled China's rural population through a low-cost health service delivery system on the basis of collective economy and the people's commune system, contributing to the great improvement of life expectancy from 35 in 1949 to 67 in 1978.

After 1978, China experienced nation-wide promotion of the household contract responsibility system with remuneration linked to output, the collapse of the people's commune system and the rapid shrink of rural economy. Insufficient government support and the marketization of health care services eventually became the straw that broke the back of the rural cooperative medical service, which saw a quick collapse in the 1980s due to the loss of its previous political, economic and social foundation. In 1989, only 4.8% of China's administrative villages were still implementing cooperative medical service. Over the next decade, a high proportion (30%-40% in average or even 60% according to some researches) of China's rural population suffered from poverty caused by, returning to poverty due to illness due to the loss of health insurance and inability to pay for the health care expenditure.

Entering the new century, the Chinese government decided to reconstruct the rural cooperative medical service system. A policy document issued by the Ministry of Health, Ministry of Finance and Ministry of Agriculture in January 2003 emphasized that the new rural cooperative medical service system was a mutual assistance system for the rural population which mainly covered serious illnesses through multiple fund-raising channel from individual, collective and government on the basis of people's voluntary participation and governments' organization, guidance and support. Thereafter, nearly all the counties and cities in China implemented the new rural cooperative medical service which saw a big rise in the number of insured and improvement of insurance coverage due to strong governmental support and large financial investment. The new rural cooperative medical service helps to improve the accessibility of essential health care provided by rural health institutions to rural maternal and children population, lower the economic burden of institutional delivery by increasing the government subsidies provided for the pregnant women with low economic income. The key for the rapid development of the new rural cooperative medical service system lies in the returning and strengthening of government's responsibilities and strict constriction of market participation.

The significant impact of the changes of China's government-oriented health care system on health services utilization of rural population can be clearly interpreted through data collected from the national health services survey in 1993, 1998, 2003 and 2008.

Table 9 Health services utilization of China's maternal and children population in 1993, 1998, 2003 and 2008

Year	Two-week Visiting Rate (‰, rural female)	Two-week Visiting Rate (‰, rural 0-4 years old)	Two-week No-visiting Rate (‰, rural female)	Hospitalization Rate (‰, rural female)	Hospitalization Rate (‰, 0-4 years old)
1993	173.6	302.9	--	32.5	43.2
1998	180.5	306.5	33.0	34.4	41.5
2003	151.0	212.8	45.8	39.3	35.0
2008	166.6	259.8	37.7	76.7	90.7

4. Applicability study on implementation of China's experiences in other countries

This study aims to analysis the gaps among Vietnam, Laos, Ghana, and China on country context, to identify the priority problems related to maternal and child health and child nutrition in three countries, and to develop the country implementation proposals on the potential intervention chosen from the synthesized China implementation experiences based on the individual demand of health and policy. The main outputs are as follows:

4.1 Context analysis of four countries

According to the country context analysis reports of four countries, the main results are as follows:

Political system

China, Vietnam, and Laos share many similarities on national political system. China is a socialist state under the people's democratic dictatorship led by the working class and based on the alliance of workers and peasants. It is stated that the people own all national authorities. The National People's Congress and local People's congresses are the main channels for Chinese people to exercise political consultation and democratic supervision. The State Council is the highest executive organ of national power. The fundamental political system of China consists of multi-party cooperation and political consultation under the leadership of the Chinese Communist Party.

Vietnam is in a one-party system led by the Communist Party of Vietnam. The state constitution defines that people own state power. The National Congress is the highest executive organ.

The Laos is also a one-party socialist republic. The National Assembly is the legislative body, while the executives are the president, the prime minister and the ministers. The Government operates under the guidance of the Lao People's Revolutionary Party (LPRP) through the Party Congress, the Politburo and the Central Committee.

Ghana is a unitary presidential constitutional democracy with a parliamentary multi-party system. The president of Ghana is head of state, head of government, and commander in chief of the armed forces. The constitution declares that Ghana is to be a unitary republic with sovereignty residing in the Ghanaian people. The Judiciary is independent of the executive and the legislature. Executive authority is established in the Office of the Presidency, together with his Council of State. Legislative functions are vested in Parliament. To become law, legislation must have the assent of the president, who has a qualified veto over all bills except those to which a vote of urgency is attached.

Geography context

The four countries have remarkable differences on geography context. China is located in the east of Asia and on the west shore of Pacific Ocean. The terrain of China elevates westward, with diverse landscapes and climates suck as tropical, subtropical, warm temperate, temperate, cool temperate and frigid zones from south to north. Vietnam is located in the south-east Asia. The terrain elevates westward, with coverage of hilly areas and highlands in three fourths of territory. Vietnam lies in the hot region of the tropics. The climate is monsoon and subtropical in the North, which has four distinct seasons. The southern provinces have two seasons, a rainy season and a dry season; the rest areas have rainy season from May to October and dry season from November to April.

The Lao People's Democratic Republic is a landlocked country located in the heart of the Indochina peninsula of South-East Asia. The topography is three quarters mountainous and plateau, and forests cover 47% of the land. The country has a tropical monsoon climate, with a wet season lasting from May to October and a dry season lasting from November to April.

Geographically, Ghana, a West-African state is located along the Gulf of Guinea on the Atlantic Ocean. It is an Anglophone country surrounded by three Francophone countries; on the west by Ivory Coast, on the

east by Togo and on the north and northwest by Burkina Faso. The country has a varied geography of savannas, forests, woodlands, mountainous areas, coastal border, oil reserves on its coast, and several other nature reserves. The rainy season there is from April to September, and the dry season is from November to April.

Social status

China is a multiethnic and multilingual country, with 56 officially recognized ethnic groups who have their own languages, customs and lifestyles. The largest ethnic group in China is the Han who constitute about 91.51% of the whole population, and other large ethnic minorities are Zhuang, Man, Hui, Miao and Uyghur. Various religious co-exist in China, including Buddhism, Islam, Catholicism, Christianity and Taoism. Chinese citizen owns the freedom of religious worship. The Ministry of Education runs a national public education system in China, which authorizes all citizens must attend school freely for at least nine years including six years' primary education and three years' junior secondary education, known as the nine-year compulsory education.

Also Vietnam is a multiethnic and multilingual country, having 54 officially defined ethnic groups with their own languages. The biggest population is the Jing, accounting for 85.7% of the population. Buddhism is the main religion belief. The national public education system in Vietnam includes 5-year primary education, 4-year junior secondary education, and 3-year senior high education. In 2000, Vietnam stated that it had achieved the universal coverage of compulsory primary education. From the 2001, Vietnam started to implement the universal coverage of the nine-year compulsory education.

Lao PDR is a country with ethnic diversity. Forty-nine different ethnic groups were officially declared in the 2005 reclassification. Majority of the Laotian population is Lao, accounts for 55% of the whole population; 11% are Khmu; 8% are Hmong, and the rest are other ethnic groups. The constitution defined Buddhism as the national religion; 65% of Laotian population believe in Buddhism in 2013. The education system in Laos includes primary education (5-year), junior secondary education (3-year), and senior high education (3-year), and all of them are adapted into compulsory education system.

Ghana is a multiethnic country with four main ethnic groups. English is the language of the state, and there are eleven government-sponsored languages. Ghana is a largely Christian country, although a sizeable Muslim minority exists. Traditional beliefs are also practiced. In 1957, Ghana declared its independence and established a unitary presidential constitutional democracy with a parliamentary multi-party system. However, the system of tribe chief is still remained in rural areas. The chief of tribe enjoy high prestige in local community and have significant social influences. They usually play the role of spokesman to reflect the demands and perceptions of their tribe, and also to address civil disputes and organize commonweal activities. The compulsory education implemented in Ghana includes primary education of 6-year and junior secondary education of 3-year.

Demographic and economic indicators

In terms of demographic and economic indicators, Laos has the smallest population which was 6,771 million in 2013, only occupying 0.5% of population in China. Ghana has the highest population annual growth rate among the four countries, which was 2.19% in 2014. This indicator was twofold higher than the one in Vietnam and 5.5 times higher than the indicator in China. Meanwhile, the ratio of children under-5 in Ghana, which was 14.3%, was the highest among four countries. The Life expectancy at birth in four countries were significantly improved during the last fifty years, but gaps still exist among them. The Chinese population has a similar life expectancy at birth as Vietnamese population, while the life expectancy at birth in Laos only reaches level of this indicator at 2000s in China and the life expectancy at birth in Ghana only gets to level of this indicator at 1990s in China. China was the country with the highest GDP per capita during 2011 to 2015, which was 12, 609 US dollars. Vietnam and Laos have

similar GDP, but were below the GDP in China. Ghana has the lowest GDP among these four countries during the same period, which was 3,902 US dollars. The details are summarized in table 9 below:

Table 10 Summary of demographic and economic indicators in China, Vietnam, Laos, and Ghana (1990-2013)

Indicators	Year	China	Vietnam	Laos	Ghana
Total population (million)	2013	1385.6	91.7	6.8	25.9
Children under-5 (million)	2013	90.2	7.1	0.9	3.7
Population annual growth rate (%)	2013-2030	0.28	0.62	1.55	1.81
Life expectancy at birth (year)	1970	63	60	46	49
	1990	69	71	54	57
	2013	75	76	68	61
Crude mortality rate (%)	1990	6.9	6.3	13.3	10.9
	2013	7.2	5.7	5.9	9.0
Proportion of urban population（%）	2013	53.2	32.3	36.5	52.7
GDP per capita (US$)	2011-2015	12609	5370	5074	3902
Net primary school enrolment rate, total	2008-2011	100	98	97	84
Literacy rate (%), male (aged 15 to 24)	2007-2011	99	97	89	82
Literacy rate (%), female (aged 15 to 24)	2007-2011	99	96	79	80

Source: data adopted from database of UNICEF.

With respect to health related MDGs, four countries all have made remarkable improvements during the last decade, but in different extents. Ghana and Laos have gained bigger achievements on health related MDGs than China and Vietnam. However, Ghana still has the highest maternal mortality rate among four countries (380 per 100,000 live births).

Table 11 Summary of health related MDGs in China, Vietnam, Laos, and Ghana

Indicators	Year	China	Vietnam	Laos	Ghana
Under-five mortality rate (per 1000 live births)	1990	49	50	148	128
	2011	15	22	42	78
Infant mortality rate (per 1000 live births)	1990	39	36	102	80
	2011	13	17	34	52
Maternal mortality rate (per 100 000 live births)	1990	97	140	1100	760
	2013	32	49	220	380

Source: data adopted from database of UNICEF.

There exist big gaps on human resources for health among four countries. China have the most health workers whose number of doctors are 9 times higher than the number of doctors in Ghana.

Table 12 The indicators of health workforce in China, Vietnam, Laos, and Ghana

Countries	Year	Health professionals per 1,000 population	
China	2013	Physician	2.04
	2013	Nurse	2.04
	2013	Village health worker	1.23
Vietnam	2012	Physician	0.7
	2012	Nurse and midwife	1.0
	2012	Assistant physician in community health center	0.57
Laos*	2012	Physician	0.24
	2012	Nurse and midwife	0.82
	2012	Assistant physician in community health center	19
Ghana	2012	Physician	0.2
	2012	Nurse and midwife	0.69

Source：data from context analysis reports of four countries.
* Primary health worker in Laos includes volunteer.

The four countries have their own health insurance systems with different population coverage. Overall, the coverage of health insurance in China is relatively higher than other three countries, which reached to 96.9% of population in 2014.

Table 13 Summary of health insurance schemes in China, Vietnam, Laos, and Ghana

China	Target population	Coverage（%）
Urban Residents Basic Medical Insurance (URBMI)	urban residents who are not employed by any organization	96.9（2014）
Urban Employee Basic Medical Insurance (UEBMI)	Urban employed and pensioners	
New Cooperative Medical Care (NCMS)	Rural residents	
Medical Financial Assistance (MFA)	low-income elderly or disabled residents, poor residents	
Vietnam	Target population	Coverage（%）
Compulsory scheme	Civil servants, state enterprise workers, poor people, ethnic minority people, pupils, under-6 children, and rural residents.	68（2013）
Voluntary scheme	This scheme was abolished after December, 2017.	
Laos	Target population	Coverage（%）
State Authority for Social Security，SASS	Civil servants	89（2012）
Social Security Organization，SSO	Salaried private-sector employees	33（2012）
Community-Based Health Insurance Community-Based Health Insurance，CBHI	Non-poor workers in the informal sector	3.8（2012）
Health Equity Fund ，HEF	Poor people	12（2012）
Ghana	Target population	Coverage（%）
National Health Insurance Scheme	General population uncovered by any health insurance scheme	34（2010）

Source：data from context analysis reports of four countries.

4.2 Country proposal for implementation of Chinese experiences

4.2.1 Country proposal of Ghana

Maternal and newborn health (MNH) is a major health concern in Ghana and efforts have been made to improve the health indicators in this area. Despite several interventions to accelerate the progress towards the achievement of MDGs 4 and 5, Ghana did not achieve the targets by 2015 due to inequities which

hamper the efforts to reduce maternal and newborn morbidity and mortality.

Training and supervision in maternal and newborn health has been going on in Ghana for some time now. The current situation is that there is no formal established training system for MNH workers. Training occurs mostly when an agency comes in with a program which is externally funded.

The Ghana Health Service and Ministry of Health have explored ways of getting specialists in teaching hospitals to provide services in district hospitals. Some of the resultant models include teams of specialists who travel outside the regional capitals to run clinics and perform surgeries in district hospitals. None of these models have explored the possibility of getting the professional associations of the specialists to be the owners of the service provision programmes or to negotiate with the primary employer of these specialists, which is usually the University (Ministry of Education) and not the Ministry of Health. Even when the specialists are employed by the Ghana Health Service or Ministry of Health, the time away from their regular post is usually frowned upon by their hospital managers.

The project is based on three guiding principles learned from the successful Chinese experience at reducing maternal mortality, including coordinated effort from all stakeholders, monitoring and evaluation, and accountability mechanism.

The proposed project "Supportive Supervision to Strengthen Maternal and Child Health in Ghana" aims to create and test a system of supportive supervision for MNH in Ghana. In other words, the goals of this project is to establish the internship bases for MCH training in district hospitals in Ghana and to make fully application of them under the supervision of experts.

A quasi-experimental design will be applied in this project, and two intervention districts and two control districts will be selected in this design. Supportive and facilitative supportive supervision of two-year duration with training in MNH skills will be provided by trained personnel in the intervention districts. This will involve professional health volunteers to be attached to rural facilities in the intervention districts. The intervention intends to bring all the professional groups in urban areas together under one society to provide supportive training to frontline MNH workers in rural areas and to implement powerful supervision and evaluation system. Meanwhile, this project is designed to introduce and maintain a network to supervise and support training and to empower supervisors to provide supportive supervision and mentorship in high-quality MNH care. Moreover, the feedbacks on supervision and evaluation would be submitted to stakeholders at national, regional, and district levels.

4.2.2 Country proposal of Vietnam

Hanoi School of Public Health think China and Vietnam share many similarities on social economic and political context, therefore the experiences and lessons of MNH in China could be adopted into Vietnam. Also Hanoi School of Public Health invited MNH officer of the MOH in Vietnam to attend the project meeting in Shanghai and international dissemination conference in Osaka for better dissemination output of OP102 to policy makers.

As the outputs of OP102, Hanoi School of Public Health adopted experiences of three Chinese cases to develop three country proposals which are consistent with national health strategy of Vietnam.

(1) Implementation plan for enhancing the sustainability of breastfeeding hospitals

According to the National Nutrition surveillance survey in 2010 conducted by the National Institute of Nutrition, the rate of children breastfed within the first hour of birth was 61.7%. Children receiving exclusive breastfeeding within the first six months of life made up only 19.6%. Vietnam has been implementing the Baby-Friendly Hospital Initiative (BFHI) (10 steps to successful implementation of

breastfeeding) since 1992. However, by 2015, or after 23 years of implementation the Initiative, the implementation of breastfeeding hospitals has progressed slowly and failed to meet expectations, and the number of hospitals participating in the Initiative has seen no increase.

There are three main attributed factors to the unsuccessfully implementation of breastfeeding hospitals. On the hospitals' part, after being recognized as BFHs, they did not pay attention to implementing and making effort in sustaining the initiative because they had other priorities, no self-assessment teams were trained, and there was a shortage of financial sources for sustaining the implementation of BFHI. On the MOH's part, the lack of human resources for conducting supervision and re-assessment as well as providing continuous support for hospitals. On the mothers' part, many of them were not aware of the importance of breastfeeding nor did they have enough favorable conditions to follow the practice of breastfeeding (e.g. giving birth by cesarean section, lacking self confidence in whether they have enough milk or not, or laying blind trust in advertisements about breast-milk substitutes).
China had established 7,329 baby-friendly hospitals during 1990 to 2012, mainly covering health facilities with obstetric departments. As results, the professional standard, services provision system, human resources, and governmental supervision on breastfeeding have been significantly improved. Meanwhile, breastfeeding rate was raised. However, China also experienced decreased breastfeeding rate due to poor market supervision and insufficient reassessment.

Three steps including identification barriers to the implementation of BFGs, adoption of successful Chinese experiences, and assessment of pilot interventions implemented in Vietnam would be taken to strengthen the implementation of BFG. The borrowed experiences are: clearly stated government actions, establishment of supportive system for breastfeeding education and breastfeeding, supervision of milk market and baby-friendly hospitals, and enhancing re-assessment of baby-friendly hospitals.

(2) Role of village health workers network to promote institutional based childbirth in rural areas in Vietnam.
Facility-based delivery was the core of national strategy on safe mother in Vietnam. Home delivery rate is still high in the mountainous areas where there were many ethnic minorities, distance, economic difficulties plus customary backward were basic factors in obstructing childbirth in health facilities. The government has taken a group of actions to improve mother safety, it adopted the poor and minority groups into the coverage of medical insurance scheme to address the financial barrier. However, the home delivery rate is still very high in rural remote areas where most pregnant women delivery at home assisted by traditional birth attendants due to ineffective linkage between health system and local communities.

These problems are quite similar to the ones China faced with during the primary period of implementation of "Safe Motherhood". In remote locations in China, pregnant women largely relied on the traditional delivery services due to transportation, economic, and convention factors. The role of traditional birth attendants was then shift to be the village midwives so that TBA's traditional role of providing in-home care during childbirth was restructured and their social role in raising awareness of institutional delivery was strengthened, functioning as the bridge between health system and service users.

Vietnam propose to implement the similar intervention to replace the TBAs of well-trained ethnic village midwives to advocate women to use the institutional childbirth services in order to expand the coverage of healthcare services to community or village level.

Two provinces would be selected for implementation, representing the North and Central highland of Vietnam, one district in the remote regions of each province will be recruited, and one community of each district will be further selected for pilot implementation. The main intervention is to shift ethnic minority

midwives to village health workers through training (6-18 months); to enhance and sustain the integration of EMMs to the VHW network for advocating and promoting institutional delivery and also providing first line MCH services; to improve the provision of continuity of care in antenatal and postpartum care. In addition, the M&E and accountability on maternal and child healthcare at primary level will be strengthened during implementation.

(3) HIV prevention from mother to child in Vietnam: Barriers to access and utilization of services and measures

The rate of HIV among pregnant women is approximately 0.19% in Vietnam, and about 40% of mothers were diagnosed with HIV during labor. The rate of HIV testing among pregnant women is low (about 57.3% in 2012). The disease control and prevention system of HIV in Vietnam is independent from the whole health system, and PMTCT services in Vietnam have not been provided routinely in reproductive health care facilities. Meanwhile, the international funds for controlling HIV has reduced. Therefore, it is he significant to strengthen the role of domestic health system on control and prevention of HIV. It is necessary to integrate PMTCT services into MCH services. Vietnam aims to achieve the global and national goal on elimination of mother to child transmission by 2015.

The evidence from China shows that it is feasible and effective to implement the integrated services for preventing mother-to-child transmission of HIV/AIDS, syphilis and HBV for pregnant women. One lesson learnt in China's PMTCT is to begin with the pilot intervention for preventing mother-to-child transmission of HIV/AIDS, then to expand the scope of services to syphilis and HBV after the successful implementation of the pilot intervention on HIV/AIDS. Another lesson is to strengthen the main role and the sustainability of current maternal and child healthcare system in PMTCT of HIV/AIDS, syphilis and HBV. The research team of Vietnam aims to identify the barriers to PMTCT related services and to implement the pilot integrated PMTCT model borrowed from China in one selected site. The intervention includes: to develop the integrated PMTCT services network of HIV/AIDS, syphilis, and HBV based on the collaboration of maternal and child healthcare providers and CDCs; to implement the integrated PMTCT model of China in one pilot site in Vietnam; and to M&E and assessment of the cost-effectiveness of this pilot intervention.

4.2.3 Country proposal of Laos

(1) Health workers' capacity in skilled birth attendance at Vientiane Capital health centers: the health challenges.

Maternal mortality decreased from 1,600 per 100,000 births in 1990 but remains very high in Laos (357 per 100,000 live births in 2013) and the country is off-track to attain the government's target of 260 per 100,000 live births by 2015. Low utilization of maternal health (MH) services is a key reason for these poor outcomes as only 42% of births are attended by a skilled birth attendant, contributing to high maternal mortality rates and only 38% of births occurred in a health facility.

In Laos, there are more than 80% of households that are resident in rural area where access to health facilities is difficult. Beside of this difficulty, the financial barriers are also found important and are reported as constraint to the utilization of health services. According to the findings of assessment study on skilled birth attendance in Laos, the findings found that the capacity to provide skilled care in pregnancy, birth and postnatal care is overall low in the selected provinces. However, the Minister of Health has signed the Interim Guidelines for the Implementation of Prime Minister Decree on Free Delivery and Free Health Care for Children under 5 years old (called the national free MCH policy) on May 29, 2012.

The proposed research on "Health workers' capacity in skilled birth attendance at Vientiane Capital health centers: the health challenges" will explore the knowledge and practices on skilled birth attendance of

health personnel working at remote health centers under responsibility of Vientiane Capital Health Department. The study will also try seeking information on their knowledge on maternal health and their routine work in the provision of health care services to expecting and postnatal mothers.

This program will be conducted in five remote districts under the administration of Vientiane Capital Health Department. Health centers will be purposively selected based on the criteria of misdistribution, understaffing and having rare chance of capacity development.

Firstly, information will be elicited from midwives or staff serving the mother and child and some concerned district health officers that will be focusing on the current status and problems of maternal services to identify the main gaps on services provision capacity. Furthermore, the short-term and long-term priorities identified in previous stage will be reported to policy making departments through study reports and policy briefs once or twice annually. Secondly, capacity training aiming to improve the knowledge and skills of maternal and child health workers would be implemented in the pattern of workshops or sending specialists to health centers. Then in the third phase, the impact evaluation of this intervention will be carried out.

(2) Improving the nutrition of children in undeveloped areas in Laos

In Laos, infant mortality rate was 68‰ in 2013, and mortality rate of children under-5 was 79‰, and ratio of underweight children was 27%. The NIOPH in Laos proposes the program of improving the nutrition of children in underdeveloped areas based on the experiences of China. The main interventions in this project includes: to hold to carry out health education activities and trainings in various approaches for improving health education; to advocate community to support this program; to engage primary health workers to disseminate the knowledge on child feeding; and to develop the cross-sectional collaboration and administration network for supporting this program.

5. Knowledge management and dissemination

Seven research papers were produced as the scientific outcome of this program. Eight policy briefs were written based on the principle of conciseness and convenience to disseminate the phased outcomes to the targeted audience (Appendix 6). A book was produced based on the technological research reports formed through this project, acting as a communication carrier of case studies to the public. Besides literal communication, we also organized several meetings for dissemination (Table 13) and the literal material of these meetings were collected in the meeting document compilation.

Table 13 Meetings for knowledge and outcome dissemination

Meeting Time	Topic	Number of Participants	
		Internal researchers	External experts
10th -12th February, 2014	History of China's Maternal Health on the starting meeting	18	1
14th -19th September, 2014	Phased outcome of China's experience on the project management meeting 2014	22	2
6th March, 2015	Verification and accreditation of China's experience summarized by the project team conducted by the national informants and several stake holders	15	9
23rd -24th March, 2015	Dissemination of phased outcome to the experts and government officials from cooperative countries	21	3
1st June, 2015	Reporting on ten project-produced Chinese Experience to Maternal and children health department, NHFPC	1	12

1st November, 2015	Dissemination of OP102 outcomes on maternal and children health through APRU Global Heath Workshop	20	15
18th -19th November, 2015	Combined dissemination and discussion of China's experience and national strategy for Ghana, Laos and Vietnam	20	0
7th December, 2015	Dissemination of research outcomes on reproductive health and maternal and children health, 2nd parallel sessions of the symposium on the theme " Global Health Prospects on the perspective of China's experience on health development"	17	13

Chapter 5 Reflection

1. “Chinese Experience”

The meaning and features of the Chinese experience in this study.

The so-called "Chinese Experience", is to explore and formulate a set of effective practical measures toward the specific problems during certain contextual and historical background in different development background. From this study, a large number of review on the existing literature and report indicate that the Chinese experience safe motherhood and children nutrition mainly includes: the setting of development goals, the practical implementation pathway, and the effective method for good performance. This study is just a summarizing of those conventionally acknowledged measurement with Chinese character.

The applicability of Chinese experience to other developing countries.

The scientific evidence and technical intervention measurement on safe motherhood and child nutrition interventions are well established. However, it is a challenge to effectively transfer these measurement into policy practice in many developing countries. This study tries to discover the internal bottleneck of those transition. During the study, we strongly feel that external assistance should take effect through the internal factors which is the vital determinant. In China, the international assistance have provide China very important initial resources, but two more determinants are indispensable. The first is the unified political structural which will ensure the smooth transfer to of the national policy goals, along with the flexible local innovation within the national policy framework. Meanwhile, the rapid economic growth and the large financial support is the strong basis for the well-functioning MCH system. The second is the cultural factors particularly in MCH field. The priority of MCH is a very favorable social convention which facilitate the implementation in each level within the administrative system. Another key impetus is the hard-working value of the worker of MCH who could endure the difficult working environment and rather low payment. In this sense, these two major determinants should be taken consideration when apply Chinese experience to other countries. From the contextual situation of the three partner countries, Vietnam is most similar to China in terms of culture and institutional framework, Laos is also similar in the political infrastructure, but far left behind in reform and opening-up compared with China and Vietnam. This is why the researcher from Laos worried about the applicability of Chinese experience in Laos. Ghana has quite different institutional and cultural background to China, especially the gaps in health human resource, therefore, Ghana want to firstly learn the Chinese implementation mechanisms for strengthening primary health worker’s capability.

How to promote Chinese experience in different countries.

Firstly, we formulized a list of Chinese experiences toward the common problem on safe motherhood and child nutrition in low and middle income countries. Then we help the developing countries to choose or adapt the candidate experiences considering the domestic condition in terms of the health need, health system situation and the cultural acceptability. Hopefully those experience would be adapted into the domestic MCH projects and policies, and enhance the effects of policy implementation.

2. Limitation of the research

- This study only summarizes a small part of Chinese experience on MCH.

China's MCH service system is a highly comprehensive system after years of construction, with strong and professional capacity. Due to the limitation in time, funding and staff professional background, the results of this study show only part of China MCH experiences and lessons, and cannot show the whole picture. The research needs to be further expanded and in-depth carried on.

- Lack of sufficient relevance in evidence between the measurement and effect.

The basic method of this study was to literature review and informant interviews. On the one hand, the current published literature has obvious bias. There are many more literature on experiences than lessons,

more positive intervention and failed. Meanwhile, most of the paper are report to show the good effect of certain working by statistical figures, and there are very few intervention study papers with well design (e.g. With representation and match group). On the other hand, the content of the measurement in this study are mainly basing on the literature and interview, the effect mainly bases on case study with few systematic reviews. Meanwhile, most of the Chinese experience is a combination of various approaches, therefore the effect of a single method is hard to be figured out. The insufficient attribution evidence from intervention to effect have affected the conclusion to some extent.

- Inadequacy on interdisciplinary study.

Although the project was originally designed as a multidisciplinary cooperation study, but in fact the researchers mainly from the public health related disciplines, so the analysis in political, historical, and public policy perspective is less strong than expected. Such a limitation also makes the Chinese experience refined from this study has certain limitations in terms of macro perspective.

3. Problems during project carried out

Conflicts between legal provisions in different countries impeded the signing of trans-national cooperation agreement. Currency issues caused a loss to some of our partners in appropriation allotment. In accordance between project partners and project management office in regulation provision brought great difficulties to the project implementation party. Sometimes communication with developing countries was delayed due to underdeveloped Internet coverage. The attitude and effort to the project was also an influencing factor for the quantity and quality of project outcome.

Annex (Omitted)

1. Annual Work Plan Implementation
2. Financial Management Progress
3. List of articles
4. List of policy brief
5. Content of book
6. List of other outputs

OP103 Peking University School of Public Health (SPH)

Output 103 Global Health Core Research: Sub-project in Health System Strengthening
Final Report

Abstract

The overall target of Global Health Core Research - Health System Strengthening is to synthesize and analyze China's health system strengthening experiences and lessons during the past six decades from global health perspective. In order to accomplish these objectives, research and project activities were carried out mainly in three aspects: to synthesize and distill China's health system strengthening experience; to analyze the applicability of China's experience in other countries by conducting comparative study between different countries; knowledge dissemination and sharing. Project implementation institutions include Peking University School of Public Health, Fudan University School of Public Health, London School of Hygiene and Tropical Medicine, and the Ifakara Health Institute in Tanzania. Project period lasts from January 2014 to December 2015. 19 activities were planned in total, and 18 were completed. One activity has been officially postponed.

In order to synthesize and distill the lessons learned from China's health system, we carried out five studies on the different building blocks of China's health system (health financing in rural areas, public health care financing, health service delivery system, rural health workforce and health systems governance). In order to better international dissemination, we synthesized the implementation process, policy contexts and mechanisms, as well as the impact of the implementation of the policy. By building the chain of evidence from policy design to impact, we can provide complete evidence for other low- and middle-income countries, so that they can get all the information to determine the applicability of China's experience.

We carried out a transferability framework in this study, and did a comparative study between China and Tanzania to analyze of the applicability of China's experience in Tanzania. The transferability framework of this study believe that the condition of one policy in one country being applied in another country includes: resources that the policy need is available in another country, and can be mobilized for this policy; the backgrounds of the policy in two countries are consistent; the policy mechanisms in one country will also work in another country. Using this framework, we analyzed the applicability of China's new rural cooperative medical scheme (NCMS) and rural human resources policy in Tanzania. The study found that it is impossible for Tanzania to adopt the whole design of NCMS under the current economic development and decision-making system of Tanzania; but some specific practices for attracting residents and earmarking funds for NCMS can be implemented. Tanzania is planning to rebuild rural community health workforce policy, they can borrow China's experience in selection, training and management of barefoot doctors; however, stable income source for the community health workers in Tanzania is still not feasible due to lack of resources and no integration between the

community health workers and the medical insurance system for rural residents, as well as the differences between the two countries in defining the role of community health workers.

In order to disseminate and share the results of this study, China experience dissemination seminar is held in Tanzania, and we also present the results of this study on different international conferences. 11 English papers and 4 policy briefings will be published in total.

After conducting project activities during past two years, our team introduced Chinese health system experiences and lessons comprehensively and systematically to the whole world for the very first time; the ability of summarizing and analyzing Chinese experience of researches in core institutions has been increased, as well as the ability in analysis of Chinese experience from global health perspective; collaboration between core institutions in China, Tanzania and UK was strengthened; we also cultivate the next generation of global health system researchers; Chinese researchers' capabilities of contributing to global health are also improved. The research team also accumulated experience on comparative study between countries, and the ability to coordinate international collaboration projects was enhanced. These gains have laid a solid foundation for future global health system research in China and China's contribution to global health development.

Chapter 1 Project background

Health system provide a platform for interventions of health policy implementation, it is a key area searching for improvement and perfect. When China is still a low-income country, in the 1950s to 1970s, the Chinese government has taken many measures to build health system, including health infrastructure investments, training primary care health workers, expanding the coverage of basic disease risk protection mechanisms, coordination health-related departments. Since the late 1990s, especially after 2009, to maintain continuous improvement in health of our country in transition and improve health equity, the Chinese government has promoted and deepened the health system reforms to achieve health for all, including financing system, governance, health care delivery systems and health workforce. On the other hand, over the past six decades, China has experienced a decrease in the performance of health systems, including the disintegration the rural cooperative medical system in the mid-1980s, which leads a catastrophic health expenditure of rural residents; the funding mechanisms of user charge in public hospitals, it not only leds to rising health care costs, but also reduces the accessibility of health services for the poor. Many countries also face the challenges on the health system level, in order to achieve high-quality universal coverage. China's experience in building health systems in the past 60 years could be an important reference for other low- and middle-income countries to achieve universal health coverage. At the same time, the capacity of Chinese agencies involved in global health activities, providing experiences and evidence to improve global health system also needs to be strengthened.

In this context, the Chinese Ministry of Commerce and Department for International Development of the Great Britain (shorted as DFID) launched the Sino-British global health support program (shorted as GHSP project). GHSP project aims to establish a new type of China-UK health partnership, strengthen each other's cooperation in global health, enhance China's ability to participate in global health development, to jointly promote global health improvement. GHSP project selects advisory institution through a public tender. School of Public Health, Peking University undertook the "core global health research" to improve health systems research field in December 2013, through an open competitive bidding. Project life cycle is January 2014 to December 2015.

The overall objective of this study is to synthesize and analyze the experience and lessons of China over the past 60 years in the construction of the health system in a global perspective. Specific study objectives include:

1) To strengthen capacity of Chinese researchers in evidence generation and synthesis in health system strengthening with global health perspective;

2) To establish international partnership in synthesizing, analyzing, and translating evidence-based practice in health system strengthening;

3) To synthesize and distil China's experiences and lessons in health system strengthening and analyze relevance of those experiences and lessons in other LMICs;

4) To explore feasibilities of applying China's experiences health system strengthening in low-income countries by conducting comparative study and feasibility analysis; and

5) To promote the application and uptake of research findings in health policy and practice. The main outputs of the study include: improvement of the ability of studying health systems, publication of papers, establishing policies' influence and international cooperation.

Chapter 2 Study design and implementation

In order to achieve the overall goal of project, according to the requirements of TOR and project proposals, the contents of this project can be summarized in three main areas: the synthesis of Chinese health system strengthening experience; undertake comparative study analyzes between countries, also the applicability of China's experience in other countries; knowledge dissemination and sharing.

Research institutions involved in this study include Peking University School of Public Health, Fudan University School of Public Health, London School of Hygiene and Tropical Diseases Institute, Ifakara Health Institute in Tanzania. Peking University School of Public Health, Fudan University School of Public Health is responsible for synthesizing lessons learned from the Chinese health system; Ifakara Health Institute in Tanzania takes charge of the comparative study between China and Tanzania; London School of Hygiene and Tropical Medicine is mainly responsible for designing transferability framework, and providing technical support for comparative study.

On the experience synthesis part, the work procedures and methods are introduced as below. In order to select the best topics representing Chinese health system experience, we used World Health Organization health systems function framework firstly, confirming a topic on 4 aspects: delivery system, governance and leadership, health financing and health workforce; and then we carried out a meeting to confirm the topics of the review, senior experts at the field of health systems and key officials involved in health systems policy development discussed and identified topics in four areas; decided China’s experience evaluation framework, namely the use of transition theory, to analyze policy research background, content, processes, mechanisms and effects; and we used systematic review of published literature, policy documents and key informant interviews to collect raw data; extracted raw materials according to the transition theory.

In the "to conduct comparative study, analyzing the applicability of China's experience in other countries" part, procedures and methods are as below. By literature review about Tanzania health system, and key informant interviews on health systems, the areas for comparison study were identified, which were health financing of non-formal sector, human resources for health in rural areas. The Tanzania research group learned the research results of China's health system experience, including the content, processes and mechanisms of health financing and health workforce policies in rural area; conducted stakeholder census workshops, informant interviews and focus group interviews to get stakeholders’ ideas on the applicability of Chinese experience in Tanzania; finally based on collecting policies background information between the two countries, analyzed and judged the applicability of the Chinese experience.

Specific research activities undertaken for each research objective, as well as research methods and responsible organizations are shown in Table 1.

Table 1 "Research on Health Systems Strengthening in Global Health in China" research goals and content

Target	Content	Methods	Activities	Assignments
To strengthen Chinese researchers' ability to synthesize research evidence on global perspective	1, to carry out global perspective specific research on evidence synthesis 2, participate in and organize various forms of training, including training courses for specific contents as discussed training, and participation in national conferences	——	2.1.2 Visits to the London School of Hygiene and Tropical Medicine study Participate in the "China-Africa Health Roundtable" 3.3.2 Participate in the 2014 World Health System Assembly 2.1.1 Training Seminar in China	Peking University School of Public Health Fudan University School of Public Health London School of Hygiene and Tropical Medicine Ifakara Health Institute in Tanzania
During the process of synthesis, analysis and dissemination of the health system strengthening, establishing an international partnership	1, In the project implementation process, keep close consultation and cooperation with partner organizations, including cooperation between the project implementation plan, research methods and design, as well as doing research 2, The visits between the partner institutions	——	1.1 Startup and project implementation planning meeting 2.2.1 1) The meeting of deciding the theme of review 2.3.2 Applicability and comparative analysis seminar as well as the second annual Symposium Work Plan Seminar 2.1.3 +3.2.2 Visit to Tanzania for learning and training seminars	Peking University School of Public Health Fudan University School of Public Health London School of Hygiene and Tropical Medicine Ifakara Health Institute in Tanzania
Synthesis experiences and lessons learned on the health system strengthening in China, analyzes the applicability of these lessons in other low- and middle- income countries	1, Around the health system function modules, summarized Chinese health system e experience and lessons, including five specific elements: 1) The development and evolution of primary health workforce 2) New Rural Cooperative Medical System construction 3) Financing of basic public health services 4) Evolution and experience of the Chinese health system governance 5) The establishment and development of primary health care delivery system 2. Application and design for the Applicability framework	Systematic review; Policy document analysis; Depth interviews with experts and insiders; transition theoretical framework	2.2.1 3) + 2.2.2+ 2.2.3 Health workforce systematic review, secondary data analysis and interviews (a theme) 2.2.1 2) + 2.2.2+ 2.2. Health finance system systematic review, secondary data analysis and interviews (2 topics) 2.2.1 4) + 2.2.2+ 2.2.3 Health system governance and background systematic review, secondary data analysis and interviews (2 topics) 2.3.1 The framework confirmation and development of applicability	Peking University School of Public Health Fudan University School of Public Health London School of Hygiene and Tropical Medicine

Through comparative research and feasibility analysis, to study the applicability of the implementation of China's health system in other low- and middle-income	1, A Comparative Study of China and Tanzania 2, Tanzanian research team and policy makers' fieldwork in Chinese primary health care system 3, The Chinese team fieldwork in Tanzania primary health care system	Systematic review; Transition theoretical framework; Individual in-depth interviews; Focus groups; Stakeholders Symposium	2.3.1 Comparison of Summary and Study Design 2.1.3 +3.2.2 Visit to Tanzania , learning and training seminars 2.3.3 Data Collection of China on Comparative Study 2.3.3 Data Collection of Tanzania on Comparative Study 2.3.4 A comparative study report writing	Peking University School of Public Health London School of Hygiene and Tropical Medicine Ifakara Health Institute in Tanzania
To promote application of the scientific results on health policy and practice	1, Policy briefs and publishing papers 2, Training seminars about Chinese experience in building health systems in Tanzania	——	3.1 To write and publish articles 3.2.2 Low-income countries Training Seminar 3.3.1 Dissemination conference	Peking University School of Public Health Fudan University School of Public Health London School of Hygiene and Tropical Medicine Ifakara Health Institute in Tanzania

Chapter 3 Completion of project objectives

3.1 Completion of technical targets

As mentioned above, the study has five specific objectives, a total of 19 planned activities aiming to achieving the objectives. By the end of May 2016, 18 activities have been completed, achieved the desired output results; an activity has been officially postponed, and the related works are in progress. Annex Table 1 shows all the planned activities, the corresponding proposal activities, and completion of expected outputs.

This study has the following five specific technology goals, completed as follows:

3.1.1 Strengthen Chinese researchers' working ability to synthesize research evidence with a global perspective

In order to improve the team and the Chinese health system researchers' ability to synthesize and disseminate policy experiences, the activities of the project included: research team members participated in the whole work progress of " Synthesizing Chinese Health System Strengthening experience", visited and studied in the London School of Hygiene and Tropical Diseases Institute, organized training seminar "complex health system interventions evaluation method", and attended the third Health System Symposium in South Africa.

The main activities of the research team are to conduct the systematic review of China's health system strengthening experience, focusing on the five aspects of China's health system building blocks. All these research topics of the project covered broad policy content, the contextual factors, policy process and causal relationship are complex, so we cannot use the traditional system review method. In addition, in the early stages of research, the research team also lacked experience on how to translate China's policy experience from an international perspective into practical research methods. In order to master and apply more applicable research methods, the team members visited the London School of Hygiene and Tropical Diseases in June 2014 for a two-week study. In September 2014, the project team attended the Third Global Conference on Health System Research in Cape Town, South Africa, and was able to learn more about cutting-edge research by participating in and listening to the latest research in global health system improvement. Through the above-mentioned "learning by doing, doing while learning " and international training, analyzing capacity of Peking University and Fudan University researchers participated in the project increased significantly. In particular, research team had a deeper understanding on how to evaluate complex health system policy, how to synthesize the various types of research evidence, policy and how to summarize China's health system for the perspective of dissemination.

The study also tries to help a wider range of Chinese health system researchers to improve research capacity in international perspective. February 2015, the project organized "complex health system interventions evaluation method training", nearly 70 students in more than 25 universities and research institutions participated in the training courses. The method described in this training is very suitable for integration and evaluation of the content and effects of Chinese health system policies, which is also applied in all subjects of the project; introducing these methods to researchers in this area has extensive increased the capacity of integration, refining the content and effects for them.

3.1.2 During the practice of synthesizing and disseminating health strengthening experience, to establish international partnerships

Most of the activities of the project have strengthened international cooperation, both directly and indirectly, including discussions with London and Tanzanian partners on project initiation and annual project meetings, organization of international and domestic training, Tanzanian research team visiting China's primary health care institutions, Chinese research team visiting Tanzania to study and disseminate the Chinese experience.

In order to develop cooperative relationships, the project attaches great importance to the daily work of the project, including the organization of multi-party seminars in the research phase of the design or event organization, the project annual meeting all parties involved in. Based on their research experience, the China and UK research teams have collaborated in the design of training sessions in Shanghai, China. In order to better disseminate China's health system construction experience, Tanzania's research team and policy-makers visited the township health centers and village clinics in Shunyi District, Beijing, in February, 2015. They had in - depth and meticulous communication with the staff of local health and family planning committees, hospitals and village clinics. In July 2015, a Chinese research team visited Tanzania and exchanged views with the head of the Health Financing and Health Workforce Division of the Ministry of Health and Social Welfare of Tanzania, researchers from the Ifakara Institute of Health, regional hospitals and primary health care facilities. Through this series of activities, we have established cooperative partnership between China and the United Kingdom, Tanzania, formed a relatively stable relations of cooperation.

3.1.3 Synthesize and refine lessons learned from China's health system construction to analyze applicability in other low- and middle-income

In order to systematically introduce the experiences and lessons learned in the process of China's health system construction, all the participating institutions and relevant experts, after several rounds of discussion and selection, selected five research themes, namely, "Development and Evolution of Rural Health Resources", "The strengthening of New Rural Cooperative Medical System", "The financing strategies of basic public health services", "The evaluation and experience of health system governance in China", and "Three-tiered health delivery system". From the perspective of disseminate, in order to analyze the applicability of Chinese experience better, each topic is based on the theory of change to make a theoretical framework for the background, content, process, mechanism and effect of the corresponding policy, and then using realism review method to extract and synthesize the literature, the output of each policy in the context of how to propose, implement and produce the full effect of the evidence. Each of the thematic studies emphasizes the importance of contextual and action mechanisms for policy. The complete evidence from the policy formulation to the process of generating results will help other low- and middle-income countries to determine the appropriateness and effectiveness of Chinese policies in terms of their country-specific context and mechanisms.

3.1.4 The feasibility of transferring China's health system building experience in low-income countries through comparative research and transferability analysis

To explore the feasibility of implementing the experience of building health systems in low-income countries, the Tanzanian team visited China's primary health care system, the

Chinese research team visited Tanzania, and conducted a China-Tanzanian comparative study.

In February 2015, prior to the design of the comparative study, the Tanzanian partner institution had a better understanding of China's health system-building experience in order to have an intuitive feel for the Chinese health system; two researchers from the Ikka Kola Health Center in Tanzania, An official from the Ministry of Health and Social Welfare of Tanzania visited the township health centers and village clinics in Shunyi District, Beijing, and learned about the operational and operational aspects of the health system. The China research team visited Tanzania in July 2015, held a seminar on the experiences of health systems development in China organized by the Ifakara Institute of Health, and held a China-Tanzania Symposium on Comparative Studies in Health Systems, The applicability of the policy and experience of health system development in China was discussed by policy-makers at all levels, such as the Head of the Health Financing and Health Workforce Division of the Ministry of Health and Social Welfare of Tanzania and Regional Hospital Representatives. After the workshop, the Tanzanian research team conducted in-depth interviews with health policy makers at the national and local levels in Tanzania on the basis of the discussion, and analyzed the applicability of the New Rural Cooperative Medical System and rural physician team in Tanzania. China-Tanzanian comparative studies have been used to determine the feasibility of specific policy approaches in rural health financing and health workforce in Tanzania.

3.1.5 Promote the application of scientific findings in health policy and practice

In order to promote the application of scientific findings in health policy and practice, the project is actively engaged in a variety of output-related activities, including translating research findings on China's health system construction and applicability in Tanzania into policy briefs and article presentations, holding training seminars on health system construction experience in Tanzania. In addition, the project team is working to publish the results of the study in the form of English special issue to spread the scope of the Chinese experience in a wider range, two well-known health system magazine（Health Policy and Planning and International Journal for Equity in Health） has launched the convening and review work. In addition, the China research team organized a seminar on China's experience in health system construction at the Ifakara Institute of Health in Tanzania in July 2015, and informed rural policymakers about the New Rural Cooperative Medical System in China and the policy of training, managing and maintaining barefoot doctors and rural doctors in Tanzania, which is working on reform of rural health financing and community health workforce. Through the above positive and effective dissemination of scientific evidence, this project promoted the transformation of scientific research output to policy practice.

3.2 Implementation of the budget (Omitted)

Chapter 4 Research results

The project has three aspects: synthesizing and integrating lessons learned from China's health system construction; conducting country comparative studies to analyze the applicability of China's experience in other countries; and disseminating and sharing knowledge. Specifically divided into the following six sub-topics:

4.1 China's experience in rural health financing system

4.1.1 Background

The health financing system is the most important basis for achieving universal health coverage. By mobilizing resources for health, it eliminates the economic risks and barriers to access to health services and ensures access to basic health services for all. How to establish a health insurance system covering the entire population in rural and underdeveloped areas is an important challenge for the health financing system in low- and middle-income countries.

Since the 1950s, "cooperative medical care" in rural areas in China had covered more than 90% of the country's villages and played an important role in improving the health of rural residents. However, with the reform of the social economic system, the cooperative medical system began to disintegrate gradually from the 1980s. In 2003, the third national health service survey showed that nearly 80% of the rural population did not have any medical security, the rural residents of poverty caused by illness, poverty back to poverty problems are prominent. Since 2002, the Chinese government saw strengthen rural health work as an important work to protect rural productivity and develop rural economy. It planned to establish a New Rural Cooperative Medical System in rural areas (hereinafter referred to as "NCMS"). By the end of 2014, NCMS had covered 98.9% of the rural population, and played a very important role in ensuring the accessibility of rural residents' health services and alleviating the economic burden of disease.

Current research on NCMS focuses on how this system works and how much protection it can provide to participating farmers, but few studies are based on these results to further explore in detail what elements of China's experience are replicated or extended in other developing countries.

4.1.2 Research framework and methodology

This subproject explores the applicability of China's experience in other low- and middle-income countries using a realistic review methodology. We study the national policy documents, investigation reports and the related English literatures of rural health financing in China, and synthesize the empirical evidence of China's new rural cooperative medical fund - raising experience. We summarize the theory of transition based on the hypothesis of the theory, and combine the evidence of previous studies and revise and summarize the experiences of the reform theory on rural health financing in China through stakeholder interviews and systematic literature search. The specific research contents of the sub-project include: 1) Describe the environment, the main policy content and the important mechanism design in the implementation of the New Rural Cooperative Medical System. 2) summarize the impact of the New Rural Cooperative Medical System after the implementation of the policy, and the outcomes and outcomes of the health system. 3) Identify and summarize the experiences and lessons learned from the use of NCMS financing in other low- and middle-income countries.

The sources of this study are the electronic journals of scientific journals, the internal investigation reports of the Ministry of Health, policy documents and so on. Among them, 1,073 English papers were selected by topic and full text, and 50 were included for data extraction. Supplemented by Chinese policy papers and survey reports.

4.1.3 Results

1. The funding mechanism of NCMS

1) Residents voluntarily to get insured as a unit of a family. The NCMS insists on the principle of voluntariness, and the farmers decide whether to participate in the insurance. This not only reflects the government's respect for the wishes of the farmers, but also through the household unit insurance reduces the risk of adverse selection to a certain extent, helps to maintain a normal age structure of the participating population.

2) Multi-party financing, the Government assumed the main financing responsibility. The NCMS implements a funding mechanism that combines individual contributions with government funding. The central government and local governments shall give corresponding subsidies to the rural residents participating in the New Rural Cooperative Medical System. At the beginning of the pilot in 2003, the annual fund-raising amount of individuals is not less than 10 yuan, the sum of government subsidies to farmers at all levels is not less than 20 yuan, government financing accounted for 66.7%; 2015, personal financing standards increased to 120 Yuan, the government subsidies to farmers totaling 380 yuan, government financing accounted for increased to 76.0%.

3) NCMS safeguards the basic medical needs of outpatient and inpatient care, focusing on critical care. The NCMS system sets up a list of essential medicines, basic medical treatment and medical facilities, and sets out the payment, co-payment rate and capping line for outpatient and inpatient expenses to ensure the basic and reasonable medical treatment for the participants. Inpatients, out-patients with serious illness and other medical expenses higher insured, the new rural cooperative will give a higher proportion of reimbursement, and effectively reduce the financial burden of patients. For example, since 2013, the Ministry of Health putted the child leukemia, congenital heart disease, end-stage renal disease, breast cancer, cervical cancer, severe mental illness and other 20 major diseases into serious illness coverage, the actual ratio of reimbursement of these diseases are not less than 70%.

4) Establish a more perfect management operation mechanism and supervision system. The NCMS is organized by the government. There is a management and operation mechanism, which is run by the government from the central to local governments, with the departments of health, finance, agriculture and civil affairs, and with the participation of farmers. The establishment of a variety of regulatory mechanisms, the regular publicity of the use of funds and compensation for farmers to participate in the situation, to accept the NPC oversight and audit supervision, and through the establishment of monitoring telephone, box advice, hire supervisors and other forms of voluntary supervision of the masses, the standardization and openness, fairness and fairness of NCMS have been greatly improved.

2. The impact of NCMS

1）NCMS enhances rural residents' access to health services. According to the statistics of the State Planning Commission, about 95% of NCMS outpatients and 80% of inpatients received treatment in the county in 2011. The results of the fifth national health service survey in 2013 showed that the hospitalization rate of rural residents increased from 3.4% (2003) to 9.0%, and the rate of non-attendance for two weeks decreased from 45.8% (2003) to 16.9%.

2）NCMS effectively reduce the economic burden of rural residents to seek medical treatment. In 2013, the actual compensation ratio of farmers in hospitals at all levels of medical institutions reached 50%, of which 80% in the township level, more than 60% at the county level; actual compensation ratio of outpatient is more than 50%; compensation ratio of 20 kinds of serious illness in hospital have reached 69%.

3）The system is recognized by rural residents. In 2010, the National Committee on the new rural cooperative monitoring county household survey data show that 87.08% of rural residents of the new rural cooperative system is satisfied or very satisfied. Sustained high participation rates also show the residents of the system of trust and support.

4.1.4 Implications for other low-income countries

In the context of the collapse of the original CMS system, China has reconstructed a New Rural Cooperative Medical System in rural areas after more than a decade of construction. This financing system has basically achieved full coverage of rural residents, its development experience is worth other low-income countries learn from. First, the establishment of basic medical insurance system in rural areas requires the government to play a leading role, as far as possible to provide financial support for institutional development and organizational security. Second, according to local conditions to carry out system design, pilot first, and steadily improve the system. Third, in the system design, publicity and communication to take a variety of measures for the participation of the public. Fourth, the protection of the insured level of benefit, which is the key to maintain the system attractive.

4.2 China’s financing policy to promote the accessibility of public health

4.2.1 Research background

The provision of basic public health services free of charge to urban and rural residents is a basic institutional arrangement in the field of public health in China. As a part of public service, public health should take the leading responsibility of financing by the government. Lack of sustainable public financing will affect the accessibility and equity of public health. China has had a profound lesson in this regard, but also accumulated a lot of experience. Systematic summary of China's financing strategy to promote public health accessibility, have a reference for low-income countries.

Most of the present studies on public health financing in China focus on the content or effectiveness of specific policies and interventions. A few studies have analyzed the experience of public health financing in China since 1949 and public health financing shortage since fiscal decentralization and marketization since 1984, or the problem it brings. But there is no research systematically summarize the evolution of public health financing in China since 1949 and the financing strategy of basic public health equalization since 2009.

4.2.2 Research framework and methodology

Based on the theory of change and health policy communication, this study builds a model of input, process, outcome and impact of public financing in China. It explains the mechanism of different public health financing strategies and the influence of background factors such as fiscal decentralization and transfer payment on the process and effect of public health financing. The main contents of the research include: 1) the evolution of public health financing in China and its characteristics in different historical stages; 2) the change of Chinese public health financing strategy and the effect of its implementation in 2003, taking China's public health equalization as an example; 3) Explain the problems and solutions of public health financing in China since the reform and opening up, taking China's planned immunization as an example.

In this study, retrospective review was used to systematically review and collate domestic and foreign literatures, interview public health fund-raising experts, and collect basic public health expenditure, basic public health service coverage, planned immunization coverage rate and various health indicators for secondary data analysis.

4.2.3 Results

1. China's historical experience in promoting the equalization of financing for basic public health services proves that only by strengthening the government's responsibility for financing public health, can the public health be stable and sustainable.

1) During the planned economy period after the founding of the People's Republic of China (1949-1984), the central government concentrated funds to deal with major public health problems, mobilized people to carry out the "Patriotic Health Campaign", effectively reducing the incidence of infectious diseases, the overall health of residents was significantly improved. The World Bank and WHO have called it the "China model", which has the greatest health benefits with the least amount of money, to spread to developing countries.

2) During the period of financial system reform and marketization (1985-2002), local governments failed to take responsibility for public health financing after the implementation of the decentralization and tax reform of central and local governments, leading to the weakening of the public health function of primary health care institutions. The budget share of government spending on public health has fallen sharply. Primary medical and health institutions gradually lose public financial support, into a self-financing entities, the basic public health services faces stagnation, or even retrogression, then there is the resurgence of some infectious diseases.

3) The Chinese Government has established a "harmonious society" and a "people-centered" ruling conception, and the government has regained its responsibility and attention to public health. During the reconstruction period since the outbreak of the SARS epidemic (2003). The government included professional public health institutions and primary health care institutions in overall budget management, increase public health input, strengthen grassroots medical and health institutions and human resources training, and provide 12 categories of basic public health services to urban and rural residents free of charge.

4) China's public health service system includes CDCs (3492), TB prevention and control centers (1271), hospitals (27,215), and primary health care institutions (912,074). The funds for major public health services, such as personnel funds, construction funds, operation funds, and

AIDS, tuberculosis, and endemic disease prevention and control, shall be fully borne by the government budget. Public health services undertook by public hospitals will get special subsidies from the Government. Construction of funds and personnel funds of Primary health care institutions are from the government budget allocation, operating expenses will get subsided through the purchase of services. On this basis, funding strategy of basic public health services free provided to the urban and rural residents is as follows:

5) Clearly defined basic public health service packages. In 2009, the Chinese government regulated the content of the "Basic Public Health Service Package", including the establishment of the residents' health record, health education, vaccination, child health management, maternal health management, elderly health management, hypertension, type 2 diabetes Health management, management of severe mental illness, infectious diseases and public health emergencies reporting and processing of 9 categories of services. In 2011, the government increased the supervision of health supervision, in 2015 the government increased the health management of Chinese medicine and TB health management, a total of 12 categories of services. Local governments can add other services on the basis of the country's basic service package, depending on the level of local economic development, fiscal capacity and public health. A clear definition of public health services and scope of the primay health work more targeted, also facilitate the assessment.

6) Minimum funding criteria were identified and increased year-on-year. The funding standard is based on the comprehensive cost of each service. The level of fund raising has increased from RMB 15 per capita in 2009 to RMB 40 (2015: RMB 1 in RMB). This ensured the implementation of service funds and standardized management, from the point of system. Local government according to the contents of the local service package and financial capacity can be appropriately raised funding standards.

7) Central, provincial, prefectural, and prefectural governments share the funds for basic public health services, and the central government funds are transferred to the economically underdeveloped central and western regions through transfer payments. The proportion of governments at all levels in accordance with local economic and social development level. The central government funds grant 80%, 60% and 10-50% of the funds to the western, central and eastern regions respectively through general transfer payment and special transfer payment to alleviate the shortage of public health funds in the underdeveloped areas of central and western China. In 2009, the per capita funding level of 15 yuan, for example, the central region of the western region of 12 yuan, 12 yuan and provincial and local governments raised 2 yuan and 1 yuan; central region central funding of 9 yuan, provincial government financing 6 yuan; The eastern developed areas mainly depends on local financing. The provincial finance also achieved cross-subsidies from province's affluent areas to the poor areas through the transfer of payment.

8) The use of earmarked and per capita allocation of strict financial management. Funds for basic public health services are managed according to special funds, separate accounts, unified accounting, allocated according to the head of the people. On the one hand, the amount of funds allocated is relatively transparent, which can effectively reduce the interception and misappropriation of funds; on the other hand, it is conducive to direct supervision by the

financial department and to ensure the safety of funds to ensure the smooth flow of funds allocated.

9) Take the " appropriation before, settlement after " approach, and the establishment of performance evaluation system. In order to prevent financial resources from being stagnated at various levels and to improve the efficiency of capital use, the local government finance departments usually allocate a certain proportion (50%) of the funds at the beginning of the year. The remaining funds are linked with budget supervision and performance evaluation. Performance evaluation includes: project management, capital utilization, the number of tasks completed, quality and timeliness, as well as economic and social benefits, sustainable impact, social satisfaction and so on. Mobilize pimary health services to carry out the initiative of public health services to ensure that the subsidy funds really used for basic public health services.

10) Government procurement services and public-private partnerships (PPPs) are conducive to mobilizing private sector initiatives and alleviating inadequate health at the pimary level. Before the implementation of equalization policy, primary health care institutions only have personnel funds, no work funds, it is difficult for them to really carry out a comprehensive public health services. After the implementation of equalization, through the purchase of services, funds for public health services are protected, health workers can be paid by assessment, primary public health institutions' initiative to provide services has been improved. In addition, the government's purchase of public health services, such as village doctors, in the private sector, also eases the shortage of public health workers at the primary level.

Data shows: in 2015, the rate of national population health file standardized electrified is 75%, systematically management rate of children under 3 years old and the maternal remained at 85%, rate of 65 years of age and older health management remained at 65% or above. The standardized vaccination rate of school-age children is more than 90%, and the standardized management rate of hypertension and diabetes is 35% and 30% respectively. The standardized management rate of registered serious mental disorder patients is over 73%, 40% coverage of TCM health management, TB health management of 90 million people (management rate of 90% or more). The rate of rural maternal delivery in hospital is 99%. The Gini coefficient of public health expenditure fell from 0.25 (2008) to 0.23 (2014), and the Gini coefficient of government health expenditure fell from 0.33 (2003) to 0.10 (2014).

3. The main body of China's planned immunization financing should be the government, especially the central government in the provision of vaccines. The local governments should ensure the funding of the planned immunization work and institution-building, and charging the individual vaccination for a certain period has negative impact. China has three important stages in implementing EPI work experience:

1) Beginning phase (1950-1977). The situation of infectious diseases in China is grim. Smallpox, polio, measles and other diseases seriously endanger people's lives and health. After the founding of New China, China launched a rapid program immunization. In 1950 China began vaccination in the nationwide vaccine, which quickly inhibited the epidemic of smallpox. The central government issued the "instructions on autumn vaccination," clearly stipulated vaccination of vaccine shall not charge any fees to the individual, the central government to

local governments free vaccines, local government organizations vaccination. As of 1952, China's 500 million people have been vaccinated against vaccinia vaccine, to the early 60s China has eliminated the smallpox. The main experiences in this phase include: 1) The government attaches great importance to EPI and gives full financial support under the conditions of very backward economic development; 2) Give full play to the role of the central and local governments, and clear financial responsibility and organizational responsibility; 3) To mobilize social forces to participate, to solve the problem due to lack of professional health personnel.

2) Development stage (1978-2006). In response to the World Health Organization's call for immunization programs in 1978, China plans to promote four vaccines (Bacillus Calmette-Guerin, Poliomyelitis Vaccine, Vaccine and Measles) nationwide to prevent and control six infectious diseases (tuberculosis, Pertussis, diphtheria, tetanus and measles). Due to limited conditions, China implemented two walking programs: the first step in 1988 is to achieve the inoculated rate of four children vaccination gets to 85% within the scope of province; the second step in 1990 is to achieve the inoculated rate of four children vaccination gets to 85% within the scope of county. Immunization program in 2002 and added hepatitis B vaccine vaccination. In 2000, the Chinese government announced that since October 1994, there has been no new case of poliomyelitis in China. China's relatively well-established primary health institutions and public health system provides a good basis for the implementation of EPI. In terms of financial arrangements, the central government provides funding for vaccinations and inoculations in economically underdeveloped provinces, while other provinces are responsible for raising funds. Individuals are still exempt from vaccination, but are required to pay a certain amount of vaccination service to encourage vaccination personnel and institutions. The toll on users has somewhat affected the immunization program, and in 2005 China stopped the charges. During this period, government spending accounted for the proportion of total expenditure on public health declining, only 30-50%, but other expenses need medical institutions to provide paid services to make up for the planned immunization, which has brought some negative impact. The experience and lessons learned during this period include: 1) the government responded positively to the World Health Organization's action proposals, and continued to expand the scope of vaccination through national planning; 2) under the influence of market economy reform policies, inadequate investment in public health has encouraged medical institutions' pursuit of interests, deviating from the provision of public service track, affecting the quality of immunization program.

3) Improvements (2007 - present). With the increase of national financial resources and increasing awareness of the importance of EPI, the Chinese government has rapidly expanded the scope of immunization programs. In 2007, it promulgated the "Expanding the Implementation Plan of National Immunization Program", expanding the types of planned vaccines, strengthening immunization quality control, enhancing the effect of immunization. At present, the number of vaccines provided free of charge by the government reaches 14 (Vaccines for measles, Hepatitis B, Hepatitis B vaccine, Vaccine, JE vaccine, Mumps vaccine, Leprosy vaccine, Hemorrhagic fever vaccine, Anthrax vaccine and Leptospira vaccine). These diseases can effectively prevent 15 kinds of diseases (Tuberculosis, poliomyelitis, whooping cough, diphtheria, tetanus, measles, hepatitis A, hepatitis B, encephalitis, mumps, rubella, hemorrhagic fever, anthrax and leptospirosis). Vaccination rate continues to be consolidated and

improved, the main vaccination rate of children of the school-age as a unit of township has achieved more than 90%, the reported new vaccination coverage rate is more than 70% (in the year of 2007, 0-14 year-old children population is 257 million). Key experiences in this phase include: a) Economic security is the most important condition for EPI, and it is very important for the central government to support the EPI work in economically underdeveloped areas through transfer payments. b) With the development of economy and the improvement of people's health demand, the scope of immunization program will be expanded gradually according to the principle of cost-effectiveness, this policy not only can promote health, but also improve the efficiency of health resource utilization.

4.2.4 Implications for other low-income countries

In many low- and middle-income countries o rural and underdeveloped areas, access to basic public health services is not available or equitable due to the lack of stable, efficient and sustainable public financing, leading to significant epidemics and endemic diseases and maternal and child mortality rates, which significantly affected the achievement of the Millennium Development Goals (MDGs) of the United Nations. China's policy to promote the equalization of basic public health services since 2009 is not an innovation, it is government's returning to the commitment of responsibility to promote equalization of health and financial services. For developing countries that rely mainly on central government finances or international organizations for public health financing, China's experience can be useful, but it should be also noted that any country's political system and fiscal system will contribute to the country's financing of basic public health Service.

1. To strengthen the government in public health financing to the dominant position. A clear public health service package should be defined by the government to clarify service items, service norms and minimum funding levels to facilitate accountability; the central government should assume the primary funding responsibility and clarify the financing responsibility of the governments at all levels through central or provincial Government transfer payments to ensure the fairness of financing; the central government should develop subsidy funds management approach, take charge of the central allocation of central grant funds, and the implementation of the funds at different levels of management.
2. Synthesized management to ensure timely and adequate funding in place. The use of capitals can make the allocation of funds relatively transparent, reducing the retention and misappropriation of funds. In the actual use process, regular expenditure management can encourage the primary health care institutions to provide services. Allocating at the beginning of the year with performance-based payment in the middle of year speed up the progress of the allocation of funds. Government procurement services can promote public-private partnerships (PPPs), increasing private sector's initiatives to provide public health services, and complementing the capacity of providing public health services.

3. Local governments can design and implement basic public health service packages according to local conditions and under the general framework of national policies. Local governments should determine funding standards, progress and targets in a practical way and steadily improve the system. Central policy should have some flexibility to encourage and respect the efforts of local governments to promote the equalization of local basic public health services.

4. When the economic development status is not good enough, as long as the Government attaches great importance to, one country can still do a good job of immunization program. The country and government attach great importance to the immunization program is the guarantee. One country should establish a strong central and local fiscal compensation policy. Cost of vaccination and inoculation should be funded by governments at all levels, and the central and local governments should have a clear policy of fiscal sharing. After 2007, the central government is responsible for the cost of vaccines, the local government is responsible for inoculation, the central government will support the program of the economically underdeveloped central and western provinces through transfer payments and special fund. At the same time, local governments should also clarify the compensation policy, as well as subsidy policy about institution construction and operation, it should be emphasized that the immunization program does not charge any one.

5. Using international assistance to promote immunization program. After the reform and opening up, international aid has played an important role in China's planned immunization. For example, the cold chain construction in China's planned immunization was established with the support of international aid, also in the purchase of poliomyelitis and hepatitis B vaccine. But it should also be noted that international aid also requires domestic funding, primary vaccination institutions with basic capacity, and national policy support. Developing countries, while making active use of international aid, need to learn advanced technology and experience to enhance their ability to promote the sustainable development of EPI.

4.3 The development and evolution of rural doctors in China

4.3.1 Research Background

Community health workers have been extensively developed and applied in countries and regions where human resources are scarce. Community health personnel have the following characteristics: 1) living in the community, elected by the community residents, to provide health services for the residents in their communities; 2) to accept the health system support, but usually not a formal part of the health system; And the training time is shorter than the professional health technicians. Because of these characteristics, community health personnel and their communities are closer, they provide one or more medical and health services, the quality of service is not worse than the professional health technicians. There is evidence that, in some settings, community health services are effective in reducing infant mortality.

China's rural health system has always focused on primary health care. In the 1960s and 1970s, China's rural primary health care system, including three-tier health care network, rural cooperative medical system and barefoot doctors, was established in rural China, which has made important contributions to the development of China's health industry. Among them, the barefoot doctors and rural doctors as a half-farming community health workers, played a very important role in rural health development. This paper summarizes the experiences gained in developing barefoot doctors and rural doctors in China and analyzes their adaptability in other low- and middle-income countries.

4.3.2 Research framework and methodology

The researcher takes policy document analysis and literature review as the main research methods. The sources are electronic journals of science journals and government documents.

103 Chinese and English literatures and 5 monographs in Chinese and English were used to analyze the evolvement process, policy content, policy effects and policy environment of barefoot doctors and rural doctors system, and to summarize relevant experiences.

4.3.3 Results

1. The development stage of Chinese barefoot doctors and rural doctors

The first stage: barefoot doctor stage of development. In 1965, under the direction of Chairman Mao on June 26, rural health work began to receive high attention. In 1968, "Red Flag Magazine" and "People's Daily" published a book entitled "from the barefoot doctors to see the direction of medical education revolution", "barefoot doctor" officially appeared. Since then, barefoot doctor system has entered a comprehensive development stage. By 1979, 1.5 million barefoot doctors were trained.

The second phase: from barefoot doctors to rural doctors. In 1985, the Ministry of Health decided to stop using the term "barefoot doctor" instead of developing rural doctors. All barefoot doctors are required to take a uniform examination. Those who pass the exam will have a certificate of village doctor. Those who have not passed the examination will become health workers. Approximately half of the barefoot doctors passed the exam. At the same time, with the disintegration of the rural collective economy, rural doctors are no longer to obtain a fixed income from the collective economy, they must rely on medical services charges to maintain their own survival, the provision of public health services to a certain extent weakened.

The third stage: the development stage of rural doctors. Since the beginning of the 1990s, China has begun to develop primary health care, and rural doctors have once again played an important role. Especially since the new century, the central government issued a number of policy documents related to rural doctors. Rural doctors provide a lot of medical and public health services, becoming an important part of rural China's health system. At the same time, rural doctors also face a series of challenges such as low income, uncertain status, and limited professional development.

2. The experience of Chinese barefoot doctors and rural doctors' development

1) Barefoot doctor training

Barefoot doctors are mainly recommended by the villagers and village committees. The main criteria for selection are: families from poor and middle peasants, enthusiasm for medical and health care, a certain cultural basis, and medical work experience is preferred.

There are many institutions providing barefoot doctor training, mainly township health centers and county health schools. Some city hospitals have sent medical teams to rural areas to undertake the training of barefoot doctors. Even the military medical system and pharmaceutical companies are also involved in the training of barefoot doctors.

Barefoot doctors have shorter training hours, usually 3-6 months. Training is mainly on the diagnosis and treatment of common diseases, minor operations and disease prevention knowledge. Chinese traditional medicine knowledge and the use of Chinese herbal medicine is usually the focus of training.

2) The functions of barefoot doctors

Barefoot doctors are working part-time in the provision of health services; they are also engaged in agricultural labor.

The main function of barefoot doctors is the diagnosis and treatment of common diseases. Most barefoot doctors can use traditional Chinese medicine techniques (such as acupuncture) and Chinese medicine to carry out services. An important feature of their services is the initiative to go to the field or the patient's home, rather than sitting in the middle of a patient clinic. The barefoot doctor's handbook, a barefoot doctor's manual, is an informative guide to barefoot doctors.

Another important function of barefoot doctors and village doctors is public health services, including disease prevention and health education. But in the 1980s and 1990s, rural doctors' enthusiasm for providing public health services declined, mainly because of the income they received from medical services. Since 1990, with the development of primary health care activities, rural doctors began to assume more and more public health service functions.

3) Barefoot doctors and rural doctors' financial compensation

One of the distinctive features of rural doctors in China is that the rural doctors are compensated in different forms at different times. 1) Collective Economic Compensation: In the 1960s and 1970s, the main source of income for barefoot doctors was the village collective. The rural collective economy implements the reward system based on the work-points system. Barefoot doctors and farmers, every day to get a certain number of work points. When not engaged in medical service time, barefoot doctors are also engaged in agricultural labor to obtain work points. Barefoot doctors' salaries are similar to those of village cadres and rural teachers, and are higher than those of ordinary villagers. As the overall income level is not high, the collective economy can afford barefoot doctors. 2) Service charges: Since 1980, with the disintegration of the rural collective economy, barefoot doctors become rural doctors, no longer get a fixed income from the collective economy, turn mainly rely on medical service income (mainly drug income). The income of rural doctors varies greatly in different areas. Under the incentive of interest, rural doctors have more enthusiasm for charging medical services, but enthusiasm for providing public health services has declined. 3) Government grants: Since the 21st century, especially after China started a new round of medical and health system reform in 2009, government subsidies have gradually become one of the main sources of income for rural doctors, including zero subsidy of medicines, equalization of basic public health subsidies. Such as the implementation of essential drugs system in village clinics, according to the standard of 5 yuan per capita, the central and local governments give village rural doctors medical quota subsidies for income assistance.

4）The organic integration of rural doctors with rural communities and national health systems is an important factor for their maintenance and development.

Barefoot doctors themselves are peasants, the villagers recommended and selected, their income is from the village collective, and they accept the supervision of villagers and village cadres. These characteristics indicate that barefoot doctors are an effective component of the rural grass-roots community, which is an important guarantee for the development and sustainability of the policy.

Although rural doctors do not form part of the health system that is fully supported by public finances, they have a very strong link to the health system: part of rural doctors' income comes from health system inputs such as per capita 5 yuan for essential medicines; rural doctors' education and training are provided by the health system; the rural doctor policy is integrated with the rural cooperative medical policy, rural doctors are rural cooperative medical practitioners, rural doctors are the organic components of the primary and secondary health care network in rural areas of China, and rural doctors can receive technical support from doctors at higher levels. They can also refer patients to township hospitals and county-level hospitals.

4.3.4 Implications for other low-income countries

Rural doctors are a low-cost health human resource policy to solve the basic medical service of farmers and curb the high incidence of infectious diseases under the condition of scarcity of health resources. Rural doctors take over 50% of rural residents out-patient services. The villagers' satisfaction with the services provided by the rural doctors was more than 80%, and the timeliness of the on-site service was particularly satisfactory.

Sustained and relatively stable economic compensation is an important mechanism to maintain the rural doctors team. When the government and the rural community can not afford to pay the rural doctors' wages in full, allowing rural doctors to charge certain medical services can effectively stimulate them and help maintain the stability of rural primary medical teams. However, if the behavior of rural doctors is not adequately regulated, there may be over-provision of medical services, neglect of public health services and other issues. Therefore, our country needs to strengthen the supervision of rural doctors' service behavior.

As primary health service providers, rural doctors must work effectively with public health-supported health systems in order to function and grow. Through medical education, optimize the structure of the qualifications of doctors in rural areas, through standardized job training and broaden career development space, improve the attraction of rural doctors, and earnestly implement the multi-channel compensation policy to protect rural doctors reasonable income. So as to stabilize and optimize the rural doctors team, improve the rural primary health care level.

4.4 The experience of China’s rural three-tier health care delivery system

4.4.1 Background

The primary health care system in rural and underdeveloped areas is the main carrier for providing basic health services. Before the liberation, in China's vast rural areas, medical institutions, beds, personnel, housing equipment, medicines and medical equipment are inadequate. Since the founding of the People's Republic of China, under the leadership of the Party and the government, the county-level and township-level medical preventive health care networks have been set up and developed to provide basic medical and health services to the residents in the rural areas lacking medical treatment and medicine. Three levels of medical and health network, that is to establish medical and health institutions, in the county, township and village levels generally, so that the formation of networks. Institutions from different levels can get guidance from the level above, level by level. We should especially establish and improve the rural primary health organizations, so that "where there is someone, there is doctor and medicine." Rural tertiary health care network, rural doctors, cooperative medical system, this

kind of "Trinity" constitutes a rural health service system with Chinese characteristics. Rural tertiary health care network is to ensure that rural residents have accessibility to public health services and basic medical treatment services, also to narrow the gap between urban and rural residents as an important carrier of health services.

4.4.2 Research framework and methodology

This sub-topic applies the theory of change to propose a conceptual framework for the construction of a health service network, which includes background analysis, input, process and output, and impact, and analyzes the evolution of the establishment and development of China's rural tertiary health care network. And explore the mechanism and experience of three-tier medical preventive health care system in rural areas. The specific research contents of the sub-topics include: 1) the evolution of China's rural tertiary health care network; 2) the structure and function of rural tertiary health care network; 3) The mechanism of three-tier medical preventive health care system in rural areas playing an important role in the construction of Chinese medical and health system.

In this study, we adopted policy document analysis, literature review and in-depth interviews with policy participants to systematically collect, sort out and verify the rural health policies introduced by the Chinese government and health departments from 1949 to 2009. We focus on the analysis of China in the 1949-1980 years in the low level of economic and health development against the backdrop of universal access to rural basic health service network.

4.4.3 Results

1. The development of Chinese rural three-tier network of health services has gone through three stages:

1) The first stage (1949-1957): the early days of the founding of the country.

The level of socio-economic development is very low, per capita GDP is only 119 yuan, there is a serious lack of medical care in rural areas. The number of rural beds in the country is 0.05 per 1000 population, and the number of health technicians is 0.73 per 1000 population. The government has put forward the policy of "focusing on rural areas" and established the general guideline of "health, work, prevention, health, and mass movement". The government encourages the construction of county hospitals by means of direct investment and integration of existing resources; encourages the establishment of joint clinics, private medical practitioners, agricultural production cooperatives and health stations in various forms of ownership, including government-run, public-private partnerships, cooperative and private joint ventures. At the same time, the government exempts the industrial and commercial tax from the hospitals and clinics, also make the industrial free from commercial registration to promote the development of all kinds of medical institutions. By the end of 1952, 90% of the counties in the country had constructed the county hospitals. In 1957, there were 57,000 joint clinics and township health clinics, and 10,000 health stations in agricultural production cooperatives, forming the county and township 2 level work of medical and health institutions.

2) The second stage (1958-1978): During the "Great Leap Forward" period from 1958 to 1960. The government appropriated the means of production and the labor force at no cost and engaged in egalitarianism. As a result of too many interventions, the scale of workforce has shrink, village-level medical and health institutions were under the rupture. In 1965, the

Supreme Leader issued a call for "putting health work in the countryside", which provided a strong political guarantee for the development of the three-tier rural medical and preventive health care service system. The government synthesized various forms of public health resources in the village, set up health centers or health room, at the village level, improve the village-level primary health service network bottom, and gradually form the county, township and village health institutions. In 1972, the government began to subsidize the operation of township hospitals directly by public finance, which alleviated the shortage of rural primary health resources. These policies basically meet the needs of rural residents in health care and preventive care, China's experience in a primary health care model was highly praised by the World Health Organization.

3) The third stage (1978 - present): After the reform and opening up, with the disintegration of rural collective economy, CMS lost its economic base, followed by the rapid collapse. Because the government did not provide timely and targeted compensation measures, rural health face serious difficulties. Although the network structure of the tertiary preventive health care system still exists, its function was seriously impaired. In the mid-1990s, primary health system construction began to be taken seriously again. By increasing financial input, the government strengthened the comprehensive reform of primary health care and promoted the reconstruction of rural tertiary health care prevention and care system.

2. The mechanism that played an important role in China's rural tertiary health care network is:
1) Strong political commitment and effective leadership. At the time of the establishment of the tertiary health care system, both the orientation of the new China health policy and the leadership of the central government attach great importance to the rural health work. In 1950, the First National Health Conference established three basic principles: "Worker-Peasant-Soldier", "Prevention First" and "Integrative Medicine". In 1952, at the Second National Health Conference, "Combination of health system and mass movement" was added, thus the formation of the four principles of health work. In 1965, Comrade Mao Tse-tung issued a directive of "putting health and medical work in the countryside," indicating that high-level decision-makers' attention to rural health work was unprecedented at the time. This is the solid leadership foundation for the rural tertiary health care system.

2) The idea of big hygiene and large-scale mass movement. The leaders of the Chinese Communist Party have always regarded health work as an important component of social and economic development. "The reason why health work is important, is to serve the farmers", "improve people's health", including not only "active prevention and treatment of people's disease, promote people's health care", but also "eliminate all kinds of obstacles for people's health, "the approach is to" mobilize the masses, rely on the masses, cooperating with production. This "big health concept" guided the development of rural health services in China effectively. In the establishment of health institutions at all levels, our country integrated existing resources, "united Chinese and Western medicine", gave full play to the role of the Medical Association and other civil society groups. At the same time, the training of semi-agricultural and semi-medical staff to bear the primary health work has provided an important contribution to the level of provision and technology.

3) Resources planning approach combined with people-oriented and administrative level. China's rural tertiary health care system is set up under the leadership of health committees at all administrative levels. On the one hand, the work arrangement of the bureaucratic system makes the work arrangement, guidance, information reporting and accountability clear, so the health policy formulated by the central government can effectively carry out to the local; on the other hand, consistent establishment of tertiary health care system can also effectively reduce the health planning and daily work to carry out administrative costs. At the same time, China also adopted a "decentralized" administrative arrangements, authorities and financial rights were decentralized to the provincial, municipal and county levels of government, all levels of government can arrange their work priorities according to their own financial situation and health issues.

4) Constantly changing public-private partnerships and multifaceted arrangements. In the early days of the founding of the People's Republic of China, the health system has also adopted a strategy of diversified fund-raising and various forms of health and medical institutions in order to accelerate the establishment of rural primary health organizations. First of all, through government investment, the country fully synthesized existing resources to set up county hospitals, and promote the ability of the township to build health clinics. However, in the development of health care, the Chinese government has found that the financial power cannot guarantee the establishment of government-owned hospitals at the township level, and encourages joint-type clinics, private medical practitioners and other forms of ownership to improve health service coverage at the village level.

5) To adopt suitable personnel training mode. To establish and improve primary health organizations, health workforce is fundamental. In the early days of the founding of the People's Republic, China's health workforce was extremely lacking. In response to the extreme shortage of health workforce, China adopted a set of talent development strategy suited to national conditions. The second is to shorten the training time, the development of secondary medical education; Third, local materials, the use of short training approach to cultivate a large number of semi-agricultural and semi-medical workforce, which were to solve the lack of rural health workforce and the establishment of tertiary health care system played an important role in the prevention.

6) Integrated Health Service Delivery Strategy. The three-level medical and preventive health care network in rural areas adopted the integrated health service delivery strategy of combining prevention with medical treatment, combining traditional and western medicine, forming an economically viable and culturally appropriate health development model with non-specialization, but with Chinese characteristics, with primary level, but technical content Limited. It has played an important role in eradicating smallpox, controlling infectious diseases such as schistosomiasis and tuberculosis, and reducing maternal and child mortality.

7) Cooperative medical care and fiscal and taxation policies. In the system of three-level medical preventive health care, the salaries of personnel come from the state finance, and the non-state personnel are compensated by the collective economy, at the same time, the country gives certain subsidy. But the daily operation of township health institutions still need to rely on service charges. In 1968, the nationwide cooperative medical care system and the fiscal and taxation policies that exempted medical institutions from duty-free and registration at the

beginning of the founding of the People's Republic of China all provided active support for the fund raising of grassroots organizations.

4.4.4 Implications for other low-income countries

1. When strengthening the primary health service system, the government cannot make too much intervention and restrictions, but also should ensure adequate policy support and financial input. In1960s, China had all the primary institutions set up together to establish the township-level institutions, engage in egalitarianism. Because of the excessive intervention and restriction on the construction of medical and health institutions, the government could not effectively mobilize the enthusiasm of grassroots health institutions and hinder the normal function of basic health services. Strengthening the grass-roots health service system still need strong government policy support and adequate financial investment to adapt to their national conditions of personnel training mode combined with the government administrative structure to arrange the level of medical preventive health care network

2. Strengthen the primary health service system, with primary health care as the core function, implementing hierarchical diagnosis and treatment system. Primary health care is a synthesized approach to health promotion and is the most economical, convenient and effective way to improve the performance of health services. The establishment of primary health care system still has to implement the principles of social justice, community participation, cost effectiveness and cost effectiveness of primary health care, and inter-departmental collaborative action. Combined with the construction of the rural cooperative medical system, China has established a good hierarchical diagnosis and treatment system while establishing the rural tertiary health care network. It has achieved the function of classification and diagnosis, realized the wild coverage and accessibility of primary health service in the extremely scarced resources situation. The core of hierarchical diagnosis and treatment is to play the role of the gatekeeper at the primary level, providing cost-effective basic health services and ensuring the high availability of basic public health services. To play the role of primary health care system, should promote hierarchical diagnosis and treatment.

4.5 The evolution and experience of China's health system governance

4.5.1 Background

Health system governance was considered to be an important determinant of health system performance by being an important mechanism influencing the system’s revolution and function. "Leadership and governance" is one of six building blocks of the health system. WHO defined the health system governance as the role of government in the leading and supervision of health system, and the relationship with other stakeholders in the process; the functions of the health system governance were divided into six dimensions. In the six dimensions, a good health system governance performance has the following aspects: a clearly orientation of health policy, a clearly and systematically policy content and execution strategy, sufficient evidence to support policy design and monitoring the impact of the policy implementation, a good cooperation between departments, incentives and regulation measures coordinate with policy objectives and establishment of effective supervision and accountability mechanism to promote the implementation of policy.

At present, most of studies related to China's health system construction focused on the content and implementation of the specific policies and interventions. Although there are a few studies think that it is the institutional structure behind policy that can explain why specific health policy perform effectively in China, and the institutional structure is important in transforming China's experience to other countries, but no studies clearly analyzed China's health system and specified heath policies from the perspective of health system governance.

4.5.2 The research framework and method

This sub-project analyzed China's health system construction by adopting the framework of health system governance proposed by WHO, aimed to find the governance characteristics that supports the institution innovation and implementation of health system construction in China. This analysis is beneficial for other countries to consider about the feasibility of China's experience and find their own problems. Contents are as follows: 1) the characteristics of China's health system and its change in different historical stages; 2) the function of health system governance in the design and implementation of three typical health policies, namely patriotic health campaign, cooperative medical care system and New Rural Cooperative Medical System.

This study adopts the method of retrospective review, the system retrieval policy document analysis and literature review, and supplementary information by using the method in-depth interviews of policy participants and verifies the results of the analysis. After screening the title and the full text of 9313articles, there were 121 articles containing health system governance information research literature and policy documents.

4.5.3 Results

1. From the national level, China's health system governance has a significant difference in different historical stages

1) 1949-1978, Planned economy stage. At that time, Chinese people had poor health, and average life expectancy was only 35 years old, meanwhile infant mortality and maternal mortality rate were more than 15‰. Enhancing population health becomes one of the priority areas of national development, and the government was the main body of the financing and governance of health systems. There is systematic health work framework and service delivery system framework in the national level, and the health work were pushed from top to bottom. In the situation of lack of scientific evidence and think-tank resources, the national government allowed local governments to do some pilots about health policies and accumulate experience through practice. By giving the local government autonomy of policy tool design, it was better to implement proper policy. At the same time, including the innovation and performance of the health work in the assessment standard for political achievement contributes to regulatory and incentive to local health work. At this stage, China has established the cooperative medical care system, barefoot doctor team and three-level health service network, making the financing, human and service network system cover everyone in the country, especially rural residents.

2) 1979-1996, Economic Reform and Opening. At this stage, the economic development has become the center of the whole national affairs, while the development of health work was no longer a national priority area. Without clear objective in the national level, the objective of health work was wondering between population health and economical value, while the latter

became the principle one. At that time, the central government did not form a clear health system framework, and it was not the main body of health system financing because the health system began to advocate independent governance and self-financing. In addition, the collaboration between different types of organizations has been destroyed, and the commercial mode exacerbated the competitive relationship between the health services and fragmentation of health system. On this occasion, governments at all levels had no incentive to invest in health and system innovation. The three-level health service network was destroyed, and the medical expense rose rapidly, moreover, the rural cooperative medical care system collapsed without alternative, consequently, "difficulties and high expense in health care" become a serious national social problem.

3) 1997-, process of Reform-deepening. In 1997, the central government issued 《Decision of the health reform and development》, which clearly defined the orientation of health work as follows: put population health as the main objective of nation development; put the social benefit first in health revolution and development; emphasize the public finance investment in health. The central government redesigned a systematic health reform policy, after then, Urban Employee Basic Medical Insurance System and New Rural Cooperative Medical System were established from top to bottom under the national unified policy framework. The innovation and performance of the health work has been an important index in the assessment standard for political achievement again. In addition to the supervision of superior government, there were more diversity accountability subjects. The development of network media makes people's demands and the social evaluation an important power to promote China's health system reform. At the same time, it has been common that the use of evidence and think tank in the health system reform. By advocating the spread of successful pilot, the academic institutions, international organizations become more prominent in policy making and effectiveness evaluation. The reconstruction of the health system were repeated. Along with the establishment of a series of institutions and a new round of health system reform in 2009, the equality of health system has been improved and China has made great progress on universal health coverage. However, some reforms involve cross-sectorial coordination, while poor coordination was adverse to health system reform in China, which led to the unsolved deep level problems and slow progress.

2. From the perspective of specific policy design and implementation level, we found there were some common characteristics or practices of governance in some policies. These characteristics and practices contributed to the innovative and quick implementation of patriotic health campaign, cooperative medical care system and New Rural Cooperative Medical System. These features and practices were as follows:

1) At the time policy was established, the government assumed a leading role in the health system development with strong political commitment to health work. The political commitment can be summarized as follows. The government must stick to the public welfare position of health system with a commitment and lead a welfare health system; the government should attach clear importance to health system and population health, and clearly identify priority areas of health systems development according to the local health problems; the central government should set a macro policy framework and evaluate the performance of local administration officials based on this framework, in order to ensure the implementation of top-level design; the government should unite the power of financing, payment and supervision,

and encourage health institutions to set up internal governance mechanism that meet external policy incentives.

2) Under the objectives of macro policy and framework, local government was encouraged to try various policy tools. The central government should set a goal and macro policy framework rather than a generalized specific policy tool, and it was hard to do so. Local governments had the freedom to mobilize various intellectual resources to participate in health work, and it was better to design a policy which meets the local demand, moreover, the central government's recognition and advocacy has spurred local institutional innovation.

3) The pattern of "pilot-assessment-promote" was adopted in policy design and implementation process. One big challenge that low- and middle- income countries encountered in the process of policy making is the lack of high quality research evidence and think-tank resources, moreover, international experience were difficult to meet its own environment. Encouragement of local pilot can promote policy innovation and rapid execution from three the following aspects. Firstly, more diversity intelligence and economic resources can be invest into system design; secondly, the approval and recognition of the central government to local governments' successful pilot can be incentives to encourage institution innovation; in addition, a policy verified by practical verification and adjustment is more easily accepted by different departments and regions, and will be more successful in the stage of promotion.

4.5.4 Implications to other low- and middle- income countries

Many countries are promoting universal health coverage through expand health insurance coverage to the vulnerable groups. This sub-project reveals that the health system governance is an important mechanism for health policy innovation, policy design and effective implementation. The supporting practices are as follows. The local government should do some policy exploration and pilot in the design stage; evaluate and synthesize local pilot experience to form the institutional framework; ensure that the government's leadership and release the signal which shows the government's attention and commitment, combined with issued rules, determine the policy targets at the same time, moreover, incentives and compulsory measures such as bring the execution effects in the local government performance evaluation standard.
At the same time, the research suggests that China's health system governance experiences are more suitable for hierarchical administrative countries.

4.6 A comparative study between China and Tanzania

4.6.1 Background

Tanzania's health system has two prominent problems, namely lack of primary healthcare human resources in rural areas and the lack of medical insurance in informal employees. Aiming at solving these two problems, this research explored China's country doctors/barefoot doctors team construction and the feasibility of implementing New Rural Cooperative Medical Care System in Tanzania.

4.6.2 The research framework and method

This sub-project adopted self-designed applicability analytical framework. This framework assumed that: a country's policy about health financing and health human resource has close relationship with the country's socioeconomic development, value and culture, preference of

decision-maker and history; policy about health financing and health human resource have an influence on the accessibility to health care service of population and disease burden, which will ultimately effect on population health and the performance of health system. This research organized the background factors in the framework. Based on this framework, the premise that a policy is applicable and transferable through countries includes: the other country also has the resources required by the policy and can mobilize them; the two countries have similar background; the function mechanism that working in exporting country, also work in the importing country.

Based on this framework, the research group have analyzed and distilled the contents, process, background and mechanisms, after comparing the difference and combining the interview of decision-maker, this research will analyze the applicability of China's policy to Tanzania.

4.6.3 Results

Based on data of 2012, Tanzania has a total population of 43.625 million, with 70.4% of the population living in rural areas. GDP per capita was $700. As health data, based on data of 2010, Tanzania's life expectancy was 55 years old, gross mortality rate, infant mortality rate, mortality rate of children under 5 years old were 38.1/1000, 51/1000 and 81/1000, respectively. Tanzania's health system is mainly composed of public institutions, where 73.3% of the medical institutions were public institutions. Health professionals per 10000 population was 15.2, showing seriously lack of health workforce.

Based on the same period, China has a total population of 1.3328 billion, with 50.05% of the population living in rural areas. GDP per capita was $700. As health data, based on data of 2010, China's life expectancy was 71.4 years old, gross mortality rate, infant mortality rate and mortality rate of children under 5 years old were 7.11/1000, 13.1/1000 and 16.4/1000, respectively. China's health system is mainly composed of public institutions, where 52.2% of the medical institutions were public institutions. Health professionals per 10000 population was 44.0.

1. The applicability of China's New Rural Cooperative Medical Care System in Tanzania

We reviewed China's experience in health system construction, and analyzed the institution why China's New Rural Cooperative Medical Care System can run effectively. Decision-makers has a strong will and commitment to enlarge the coverage of farmers' medical security; the government offering subsidies to rural medical security coverage; New Rural Cooperative Medical Care System covers a relatively rich content of service packs. In the process of policy implementation, some practice and mechanism also plays important roles. The practices of governments at all levels actively absorb farmers in joining the medical insurance; the rural doctors and traditional Chinese medicine services were brought into service pack; New Rural Cooperative Medical Care System has its own account and don't pay for management.

By discussing in the applicability research conference between China and Tanzania, interviews of policy-makers in Tanzania, combining with the background differences between the two countries, this research analyzed the applicability of system design and mechanism in China to be transferred to Tanzania. The study found the following parts.

Decision-makers have the will to enlarge the coverage of medical insurance, through "health financing strategies", Tanzania dedicates to achieving universal coverage and a single financing pool. However, as policy makers mentioned in the interview, this strategy did not enter a priority in national development agenda in fact, different from the situation in China where we put the New Rural Cooperative Medical Care System as our priority. The economic development in Tanzania's and the local government financial resources under current tax system are still unable to support subsidies for every rural resident. Policymakers also values that the government has no liability to support subsidies for those not poor residents. Policymakers believe joining the insurance is the duty of every citizen, thus inclined to pass a law forcing residents to join in the insurance of primary medical treatment. In addition, Tanzania's medical services facilities are still fall behind and they are still not geographical accessible to all residents, and in this case, the farmers' medical insurance system has no ability to provide residents with enough and good quality service pack. Therefore, the three supportive institution of New Rural Cooperative Medical Care System in China is lack of an implementation basis in Tanzania.

But there are some practices that can be learned from China's New Rural Cooperative Medical Care System and can be applied in Tanzania. For example, villagers used to go to the rural clinic to pay for insurance fee and join the insurance, but this can be change to the situation that health workers and managers attract the villagers to participate in insurance. At present, most of Tanzania community medical insurance funds are not for special use. All the insurance premium were put in all medical expenses, and then pay from top to bottom, while this way diluted the ability of medical insurance funds to spread the risk of disease. Thus, Tanzania policymakers think it is necessary to draw lessons from China's New Rural Cooperative Medical Care System funds governance method. More importantly, Tanzania should give priority to the development of health service ability and strengthening the construction of the basic health services, and this will be a base for the function well of the medical insurance system.

2. The applicability of China's barefoot doctor team training and governance in Tanzania

The important policies in the process of training and governance of China's barefoot doctor include: policy makers have the will to improve rural health human resources; rural China has established the basic health service network; there are clear standards in choosing barefoot doctors, and by the village committee in charge of it; barefoot doctors were chosen from their own village, and they returned to work in the village after training; barefoot doctors have clear training contents, requirements and job contents; barefoot doctors can get training and technical support from superior medical institutions; barefoot doctors can get stable income through cooperative medical care system and some service.

Tanzania is developing "community health project", where establishing and developing a long-term primary health workforce is an important content. According to interviews and analysis of Tanzania, the "community health work" of Tanzania and "barefoot doctors" of China are very similar in the connotation, include three to six months of training, mainly providing primary health care such as preventive services and maternal and child health management, etc. Tanzania’s "community health project" has some contents that were familiar with China's institutional arrangements of barefoot doctor training and management, such as the primary health care center in charge of the selected population’s health and clearly define the training

and job contents of community workers. However, there was not clearly arrangement in some key contents, such as the income resource of community health workers, the construction of primary services provided by primary health center that keep the community workers work. As far as income of community workers, Tanzania policymakers still believe that community worker should be responsible for providing preventive services rather than therapeutic service, so they can't get income through therapeutic services; meanwhile, although the community health care insurance may be a source of income, but they were not connected. Policymakers in Tanzania believe that in the rural primary health human resource system, China's system arrangement provides a good idea, and there is no big contradiction with arrangement at present. But the prominent problem is that although Tanzania has designed and issued a "community health project", there is still no enough resources to start the project.

4.7 Knowledge dissemination and sharing

In order to spread the results to more low- and middle- income countries' policymakers and researchers, and improve the long term effect of the spread of the Chinese health system construction experience, this research reviewed and wrote several English papers, and reorganized the core research results into policy briefs and sent to policymakers, researchers and relevant international organizations in diverse ways. Articles and policy briefs are listed in table 4.

Table 4 Project Output: Articles and policy briefs

Sub-project	Title	Output type	Current Status
China's experience in rural health financing system	Experiences and lessons of the health financing approach to universal health coverage for developing countries: learning from the NCMS in rural China	Articles: Health Policy and Planning	Internal revise
	How to get people in informal sectors enrolled in a voluntary health insurance program? Experiences from Chinese New Cooperative Medical Scheme	Articles: International Journal for Equity in Health	Under review
	China's experience and enlightenment in health system construction series 2: establish primary medical insurance financing system in the rural areas	Policy brief	Published
China's financing strategy promoting public health accessibility	Financing Strategies to Improve Essential Public Health Equalization and its effects in China	Articles: International Journal for Equity in Health	Under review
	Strengthening Health System to Improve Immunization for Migrants in China	Articles: International Journal for Equity in Health	Under review
	China's experience and enlightenment in health system construction series 1: implementation of planned immunity, promoting population health	Policy brief	Published
The development and evolution of rural doctors in China	Development of village doctors in China: financial compensation and health system support	Articles: International Journal for Equity in Health	Under review
	China's experience and enlightenment in health system construction series 5: development of rural doctors by economic compensation mechanism and health systems support	Policy brief	Published
China's experience in rural three-tier health service delivery system	Extending access to essential services against constraints: the three-tier health service delivery system in rural China (1949-1980)	Articles: International Journal for Equity in Health	Under review
	Challenges for gatekeeping: a qualitative systems analysis of a pilot in rural China	Articles: International Journal for Equity in Health	Under review
The development and evolution of health system governance in China	The role of health system governance in strengthening the rural health insurance system in China	Articles: International Journal for Equity in Health	Under review
	Learning from health system governance in China: evolution, innovation and significance for health system strengthening	Articles: Health Policy and Planning	Internal revise

Sub-project	Title	Output type	Current Status
	China's experience and enlightenment in health system construction series 3: the evolution of health system governance in China	Policy brief	Published
A comparative study between China and Tanzania	Transferring health system policies and interventions across settings – a literature review and framework	Articles: Health Policy and Planning	Internal revise
	Making health insurance work for the poor and informal sector in Tanzania: Learning from Chinese experience	Articles: Health Policy and Planning	Internal revise

Chapter 5 Project results

Since the project launched, through the core activities, the following achievements and influence were obtained.

5.1 By summarizing China's experience and lessons in health system construction, academic institutions has improved their ability in summary and analysis experience of China under the perspective of international.

The core activities of this research are to sum up the experiences of China's health system comprehensively from the five aspects of health system framework under the international perspective.

Combined with many other activities in the project, this series of research content have improved the team ability in summarizing and analysis China's experience under the international perspective. These activities include regular group learning forum, interviewing in the international cooperation agencies, attending related training projects and meetings at home and abroad, communicating with senior scholars and health policy makers and the systematic review itself.

15 teachers from Peking University and Fudan University improved their abilities in all the above aspects. For instance, the ability to summarize and analyze Chinese health system increased significantly, the view on international relevant researches was broadened, the ability to use international language to summarize China's experience was improved, and the Chinese researches' capacity to serve the global health was enhanced. All these provide solid foundation for promoting the globalization of health system and policy researches in China. It is worth noting that the capacity building for young teachers is the key output of this project, and their sustainable development and contribution will play an irreplaceable role in promoting the globalization of health system researches in China.

5.2 The first comprehensively and systematically summed up experiences and lessons for the construction of China's health system

This project is the first comprehensive and systematically introduced report in the international, introducing experience in the construction of China's health system in recent 60 years. China has developed "three treasures" of health system, namely three-level network of rural health service system, barefoot doctors and cooperative medical system, and they improved population health in an age of lack of resources. China has made great progress in health system reform and universal health coverage in recent 10 years.

This study analyzing the historical process of China's health system, and extracting five representative fields, namely primary health human resources, rural cooperative medical system, financing of public health service, health system governance and primary health service system.

In studies of each field, the "theory of change" was used as the framework and systematic review as the method, and being guided by the aim of international dissemination. Each group summarized thousands of papers relevant to China's health system strengthening, to synthesize and analyzing the experience applicable to other countries. Outputs are as follows.

1) 5 systematic reviews on China's health system in global health perspectives. The themes include health financing, health service delivery system, health system governance, and human resources for health. The themes are important topics on health system strengthening for the international society, and the introduction and analysis of China's experiences in them will provide a wealth of information to the world;

2) The book “Health System Strengthening in China with global health perspective”. This book draft collects the main results of our project, and will demonstrate China's experience in health system strengthening systematically, as well the comprehensive analysis on the applicability China’s experience.

5.3 Deliver the experiences and lessons in the construction of China's health system widely and effectively by various means.

This research has delivered China’s experience and lessons in three ways.

5.3.1 Completing a series of research reports and papers on Chinese health system strengthening with global health perspective

For a better international dissemination of research results on China’s experience, this project submitted a special issue proposal to Health Policy and Planning and International Journal for Equity in Health, in which the project aims, the activities undertaken, and abstracts of 10 articles were submitted to journal editors. Currently, the journal has given feedback on the proposal to affirm the content, and the peer review on part of articles has been started. Although this part of the work has been postponed, but it will have important and lasting effects to the promotion of China's experience and international reference after publication.

In summary, the major outputs and impacts include:

1) 6 drafts of health policy briefs. The main contents from systematic reviews were summarized into policy briefs. By disseminating them among health policy makers, the awareness on China's health system development was raised in other countries;

2) 10 drafts of English papers. Publishing papers on Health Policy and Planning and International Journal for Equity in Health will be the first time to comprehensively introduce China’s experience on health system strengthening on an English journal. It will have significant impacts on the dissemination of China's experiences on health reform and development;

5.3.2 Training seminar held in Tanzania to introduce China’s experience on health system strengthening, comparative study between China and Tanzania conducted to discuss the applicability of China’s experience.

Tanzanian researchers visited township health centers and village clinics in Shunyi District (Beijing) on February, 2015. They observed structure of primary health care system, the policy implementation of New Rural Cooperative Medical Scheme and Equalization of basic public services. This tour laid a good foundation for Tanzanian researchers to understand China reviews and conduct comparative study. During Chinese researchers’ visit to Tanzania in July, 2015, we have held seminar in Ifakara Health Institute to introduce China’s experience on health system strengthening. During the seminar, Chinese research group introduced the overall situation of Chinese health system, health system governance and health delivery system. Moreover, they also introduced China’s New Rural Cooperative Medical System (NCMS), as well as the policies to train, manage and maintain barefoot doctors or village doctors in China. Another activity is the comparative study seminar held in Dar-es-salaam, Tanzania, and it attracted 24 participants, including directors from Ministry of Health and Social Welfare, director from Department of Health Finance, director from Department of Human Resources for Health, representatives from district hospitals, representatives from UNAIDS, and researchers from Ifakara’s Health Institute. The seminar has a deep discussion on the applicability of Chinese health system policies. Furthermore, based on the discussion points in the comparison study seminar, Tanzanian researchers had deep conversations with central and local policy makers in Tanzania, and analyzed applicability of China’s New Rural Cooperative Medical Scheme and barefoot doctors. They finished comparative study report according to these seminar discussion and individual interviews.

5.3.3 Research team participated in seminar "China's Health MDGs Experiences and Lessons and its Implications to China's Global Health Engagement" in December 2015, and also organized and engaged in the session "health system strengthening". In the session, research team presented China experience in health system strengthening from five aspects, and also reported primary results of comparative study between China and Tanzania.

5.4 Enhance core institutions' capacity to disseminate China's experiences on health system strengthening from global health perspective

Previously, studies on health system focused on problems and solutions only in China, rather than with the view to provide policy implications to other countries. The abilities of transferring China's experiences on health system strengthening and participating global health activities have been promoted during the process of this project. Supported by this project, several core activities were launched. For example: 1) participating in a 10-day training in London School of Tropical and Hygiene Medicine, and learning the skills and technologies to do international transfer studies; 2) collaborating with Health Systems Global, attending the event "emerging voice" in Cape Town, South Africa, and supporting 10 Chinese young scholars (include project members) to attend training and event; 3) attending international dissemination activities and enhance the dissemination capacity, such as attending the 3rd Health Systems Symposium in South Africa in 2014, and attending iHEA in Italy in 2015; 4) participating in international organizations' activities actively, for instance taking part in the World Health Organization (WHO) Asia-Pacific Health System and Policy Observation (APO) and play an important role in five countries alliance (Korea, Japan, Thailand, Bangladesh and China).

The activities mentioned above have enhanced researchers' abilities to share China's heath policy and system researches globally, and to serve for global health policy development. Relevant productions have emerged constantly since the project started. For example:

1) Took the main role of the publication of "People's Republic of China: Health System in Transition" (both Chinese and English version). It is the first systematic report on Chinese health system and is the most important report for the global society to understand Chinese health system, and it will be updated regularly. The complement of this report is attributed to the collaboration provided by this project and the support from cooperative partners;

2) The project members have published "Consolidating the social health insurance schemes in China: towards equitable and efficient health system" on The Lancet on 10th October 2015. It discusses China's health insurance reform, and both topic selection and paper writing are closely related to our project. In addition, project members also publish papers to introduce China's health reform on PLOS Medicine, Bull WHO, Health Affairs, etc.;

3) Project members play a more and more important role in international conferences on health policy research. For example, during Global Symposium on Health Systems in 2014, Liu Xiaoyun, Yuan Beibei, Meng Qingyue, Xu Jin and other project members gave oral presentations; during iHEA in 2015, Fang Hai, Yuan Beibei, Yang Li, He Li, Meng Qingyue and other project members gave oral presentations. Moreover, Meng Qingyue was entitled to be executive member of the board of Global Health System Research Organization on behalf of the WHO in Asia Pacific.

The improved ability of international communication will let the international know more about the development of China's health system and health reform, promoting international communication and the development of global health policy.

5.5 Collaboration between China and the international society was strengthened and consolidated through a series of activities

The close relationship provides a solid foundation for future development globally. The core activities are cooperation in project design and implementation, academic visit and communication, joint application for other research projects, and etc. This relationship was extended to a broader area, which improved the effects and sustainability of our project. Main achievements and effects are as follows:

1) This project enhanced the understanding among researchers both in and out of China, and created an opportunity to consolidate partnership. Specifically, (1) through project activities, Chinese research group has a deeper understanding of Tanzanian health system, of the contexts and mechanisms of Chinese health system and policy design, whether applicable under other circumstances; (2) Tanzanian researchers and policymakers have a better understanding on Chinese health system; (3) project members agreed that through these activities, the ability to introduce our health system to other countries, and the ability to identify what policy can play a key role in the mechanisms have increased significantly; (4) contribute to continued cooperation on health system research between the two countries in the future.

2) The project expanded the areas of partnership and improved the sustainability of cooperation. Peking University School of Public Health and the LSHTM carried out the project in a joint process, and expanded the partnership. We have applied funds from the British Government and UNICEF successfully, to do an evaluation study on health system's impacts on maternal and child health; supported by CMB, the LSHTM has trained six master students and a PhD student, and the joint 3-year doctoral/ post-doctoral training project are under negotiation.

The good international cooperation relations provide a foundation for scientific research, personnel training, policy advice and common services at Global Health. Also extend the outcomes, even after the end of this project.

5.6 Training next generation global health researchers

Research group fully make use of school resources, by allowing MSc students to participate in project activities, and by inviting international experts to carry out lectures and seminars, to cultivate China health system researchers for the next generation. 1) 20 MSc students from Peking University and Fudan University have participated in all phases of this project; 2) organizing 15 seminars on Health System and Policy Research for the graduate students; 3) inviting experts and scholars, from Stanford University and the LSHTM, to give lectures; 4) organizing training sessions beyond our institution, which is the training course in Evaluation of Complex Health System Interventions in Shanghai, on February, 2015. Nearly 70 students from 25 institutions attended, including Peking University, Fudan University, Huazhong University of Science and Technology, Shandong University and Zhongshan University.

Young scholars and graduate students are the major human resources for future research. By conducting the project activities, they can gain the knowledge and information on global health, and develop ideas and broaden international perspective. It has important significance for enhancing the overall capacity of China health policy and system with international standards.

5.7 Improve Chinese researchers' abilities to serve global health policy

Through carrying out this project, the researchers realized that the significance of this project is not only to disseminate China's experience on health system strengthening, but also to enhance ability to serve the international society in terms of the development of health policy. The researchers participate actively in global health-related activities while doing this project.

With the launching of project, the research team plays a more and more important role in global health. The major achievements are as follows.

1) Searchers play an important role in global health policy consultation. For instance, (1) Dr. Yuan Beibei attended Prince Mahidol Award in Bangkok in Thailand in 2016, and joined the “Prioritising research to deliver evidence for UHC: how can policy makers develop the research agenda according to domestic health needs” session to introduce the transfer of research results in the process of China's health system strengthening; (2) Prof. Fang Hai participated in the Thailand Health Reform Symposium in November, 2015, and introduced China's medical security system reform and its significance to international policy; (3) Prof. Meng Qingyue was invited to participate in policy consultation of UHC in the Middle East and the Western Pacific Region; (4) Prof. Liu Xiaoyun, Prof. Meng Qingyue and other colleagues will assistant the World Bank and the WHO to conduct a series of research on China’s health system study(tripartite study by the Chinese government, the World Bank and the WHO); (5) Dr. Yuan Beibei, Dr. He Li and other colleagues will assist the WHO to do systematic reviews on health policy (the WHO Center for systematic review on health financing).

2) Researchers have become intellectual resources of the government when participating in global health issues. For example, research members Meng Qingyue, Zhu Weiming, Cheng Gang and other colleagues were commissioned by the department of National Health and Family Planning International Cooperation and the WHO Western Pacific Region Office to carry out the design of budget allocation model during March to April, 2015. The Chinese personnel played a crucial role in the formation of the final plan.

Chapter 6 Lessons, experiences and advice

6.1 Technical

The core technical activity of the project is to summarize and analyze experience of China from the international perspective, and explore applicability of China's health system construction experience in other low- and middle- income countries. In this study, the biggest experience is a sufficient and sound study design. After several rounds of discussion with the health system research experts, we identified five areas that best represents China's health system performance. As far as research methods, we first designed an applicable analysis framework, and write five detailed research plan based on this framework, meanwhile the theoretical framework of comparative study between China and Tanzania also based on this applicability analysis framework, thus ensured the consistency and systematic of the whole project research methods and framework.

In technical work, there are some reflections and suggestions about how to tell and spread the story of China's health system. First, a health policy is often involved in specific intervention including financing, organization, human resource, governance and so on. However, due to different national development situation, history, decision maker preferences and other factors, it is hard to transplant the whole policy design in one country to another. In addition, the policies of the health system are more macro which was different from the spread of health technology or intervention. The health financing and health governance structure of a country closely related to the country's socioeconomic development, values and culture, the preference and history. In the applicability analysis framework of this study, we analyzed these factors and their mechanisms. But in the process of national comparative study, we found it was hard to get the answer of "whether it can be implemented", "whether we can obtain the same result" through the contrast analysis of these factors, and experts' opinions or decision-makers' judgment were needed. Third, analyzing the applicability of China's experience is based on the theoretical analysis and experience judgment of Tanzania policymakers rather than empirical trial in China in this comparative study. Of course, during the research process and spreading experience of China, the research team trying to spread and affect the higher level of policy makers to contribute to the Tanzania health system reform in the future, so we suggest that there will be a project focusing on and evaluate the long-term effect of this project.

6.2 Management

This is the first time that the research group led and managed a multinational research projects, and we accumulated a lot of project management experiences and lessons. Practice which has a positive effect to promote the project include: determine the work contents and work division at the beginning of the project; developing the budget according to the working contents, then sum them, thus ensures the cooperation team can obtain a job matching budget rather than completing work based on budgets; each side discusses progress on a regular basis, and make the next work plan.

There are many areas need to be improved further. First of all, we didn't recognize that there were some unexpected cost at the beginning (for example, taxes), which had an effect on other activities. Secondly, communication should be more active to ensure production completed on time in the process of project implementation. Thirdly, the estimate of the workload and work time was not accurate, for example, the paper didn't publish on time, which was due to the inaccurate estimate of communication with the magazine about time of paper review and editing. So, in future arrangements, research reports and articles can be written at the same time to ensure that the paper can be accepted or published at the end of the project.

Annex (Omitted)

1. Table 1 The completion status of all activities

2. Work process documents

OP104 China National Health Development Research Center

Output 104 Global Health Core Research: Sub-project in Practice and Experience Dissemination of China Integrated Care Pathway and Payment Reform

Final Report

Background and objectives

As part of ongoing public hospital reform in rural China, the development of evidence-based care pathways has been prioritized. The China National Health Development and Research Centre (CNHDRC) in collaboration with the National Institute for Health and Care Excellence (NICE) International embarked on a pilot project to develop and implement evidence informed care pathways, which are linked with payment reform for two high priority disease areas (chronic obstructive pulmonary disease [COPD] and stroke).

Clinical pathways (CPs) are recognized as effective instruments for improving medicalquality; reducing medical service costs and increasing the cost-effectiveness of overall health resource utilization; and coping with the changes in payment modes. Both health authorities and rural medical institutions regarded evidence-based care pathways as realistic options to contain medical costs while improving care quality in rural China.

This chapter details the existing challenges hindering reforms by the Chinese government to meet the increasing needs of patients in rural areas. There is evidence that healthcare providers have been financially incentivized to over- or under-provide healthcare services, and concerns remain that inappropriate behaviours by providers are fuelling costs and affecting quality of care and patient safety. The misuse of resources may at least be partly due to the absence of practical clinical guidelines and effective monitoring mechanisms over the use of medicine and medical devices. This is especially concerning for noncommunicable diseases (NCDs), which account for an estimated 87% of annual deaths and 69% of the total disease burden in China, and are

expected to absorb an increasing share of health expenditure.

The clinical pathways and payment reforms were developed as part of a long-standing collaboration between CNHDRC and NICE International. An earlier phase of this collaboration (Phase One) from 2009-12 focused on integrating CP management with case payment reform for high-priority common surgical interventions. It demonstrated beneficial changes in provider behaviour, enhanced care quality, and the containment of medical expenditure. Phase Two (2012-) focused on non-communicable disease (specifically stroke and COPD) rather than surgical interventions. These were chosen due to the morbidity and mortality rates in rural China.

This phase was designed as integrated reform in which clinical pathways are combined with other reforms, including payment reform and development of data management systems and software, rather than as a standalone pilot of clinical pathways. It also included the initiation of a South-South dissemination strategy to share two-way learning with India and South Africa. This aims to provide useful experience and resources to other policy-makers and practitioners interested in introducing similar reforms, and share the experience more broadly of designing and implementing evidence-based policies.

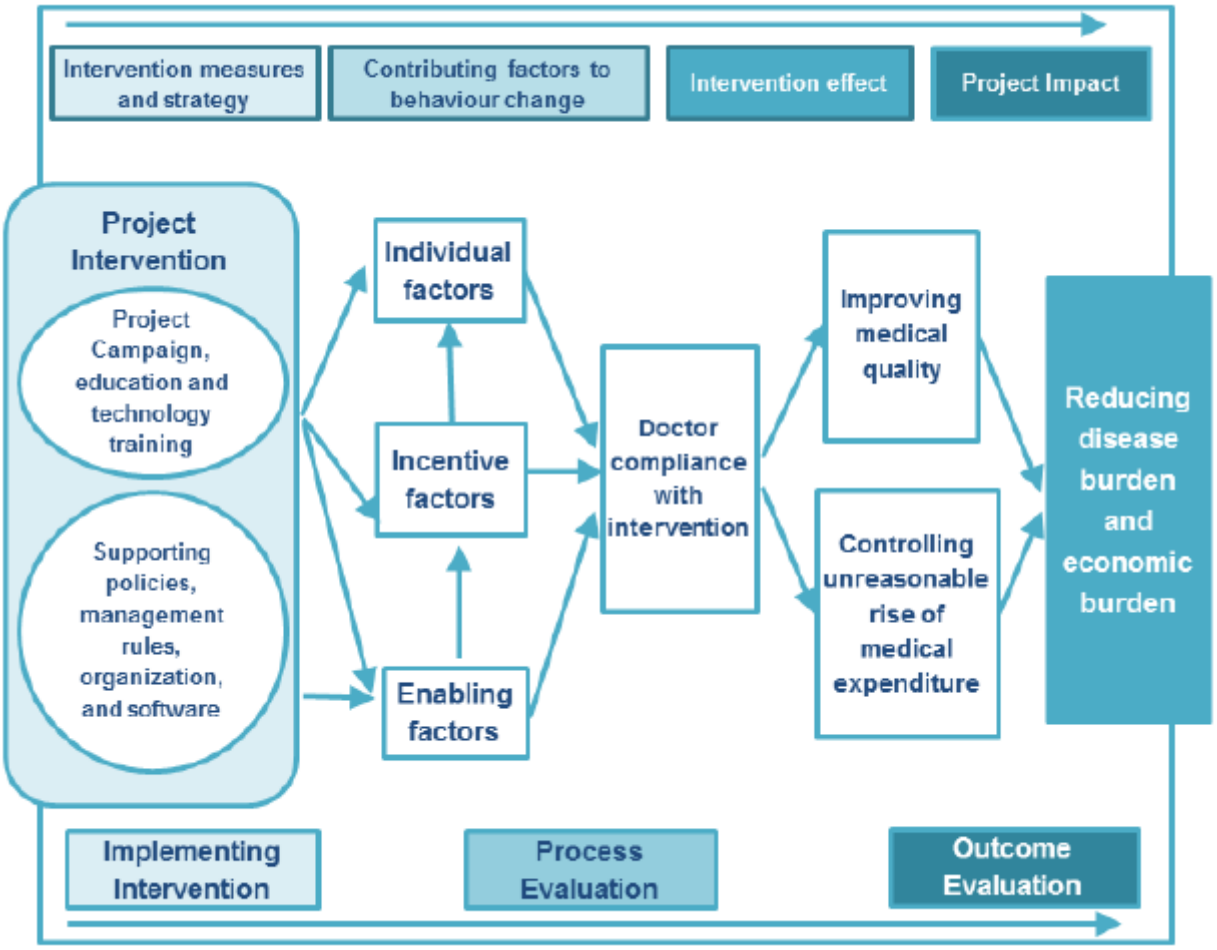
Project design

NICE International and the China National Health Development Research Centre started implementation of a pilot integrating clinical pathways with other supporting systems for selected conditions in four counties in China. Counties were chosen based on understanding and enthusiasm for the pilot and local management capacity. Hospitals included in the pilot are believed to have a 'reasonably good' level of clinical practice and to be broadly representative of this kind of institution, as well as having, for the most part, well-developed information systems. Counties included in the pilot had different levels of capacity and experience in implementing clinical pathways and/or payment reforms. Two of the project counties, Qianjiang and Hanbin, took part in the Health XI Project (World Bank-DFID China Rural Health Project) and under this carried out reforms integrating clinical pathways and payment reforms. Jiaonan was not part of the Health XI Project, but has implemented national clinical pathways policy since 2009, though this has not been integrated with payment reform.

The CNHDRC-NICE project was designed as a pilot of an integrated reform ('clinical pathways+') in which clinical pathways are combined with other reforms, rather than as a standalone pilot of clinical pathways. Core components of pilot design included development of contextually-appropriate clinical/care pathways; development of related data management systems and software in project counties; negotiation and development of remuneration systems for medical personnel to increase their support for clinical pathways; standardisation of clinical behaviour, increasing quality of services and control unreasonable growth in medical spending; enabling hospitals to provide convenient, safe, effective and reasonably-priced services; improvement of capacity for evidence-based decision making; and promotion and propagation of a model of clinical pathways and payment reform. In addition, the scope of the pilot includes trialing of integrated care across levels of the health system (county, township, village).

Planning for the project itself, and for evaluation of the results and impact of the

intervention, had to take into account the national policy context including concurrent comprehensive healthcare reforms. The research and implementation team formulated a theoretical framework for intervention with reference to the PRECEDE-PROCEED model, considering the individual and institutional factors that would affect compliance with the reforms introduced.



Main activities

1. Selection of pilot areas : Site investigations and discussions with various local stakeholders were conducted to assess the suitability of potential locations for the pilot. Four counties were selected, including two pilot areas from Phase One of the CNHDRC-NICE collaboration: Huangdao county of Shandong province, Wen county of Henan province, Qianjiang county of Chongqing Municipality, and Hanbin county of Shaanxi province.

2. Situation analysis: A situation analysis of the pilot areas collected quantitative and qualitative baseline information to facilitate cross country comparisons, including data on selected socioeconomic, demographic, health and health system indicators. Health care institutions in the pilot areas face varying local needs and economic contexts (see key institutional features of each hospital in table below). Note that during the Phase 1 project, the hospital in Qianjiang was upgraded to tertiary hospital status, the only

such hospital in the district.

3. Screening of priority conditions: The research team selected feasible conditions for clinical pathways based on a literature review and analysis of inpatient data, driven in part by NCDs' role as primary threats to health in China. Chronic obstructive pulmonary disease (COPD) and stroke were chosen as conditions for the pilots, with senior consultants viewing stroke as a preventable disease and COPD as poorly diagnosed, poorly managed and overly expensive.

4. Development of pathways: The integrated care pathways for COPD and stroke contain sections (based on existing Chinese and NICE guidance) covering guidance for prevention, clinical pathways for hospital treatment, and guidance for rehabilitation. Community-based guidance for prevention and rehabilitative care was a key innovation developed for these pathways. Sub-pathways for complications and co-morbidities were also developed as additions to the primary disease pathways, accommodating and stabilising them alongside the treatment of COPD and stroke.

5. Costing of pathways: Payment methods other than fee-for-service (FFS) were introduced, to incentivise physicians financially to comply with the pathway. The choice of payment method is dependent on local negotiation: case-based payment methods were implemented in Hanbin and Huangdao, with global budgets used in Wen County, and Qianjiang maintaining a modified fee-for-service schedule. Once the payment mechanisms were determined, project staff estimated treatment costs based on the clinical pathways, in order to establish an appropriate payment level in negotiation with local healthcare providers. This included bottom-up costing of the best-practice treatment of diseases and their complications, and analyzing historical data of hospitalization expenditure on diseases covered by the intervention.

6. Negotiation of payment schemes: Local decision-makers and healthcare providers negotiated to set rational standards for case payment. These principles were that local payers will pay more, but hospitals would be incentivized to provide better care, and critically, out-of-pocket payments by patients could not be increased. A yearly adjustment mechanism was set up to factor in general cost inflation. The researchers observed negotiations on behalf of patients' interests, and addressed any technical issues arising about the costing methodology.

7. Development of information systems: Supportive information systems improve physicians' working efficiency and strengthen their behaviour change; they also increase the amount and quality of available data for monitoring and evaluation. The pilot hospitals upgraded or created clinical management modules within the existing general hospital information system, assisting existing vendors to ensure the smooth connection between systems.

8. Capacity building: Three types of capacity building are crucial to the intervention: human resource, institutional, and informational capacity. All were repeatedly stressed throughout an introductory course reinforcing evidence-informed decision making, and strengthened through training workshops and study tours. Domestic and international multidisciplinary experts delivered lectures and engaged with local practitioners offering theoretical or skills-based training based on local needs.

9. Evaluation of outcomes: The central evaluation question is to understand the shortand long-term impact of the intervention, given the possible confounding factors. This required both quantitative and non-quantitative approaches; where data allowed, the quantitative impact of the CPs on selected outcomes was assessed using interrupted time series (ITS) analysis with segmented regression. This analyses how much an intervention altered an outcome of interest, and whether there was an instant effect or a delay.

The outcome measurements for ITS and other quantitative analysis were based on multiple assessments of aggregated patient data from each pilot site, collected using a standardized procedure to minimize bias. Data was collected for 24 monthly time points before intervention and 12 monthly time points after the intervention was introduced. As a pilot study, there was no pre-existing information available on the extent of any autocorrelation and the likely effect size.

CNHDRC conducted focus groups and semi-structured interviews with key participants of the pilot study to qualitatively assess participants' experiences and understand the perceived utility of the clinical pathways; the keenness to use clinical pathways in future; and satisfaction with its implementation and use in practice. This further informs potential scale-up. A questionnaire was designed to capture all practice-related activities during the study that might be confounding factors, and account for changes between baseline and post-intervention observations.

10. Sharing of experiences and lessons with counterparts within and between countries is an integral aspect of the China-NICE collaboration programme. The project, in its nature, was an applied piece of research with a later aim of transferring knowledge and diffusing policy nation-wide, wanting to contribute to the strengthening of the health system by producing a global public good. Considering the context of the new national healthcare reforms, dissemination within China, particularly rural areas, was targeted. A systematic dissemination strategy planned to influence healthcare providers, commissioners and policymakers alike.

Throughout the process decision makers were constantly involved, attending meetings and fieldwork. As a national think-tank, the CNHDRC's internal reporting system shares research findings with directors of all NHFPC departments and ministers, so policy briefings encouraged the incorporation of principles and experience from the pilot into national policy though active involvement. The key operational mechanisms developed whilst implementing the integrated care project were then incorporated into a recent NHFPC policy document.

Financial Management (Omitted)

Result

In November 2013, the project formally launched in the pilot sites. The integrated treatment for COPD and stroke patients were implemented comprehensively, which included prevention, treatment and rehabilitation for the patients. By May 2015, 5,490 patients were managed by the Phase II clinical pathways.

During the project, four pilot sites conducted secondary prevention for COPD and stroke patients alongside the primary prevention within the national project. Notably

in January 2014, local insurers (NCMS) at each of the four pilot sites fully subsidised polyvalent pneumococcal vaccine for COPD patients meeting certain inclusion criteria. Inclusion criteria were as follows: (1) above 60 years of age; (2) hospitalization during the past year due to COPD exacerbation; (3) no contraindication to the vaccine'; (4) no pneumococcal vaccination in the past three years. Following implementation, CNHDRC undertook a 1-year follow up analysis. Vaccination was correlated with a reduction of the number of acute exacerbations of COPD and reduced resource use.

In terms of inpatient care, during the project, the four pilot hospitals admitted a total number of 10,158 COPD and stroke patients. Among them 5,490 patients completed the clinical pathways, yielding a clinical pathway management rate of 54.05%. Three pilot areas' management rates reached over 60%, except for Huangdao which only achieved 20%.Comparing the four pilot hospitals, Wenxian People's hospital had the highest number of patients managed under the Phase 2 clinical pathways. Patient characteristics

1. Changes in clinical practice

The billing data analysis of the four diseases across the pilot areas revealed that, after a year since the implementation of the project, the intervention has overall strengthened the utilization and quality of services recommended by the clinical pathway. Among the services adopted by the pathway, services with the most significant increase in utilization were statins and brain imaging (within 24 hours of hospitalization) for stroke treatment. Utilization of TIA treatment services is an outstanding example of this change. On the other hand, there was no significant change in the use of oxygen and 'dehydrating agents' which were not recommended by the clinical pathway, and the utilization of nerve nutrition agent actually increased slightly.

2. Medical costs

In addition to standardizing clinical behaviour and raising service quality, the main aim of clinical pathway management was to improve efficiency of resource use. Following analysis of medical records, it appeared that growth in resource use and associated costs was reduced in the four pilot diseases, and the proportion of expenses made out-of-pocket (OOP) also decreased.

In addition, analysis of the pilot diseases' hospitalization costs per visit in Hanbin, Huangdao and Wenxian revealed that generally the drug costs as a proportion of total costs decreased, while the proportion of costs because of testing increased after the pilot implementation.

3. Length of stay

The integrated clinical pathway diagnostic and treatment checklist defined standard hospitalization days for each disease, although these carried slightly at each site based on the local situation. In general, the implementation of pilot project led to reductions in length of stay.

4. Health-related quality of life

The CNHDRC research team conducted an analysis of completed EQ-5D questionnaires that had been administered to 1,045 patients in order explore the

quality of life impact of the project intervention. These patients were COPD, cerebral haemorrhage and cerebral infarction patients from the Qianjiang pilot hospital as well as cerebral haemorrhage and cerebral infarction patients in the Hanbin pilot hospital. Results suggest that implementation of the Phase II pathways did not negatively affect health-related quality of life.

Conclusions and policy recommendations

Getting research evidence translated into policy, and then implemented 'on the ground',remains a persistent challenge for countries with very different income levels when aiming for evidence-informed policy making. The CNHDRC led 'Clinical Pathways' project represents one means of getting 'evidence' incorporated directly intro delivery structures in order to shape behaviour change at both the individual and institutional levels.

Notably the Phase 2 Clinical Pathways project represents a very proactively delivered and complex intervention incorporating not only a description of what would be considered 'best practice' (the 'clinical pathways' themselves), but also their integration within existing hospital information systems, extensive training and support, and importantly, linked payment reform where this was possible. All this was combined with extensive stakeholder engagement with a variety of actors at national and local levels.

Results suggest Phase 2 Clinical Pathways have led to important and positive changes in the management of stroke and COPD patients in the pilot sites; these results should be regarded as provisional, requiring further verification over a longer time period, and with additional data. It is also clear and significant that at both local and national levels the perceived importance of using evidence to inform practice has changed, the need for broader improvements in hospital performance has been reinforced, and the importance of integrated care across different tiers in the system has been highlighted. In some cases, enhanced community based management, focussed on inpatient care, appears to have led to reduced hospitalisation as result of COPD exacerbations avoided. However this would need to be confirmed with further data.

Much more can still be done in re-directing resources away from the hospital sector towards community care, at least in rural China. This will require sustained investment in primary care facilities and human resources. In addition, technologies such as telemedicine may support strategies to deliver more care in the community. Further refinement is also possible using IT innovations, including electronic pathway plug-ins into billing systems, which can better monitor baseline activity and link compliance with preferred activities to appropriate reimbursement.

The very detailed clinical pathways in this project were developed through highly iterative input involving Chinese and international experts, and tailored to local settings. There is scope here, using the expertise of CNHDRC, to recommend a new approach going forward that combines international best practice with improved stakeholder engagement mechanisms. Indeed, reforming the method of developing clinical guidelines in China forms a core component of the 2015 MOU signed between NICE and CNHDRC. Notably, there is also interest in using newly developed guidelines to create quality standards. Quality standards aim to cover whole pathways of care, but do not list all the necessary components of acceptable

care. These may potentially represent a more parsimonious and practical mechanism to support behaviour change, since in principle they would focus only key areas of concern across the whole pathway.

The CNHDRC Clinical Pathways project has received significant government interest, and is seen as a model for replication nationwide. Further expansion should be accompanied by a well-designed prospective evaluation that takes into account the findings of this pilot evaluation, with an emphasis on developing *integrated* CPs spanning different tiers in the system. Additionally, more robust consideration of the evidence with which clinical pathways are developed is needed, calling for strengthening the use of health technology assessments.

OP201 Peking University School of Public Health (SPH)

Output 201 Centre of Excellence in Health Development Aid in China: Sub-project by School of Public Health, Peking University Final Report

1、Abtract

With the support of the China-UK Global Health Support Programme (GHSP), School of Public Health, Peking University (PKUSPH), as the Programme Implementing Agency (PIA) of Output 2 (OP2), charged subproject of consultation service. The programme was launched in April 2014, and the team taking the overall goal of the programme as a guide, through the establishment of a global health development aid(HDA) core agency in China, provided intellectual and technical support for China's HDA in to give full play to the potential of China's HDA to enhance China's contribution to global health. Given the changing of programme cycle and the domestic and international environment, the team adheres to the principle: "learn from practice, open mind, disciplinary integration and flexible adjustment" .The programme was completed on December 31, 2016 as planned.

2、Overall Progress

Since the implementation of programme for three years, based on the specific objectives of the programme, we achieved the output as planned in the fields of research, teaching, training, international interaction（Table 1）.

(1) We became the policy research center of China's HDA. The team completed the "comparative study on the form, management system and best practice of international HDA", and based on the study, we simultaneously selected a typical country (Uganda) and a typical disease (malaria) as cases, to complete China's assessment of the effectiveness of HDA in Africa.

(2) We became the knowledge dissemination and training center of China's HDA. Based on the report of the study and the practical experience of the three "executive training courses on global health diplomacy and HDA", which were under the support of the GHSP programme, the team compiled a textbook of《Global Health Development Aid (tentative version)》 and a book of training material of global HDA .

(3) We became the policy advisory and decision-making think tank of China's HDA. The key members of the team often provided expert advisory services for the National Health and Family Planning Commission（NHFPC） and international organizations.

(4) We established a practical team to understand international HDA. We created opportunities

for key members of the team to participate in academic meetings of international and domestic development aid, and to address the meeting to show the results of the study.

Table 1 Output list of PIA OP2-01

No	Type	Name	Progress
1	Research Report	International Health Development Aid: Method, Management System and Emerging Aid Body	Annex 1
2		China's Health Development Aid to Uganda in the Bilateral Four-level Environment (literature review)	Annex 2a
3		Host and Guest: Jinja Referral Hospital and China Medical Team (an ethnography draft of Jinja Hospital)	Annex 2b
4		Research on Effectiveness Assessment of China's Health Development Aid to Uganda	Annex 2c
5		Assessment of the Malaria Control Programme in Africa aided by China	Annex 3
6	Journal articles	Coordinating Mechanism among International and National Health Development Aid System	Submitted
7		Establishment of Recruitment System for Foreign Medical Teams - A Case Study of MSF	Submitted
8		The Introduction and Enlightenment of the Training System of Foreign Medical team of MSF	Submitted
9		Interpretation of China from Health Aid in Africa（submitting）	Submitted
10		A Study on the Malaria Knowledge and its Influencing Factors among Travelers in Africa	Submitted
11		Demand Analysis on African Students of Anti-malaria Disease Prevention and Control Training	Submitted
12	Books	Evaluation of the Fast Elimination of Malaria by Source Eradication (FEMSE) in Comoros	Submitted
13		Training Material for International HDA	Submitted
14		Training Textbook for International HDA（trial version）	Submitted
15	Policy Briefings	Coordinating Mechanism of Health Development Aid	Submitted
16		Suggestions on Reform of Conference Setting of WHO Executive Board and China's Engagement	Submitted
17		Experience on Actively Participation of Trilateral Health Development Cooperation	Submitted
18		Contemporary Management System of Development Aid	Submitted
19		Elastic Terms and Medicine Accessibility in TRIPS under Global Health Governance	Submitted
20		Effectiveness Assessment of China's HDA to Uganda	Submitted
21		Implementation Experience and Enlightenment of Site Intervention Project of the Malaria Control Programme in Africa Aided by China	Submitted
22		Effectiveness of aid and International Aid Transparent Initiative（IATI）	Submitted
23		BRICS: the Emerging Powers in International Health Development Aid?	Submitted
24	Training Summary	Executive Training Courses on Global Health Diplomacy and HDA –a summary of three training courses（Approximately 120 people are trained）	Submitted
25		Short Training Courses on International Development - a summary of two training courses（Approximately 2 people are trained）	Submitted

26	Meeting Summary	7 summaries of meeting	Submitted
27	Other output	Memorabilia on HDA	Annex 4
28		Health Development Aid briefing	Annex 5

3、Progress

(1) Study on HDA Strengthened, Conclusions Accumulated to Influence Policy Making

1.1 Comparative Study on the Form, Management System and Best Practice of International HDA

The team completed the report – main method, management system and emerging aid body. The team submitted the final report of the activity to Project Management Office (PMO) in June 2016. Meanwhile, based on the findings of the research report, the team wrote three journal articles, which were submitted to the publishers before 31 December 2016; one of the article was published and the other two articles were reviewed by publishers and confirmed by PMO. As advised by the PMO, the team submitted five policy briefings.

1.2 Effectiveness Assessment of China's HDA to Uganda

In July 2016, PMO experts, led by Professor Zeqi Qiu , finally reviewed the progress of the activity, effectiveness assessment of China's HDA to Uganda. And they classified, analyzed and marked the interview data, collected from Uganda, Beijing, and Yunnan Province (47 pieces in total, including persons and institutions).The team queried the documentation stored in Yunnan Province Achieve, Health and Family Planning Commission of Yunnan Province, and searched data from Ministry of Commerce, PRC. The group systematically sorted and analyzed the data, enriched the research material. At the same time, the group collected information on the HDA programme provided by the U.S. (2005-2015), including basic information, cost, expenditure distribution. From the website *china.aiddata.org*, the group extracted information on HDA and other development aids provided by China. The group also searched, sorted, and analyzed the recipient's (Uganda) aid data both in health area and other areas. Literature was reviewed again and some critical publications were added into the collections. There were 1442 pieces of publications in the literature package (including books, theses, journal articles, and news reports).

The team submitted the research outputs to PMO in October 2016 and received a very positive comment from experts. The outputs include the draft of *China's Health Development Aid to Uganda in the Bilateral Four-level Environment* (literature review), *Host and Guest: Jinja Referral Hospital and China Medical Team* (an ethnography draft of Jinja Hospital), *Research on Aid Effectiveness of China's Health Development Aid to Uganda*, a submitted journal article under review, a policy briefing (under revising according to the responses from PMO).

1.3 Assessment of the Malaria Control Programme in Africa Aided by China

Material analysis and report writing were the main jobs of the first half year. Last year, the research group finished the field research on the malaria control programme in Africa aided by China, and produced two parallel reports, a policy briefing, journal articles, and abstract for conference, based on the previous sorting and analyzing of the material. Until now, the research group completed the *Report on China's Malaria Control Training Aided to Africa Countries* and the *Evaluation Report on Comors' Fast Elimination of Malaria Disease*. The two reports will serve as important parts in the final report. The research group is writing the final report. The

Evaluation Report on Comors' Fast Elimination of Malaria Disease (English) was signed for publication with Springer, which was finalized and about to publish. In addition, the research group wrote a policy briefing on the basis of the observation to the China Anti-Malaria Team. In order to disseminate the research findings, the research group submitted one journal article (published), one conference abstract (reported in the annual conference of China Consortium of Universities for Global Health, CCUGH). In the process of report writing, the group enriched literature and reviewed the key literature for a second time, producing one journal article in Chinese (submitted to *Chinese Journal of Health Policy*, which has a remarkable influence in the field of China's health policy research).

The outputs of the activity include *The Evaluation Report on Comors' Fast Elimination of Malaria Disease* (English, to be published), a policy briefing (first draft), the conference abstract titled *Health Systems Strengthening Play an Important Role* (accepted by the annual conference of CCUGH), the journal article titled *Demand Analysis on African Students of Anti-malaria Disease Prevention and Control Training* (published), the journal article titled *BRICS: the Emerging Powers in International Health Development Aid?* (to be published in March 2017).

(2) Knowledge Dissemination and Training Function of PIA Improved

2.1 Training Material and Textbook for International HDA (J-2016-4)

The textbook, *International Health Development Aid*, was prepared based on the cooperation of experts and scholars from Peking University, China Agricultural University, China National Health Development Research Center, and other institutions. The textbook has signed an agreement with Peking University Medical Press and will be published. Additionally, the group also made training material based on the training courses held by institutions.

Output：Textbook（trail version）, training material.

2.2 Executive Training Courses on Global Health Diplomacy and HDA (J-2016-5)

Supported by the programme, there are four Executive Training Courses on Global Health Diplomacy and HAD, and the training course this year was held only by PKUSPH from 17th to 21st, October in Wuxi, Jiangsu Province.

(3) Policy Consultancy Function Improved

Assigned by NHFPC, the core member of the OP2 programme, Doctor Zheng Xie did a consultancy on governance reform of WHO, Doctor Kun Tang carried out the research on operation mechanism of WHO executive board. In the WHO executive course and WHA held in January and May, 2016, these two researchers served as the consultant and provided policy consultancy. Doctor Zheng Xie participated in WHO governance reform negotiation in the working group from January to May, 2016.

In addition, according to PMO's requirement, the PIA produced memorabilia on global HDA and a policy briefing.

(4) The Capacity and Ability of Institutions and Individuals to Participate in HDA Enhanced

For the purpose to enhance PIA's capacity, we arranged Doctor Kun Tang to CMB to serve as a program officer. It was contributory for the PIA's staff to broaden vision and grow up into international talent in HDA by participating in the allocation and management of charity fund.

4、Effectiveness

The research activities , the refinement of training material and other activities within the programme have been completed and the research results are deliverable. The core effectiveness of the programme is ： The agency has taken shape in the establishment of global HDA core agency and is able to respond to another programme undertaken by the agency: global health governance core agency, which facilitate the agency to be a global health core agency with a certain influence at home and abroad.

Specially in:

(1) Influence on policy making of international and domestic HDA;

In recent years, our government has paid more and more attention to investment in HDA. With the adjustment of national policy focus and related practice, the demand for HDA policy has gradually arisen. In this process, the agency's research on the basic model, theory and experience of HDA and research on assessment of China's HDA in Africa have made a decision-making role in various sectors of the country. Based on the study, we have submitted a number of policy briefings, and participated in making and practicing a number of international development aid policies, which made us received favorable comments from relevant departments of NHFPC.

Meanwhile, through the exchange with international and domestic experts, some research results have been recognized by international and domestic counterparts, which formed a great impact. The programme produced a number of high academic level research results for publicity in the form of English books, journal articles and otherwise. In addition, we have compiled the textbook《International Health Development Aid》which is the first textbook on HDA.

(2) Exploration and Pioneering Implementation of Effectiveness Assessment of HDA

At the beginning of the programme, HDA was a new theme, and so was the effectiveness assessment of HDA in China. There are only some theories of the effectiveness internationally. Following the "learning by doing" strategy and learning from China's practice, the team explored a way of assessment of HDA programme in China, and successfully completed the programme, which experts praised. The methodology for assessment of HDA programme will guide scientific research and practical development in the future. We have also summarized some results into HDA textbooks.

(3) Influence on HDA in countries along "the Belt and Road"

Through the programme, the Chinese researchers began to actually go out of the country to carry out research. Through the systematic review and analysis of China's HDA practice in Uganda, Comoros and other countries, we have put forward some practical suggestions to improve the efficiency of China's HDA and to change the mode of HDA, which play a positive way in implementing "the Belt and Road" strategy and effectively implementing HDA in countries along "the Belt and Road".

(4) Sustainability of Programme

Though the programme are near completion, the effectiveness of the programme is sustainable. Through the programme, we formed "one voice", "one platform" and "one team". That is, the agency has made a voice in the field of HDA internationally and domestically and we will be an important role in future scientific research and policy research; Through the programme , the agency formed a platform for research and practice with UK IDS, Graduate Institute for International and Development Studies in Geneva, Makerere University of Uganda, China Agricultural University, Guangzhou University of Traditional Chinese Medicine, Jiangsu institute of Parasitic Disease and other partner institutions, continuing to focus on China's HDA in the future; Additionally, what is more important is through the programme, a number of experts and scholars who begin to have a strong interest in Chinese HDA, especially young scholars.

5、Financial Management Progress (Omitted)

6、Experience and Proposals

(1) Lacking cooperation with international academic institutions, failing to fully achieve expected results. In the process of cooperation with the developed countries, the two sides have a gap in the way to understand the programme, the expectations of the output and the way to work, resulting in a large transaction cost. In the process of cooperation with developing countries, we are more inexperienced and both the two sides need a running-in process. These have led to extra expenditure for cooperation with international academic institutions. We expect these to be a learning process that we can accumulate experience and learn from them to prepare for future work.

(2) The relationship between research and output need to be balanced. As a research agency, the agency focuses on the research results and academic influence, and the majority members are university researchers, who have insufficient experience and concern in putting research results into policy and practice. After some initial adjustments, the members consciously strengthened the training in this area, for example, focusing more on the writing and dissemination of policy briefings. However, there is still a need to strengthen capacity building in this area in the future.

(3) In terms of programme management, there is still a problem with the coordination of international programme and domestic policies. As the management rules of international programme are different from management rules in our country and schools, the cost of programme coordination and communication are very high. There are some problems can’t be resolved by the system but only by the PIA, resulting in a high cost of management of the PIA.

Annex: Financial Performance (Omitted)

OP202 National Institute of Parasitic Diseases (NIPD) of the Chinese Centers for Disease Control and Prevention (China CDC)

Output 202 Centre of Excellence in Health Development Aid in China: Sub-project by China CDC's National Institution of Parasitic Diseases

Final Report

Abstract

With the realizing of increased international responsibility, P. R. China provided a lot of international aid in low and middle-income countries in African and South Asian countries, especially in the field of health development in recent decades. However, a big gap is existed between the need and the existing capacity of Chinese governmental officials and professionals for international health aids. With the collaboration of five domestic institutions, five LIMCs institutions and five OECDs institutions, the National Institute of Parasitic Diseases, Chinese Centre for Disease Control and Prevention (NIPD, China CDC) designed and completed 23 activities, aiming to strengthen China's contribution to global health and achieve the potential of its health cooperation through the establishment of a Centre of Excellence (CoE) of Health Development Aid. Five sub-projects were implemented in this programme, including (1) improving capacities of research and analysis, (2) consulting services for international agencies, (3) forming expert team on health development aid at global level, (4) constructing training facility for public health aid, and (5) undertaking evaluation. Totally, this programme summarized and refined the experience and lessons of six practice cases in global health, initially formed a distinctive global health training model on tropical diseases, reserved a batch of professional talents tank combination global health and tropical diseases prevention and control., and thus empowers NIPD to lay a solid foundation on forming "one of Centre of Excellence in Health Development Aid in China".

1. Background

With the emergence of staggering economic development in P. R. China, international responsibility has increased in prominence in the political agenda including international development aid and global governance. International health development aid has been an important form of international development aid in P.R. China for decades. It has been an indispensible component in the foreign affairs as well as one of key elements of international responsibility of the country. During recent decades, international development aid has taken the most important role of international aid of Chinese government, and has achieved relatively considerable accomplishments.

International development aid can not only help developing countries improve their economics, health and reinforce their relationship with China, but also show the world the soft power of China. With the further understanding and support gained through international development aid from the recipient countries, China continuously marches towards a higher standard, cognisant of the need to learn from the evolution of development assistance in health. The Chinese leadership's recent recognition of engagement on global health helps build the country's global image as a contributor to global welfare which is illustrated by the Beijing Declaration, agreed by ministers of health in China and African countries, as well as representatives from the African Union, World Health Organization (WHO), the Joint United Nations Programme on HIV and AIDS (UNAIDS), United Nations Fund for Population Activities (UNFPA), United Nations International Children's Emergency Fund (UNICEF), World Bank, Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria, and GAVI Alliance, in order to fulfil the commitment of the Beijing Action Plan (2013-2015), on the occasion of the 50th Anniversary of the China Medical Team sent to the People's Democratic Republic of Algeria, in Beijing in August 2013for the Ministerial Forum of China-Africa Health Development.
Even until recently, most health development aid is provided by developed countries from western world with only a small amount from their developing counterparts. Many assistance projects still use conditional and/or tied aid which is increasingly being criticised due to its lack of emphasis on developing local capacity and using local resources. Therefore, it is urgent to implement the proposed project in order to improve the capacity of Chinese officials and scholars to significantly engage in global health, in order to establish a strategic plan and evaluation schemes, set up a expert team in the field of research, strategic consultancy and assessment, and provide consulting services with a think tank, information dissemination and training in health development aid in PR China.

Against the above background, the government of China and the government of UK, based on long-term successful cooperation in the past, have determined to take the "global health" as a new field for the ongoing bilateral strategic cooperation. On September 17, 2012, the Memorandum of Understanding for the Global Health Support Programme (MOU) was signed between UK's DIFD and China's Ministry of Commerce (MOFCOM). According to the MOU, DFID will provide a fund to support the programme by technical cooperation. GHSP is a China-UK partnership contributing to improved global health policy and outcomes. The programme will help China improve its contribution to global health and achieve the potential of its collaboration. The programme is implemented from 2012 to 2017, with a total budget of £12 million. Four outputs will be achieved through a series of planned activities, Output 1 Increased ability to distil, disseminate and apply Chinese experience in

improving health outcomes and strengthening health systems. Output 2 Improved understanding amongst Chinese officials and researchers of best practice in international health development cooperation (including bilateral and multilateral). Output 3 Enhanced ability of Chinese officials and researchers to contribute to global health policy and governance. Output 4 Pilot partnerships to apply China's experience and international best practice in development cooperation in low income countries (including at least one Asian country). This report is the core context of Output 2.

2. Objectives

2.1 overarching goal

The overarching goal of the project is to strengthen China's contribution to global health and achieve the potential of its health cooperation through the establishment of a Centre of Excellence (CoE) of Health Development Aid. This centre will work to (i) improve the capacity of Chinese government staff in understanding the principals and best practices in the field of health development aid so that they are able to play an important role in health development aid for other countries through better decision making and better implementation of relevant policies, (ii) improve the capacity of Chinese professionals in participation in policy making and implementation in the field of health development aid so that the bilateral and multilateral cooperation in health could be strengthened between China and other LMICs, and (iii) improve the capacity of Chinese government staff and professionals in technical support and policy consultancy as a think tank of government so that more contribution to the global health network and promotion of education and research in health development aid from China could be achieved.

2.2 Specific Objectives

As such, the specific objectives of this project are listed as follows:

- To improve the capacity in research and analysis of health development aid through case studies, and produce the teaching materials on problem-based strategic plans and evaluation schemes in health development aid;
- To improve the capacity in information dissemination and training on health development aid through holding short training courses;
- To improve the capacity in aid project consultancy with high impact on global health through involving consulting services in bilateral and multilateral cooperation activities.

3. Reseach contents and expected outputs

3.1 Reseach Contents

According to the overarching goal and three specific objectives, this project designed five sub projects, focused on improving the health development in the following two problems: 1) Lack of strategic plan and evaluation schemes in health development aid, 2) Lack of experts in the field of research, strategic consultancy and assessment of health development aid. The technology roadmap was showed in Figure 1. According to the technology roadmap, 23 activities were designed including research, training, and evaluation, and the main contents of each sub project were detailed as follows:

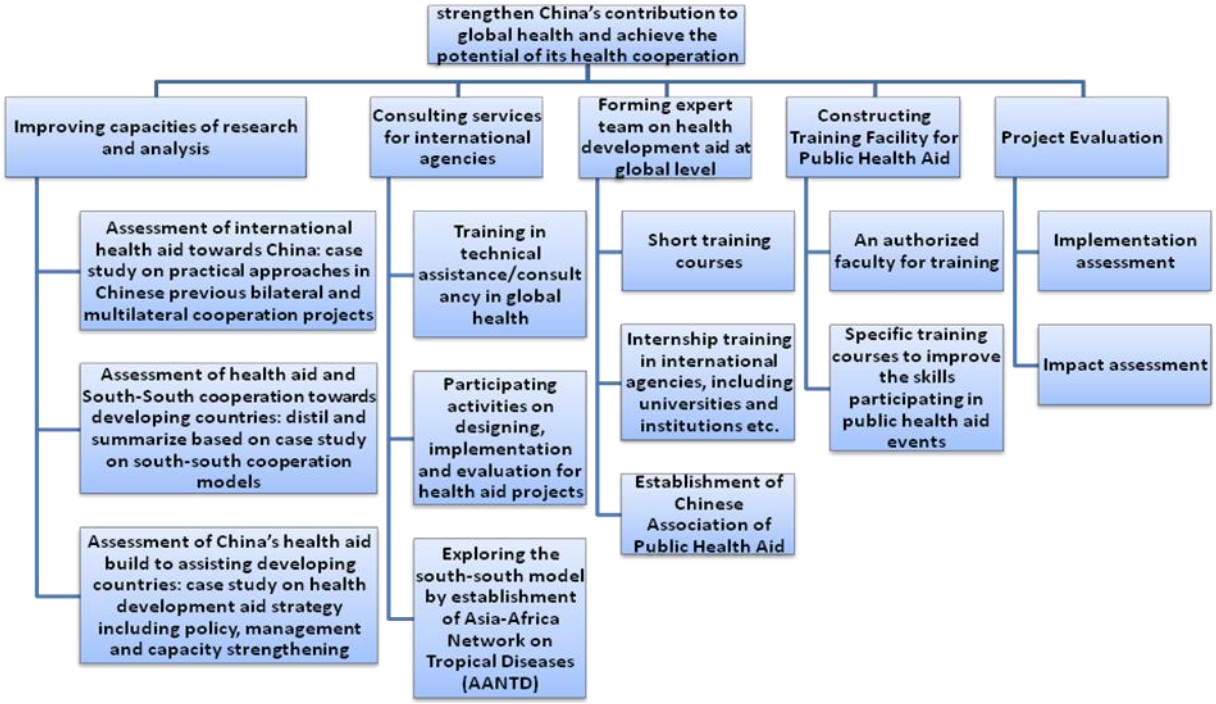


Figure 1 Technology roadmap of OP202

Content 1: Improving capacities of research and analysis

Assessment of international health aid towards China: case study on practical approaches in Chinese previous bilateral and multilateral cooperation projects

Assessment of health aid and South-South cooperation towards developing countries: distil and summarize based on case study on south-south cooperation models

Assessment of China's health aid build to assisting developing countries: case study on health development aid strategy including policy, management and capacity strengthening

Content 2: Consulting services for international agencies

Training in technical assistance/consultancy in global health

Participating activities on designing, implementation and evaluation for health aid projects

Exploring the south-south model by establishment of Asia-Africa Network on Tropical Diseases (AANTD)

Content 3: Forming expert team on health development aid at global level

Short training courses mainly for public health personnel from China and developing countries

Send young students to study in international agencies, including universities and institutions.

Establishment of Chinese Association of Public Health Aid

Content 4: Constructing Training Facility for Public Health Aid

Construct a database of experts to construct a teacher team/ resource for Public Health Aid training.

Specific training courses to improve the skills participating in public health aid events for government officials and managers

Holding training for professional and technical personnel in public health aid

Content 5: Project Evaluation
Implementation assessment
Impact assessment

3.2 Expected Outputs

Corresponding to the above research content, the project's expected output includes:
1) Improving the research and analysis ability of health assistance through case study, such as: collection classic case of health development assistance, analysing the aid mode, management style, capacity building, and policy making, so as to carry on cases' summary and evaluation, writing assessment and policy brief, hoping to make propose to the implementation of health development and aid projects for China in the future.

2) Improving the ability of information dissemination and health care training, such as: exploring the South-south model by establishment of Asia-Africa Network on Tropical Diseases (AANTD), developing training curriculum, sending more than 8 experts to participate in international global health aid, sending more than 10 people to participate in international conference, more than 5 experts participanting in various international committee, which will promote the voice and participation of Chinese government and experts in global health.

3) Enhancing the advisory ability of the global health, such as: holding capacity building for project members, holding tropical diseases related technical training for technical personnel from Asian developing countries, and Establishment of Chinese Society of Global Health（CSGH）, Chinese Preventive Medicine Association, which will create a senior expert team and a platform for global health information communication and consultation.

4) Providing a training platform for public health assistance, such as: building a information system including consulting experts and training teachers, holding 2 trainings for government officials, and holding 3 phase training for technical professional and personnel.

5) Improving the capacity of project evaluation, such as: Assessing the whole project by self-evaluation and extenal assessment, and writing project assessment report.

4. Research Methods

4.1 Case assessment and analysis

Materials of China's projects assisted by international organizations and cases where China provides medical aid for other developing countries are collected to deeply analyze the results of policy development, methodologies, project management, and capacity enhancement for each project. We are to understand the strategies and methods of global health development and cooperation, analyze and assess the bilateral and multilateral international aid, and make in-depth analysis to the models of policy development and management mechanisms on South-South cooperation through interviews, exchanges and joint researches with key stakeholders such as donor co-sponsors, aid recipients and project managers.

4.2 Sending staff to attend international conferences and international training programs

Outstanding experts and scholars are selected to attend international important meetings, special trainings or trainings from international agency, which both provides our experts with more opportunities for participation in the work related to international health aid and helps train a number of domestic public health officials and experts to improve their capabilities of the guidance or participation in bilateral and multilateral health-development aid.

4.3 Establishment of expert team capacity for training and holding train courses

Materials of experts' work fields and basic information are collected through the assessment and screening of teachers offering aid to public health to construct the expert team capacity for assisting the training of public health. At the same time, the training demand is investigated and training courses for government officials and professional technical personnel are set up to improve the capability of aid to public health projects.

5 Project Management

5.1 Partners and Working Team

The proposed programme is leading by NIPD, in collaboration with 15 partners, among with, 5 are domestic partners (1 university, 2 CDCs, 1 research institute and on NGO), 5 are from Asian and Africa LMICs (2 universities, 2 research institutes and 1 disease control institution)and five are from OECDs (2 colleges, 2 research institutes and 1 consultant company). The five domestic institutions are: Global Health Institute of Fudan University, Health Poverty Action (UK) Yunnan Representative Office, and Sichuan Center for Disease Control and Prevention, Shandong Institute of Parasitic Diseases and Jiangsu Center for Disease Control and Prevention. The five institutions from LMICs are IFKARA Health Institute in Tanzania, University of Yaoundé in Cameroon, National Institute of Public Health in Lao PDR, Health Service Academy in Pakistan and National Center for Malaria, Parasitology and Entomology in Cambodia. The five institutions from OEDCs are London School of Tropical Medicine and Hygiene in UK, Swiss Tropical and Public Health Institute, Duke Global Health Institute in USA, Liverpool School of Tropical Medicine in UK and Capacity Development International in UK.

The proposed team consists of 94 professionals from 16 universities/research institutes/CDCs/company within 9 countries. Their backgrounds are ranging from disease control, global health, health education, health economics, social economics, epidemiology, biology, environmental health, biostatic, evidence-based medicine, and etc. The task assignments of the proposal are divided subject to the expertise and research interested of all the partners.

5.2 Management mechanisms

This project will be run under the guidance of GHSP project management manual. The management manual of administrations, operations, Finances, monitoring and evaluation are set in order to guarantee the ongoing of project. Administrative management is mainly engaging in the coordinating different units, improving the team cohesion, promoting the project results to reach the expected goals. As such, the team is set with 1 head, 5 cooperation director and 1 director for each sub-project (5 in total, the 5 sub-projects are Capacity development in research and analysis,

Consulting services for international agencies, Forming expert team on health development aid at global level, Constructing training facility for public health aid, and Evaluation), and 2 vice directors for each sub-project (10 in total). Head is responsible for the overall project design, organization, implementation, and supervision and summary. Cooperation director is responsible for assisting the head to complete the overall works including design, organization, implementation, supervision and summary of duties. Directors for sub-project is responsible for according to the target of component, work plan, organization, implementation, supervision and summary, and are also responsible for assisting the head, cooperation directors to complete the project work plan. This project application unit (National Institution of Parasitic Diseases-Chinese Centre of Disease Control and Prevention) will set up the position of a group of secretary (five people in total), including 1 group leader, 1 management secretary, 2 business secretary, 1 financial secretary. The group is responsible for the project to organize and coordinate with contact and daily management, to support the head and experts team.

Financial management focuses on working to ensure the financial security, with strictly following on the GHSP project budget formulation and regulation. This project application unit (National Institution of Parasitic Diseases-Chinese Centre of Disease Control and Prevention) will audit the financial work once a month, and financial secretary will report the work at the same time.

Supervision and evaluation management are focused on the supervision work in the project schedule, organization of experts to supervise and evaluation, find problems and bring out the solution to solve the problem in the project.

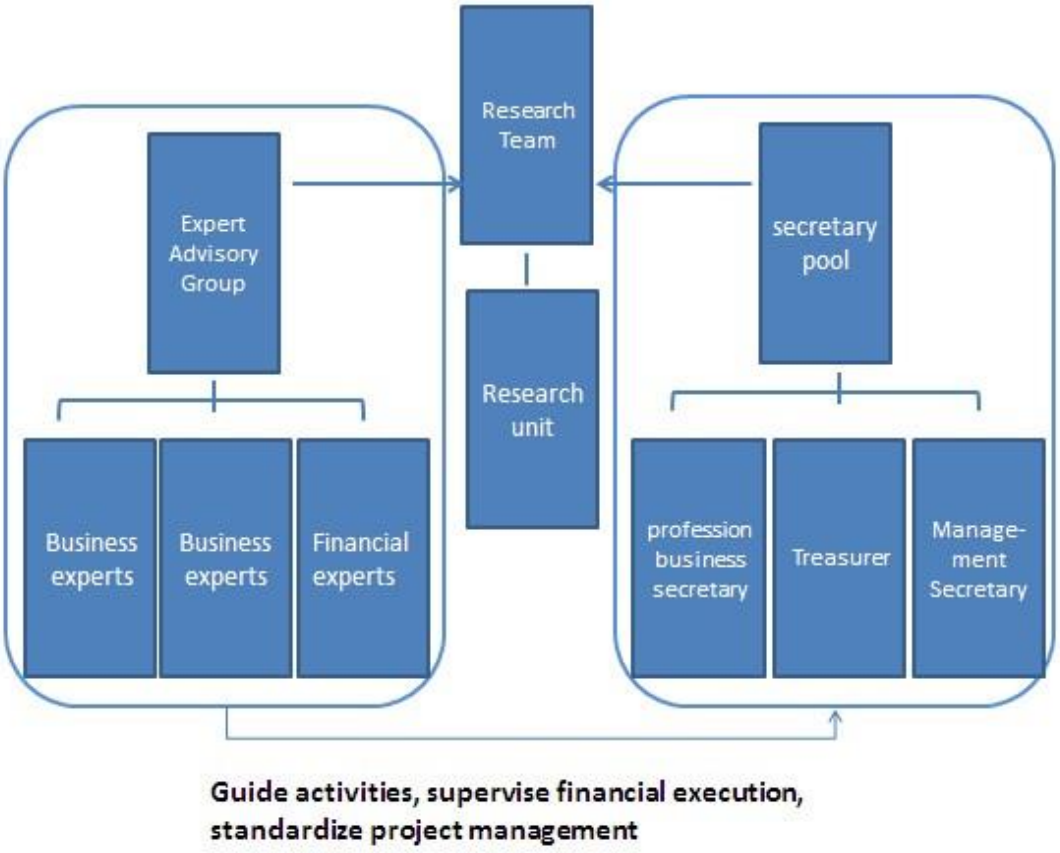


Figure 2 Construction and Role of the Team

6. Project Activities and Outputs

6.1 Research capacity of health-development model is enhanced to put forward policy recommendations for the government.

This section mainly evaluates and analyzes six classic research cases, which can be divided into two major aspects. On the one hand, two cases (6.1.1) are used to review and evaluate the health-aid projects undertaken by the International Foundation in China and we found that China's access to international health aid not only provided financial and technical support for China's health development but also brought new management ways and ideas of health- development aid, which offered a reference for China to carry out external health aid in the future work; on the other hand, experience and inspiration of South-South cooperation in health are figured from the following aspects: models and orientation of aid, dual / multilateral cooperation mechanism, management and capacity-building, etc. through the summary or analysis of four cases (6.1.2 & 6.1.3) where China dominates or implement or participate in health aid to other developing countries. The corresponding development direction and policy recommendations are put forward, which offers references for China to develop relevant policies of health aid towards foreign countries, planning and management mechanisms.

6.1.1 Assessment of international health aid towards China

Evaluation of Global Fund on Malaria Control Project in China has been completed.

In 2003, China began to receive funding from the Global Fund and launched the Global Fund on Malaria Control Project, applied for and completed five rounds of malaria projects such as the round 1, 5, 6, 10 and the National Strategy Application project. 5 rounds of malaria project closely integrated with China's national control program and malaria epidemic situation. The round 1 (2003.4-2008.3) of the project focused on supporting malaria control of high-spawning areas in China; the round 2 (2006.10-1010.10) was committed to curb the recovery of malaria in central China and reduce poverty in central and southern China; round 3 (2007.7-2010.6) focused on the malaria control at Sino-Burmese border; round 4(2012.1-2013.12) was mainly committed to reducing the malaria burden of Burmese five SARs at the Sino-Burmese border; round 5(2010.7-2012.6) of the project aimed to curb Malaria from control to elimination. By reviewing and summarizing this project, Assessment Report of Global Fund on Malaria Control Project in China was completed with one policy brief and two published papers.

Useful suggestions are provided for China to carry out external health aid through the assessment and summary of the practical experience and lessons of Global Fund on Malaria Control Project in China: to begin with, malaria-aid work in abroad should be given top priority in health-development aid, in particular to share China’s experience of malaria eradication with the Greater Mekong and African countries; in the implementation of the project, it is necessary to rely on local health-development plans and public health systems to implement aid, meanwhile, attention should also be paid to support the construction of public health system of recipient countries; it is necessary to establish a sound and effective management mechanism and evaluation mechanism for health-aid performance to strengthen the overall management of aid projects; in addition, it is recommended to promote the construction of the recipient countries to build a supportive environment for the participation of whole society so

as to mobilize social forces extensively.

Assessment of Tuberculosis (TB) Control project in China supported by Bill and Melinda Gates Foundation has been completed.

China officially launched the first round of "Ministry of Public Health of China—TB Control project in China supported by Bill and Melinda Gates Foundation" in 2009. The project is divided into two phases. The first phase (2009.4-2011.9) was to test new tools and innovative ways of health services at the local pilot areas; the second phase (2011.10-2015.12) tried to establish a comprehensive prevention and control model which integrates diagnosis, treatment, management with financing. The Bill and Melinda Gates Foundation supported China's TB Control partnership project again in 2015 to promote a comprehensive model of TB Control in China's 3-4 provinces (2016-2018). Three case reports were completed through case studies and interviews with stakeholders.

It is found that this project is mainly based on the national demand through case studies to solve outstanding problems with the core of innovation, which conforms to China’s practice and characteristics. It was designed rigorously to strengthen the supervision and management of the goal-oriented process with the full employment of resources at the assisted region, focusing on risk prediction. In the process, continuous optimization of project content and promotion of the project results step by step ensure the sustainability of the project and facilitate the promotion and application of the project. Meanwhile, we are also reminded that when carrying out foreign-aid projects, we should take action based on global health, pay attention to the needs of major health assistance, find the interest overlaps of the recipients and donors, adhere to sustainable development aid, and change from the passive donor to an active one with the focus on technical assistance, planning to promote the progress of the project.

6.1.2 Analysis of health aid and South-South cooperation towards developing countries

Assessment of the Asian Network on Schistosomiasis and Other Important Helminth Zoonosis (RNAS +) has been completed.

In the International Symposium on Research, Monitoring and Control of Schistosomiasis Japonica held in Wuxi, Jiangsu Province of China in 1998, Prof. Feng Zheng, researcher and former Director of National Institute of Parasitic Diseases Chinese Center for Disease Control and Prevention (NIPD), sponsored a network of professional organization for disease prevention and control—Regional Network of Asian schistosomiasis (RNAS) together with Dr. Remigio Olveda who came from the Philippine Institute of Tropical Medicine, which aimed to combine multidiscipline (medicine and animal medicine) and multi fields (research scholars and policy makers) to carry out prevention and control of zoonotic schistosomiasis and promote the prevention and treatment of Asian schistosomiasis. In 2005, it was renamed the Asian Network on Schistosomiasis and Other Important Helminth Zoonosis (RNAS+). At the beginning, RNAS had only six member states including China. After that, RNAS+ had more and more member countries and gradually expanded, were increasing to 10 countries until 2016, namely China, Cambodia, Indonesia, Japan, Korea, Laos, Thailand, the Philippines, Vietnam and Myanmar. In this network, member countries account for the main part of the economic circles of Northeast Asia and the ASEAN with a total population of about 2 billion. One evaluation report, one article, and one policy brief have been completed through the review and analysis of

RNAS+. In addition, this study, as a case study, was included in the book named the Introduction of Global Health.

The work model of RNAS+ is to hold an annual academic exchange meeting and training program. Since the first annual meeting of RNAS+ was held in 2000 in Philippines, 16 annual meetings have been held in nine countries, with a total of 1024 professionals and medical and health executives participating in the RNAS+ annual meeting or training program. Chinese scientists dominate the network. By assessing RNAS +, it shows that China has a team of experts with rich and excellent prevention and control skills towards schistosomiasis and helminth disease, and China is able to secure funding from certain international organizations. China can play a huge role in diseases prevention and control in the field of schistosomiasis, helminthiasis and other tropical diseases. By building a regional network with China dominating the topic of diseases or health, it is not only possible to create conditions that will enable China to gain more influence, dominance and voice in the global health, but also good at maintaining health and safety in China. In the future, it can also be developed as the prevention and control models of other neglected tropical diseases or tropical diseases.

Assessment of the Chinese medical team in Zanzibar and the Republic of Malta has been completed.

During the 50 years from 1964 to 2014 when Jiangsu Province assumes the task of offering medical aid abroad, Jiangsu Province has sent 52 batches of medical teams with a total of 892 people to five countries and districts of Iran, Libya, Zanzibar, Guyana and Malta in Asia, Africa, South America and Europe, of which 11 batches were sent to Malta with 66 people and 25 batches were sent to Zanzibar with 654 people. It has experienced the initial stage (1964-1992), the development stage (1993-2003) and the reform phase (2003 to present). Located in the middle of the Mediterranean, the affluent Republic of Malta enjoys its traditional industries like tourism, shipbuilding and ship repairing industry with medical science and technology and sound health insurance system, covering the land area equivalent to the area of Wuhan city. The Republic of Zanzibar is an integral part of the United Republic of Tanzania, covering an area of about 8.5 times that of Malta. With the single economic structure and the backward infrastructure, the level of medical technology is extremely low. An assessment report, two articles and a policy briefing have been completed through the assessment of the medical team. In addition, this study, as a case study, was included in the book named the Introduction of Global Health.

It is found that even both recipient countries are all African countries, there is a large difference based on the comparative analysis of the basic situation, aid patterns, management mechanisms and effects of the two medical teams in Malta and Zanzibar. As for the Malta medical team, it still takes time for Chinese medicine to become the modern mainstream medicine in the world although acupuncture and massage have been fully accepted and recognized by Malta. In the face of the health problems of Zanzibar, we need to spread the successful experience of public health in China to help them establish a sound and complete public health system. Problems can be fundamentally solved through the improvement of production and living environment. At the same time, the experience and enlightenment of the foreign-aid teams in aid mode and thinking are also be summarized with the problems faced by them in policy making and management mechanism. Corresponding suggestions are also be put

forward. Suggestions and recommendations are as following: 1. To speed making the medical aid long-term strategic plan, and formulating the national plan; 2. Improve the treatment of foreign aid medical team, to form a national "talent pool for foreign aid medical and health technology and management", establishing technical standards of foreign medical and health-related aid and taking the professional road; 3. Establish a comprehensive evaluation system, maining the image of foreign aid medical team; 4. to form a actively cooperation with international organizations (eg.WHO) or other national cooperation mechanisms.

6.1.3 Assessment the China's development of health assistance and strategies to other developing countries

Assessment of the collaborative project of transverse HIV / AID and malaria program between China and Myanmar has been completed.

The round 6 and 10 of the malaria project of China's Global Fund implemented in Myanmar by the activity of Health and Poverty Alleviation during the period from 2007 to 2013 are funded and managed by the Chinese government's professional health agency (Chinese Center for Disease Control and Prevention) with technical support. It is a health-aid project implemented specifically by the private sector through the procurement services. It mainly features the cooperation between civil society and the professional health agencies of the government, assuming a different role in the implementation of the project so as to effectively reduce the burden of infectious diseases in the project area. Two papers and a policy briefing have been written through the development of two research projects.

The study points out that it is feasible and advantageous for the civil society to play the role of the implementers of global health projects. Civic organizations are given the full play of its adaptation to their culture and community practices to implement the global health programs, which are able to avoid the risks that may be encountered by professional health institutions in the process of "going out" alone and the lack of interaction with other communities. It has been proved to be feasible and effective in practice that two parties work together on the global health program. Therefore, it is recommended that the government should: 1. identify the status of civil society in the global health strategy as soon as possible and establish their position in China's national health foreign-aid system (including humanitarian-relief systems); 2. support civil society participating in the global health with cultivation, guidance, policy, funding and coordination; 3. learn from the cooperation between China Global Fund Projects and civil society and purchase public health services from civil society (including overseas civil organizations that legally exist in China) by means of the bidding method of service procurement to implement overseas health aid projects. Promote cooperation between civil organizations and professional health institutions and give full play to their respective advantages.

National studies on primary health care, maternal and child health care received in Pakistan have been completed.

Pakistan has the sixth largest population in the world. It is far from MDG's goal in maternal and child health care, maternal mortality and mortality rates for children under 5 years, owing to the main risks of poverty, malnutrition, poor health and homelessness refugees. China and Pakistan are friendly neighbors. China's economic and trade cooperation with Pakistan has a long history while health cooperation and civil relations began in recent years. A country study report and a policy brief have

been prepared by analyzing the status and problems of the Pakistani maternal and child health-development project.

In view of the long-term friendly relationship between China and Pakistan, it is proposed that the cooperation of maternal and child health care between China and Pakistan can be carried out directly from the government level. The cooperation between the two countries on maternal and child health care may take into account the following priority areas: 1. joint control of disease prevention: eliminating polio and other new infectious diseases through the aid of the planned immunization at the border areas between Pakistan and China to benefit the majority of children; 2. construction of first aid system: the integrity of the first aid system is necessary to reduce the maternal and child mortality rate; 3. mobile communication technology in the field of health applications; 4. construction of health and human training center: Pakistan's new decade of maternal and child health action plan pays much attention to grass-roots women; 5. construction of service-security systems; 6. strengthening the research and cooperation of the management on health system.

6.2 Providing advisory services and technical support for international organizations or networks

Strengthen the capacity of Chinese government officials and scholars to provide advisory services for international health development through the provision of special training, guidance and participation in various activities supporting bilateral and multilateral health development aid of government.

6.2.1. Investigation of the demand for tropical diseases aid in low- and middle-income countries and the focus of China's aid to countries with epidemic diseases

The event was organized in conjunction with the 2nd International Seminar on the Elimination of Tropical Disease Surveillance and Response Systems held in Shanghai from 16 to 17 June 2014, inviting experts from the cooperative project partners and other domestic and foreign experts to collect information and seek experts' advice through questionnaire and brainstorming so as to explore the needs of global health in low-income countries of Asia and Africa in the field of tropical disease prevention and control and have completed a report on the aid of global tropical disease control. The focus of our country on providing aid for low- and middle-income countries with epidemic diseases in the field of tropical diseases is to carry out capacity-building activities based on training, build demonstration zones with output-based experiences on prevention and control of tropical diseases in China and conduct the prevention and control technology and product applicability research on the Chinese tropical diseases.

6.2.2 Sending experts to participate in international aid projects

During the implementation phase of the project, a number of experts participated in international aid projects and provided services of tropical diseases prevention and treatment consultation to five countries.

Two project members went to Zambia to promote the rapid diagnosis of schistosomiasis and training work with a positive effort, spreading China's tropical diseases prevention and control technology to developing countries to help them achieve early diagnosis, early treatment and harm reduced; an expert went to Egypt to discuss the Chinese mollusc medicine used in the Egyptian schistosomiasis site of the

cooperative research program, doing a practical exploration for the Chinese schistosomiasis medicine which would be promoted in the African countries; one expert traveled to the Philippines in 2015 to assist its Ministry of Agriculture's Veterinary Bureau in drafting a mid-term plan for the prevention and treatment of schistosomiasis in the Philippines, the criteria of animal schistosomiasis diagnosis and treatment and the field investigation program of animal schistosomiasis in Wright province. Three technical documents provided the technical support for schistosomiasis prevention and control for the Philippines in the next five years, and also did a useful exploration of the output of China's successful experience in preventing schistosomiasis in Asian countries; 3 project members participated in designing and writing the China - Australia - Papua New Guinea Malaria prevention and control pilot project, making a positive role in promoting and implementation of the project; four project members participated in the launching ceremony of project funded by GHSP, one of which was appointed as the head of the project. The project would use the Chinese experience to explore the malaria control and elimination model suitable for Tanzania and make useful explorations for its applicability in other countries in Africa.

6.2.3 Exploring the South-south model by establishment of Asia-Africa Network on Tropical Diseases (AANTD)

Continuing to play the role of Chinese experts in Asian schistosomiasis and other zoonotic worms

There are similarities and differences in epidemic tropical diseases in developing countries. Prevention and control of tropical diseases like schistosomiasis in Asia, especially in China, has attracted worldwide attention, which accumulated rich disease-control experience; while in Africa, schistosomiasis and other tropical diseases prevention and control has gained little concern, which is in slow progress. Therefore, countries with epidemic tropical countries such as African schistosomiasis have the needs to learn the prevention and control experience in schistosomiasis and helminthiasis from Asian countries, especially China. At the same time, globalization, informatization and industrialization effectively integrates global resources, bringing new challenges to the coordinated development of resources, environment and health. Prevention and control of new and imported tropical diseases has become national, intercontinental and even global public health concerns, such as schistosomiasis haematobia and schistosomiasis mansoni have been reported from time to time in China which is true of the relevant vectors. Therefore, there is an urgent need to establish an inter-regional network of tropical diseases, promoting exchanges of relevant technologies and experience, and the prevention and control of tropical diseases in different countries and regions.

At present, a number of tropical diseases networks have been established in the world, in which RNAS+ was established in 1998 to promote the prevention and treatment of tropical diseases in Asia. In order to strengthen the prevention and control of Asian and African tropical diseases, a network of Asian and African tropical diseases is established, including the RNAS+ and the Sino-African schistosomiasis cooperative network. As the Asian network of tropical diseases prevention and control, the RNAS+ continues to carry out tropical disease cooperation while the Sino-African schistosomiasis cooperative network working as a bridge to give the priority to promoting cooperation between China and Africa in schistosomiasis prevention and control and gradually extend to malaria and other diseases.

Chinese scientists play a leading role in RNAS+. NIPD is one of the two sponsors of the organization. Assuming an important position, Chinese experts work as an important force to maintain the normal operation of the network, responsible for RNAS+'s annual meeting and training arrangements, website construction, applications for projects, and so on. RNAS+ not only provides a good regional network platform for experts from Asian countries in parasitic diseases prevention and control, which becomes a platform for information exchanges in Asian regional schistosomiasis. More importantly, it offers technical references to policy makers of national relevant disease prevention and control in countries, strengthening the cooperation and ability of Asian countries with epidemic diseases and enhancing their prevention and treatment of parasitic diseases.

Establishment of a network of schistosomiasis elimination agencies in China and Africa and promoting cooperation in prevention and control of schistosomiasis

With the support of the World Health Organization (WHO), a network of schistosomiasis elimination agencies in China and Africa was established in Malawi in April 2015 to promote the global process of eradicating schistosomiasis. Together with the Tanzania National Institute of Medicine, School of Health Sciences at the University of Zimbabwe, Science School of Cameroon First University, the Mali National Institute of Public Health, the Jayira-Wade Meidani University, the Blue Nile National Institute of Infectious Diseases, NIPD jointly signed on the memorandum of Institute-based Cooperation Network between China and Africa on Schstosomiasis (INCAS) to focus on the challenges and problems like the lack of rapid diagnosis technology and ineffective molluscic medicine during the eradication of schistosomiasis in Africa so as to work together to do joint researches. This is the implementation of the *Beijing Declaration* proposed to establish schistosomiasis and malaria pilot in Africa, and also lays a good foundation for South-south cooperation with African countries in malaria and schistosomiasis, which is conducive to the training and expansion of China's health development aid team of experts.

In June 2016, drawing on China's medical aid mode to take the way of schistosomiasis institutions in one China's province working with one country in Africa, INCAS was extended to China's provincial schistosomiasis institutions and other national institutions. In October 2016, we met with seven provincial schistosomiasis experts at the 2nd meeting on INCAS held in Cameroon to exchange with relevant African institutions to further refine the areas of technical cooperation and the direction of the work face to face. The network is to give full play to the research expertise of NIPD and other professional institutions in other provinces and African countries, take two cooperation models of "one to many" for national institutions and "one to one" for the provincial institutions, employ resources of experts and technics of WHO, and explore new mechanism of South-south cooperation.

6.2.4 Providing health advice for international organizations to promote the participation of the Chinese government in global health work

With the support of the project, 18 experts have gone abroad to provide technical support and policy advice for international organizations, mainly in the following aspects (Table 1): first, NIPD has successfully changed the name of WHO Collaborating Center for Malaria, Schistosomiasis and Filariasis to WHO

Collaborating Center for Tropical Diseases, which extends the scope and function of the Center and will offer services to WHO; second, one expert participated in the institution-based cooperation similar on China-Africa schistosomiasis elimination held by WHO, in which INCAS was founded with the proposal of our experts so as to further implement the pilot project of tropical diseases proposed in *Beijing Declaration* focused on cooperation between China and Africa and promote the cooperation between the various professional agencies in different countries; third, three experts participated in the annual meeting of RNAS+ to continue to optimize the network of schistosomiasis and other zoonotic diseases and establish Asian-African tropical diseases network together with the African collaborative network of schistosomiasis; fourth, one expert participated in Joint Coordinating Council of WHO/TDR for three consecutive years and successfully applied for a four-year TDR member country for our country; fifth, two experts participated in the 19th annual meeting with executive Council members and partners on the Asian Collaborative Training Network Malaria (ACT Malaria), sharing information on malaria control and elimination processes with the participating countries and enhancing cooperation between member states and partners; seventh, one expert participated in the meeting of the Neglected Tropical Diseases programme managers in the WHO's Western Pacific Region and the sixteenth regional programme review group for Neglected Tropical Diseases in the Western Pacific Region, in which the progress of China's neglected tropical disease prevention and control was shared and the goal of control and elimination of neglected tropical diseases by the West Pacific Region in 2020 was set; eighth, one expert attended the inaugural meeting of the strategic advisory group on malaria eradication which was established by WHO to end the epidemic malaria in 2030, and the meeting explored the overall strategy for the eradication of malaria and the medium- and long-term action programs, focusing on the assessment indicators on elimination of malaria and other parasitic diseases in China; ninth, one expert joined the collaboration conference of WHO collaborating centre (first and second meeting) to share our progress in improving health outcomes and strategic partnerships as a national institution, contribute ideas and exert efforts for the effective employment of intelligence and regional resources of WHO Collaboration Center, further broaden our role in the WHO Collaborating Center for Tropical Diseases, and the strengthen our cooperation with WHO. These advisory services or technical activities provided NIPD with more opportunities for international cooperation and would provide a good platform for our experts to go out and participate in international health policy and technical advice.

Table 1 Sending experts to participate in international meetings and providing consulting services for international organizations

Year	The name of consulting services	No. of expects
2014	the 37th Joint Coordinating Council of WHO/TDR	1
	Evaluation of the Dipstick Dye ImmunoAssays (DDIA) for screening of Schistosoma hematobium infection in school-aged children	2
	The first collaboration conference of WHO collaborating centre	1
2015	The meeting on diagnostic tools for Schistosomiasis control	1
	the institution-based cooperation similar on China-Africa schistosomiasis elimination	1
	the 15th annual meeting on RNAS+ (Regional Network on Asian Schistosomiasis and Other Zoonotic Helminthiasis)	3
	the 38th Joint Coordinating Council of WHO/TDR	1

	the 19th annual meeting with executive Council members and partners on the Asian Collaborative Training Network Malaria (ACT Malaria)	2
2016	the 39th Session of the Special Programme for Research and Training in Tropical Diseases (TDR) Joint Coordinating Board (JCB)	1
	the meeting of the Neglected Tropical Diseases programme managers in the Western Pacific Region and the sixteenth regional programme review group for Neglected Tropical Diseases in the Western Pacific Region	1
	the inaugural meeting of the strategic advisory group on malaria eradication	1
	The 67th session of the WHO regional committee for the western pacific	2
	The second regional forum of WHO collaborating centres	1
Total		18

6.3 Forming expert team on health development aid at global level

Our three experts, Zhou Xiaonong, Tang Linhua and Xiao Ning of NIPD, together with two project partners from Fudan University, Qian Xu and Xu Biao, are appointed as committee members or chairman in 10 international health organization committees of experts including the WHO Relevant Expert Advisory Committee, TDR Joint Council, Asia-Pacific Network for the Elimination of Malaria, RAI-RSC Council, etc. (Table 2) By serving as a member, five experts actively participated in the planning of prevention and control, and making of strategies and measures of prevention and control in the areas of global malaria, neglected tropical diseases and key maternal and child diseases, actively disseminating and promoting China's experience in tropical disease prevention and control. They have offered advice and suggestions to the establishment of key points in relevant tropical diseases prevention and control, recommendation of prevention and treatment strategies and solutions to key maternal and child problems. They have played a positive role especially in the dissemination and promotion of tropical diseases prevention and control of China. For example, China's "1-3-7" malaria-eradication strategies have been promoted to Myanmar and other countries, and adopted by Myanmar malaria control plan.

Table 2 Status of the appointment of experts in international organizations

No.	Expert Name	Name of the Committee	Time
1	Zhou Xiaonong	Chairman of Review Group on WHO Western Pacific Region Neglected Tropical Disease Project	2014—
		Member of WHO-TDR Scientific and Technical Advisory Committee	2014—
		Member of WHO Expert Group on Neglected Tropical Diseases	2014—
		Member of the WHO Advisory Committee on Malaria Elimination	2015—
2	Tang Linhua	Member of WHO Expert Group on Neglected Tropical Diseases	2008—
		Board Member of the Asian Malaria Training Network	2008—
3	Xiao Ning	Member of TDR Joint Council	2012—
		Member of the Asia-Pacific Network on the Elimination of Malaria	2013—
		RAI-RSC Council Member	2014—
4	Qian Xu	"Science and Technology Advisory Committee" of WHO Department of Reproductive Health and Research	2012—
5	Xu Biao	Member of WHO Expert Group on Neglected Tropical Diseases	2010—

6.3.1 Short-term training courses

Designing a curriculum of global health and management courses of tropical diseases prevention and control

Employing the opportunities of international conferences and foreign experts coming to visit, experts of domestic and foreign tropical diseases carry out the survey of demand of a curriculum of global health and management courses of tropical diseases prevention and control. The training of them has been designed, based on the analysis of the demand.

At the same time, in order to train public health officials and experts from China and other developing countries, our government agencies, tropical disease professionals, as well as professionals from low- and middle-income countries have been trained for short term and medium term respectively. During the project period, a total of 9 training courses were held with a total of 438 trainees (Table 3), of which the first international Medical Malacology training course was held by NIPD and WHO from October 7 to 14, 2015. 53 participants from 15 Asian and African countries and 10 provinces and cities in China attended the training, which greatly improves the ability of students to monitor the medical mollusca, and enhances the communication between provinces of China and countries of Africa and Asia on elimination and control of schistosomiasis and related snail-borne diseases.

Table 3 Summary of training programs for global health and tropical diseases prevention and control

Training Type	**Time (Location)**	**Training Topics**	**No. of Participants**
Capacity Building for Programme members	2015 (Jiangsu)	Reports on projects progress for cooperation partners	24
	2015 (Jiangsu)	How to write a Policy Brief?	23
	2016 (Beijing)	The first academic conference of Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA)	126
Training Course on public officers and experts from the other low-income countries	2015 (Shanghai)	The first training course on Medical Malacology	53 (15 countries）
Training courses for government officials	2016 (Yunnan)	The advanced training class on public health aid	59
	2016 (Xinjiang)	Global Health training course on Vector-borne Tropical Diseases	93
Training courses for technical professionals	2014 (Shanghai）	The first course on Global Health and Tropical Diseases Aid	21
	2015 (Shanghai）	The second course on Global Health and Tropical Diseases Aid	19
	2016 (Shanghai）	The third course on Global Health and Tropical Diseases Aid	20
Total		Nine courses	438

Organizing team-building workshops

During the project period, a total of 3 team-capacity building workshops were held in order to strengthen the information exchanges and experience sharing among the team members.

On September 25, 2015, Progress Seminar of China-UK Global Health Support Programme was held in Wuxi in order to promote the progress of the project and exchange activity experience. 24 members from Jiangsu CDC, Health Poverty of Action (HPA), Shandong Institute of Parasitic Diseases, Sichuan CDC, NIPD and other cooperation units attended the meeting. Project managers reported their respective planned activities, budgets and project completion. During the meeting, the participants discussed the difficulties in the recent plans and activities, further clarified the contents and outputs of the cooperative units, and deployed the next phase of key work.

In order to improve the quality of the outputs, NIPD held a briefing seminar in Wuxi on December 25 - 26, 2015 in which 23 members from Jiangsu CDC, HPA, Shandong Institute of Parasitic Diseases, Sichuan CDC and NIPD participated. The seminar invited the well-known professor of Chinese Academy of Social Sciences to make a special report on how to write policy brief, and make comments on the policy briefs written by the members respectively, which greatly promoted the members' understanding of the policy briefs, and laid a good foundation for issuing high-quality brief.

In order to further promote the understanding of the frontier and strategy of global health development by member units, relevant partners were invited to participate in the first academic meeting of Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA) from December 3 to 16, 2016 with 126 people participating in it. At the meeting, famous experts from the Ministry of Commerce, CPMA, China Foreign Affairs University, CICCST and Peking University made speech on global health development strategy and challenges, and shared with participants the experience, opportunities and challenges of China as a member of Global Health, actively offering advice and suggestions and discussing the future development of China’s Society of Global Health.

6.3.2 Sending young students to study in international organizations or foreign universities and research institutions

Under the auspices of this project, 10 scientific personnel were sent to international units for training and internship (Table 4). These experts of different ages and experiences went to the London School of Hygiene & Tropical Medicine, Swiss Tropical and Public Health Institute, IHI, World Health Organization headquarters and World Health Organization West Pacific Office and other units to receive training or technical advisory services. These training and internships in different international institutions have not only broadened our international horizons, strengthened our links with internationally renowned institutions, and greatly improved the awareness of our experts on global health and development aid for sanitation.

Table 4 Young professionals dispatched to international organizations or foreign universities and research institutions

Year	Training or intership of international units	Number of professionals
2015	World Health Organization Headquarters, Belgium Institute of Tropical Medicine in Antwerp	2
	London School of Hygiene & Tropical Medicine	1
	Swiss Tropical and Public Health Institute	2
	World Health Organization West Pacific Office	1
	Ifakara Health Institute (IHI), London School of Hygiene & Tropical Medicine	1
2016	Ifakara Health Institute	3
Total		10

6.3.3 Establishment of Chinese Society of Global Health（CSGH）, Chinese Preventive Medicine Association（CPMA）

Proposed and supported by the project, NIPD together with renowned experts in Global Health initiated the formation of Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA) in February 2015. In June 2016, Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA) was established through the deliberation at the fifth session of the Standing Committee of the Chinese Preventive Medicine Association at its fourth meeting and reconsideration at the fifth meeting. In July and November 2016, experts from the Chinese Preventive Medicine Association and National Health and Family Planning Commission held a second preparatory meeting for the establishment of Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA). Its main roles and tasks were identified at the meeting, and the first members of it were also nominated. Its main duty is to lead and guide the global health staff of national health agencies to promote and conduct academic exchanges in global health, and organize the discussion on global health research and activities of scientific research; it is responsible for reviewing, coordinating and developing long-term planning or annual plan of academic activities; inspecting and supervising the implementation of academic activities, and conducting quality assessment; finding and training excellent global health personnel.

On December 3, 2016, the Inauguration Meeting of Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA) was formally held in Beijing. The meeting was chaired by Prof. Yang Weizhong, Vice President and Secretary General of the Chinese Preventive Medicine Association. Zhou Xiaonong, researcher and the initiator of the society made the report on the application of its foundation, while Yang Weizhong made the report on the foundation details of the society. The meeting elected the first members, vice chairman, standing committee and committee members. The first committee members consists of 69 experts and scholars from universities, research institutes, related businesses and NGOs in areas such as health, diplomacy and international relations. Prof. Chen Jie, Prof. Liu Peilong and Prof. Yang Weizhong were appointed as advisers to the committee,

Researcher Han Tieru as Chairman, and Researcher Zhou Xiaonong, Prof. Guo Yan, Prof. Qian Xu and Prof. Wang Youfa as Vice Chairman.

The establishment of Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA) marks the growth of China's global health work to a new stage. Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA) will conscientiously implement the relevant provisions of the State on foreign affairs, carry out international exchanges and cooperation; develop and expand exchanges and cooperation with the international health organizations; further strengthen and expand bilateral or multilateral exchanges and cooperations for more international health resources; committed to the solidarity and mobilization of our vast global health workers, promotion of people's health and scientific research and application practices in global health, as well as the exchanges in global health research results and experience through health promotion and elimination of avoidable diseases, disability and death.

6.4 The formation of a training model for public health aid became the core task of the project

Training of Public health aid is the key work for the construction of a center of health development aid. It organizes public health aid training and continuing education in accordance with the project plan and requirements from time to time to consolidate and strengthen existing and future public health expertise and skills from government, institutions, universities and hospitals staff to achieve "improvement of the capacity of national public health aid by strengthening the current and future public-health technology, research, management, and leadership for professional."

6.4.1 Establishment of information systems about consultants and trainers in public health aid

In order to better organize the training course of the project, information screening and collection work has been done about more than 100 domestic and foreign training teachers and consultants who engage in public health, global health, policy research, international diplomacy, development assistance and so on with experience in international organizations on the basis of the training needs of the survey participants through industry recommendation and popularity. Relevant teachers are invited to teach training courses for government officials and professional and technical personnel organized by NIPD, while consulting experts are hired to participate in project consulting work.

In order to facilitate the dissemination and promotion of teacher information, we have set up a information system about consultants and trainers in public health aid (web version) to manage and display the basic information, work areas and research experiences of consulting experts and training teachers. Information system contains the expert name, title, education, professional fields, units, titles, countries, photos, related personal resume and other information. Teacher information can be displayed in accordance with the professional field and the geographical distribution. Ordinary users can log on the website http://139.196.188.125:8021 to browse the expert information.

6.4.2 Conducting training course on public health aid

One is to train and enhance the public health aid capacity of government officials

and managers

NIPD held two training courses on parasitic disease prevention and control for the administrative staff of provincial health system in order to improve the awareness of relevant leaders from our provincial health units and CDC departments to attract them to actively participate in global health, strengthen the capacity building of public health aid in China's provincial professional institutes working on parasitic disease prevention and treatment, and help promote them to participate in global health cooperation with schistosomiasis and malaria.

NIPD held an advanced training class on public health aid in Pu'er City, Yunnan Province on January 17-19, 2016. 59 leaders with specific duties and relevant personnel from Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Hunan, Yunnan, Sichuan, and Hubei provincial CDC departments of health units participated in the training where participants focused on China's role and mission in global health and a number of experts from different perspectives elaborated and analyzed the global health cases. During the meeting, participants also discussed how the provincial units participated in the new situation and better promoted the global health work in parasitic diseases. During the meeting, the participants also discussed how the provincial units involved in the new situation and better promoted the global health work in parasitic diseases. This training enabled participants to know China's role and mission in global health and laid the foundations for global health cooperation in parasitic diseases.

NIPD held global health training courses on vector-borne tropical diseases for management personnel in Urumqi, Xinjiang on November 21-25, 2016. More than 93 people from over 20 provincial health and family planning commission, CDC, institutions of parasitic diseases prevention and control and other institutions responsible for the prevention and control of parasitic diseases participated in the training. The trainers were well-known experts and professors from WHO, London School of Hygiene & Tropical Medicine, Médecins Sans Frontières (MSF), Peking University, Chinese Academy of Social Sciences, China Center for Disease Control and Prevention and so on. The course was organized by a combination of thematic reports and group discussions. The thematic reports focused on foreign countries' global health cooperation, prevention and control and their disposal of vector-borne diseases, diagnosis and treatment strategies of them, and the sharing of major cases of international epidemic diseases prevention and control. Group discussion was attached to linking the theory with practice. Four groups discussed topics in disease monitoring, diagnosis and treatment, vector control and cooperation along the "Belt & Road". Through this training, we not only exchanged with the international experts in China's prevention and control technology and experience in vector-borne diseases and the international latest research and progress on the diagnosis and treatment of vector-borne diseases, but also improved the awareness of health management staff of global health theory level and health aid, which improved the enthusiasm of agencies to participate actively in the global health work of tropical diseases.

Second, training and improving the capacity and level of professional and technical personnel in public health aid

In the training of professional and technical personnel, supported by this project, combined with the characteristics, NIPD held the training course on Global Health and Tropical Diseases Aid annual. A total of 3 sessions of this training were held for

professional and technical personnel, and every session was lasting nearly 2 months. Each training can be split into two stages, the first stage is mainly to teach professional theory and enhance oral English ability; the second atage is toward to the theory with practice, according to their aptitude, fully considering the background of students, and setting up practical courses. The aim is to train the reserve personnel of public health aid and tropical diseases in China, through introducing the technology and management experience on malaria and schistosomiasis prevention and control, so as to further spreading those technologies and experience to African and Asian countries in a planned way, and to lay a foundation of trainning tropical diseases experts team with the global vision in China, which could accelerate China's participating in global health control and providing technical supports.

The first training course on Global Health and Tropical Diseases Aid for young professionals was held by NIPD from June 4th to 27th, 2014 in Shanghai (the first stage). A total of 21 trainees from provincial CDCs in Sichuan, Guangdong, Hainan, Yunnan, Hubei, Shanghai, Shandong, Jiangsu and Hunan were enrolled. The course aims at training the public health care reserve personnel in China cultivating a Chinese expert team with the global vision of tropical diseases and further promoting China's participation in the global health issues. Contents of the training included basic theories in global health and health development such as conception of global health, health development aid, skills and tools for investigation, manuscripts drafting and oral English practice led by native speakers as well. The lecturers for the training are from domestic and international well-known universities and research institutions, together with China CDCs. The second stage of training course was held from Sep 1-26, 2014 in NIPD. More than 30 trainees from Shanghai, Shandong, Sichuan, Yunnan, Jiangxi, Hunan, Hainan and NIPD staff were benefited. The lecturers consist of NHFPC officials, China Medical Team members, University professors and Chinese pharmaceutical entrepreneurs working in Africa. A summary report and a set of training materials will be compiled after the training.

The second course on Global Health Development and Tropical Diseases for technical c was held by NIPD from 22th September to 22th October, 2015 in Shanghai, and 19 trainees from provincial CDCs in Sichuan, Guangxi, Guangdong, Hubei and provincial parasitic institutes in Jiangsu, Anhui, Shandong, Yunnan were attended this training. During the training, the Chinese technical and managerial experience on malaria and schistosomiasis control was introduced. The whole training was mainly composed by theoretical course of global health, epidemiology, statistics and health economics, as well as participating twice international meetings and strengthening the capacity of oral English, and also including the experiences sharing in international cooperations of experts and projects. The invited professors were from famous universities and institutes, such as Fudan University, Peking University, Duke Kunshan University, WHO NTDs and NIPD. The second stage of this training was held from 24th of November to the 11th of December 2015 in Shanghai. NIPD held the training course for the project management. Several experts from Swiss Tropical and Public Health Institute were invited to give lessons. Logical framework was introduced in a systematic way through theoretical learning and case study, which laid foundation for international project management in the future.

The third course on Global Health and Tropical Diseases Aid for technical professionals was also held in Shanghai. The course lasted about 6 weeks, which was

divided into two stages, the first one from May 8 to May 28, and the second stage from July 11 to July 25. Eighteen trainees from provincial CDC, institutes of parasitic diseases, NIPD and 2 from Afrian countries (Ethiopia, Nigeria) participated in the training course. The training course was mainly composed by theoretical course of Global Health, practical course in statistics and epidemiology, professional course in tropical diseases control, as well as the oral English. Through the oral and writing English training by foreign teachers, the trainees' English skills have been obviously improved. Furthermore, they also joined several lectures related to Global Health and the 3rd Symposium on Surveillance Response System Leading to Tropical Diseases Elimination.

After this training course, the trainers think that their professional knowledges and English skills were greatly improved, and most importantly, they understand the implication of global health, which will provied a good base for them to devote to the field of global health in future.

Third, strengthen the quality and effect of trainings.

From the results of the training effect assessment, the participants' awareness of global health has significant improved after those trainings. The main purpose of the trainees attending this training is to improve their ability. The highlight of the training course is the novel of training content. In all of the curriculums, trainees prefer the global health lecture, project management, the technology and experience on diseases prevention and control, sharing working experience in international organizations, participating international conference, participating investigation and oral English course, those gaving trainees a lot of help and inspiration. The training model combining with lectures and group discussions was also approved by all trainees. Through training, trainees' view of global health, technology of diseases prevention and control, and English communication ability are increased greatly, especially by attending international meetings, learning about the situation of diseases prevention and control in other Asian and African countries, greatly deepened the understanding of China-Africa and China-Asia cooperation and exchanges, even enhanced the exchange and cooperation relationship at the provincial level and international level. One paper of training effect evaluation is competed.

Through a series of public health aid trainings, five sets of training materials have been basically sorting and formed. Those are 2 sets of training materials for government officials, namely the global health care work of health project management materials and advanced training materials); 3 sets of training materials for professional and technical personnel, namely the training materials for the three global health training on tropical diseases aid for reserve personnels. The teaching materials mainly include basic knowledge theory and typical case analysis, etc., and the content of the textbook is focused and adjusted by different training groups. These materials, which are set up and organized in this project, will be the basis for the continuing training of health development aid.

Fourth, disseminating global health knowledge and reserving foreign aid professionals.

With the support of this project, various training courses have been held for three consecutive years, which gradually attracted a large number of management personnel and professionals of tropical diseases. Such as: only paticipants from 10 provincial

units take part in the first training for government officials and management personnel, while students expanded to 28 provincial-level units in the second training, greatly expanded the scope of the spread of the global health knowledge, which laid a good foundation to get the provincial units' support on global health work in the future.

Trainees in the training for technical personnel mainly comes from the provinces epidemic malaria and schistosomiasis in China, trainees in the first and the second training were mainly designated and recruited form the cooperation and epidemic provinces. However, recruiting trainees in the third training are facing the whole country, and recruited 2 African students. Through nearly 2 months of training, trainees have a better understanding on the knowledge of global health and skills of tropical diseases prevention and control, which not only broaden their vision, improving their professional quality, but also developing talents combining global vision and tropical diseases aid and reserving talents for foreign aid to our country. For example, among the GHSP Output 4 project that NIPD has undertaken, 8 of 14 technical staff involved in the field work in Tanzania are the trainees attending this project's training courses.

6.5 Project Evaluating

In the self-evaluation, the execution time of this project is from March 4, 2014 to December 31, 2016. In order to timely summary and improve the quality of project's output, NIPD carried out the self-evaluation, and wrote the evaluation report, summarized all activities and related progress, and cleaned up all outputs one by one with the project implementation plan, which provides a conditions for a better assessment of this project.

For the external assessment, the external assessment meeting was held on 18th-19th December 2016 in Shanghai, the experts of the assessment team are from Peking University, Dalian Medical College, China CDC, Wuhan University, Zhejiang Academy of Medical Science, Anhui Institute of Schistosomiasis Control. The external assessment team assessed the whole project by listening to reports, reviewing output files, participant interviews. At last, the external assessment team of the Output 2 believed that, NIPD finished the working contents according to the project design, has reached the overall objective of the project, cultivated and stocked a group of professional talents majoring in global health combined with the tropical diseases prevention and control, summed up and extracted the significant experiences and lessons with the infectious diseases. NIPD established the Global Health Center under the supportive of the project, and undertook the secretariat work of WHO Collaborating Centre for Tropical Diseases and Chinese Society of Global Health (CSGH), Chinese Preventive Medicine Association (CPMA), building the solid base for becoming one of the Centres of Excellence in Health Development Aid in China. Experts also hoped that the successful exploring experiences could combine with the Chinese Global Developing Strategy, providing better platform for China leading Global Health.

7. Project Effectiveness and Impacts

7.1 Enhancing Chinese government and personnel's understanding of the best practices in policy and health development assistance

Enhancing Chinese government and personnel's understanding of the best practices in policy and health development assistance enables them to play a role

in the implementation of decision making and policy of health-development assistance. The capacity for research and analysis of international development assistance has been significantly improved, which is also true of the quality of policy recommendations. Through the analysis, summarization and evaluation of international aid cases and South-South cooperation, China's experts have improved their research and analysis capabilities in the field of international development assistance, providing a lot of experience and ideas for China's implementation of foreign aid projects.

1) Our partner HPA has made full use of the role and capacity of NGOs in malaria control as well as their flexibility of working methods, maintaining close contacts with the health administrative departments of Yunnan and Myanmar and establishing the mechanism of joint defense & control malaria at the border area. Through the active technical support for malaria control in Myanmar, anti-malarial strategies have been moved forward and efforts have been made to cut off the imported channels of malaria cases, promoting the process of malaria elimination in China.

2) Health and Family Planning Commissions of Jiangsu, Jiangxi and other provinces have signed a memorandum of understanding of schistosomiasis cooperation with the counterparts of African countries. Reciprocal visits have deepened the understanding and the cooperation areas and direction have been made clear. The implementation plan of cooperation project has been developed and refined. In addition, 15 Central African and Central Asian agencies have signed an agreement to launch cooperation projects with the African countries on tropical diseases prevention and control, which provides a platform for China to achieve Belt & Road.

7.2 Improving the capacity of Chinese professional and technical personnel to participate in the activities of health-policy development and health-development assistance

The capacity of Chinese professional and technical personnel to participate in health-policy development and health-development assistance activities has been improved to cultivate a group of inter-disciplinary talents who have knowledge of both global health and tropical diseases prevention and control, which has strengthened bilateral and multilateral cooperation between China and other low-income countries in global health. Our ability to participate in global health governance has been further expanded so that Chinese experts have a voice in the international arena and the capacity to offer Chinese government advisory services and technical support has also been significantly enhanced.

1) Leading Role

Chinese experts, making full use of the WHO Collaborative Center for Tropical Diseases, have played a leading role in the global health management. China has carried out bilateral and multilateral cooperation, for example, we have played the role of experts in China-UK- Tanzania malaria pilot project under China-UK Global Support Program. Combining with the actual situation in Tanzania, we have developed a practical pilot project implementation plan, which is a key step for Chinese malaria control experience to be promoted in African countries. In addition, as the cooperation center on tropical diseases, we have established an effective communication mechanism with the support of WHO. Sino-Burmese Malaria Prevention Symposium has been held annually, which has been held twice. China's "1-3-7" malaria control strategy has been adopted by the Ministry of Health in Myanmar through exchanges and seminars, which has played a positive role in

achieving information and experience sharing so as to promote this region's malaria elimination process. Another example is that the prevention and treatment of schistosomiasis research cooperation with multi-national participation has been carried out through the establishment of the cooperation network of schistosomiasis elimination between Africa and China. Both will play their respective advantages through collaborative research to solve key technical problems and promote schistosomiasis elimination process.

2) Planning Role

To further explore the Sino-African cooperation in tropical diseases, implement the pilot work about tropical diseases mentioned in the "Beijing Declaration" of Sino-African health cooperation, accelerate the application of China's experience in the elimination of schistosomiasis, malaria and other tropical diseases, and promote the process of global program to eliminate tropical diseases, our project units and partners propose to establish a center on tropical disease cooperation in Ethiopia which has been adopted. In addition, projects of schistosomiasis elimination in Central Africa and Central Asia have also been planned to play the role of Chinese experts in the global governance of tropical diseases.

7.3 Improving the capacity of Chinese government staff and professionals in technical support, planning development, policy advisory and assessment

The capacity of Chinese government staff and professionals in technical support, planning development, policy advisory and assessment has been improved through the establishment and implementation of project training model, which has transformed China's experience and applied it to other developing countries' national plans so as to enhance the education and research capacity of China's health development assistance, better play the role of government as a think tank and achieve China's leading role in global health. A distinctive global health and tropical disease training model has been formed and a large number of China's tropical disease aid professionals has been reserved.

Through the participation of foreign institutions training and organization of domestic training courses, a large number of health staff and professionals and technical personnel has been trained, therefore, the global health and tropical disease training model with characteristics has been initially formed, which has provided a strong talent pool for our foreign aid projects to go out.

1) Chinese Society of Global Health of Chinese Preventive Medicine Association has been established to promote the construction of the global health discipline in the country, which has set up a good platform for the personnel training, information exchanges and advisory services. Cooperation with more institutions, research institutes and enterprises through the project enables Anhui, Jiangsu and other provincial units to actively participate in health assistance, especially Africa aid and global health personnel training.

2) At the international level, the proposal of transforming China's experience in the prevention and control of tropical diseases to apply to other developing countries has been put forward on the international stage and approved by WHO.

8. The overall evaluation on the project implementation

Over the past two years, the implementation of this project has been successful, fully

completing the work of the project design and achieving the overall goal.

8.1 A solid foundation for the formation of "Excellent China's Health Development Assistance Center"

Based on NIPD, Global Health Center has been set up with clear responsibilities and new staff recruited. It also undertakes the daily work of the Secretariat of WHO Collaborating Center for Tropical Diseases and Chinese Society of Global Health of Chinese Preventive Medicine Association, which has laid a solid foundation for being one of the Excellent China's Health Development Assistance Centers.

8.2 A large number of inter-disciplinary talents in both global health and prevention and control of tropical diseases have been trained and reserved.

286 professionals and technical staff and 152 government staff have been trained in theory and practice through domestic, international, networking, visits, exchanges and training, in which their capacity of research and application of global health governance, global health development, international health project management and the ability of spreading professional knowledge and skills have been widely improved. The global health and tropical diseases training model with characteristics has been initially formed, and a large number of inter-disciplinary talents in both global health and prevention and control of tropical diseases have been trained and reserved, which has comprehensively enhanced the awareness and capacity of Chinese government staff and professionals to participate in global health development assistance.

8.3 Summarizing and refining the experience and lessons in best practices of global health

The project has supported the evaluation on best practices in international assistance to serious infectious diseases and South-South Cooperation in Health participated by China (including the Global Fund Chinese Malaria Control Program, China-Myanmar HIV, AIDS and Malaria Partnership Project, Evaluation on Chinese medical team in Zanzibar and Malta, and Evaluation on RNAS+), summed up and refined the experience and lessons learned from them as well as formed nearly 20 policy briefs or assessment reports, which has provided policy advice, think tanks and technical support for the bilateral and multilateral cooperation in public health sector.

In short, the implementation of the project has comprehensively increased the management capacity of government staff and professionals to participate in global health management and health development assistance, laying a solid foundation in the new situation to improve the development of China's global health policy and technical assistance.

In the process of the project implementation, we also find that government officials and professionals have much to improve in the concept of global health governance, humanities and science participation as well as international vision in the hope that "excellent Chinese health development assistance center" formed in the project can continue to play a sustainable regional role in global health, promote and implement China's contributions to global health management pattern and system.

Attachment Financial Report (Omitted)

OP203 China National Health Development Research Center

Output 203 Centre of Excellence in Health Development Aid in China: Sub-project by China National Health Development Research Center Final Report

1. Abstract

During the past three years, the project has focused on the core goal of "Enhancing the Understanding of Global Health Development Cooperation Practice between Chinese Government and Academia". The Center is jointly with the expert team from African Centre for Global Health and Social Transformation (ACHEST), the International Development Research Center (IDRC) of China Agricultural University and other internationally renowned academic institutions to carry out the South-South health cooperation best practice research and China's Health Aid to Foreign Countries (CHAFC) policy summary and evaluation research. Through a large number of literature search, stakeholder interviews, field visits and research in more than ten domestic provinces and cities and in four African countries and expert consultation, they have made systematically research on the history of development, the overall effectiveness, the existing problems, experience and lessons of China's Health Aid to Foreign Countries, and have ultimately completed China's Foreign Health Aid Policy summary and evaluation report, five Chinese journal articles and 4 manuscript chapters. At the same time, multi-channel propagation and communication were made about China's Foreign Health Aid Policy theory and practice, experience and lessons. Three short-term training courses for health development aid managers and consultants and eight thematic academic seminars and five policy consultative meetings were held. In addition, eight news media reports were published.

In the aspect of policy consultation, the China National Health Development Research Center (CNHDRC) has focused on the work of foreign cooperation of the National Health and Family Planning Commission (NHFPC), the Ministry of Commerce and other government departments, and has repeatedly provided decision-making basis, technical proposals and policy recommendations on important issues such as health development aid and bilateral multilateral health cooperation, which provide strong support for the Chinese government's participation and promotion in global health cooperation foreign health aid. In addition, with the support of the project, the center selected three members of the research group to the National Health and Family Planning Commission (NHFPC) International Cooperation Division secondment, organized 35 people to participate in various international health development cooperation meeting, and had 12 people participate in short-term training on global health diplomacy and health development aid. The overall capacity of the team in our center has been significantly improved. We have gradually grown to "China's core supporting institutions for China's Health Aid to Foreign Countries (CHAFC)," and play a central role in China's Health Aid to Foreign Countries (CHAFC) theory and research, policy advice and capacity-building activities.

2. Accomplishments

2.1 Activities about enhancement of research and analysis ability

2.1.1Research on the best practices and inspirations of South-South Health Cooperation

The African Centre for Global Health and Social Transformation (ACHEST) was commissioned to carry out “Research on the best practices and inspirations of South-South Health Cooperation”. Through literature research and stakeholder interviews and related data collation analysis, they screened health development Cooperative projects carried out in Cuba, China and South Africa as the best practice of South-South health cooperation, completed the study design, literature search, stakeholder interview tool, mid - term progress report and " the best practices and inspirations of South-South Health Cooperation " research report stage draft.

The report provides a more detailed overview of South-South cooperation and its historical evolution and best practice screening criteria. At the same time, the report do a simple analysis on the China-based medical team aid, anti-malarial project and health cooperation under China-Africa Cooperation Forum, as well as health cooperation other BRIC countries and Cuba do to Africa, and put forward a number of suggestions. As a result of African research progress and feedback lag, only 60% of the amount of the financing of the contract was appropriated.

2.1.2Evaluation and summary research on China’s health aid policy and International External Health aid Strategy research

2.1.2.1 Evaluation and summary research on China’s health aid policy and Strategic research on National Health Aid to Foreign Countries

As the core research of the project, during the past three years, through systematic review of the historical development stage, guiding ideology, aid mode, scale, field, organization and management of China’s Health Aid to Foreign Countries (CHAFC), in-depth interviews of the state and local Health and Family Planning Commission, hospitals for foreign health aid, medical team captain, a questionnaire survey of some foreign aid medical team members, on-site investigation in Jiangsu, Jiangsu, Henan, Guangxi, Ningxia, Henan and other domestic more than ten provinces and cities and the four field investigations in African countries of Ethiopia, the Comoros, Ghana, Guinea and two expert demonstration, our center ultimately completed the overall evaluation and summary research report of China’s Health Aid to Foreign Countries, complete sets of Hospitals Construction Projects, China medical team, health human resources development cooperation report.

2.1.2.2 Research on the Impacts of Chinese Medical Teams from the Perspectives of Anthropology and Development: Tanzania case studies and related activities

China Agricultural University IDRC team was commissioned to make in-depth analysis of the living environment, working mechanism and interaction with local communities of the medical teams providing health aid to Tanzania, Zanzibar, and to make proposals to improve the effectiveness of China’s Health Aid to Foreign Countries through the literature search, combined with interviews of Jiangsu provincial Health and Family Planning Commission, Suzhou City Health Bureau, Jiangsu Provincial Institute of schistosomiasis prevention and control, hospitals undertaking foreign aid mission, the captains of medical teams who recently came back, and field work up to a month of medical teams in Tanzania and Zanzibar. Finally the team completed a case study of the Chinese aid Tanzania medical team and published an article.

2.2 Knowledge dissemination and training capacity promotion activities

2.2.1 Development of short-term training materials on health development aid

On the basis of the research on the health aid to foreign countries undertaken by our center, the research group participated in the writing of teaching materials organized by the School of Public Health of Peking University Health Science Center and completed the writing of the second chapter of China's Health Aid to Foreign Countries which was submitted to the School of Public Health of PKUHSC (Peking University Health Science Center) to be composited and audited.

2.2.2 Short-term training courses

2.2.2.1 Health development aid management training course

Our Center has successfully held two training courses on health development aid management in Beijing in November 2015 and November 2016, respectively. A total of 86 first-line managers who are in charge of the health development aid from the Foreign exchange and cooperation departments of Health and Family Planning Commission and the health and CDC(Centers for Disease Control and Prevention) of the provinces (autonomous regions and municipalities) all over the country participated in this training.

The teaching faculty consisted of managers from NHFPC, Ministry of Foreign Affairs, Ministry of Commerce (MOFCOM) and other government departments, and senior professors of Peking University, China Agricultural University and Guangzhou University of traditional Chinese medicine, as well as a few of experts from China foundation for poverty alleviation, WHO, China - Africa Development Fund, China Health Products Import and Export Chamber of Commerce and other institutes and our center. The courses contain the theory and practice of health diplomacy, the theory and practice of international development assistance, the theory and practice of health development aid, typical cases of China's foreign aid for health, health cooperation in the view of Global Health Management and Regional Health Cooperation. The training courses improved the learners' strategic thinking ability and policy development and execution ability, achieving good results.

2.2.2.2 Health development aid consultants training course

The Center successfully organized a training course for health development aid consultants from 5 to 9 December 2016, introducing the "British Health Development Assistance Flagship Training Course" course, inviting the former Director of DFID, Chairman of the OECD Development Assistance Committee Professor Richard Manning, Professor Martin Greeley from the British Institute for Development Studies, African Division of the Ministry of Foreign Affairs, World Bank, WHO Representative Office in China, UK Office of the International Development Agency, Chinese Academy of Social Sciences, International Trade and Economic Cooperation Institute of the Ministry of Commerce, Guangzhou Medical universities and other domestic and foreign senior professors and experts in the field of health development assistance consultation together as teachers.

Thirty participants from the Institute of West Asian and African Studies of the Academy of Social Sciences, the International Trade and Economic Cooperation Institute of the Ministry of Commerce, the National and Local Disease Control System, the research institutes, international organizations and non-governmental organizations participated in the five-day training.

The course focused on the three major themes of "Global Health Diplomacy, International Health Development Assistance Theory and Practice, Consultative Expert Capacity Building". In addition to centralized teaching, the course will have daily discussions and case links.
The courses used the actual case of consulting work of experts working in World Bank and British Agency for International Development and sub-group exercise and report which would be commented by lecturers. This can train the students' understanding ability, project design ability, evaluation ability, communication and contract negotiation capability. The training program received a high degree of recognition and positive evaluation from the learners.

2.2.3 Multi-channel communication of health development aid policy development and management experience

2.2.3.1 Academic Publication

In the past three years, the research group has published five articles on health aid policy development and management experience in domestic academic journals, magazines and newspapers, focusing on theoretical research on health aid, practical effects and case analysis of China's foreign health aid. At the same time, they participated in the "Sino-Africa health cooperation - international development aid theory of exploration and innovation", 2017 "China International Security Blue Book" and the writing of other related manuscript chapters. In addition, the research team communicated project experience and results through various channels. They have published 8 media reports via press, and the website, expanding the project influence.

2.2.3.2 Holding health development and aid academic seminars

In the past three years, the Task Force has held a total of eight seminars on various topics of health development aid, inviting Dr. Liao Manchang who is the president of MSF, Mr. Doi Jenkins, Assistant Director of the Japan International Cooperation Agency(JICA),Dr. Victoria Fan from US Global Development Center, Professor Michael Tierney of College of William & Mary and other internationally renowned experts and scholars in the field of health development aid to share their insights and experience in the field of health development aid.
The Audience are mostly the National Health and Family Planning Commission International Cooperation Department, the National Health and Family Planning Commission International Exchange and Cooperation Center, the National Health and Family Planning Commission project financial supervision and management center, the Chinese Center for Disease Control and Prevention, the Chinese Academy of Medical Sciences, Peking University, Fudan University and other domestic health Management and research department managers, experts and scholars, project personnel.

2.3 Policy consulting and impact capacity promotion related activities

2.3.1 Provide policy advice

During the past 3 years, our center, as the National health policy research consulting think tank, has provided more than 12 counseling services in areas involving health aid management and innovation, bilateral and multilateral health cooperation, health cooperation under the "One Belt and one Road " initiative, and "Healthy China 2030" and completed various proposals for various policy recommendations, 8 policy briefing (draft), and has significantly improved policy advisory service capacity. In addition, in June 2015, our Center was appointed by the World Health Organization as the "World Health Organization Health Enhancement Cooperation

Center" to provide health support for health accounting, national health policy advice and capacity-building for the World Health Organization, and to promote China's the best practices and experience of health system strengthening and universal health coverage to the West Pacific and other regions.

2.3.2 Holding policy advisory seminars

Over the past three years, at the request of the National Health and Family Planning Commission (NHFPC) and other competent departments in policy consultation, we have held five policy consultation seminars on the topics of innovation and health aid, the implementation of the South-South health cooperation and the "One Belt and one Road" Healthcare Cooperation, and organized experts to provide advice on relevant government departments in relevant fields.

2.4 Team capacity building related activities

2.4.1 International inspection and guidance of technical experts

Rely on the health system strengthening cooperation center of WHO, NHDRC plan to provide technician aid in health cost accounting and universal health coverage areas to Ministry of Health of Lesotho through an initial communication. NHDRC plan to invite the staffs from Ministry of Health of Lesotho to China and present China's experiences in health cost accounting and health system reform and discuss specific cooperation between the two sides from 21th to 27th in March, 2016. But because of unilateral reasons of Lesotho, this visiting was cancelled. However，the two sides still maintain communication and will cooperate when there are proper opportunity.

2.4.2 Organization to participate in international meetings or training

As an important way to exchange experience in health development assistance internationally, disseminate research results and promote capacity building of project personnel, the project has organized 35 people to participate in all kinds of international health cooperation conferences and selected 12 participants to participate in trainings of global health diplomacy and health development aid over the past three years.

2.4.3 Work Secondment

According to the actual work needs, we have selected three members of the project team to the National Health and Family Planning Commission International Organization Department, the Asia-Pacific Department, Africa work seconded for 6 months to 20 months to promote the project team members to grow and be familiar with health aid, foreign health cooperation policy development and management. In addition, the center has received global health graduate students from the College of William & Mary, Peking University, Wuhan University, Guangxi Medical University and other domestic and foreign scientific research institutions to visit and study, which strengthened the communication and cooperation with the medical schools in the implementation of the project and trained talents in the field of health development aid.

3. Financial performance (Omitted)

4. Achievements

4.1 The enhancement of Research ability

Over the past three years, with the support of the project, the research group has carried out the research on the best practices of South-South Health Cooperation and China's Foreign Health Aid Policy Summary and Evaluation. Through a large number of literature search, stakeholder interviews, field visits and research in more than ten domestic provinces and cities and in four African countries and expert consultation, they have made systematically research on the history of development, the overall effectiveness, the existing problems, experience and lessons of China's Health Aid to Foreign Countries, and have ultimately completed China's Foreign Health Aid Policy summary and evaluation report, five Chinese journal articles and 4 manuscript chapters. The research team has made incessantly improvement on research ability, cross-domain comprehensive analysis ability in fields of health development aid, and has a more in-depth understanding of China's Foreign Health Aid theory and practice.

4.2 The continuous widening of research area and scope

Around the health development aid and global health development cooperation, three years the continuous widening of the project team's research field and scope, from the international health development aid theory and the status quo, to China's foreign health aid policy evolution, and then refined to special studies on the sub-field of foreign health aid including building medical institutions, health human resources development and cooperation, foreign aid medical team, we have carried out systematic and in-depth analysis of the overall situation of China's external health assistance, and on the basis of this, put forward the policy advice on the strategic objectives of China's foreign health aid, innovative health assistance methods, improving synergies in health aid management. At the same time, on the basis of the study of foreign health aid, we kept up with the hot issues in the global health field, the " One Belt and one Road " health cooperation, the 2030 sustainable development agenda health-related goals, the BRICS countries health cooperation, China and ASEAN countries Health Cooperation and other aspects. We carried out relevant research activities and made all-round, multi-angle analysis and research about China's participation in global health cooperation practice, which enhanced our understanding of China's participation in global health development cooperation.

4.3 Significant improvement in policy consulting service ability

As a research and consulting organization directly under the National Health and Family Planning Commission, our center, relying on the relative advantage of policy follow-up and policy analysis, has provided advisory services for the International Cooperation Division and Planning Division of the National Health and Family Planning Commission, Ministry of Foreign Affairs, Ministry of Commerce, Peking University and other government departments and academic institutions in the areas of bilateral and multilateral health cooperation, foreign health aid management and innovation, "One Belt and one Road" Healthcare Cooperation, global health strategy, healthy China 2030 and other important areas and our policy advisory service capacity has significantly improved.

During the implementation of the project, our center has participated in the drafting, design and development of the "Global Health Strategy", "health Asia Pacific 2020" roadmap, the implementation plan of "One Belt and one Road" Healthcare Cooperation of the National Health and Family Planning Commission(2015-2017), "Design of projects of aiding to construct 100 hospitals", "cultivation of health workforce in developing countries", the international exchange and cooperation of "2030 health sustainable development targets" and other strategic

plans at the national level. Many policy recommendations, proposals have been adopted by government departments and the policy advisory services capacity and influence of our center have significantly improved.

4.4 Partners continue to increase and cooperation channels continue to expand

During the course of the project, the center gradually established stable cooperative relations with government departments, academic organizations and non-governmental organizations at home and abroad, including the National Health and Family Planning Commission (NHFPC), the International Exchange and Cooperation Center of NHFPC, the Aid foreign division of Ministry of Commerce and other government departments, the International cooperation department of NHFPC in Guangdong, Henan, Jiangsu and other provinces and municipalities, the World Health Organization in China, the United Nations Association of China, China-Africa Development Fund, Gates Foundation, China Agricultural University, Duke Kunshan Universities and other international organizations, non-governmental organizations and academic groups to strengthen cooperation in the field of global health and health development aid, laying a good foundation for cooperation to carry out relevant research and advisory services in the future.

In addition, during the past three-year, our center(NHDRC) has become China's South-South Health Cooperation Research Union, China Global Health Network, the Global Health Branch of Chinese Preventive Medicine association and other academic alliances or network member units. Together with a number of domestic academic institutions, the center commits to global health cooperation research. In 2015, NHDRC was appointed as the WHO Collaborating Centre for Health System Strengthening, dedicated to providing technical support of policy consultation and capacity building on Health Expenditure Accounts and Universal Health Coverage. In addition, NHDRC is responsible for promoting the best practices and experience of health system strengthening and universal health coverage to West Pacific and other regions, and jointly promoting South-South health cooperation.

5. Experience, lessons and inspiration

5.1 Project research activities

To carry out the evaluation and summary research of China’s foreign health aid policy, the focus is to know the real situation of the past foreign health aid and do statistical analysis. However, since the data of China's foreign health aid is secret and there is no total or detailed data released by the official, we can only obtain research information through some qualitative research methods, which pose a great challenge to our research work. Therefore, our research report and policy recommendations also mentioned that in the field of foreign health aid, in order to facilitate the effectiveness of aid, it is necessary to proceed as soon as possible to establish a full-caliber statistical data management system and evaluation system, but also to strengthen the sharing of foreign health aid data between different ministries to increase the transparency of foreign aid management, and to provide data support for future research.

5.2 Sub - contract project management

According to the research needs, our center commissioned the African Global Center and Health and Social Transformation to carry out the South-South health cooperation best practice study. The study period is one year, with the contract period from May 20, 2014 to March 31, 2015. As

a result of the delay in signing of the contract and the lag in international remittance, the actual start time of the activity is later than the time stipulated in the contract. The funds are allocated only 60% of the contract amount and the research report is not finished in the end.
If we carry out such research cooperation in the future, we need to strengthen our understanding and screening of our partners, make predictions, clarify responsibilities and contract terms, and strengthen communication and contact to ensure the smooth progress of project activities.

5.3 Financial management

Our center is a scientific research institution directly under the National Health and Family Planning Commission (NHFPC) and the project participants and beneficiaries of the project also includes the relevant government officials. Therefore, the project expenditure should not only meet the requirements of the sponsor and the PMO, but also be in line with the relevant rules and regulations of the state officials and the financial management of the administrative organs and institutions, resulting in a slight progress in the financial execution of the project, affecting the smoothness of carrying out many project activities. Second, in the implementation of the project, the task force also needed to spend a lot of time for project management and financial reimbursement work which scattered the energy of the task force. It is advisable to simplify management processes such as project reporting; review and inspection in future project activities, improve management efficiency, and enable researchers to spend more time on research.

Annex: (Omitted)

1. Work plan implementation table
2. List of academic results
3. List of consulting services
4. List of important events

OP301 Peking University School of Public Health (SPH)

Output 301 Centre of Excellence in Global Health Policy Development and Governance in China: Sub-project by School of Public Health, Peking University
Final Report

Since signing the GHSP Contract (OP301) in March 2014, School of Public Health, Peking University has committed to building itself into China's main force on global health policy development and governance through self-capacity construction, which correspondingly would bring in the improvement of teaching, research and consulting capacity of academic institutions in global health field at China. Through the implementation of the project for nearly three years, School of Public Health, Peking University has achieved four intended goals of building itself into a global health policy research center, a global health education and training base, a core member of China's Global Health Network and a key player in global health community. Also, the project has exerted extensive influences at national, institutional and individual level. This report summarizes the completion of OP301 project and reports its achievement from the perspective of its four outcomes and three levels of impact. At the end, the report provides our reflections and suggestions.

1. Project Completion Descriptions

1.1 Completion of Technical Indicators

Since the implementation of the project, our institute has achieved its intended objectives in four areas: research, teaching, training and international interactions (see Table 1 and Table 2).

the field of research, on the one hand, systematic study of China's global health strategy has been completed with six outputs presented (see Annex 1 - Annex 7for details),providing technical support for the formulation of Global Health Strategy for Chinese government and China's better involvement in global health management; on the other hand, we have completed the research on China's health R&D and public health equity with outputs of 1 main report, 2 policy briefs, 5 English papers and 3 Chinese papers through systematical analysis of the R&D and financing situation of Type II, Type III disease-related product in China and other BRIC countries, which provided evidences for China to formulate national policies on related R&D financing and coordinating issues, and domestic positions to participate in international negotiations.

In the field of teaching and training, our institution focuses on knowledge reserves and talent cultivation in the global health field, and has successfully completed three year of Global Health Certificate Course and Global Health Diplomacy Executive Training, with a total number of 96 students receiving global health certificates and of 17 participants participated in the World Health Assembly. Two new graduate courses - *Introduction to Global Health* and *Global Health Governance* were started respectively in December 2014 and in May 2015 at Peking University. Chinese textbook of *Introduction to Global Health* has been revised and three textbooks of *Global Health Diplomacy* have been translated (Annex 8).

institution building, China Global Health Network (CGHN) was formally established in Beijing on December 6, 2015, and has organized a series of effective activities in the fields of scientific research, capacity building, consultation and international exchanges. Meanwhile, a lot of efforts have been made on network construction such as network operation, organizational development, external publicity, communication between member units, etc. (details of network objectives completion, see Annex 9 for details).

In order to strengthen the interaction and contact with the global health community, 27 people from our institution and partner members were sent to Geneva, the United States and other places to participate in a number of international trainings and conferences during the project.

On the whole, the specific objectives of the project have been successfully completed. Our institution has enhanced the overall capacity of global health research, teaching, consulting and network construction by strengthening the core competencies of global health policy development and governance.

Table 1 Projects Complete Status

General Objective: Building the Institute into a Core Force of Global Health Policy Development and Governance in China	
Specific Objectives and Expected Outputs	**Progress**
Sub-objective 1: A Policy Research Center on Global Health Policy Development and Governance	
1. China's Global Health Strategy Report	All Completed
2.China's Health R&D on Public Health Equity Report	All Completed
Sub-objective 2: An Education and Training Base in Global Health Policy Development and Governance	
1. Compile textbook of Introduction to Global Health; Translate textbook of Global Health Diplomacy	All Completed
2. Develop graduate selective courses of Introduction to Global Health and Global Health Governance	All Completed
3. Hold PKU-DUKE Global Health Certificate Course (3 times)	All Completed
4. Hold Global Health Diplomacy Executive Training Course (3 times)	All Completed
Sub-objective 3: The Core Founder and Leader of China Global Health Network	
Set up Global Health Network and hold board meeting and annual meeting	All Completed
Sub-objective 4: A Key Player in Global Health Community	
Participate in short-term training course and international seminar to enhance team capacity	All Completed

Table 2 Centre of Excellence in Global Health Policy Development and Governance in ChinaOP3-01 Outputs List

	No.		**Output**	**Reference**
Research on China's Global Health Strategy Research	1	Output Introduction	1 *China's Global Health Strategy Complete Report*	**Appendix 1**
	2	Output 1	1 *China's Global Health Strategy Suggestion Report*	**Appendix 1**
	3	Output 2	Ten Strategy Sub-areas Report (10)	**Appendix 3a-Appendix 3j**
	4	Output 3 (added) 1	1 *Assembly of Global Health Strategies of Major Countries in the World*	**Appendix 4**
	5	Additional Output 1	1 *Report on Theoretical and Practical Basis of Global Health Strategy in China*	**Appendix 5**
	6	Additional Output 2	9 academic papers	**Appendix 6**
	7	Additional Output 3	2 Policy Briefs： *The Essence of Global Health Diplomacy and Reflections on China 's Participation in Global Health Diplomacy;* *Research on relations between Global*	Submitted in the system

	No.	Output	Reference
		Health and Food	
	8	Summary of the OP301 outputs (Main report)	**Appendix 7**
Research on Health R&D and Public Health Equity	9	1 Main Report	Submitted in the system
	10	1 Stage Report	Submitted in the system
	11	45Papers in English，3Papers in Chinese	**Appendix 6**
	12	2 Policy Briefs	Submitted in the system
Textbooks\ Courses\ Trainings of Global Health Policy Development and Governance	13	1 Chinese Textbook of *Introduction to Global Health*	Submitted in the system
	14	Translate and Revise 3 textbooks of Global Health Diplomacy	**Appendix 8**
	15	1 Curriculum Outline of Graduate Selective Course *Introduction to Global Health*	Submitted in the system
	16	1 Curriculum Outline of Graduate Selective Course *Global Health Governance*	Submitted in the system
	17	3 Summaries of Global Health Certificate Course	Submitted in the system
	18	3 Summaries of Global Health Diplomacy Executive Training	Submitted in the system
Establishment and Operation of China Global Health Network	19	1 Complete Report of China Global Health Network	**Appendix 9**
Important Member of International Global Health Community	20	27 Conferences Summaries	Submitted in the system

1.2 Budget implementation (Omitted)

2. Project Impacts

2.1 Achieved Four Expected Outcomes

1）A Research Center for Major Global Health Policy Development and Governance Issues

It has been only less than three years since we carried out the research on China's global health strategy, the development of this strategy has already become one of the key priorities of NHFPC, and furthermore, it has been included on top of the entire Chinese government's agenda. Five approaches were presented in the *Proposal on China's global health Strategy*, including "to integrate health into the high-level diplomatic agenda with dominant countries through international strategic dialogue mechanism", to "actively participate in global health governance", to "increase the development aid for health and innovate health assistance mode", and to "offer more Chinese medicine and health products to the world". These proposals highly consist with national policy documents, demonstrating that the research group is on the right direction. As members of the World Health Assembly Advisory Group, main participants from

China's Health R&D on Public Health Equity (another sub-research of GHSP), have visited Geneva several times attending World Health Organization Executive Committee and the World Health Assembly. They participate in international consultations and provide advices for NHFPC in international meetings, realizing the project's expected objective of putting research into practices and supporting government in global health policy discussions.

Policy research has greatly enhanced the institute's capacity in global health policy development and governance. This capability has been fully recognized by the external, thus the research network has been greatly expanded as well. During the implementation of GHSP, government departments have entrusted the team with more research projects, and more agencies have come to collaborate with the team to jointly undertake research projects such as "Performance Evaluation of Chinese Foreign Aid Medical Team", "Research on Innovative Models for China 's Foreign Health Assistance ", "World Health Organization Reform Review", "Review on A study on the public health and socioeconomic impact of SSFFC medical products" and so on. Upgraded research capacity and expanded research scope have successfully allowed institutional members to apply for new research projects funded by National Natural Science Youth Fund and China Postdoctoral Fund, which has proved that the institution's ability in establishing itself to a research center in Global Health Policy Development and Governance field has been improved. All these have laid solid foundations for maintaining its dominant role in the future.

2) A Knowledge Dissemination and Capacity Training Base in Global Health Policy Development and Governance

After two graduate elective courses *Introduction to Global Health* and *Global Health Governance* were open, and 67 graduate students have completed the bilingual courses, resulting in more exchanges between global health discipline and other disciplines. The course-advisory-group from Peking University Health Science Centre has audited the lectures, of which they spoke very highly, and recommended to try more innovative teaching methods in the next term. Introduction and translation of three textbooks on global health governance have been completed: *Global Health Negotiations and Navigation*, *Innovative Health Partnership*, *Global Health Diplomacy in 21st Century*. Officially published by the Peking University Medical Publisher, the materials are translated and proofread all by the teachers and students of our institution, which has ensured the quality of the textbooks. While disseminating the knowledge of global health governance to domestic audience, the team members' theoretical capacity has also been improved during the translation process. In addition, new Chinese textbook *Introduction to Global Health* is also to be published.

Since its start, the Global Health Certificate Training Course has attracted huge attention from domestic academia. More than 100 domestic students apply to the class every year with admission rate only being 1: 5. The Global Health Certificate Training Course provides students with systematic knowledge and typical cases in the fields of global health theory, helping students to better grasp and understand the most cutting-edge expertise. Through the analysis and exchange between teachers and students, global health knowledge has been exchanged and disseminated among people from different academic background which in turn has greatly broadened students' horizon. Satisfaction survey indicates that 70% of the participants were "very satisfied" with the training course. Meanwhile, the participants from another Global Health Diplomacy Executive Training Course have also improved their comprehension of

international health development cooperation in two folds: they provide useful advice to Chinese delegation at the global level of policy discussions and negotiations on health issues as advisory experts; and they have also deepened their own understanding on the role and challenges that China face in global health governance. Their perceptions on how China can better play its great role and can better represent developing countries' interests have been clearer. After the WHA69 in 2016, the Department of International Cooperation of NHFPC sent a thank letter in which they expressed their sincere gratitude for the professional advices, support and other contributions that PKUHSC has made during the assembly, and expressed the willingness to maintain good cooperation in the future. Also, NHFPC indicated that continued funds after GHSP would be managed for PKUHSC, as an advisory body, in order to better support National Health Commission's participation in global health negotiations (Annex 10).

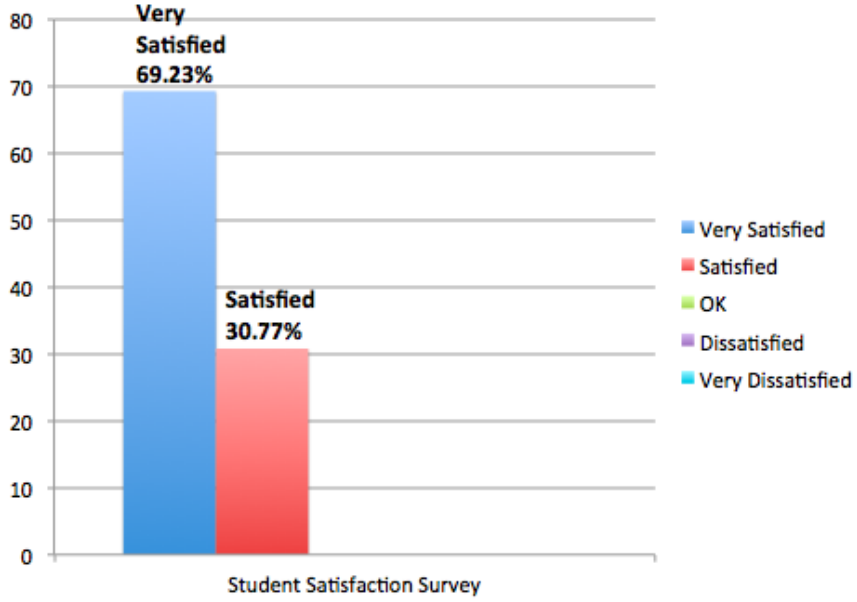


Figure 1 Global Health Certificate Training Course Students' Satisfaction Survey Result

The above activities demonstrate our proficiency in conducting dissemination and training in global health policy and governance field. Since the second year of GHSP, our institute has been invited to host a number of other training courses, including the Beijing Global Health Diplomacy Training Course; a national health diplomacy training course commissioned by the International Cooperation Department of NHFPC, designed for national health foreign affairs cadres, and also recommended several key teachers to teach Global Health Policy Development and Governance related content for the economic and commercial counselors. At the beginning of 2017, followed with President Xi 's visit to the headquarter of WHO and the sign of B&R Health Cooperation Memorandum of Understanding (MOU), experts of our institution were specially recommended by the Publicity Department of the CPC to speak about their interpretations on "China 's participation in global health governance", "China's external health assistance development", "Cooperation between China and the World Health Organization", "the Meaning of the signing of MOU" in seven mainstream media. Relevant media reports have been widely forwarded (Annex 11). The ideas and suggestions in the *Proposal on China Global Health Strategy* have been widely disseminated, and they also have further boosted the

understanding of Global Health Policy Development and Governance among people from non-health sectors.

3) The Core Founder and Leader of China Global Health Network

China Global Health Network was officially established in Beijing on December 6, 2015, with School of Public Health, Peking University being the first Chair and the secretariat. Since its establishment, the Network Secretariat has organized a series of fruitful activities in the areas of scientific research, capacity building, advisory services and international exchanges, with the support of the project office and the network member units. At the same time, a lot of efforts have been made in network operation, organization development, external publicity, and communication between member units and with other networks (see Annex 7). By December 31, 2016, the number of CGHN members had increased from 46 to 59. Meanwhile, CGHN WeChat public account, with 2,500 followers, has become an important channel for external publicity network. There have been more than 60 posts with a total of 10 million hits, covering the content of network members' introduction, global health news, global health lectures, useful information and so on. WeChat public account has played great roles in promoting members' communication and in disseminating the latest global health knowledge to professionals and the public. It serves as the gateway of the network and links closely with the network secretariat, receiving widespread attention and praises.

CGHN has become a significant platform for cooperation and interactions with network members domestically and abroad. For example, the network secretariat has invited nearly 20 experts from seven network members to the United States and participates in the China-Harvard-Africa Global Health Network Symposium. This has extensively expanded the impact of CGHN, and has greatly promoted the health cooperation network among institutions from China, Harvard University and Africa. At present, the tripartite health cooperation network is jointly applying for China - World Bank Fund to support maternal and child health programs.

4) A Key Player in Global Health Community

From June 2014 to November 2016, 27 people have been funded to participate in international academic conferences and training workshops in global health area. Those people were from China National Health Research Development Research, Guangzhou University of Traditional Chinese Medicine, Institute of Medical Information, Chinese Academy of Medical Sciences, the International Relations Institute of Peking University, and School of Public Health, Peking University, and those 27 people are all involved in the subproject. The training and conference contents include global health diplomacy, intellectual property and global health and health systems, and knowledge reserves and research results related to China's global health strategy and health R&D issues have been also involved. Meanwhile, funded people actively use the opportunities to introduce GHSP project to the international community. In 2014, Professor Wang Yu, members of the China Global Health Strategy Research Group from School of Public Health, Peking University, and Professor Zhang Qingmin, member of the Group from School of International Relations, Peking University, went to Geneva for the 2014 Global Health Diplomacy Advanced Course. During the course, they were invited to introduce GHSP project and the ongoing research framework of China's global health strategy. This process has brought in lots of valuable comments and suggestions from experts and scholars including the Assistant

Director-General of the WHO, and also has enhanced the impact of GHSP and its PIAs in global health sector.

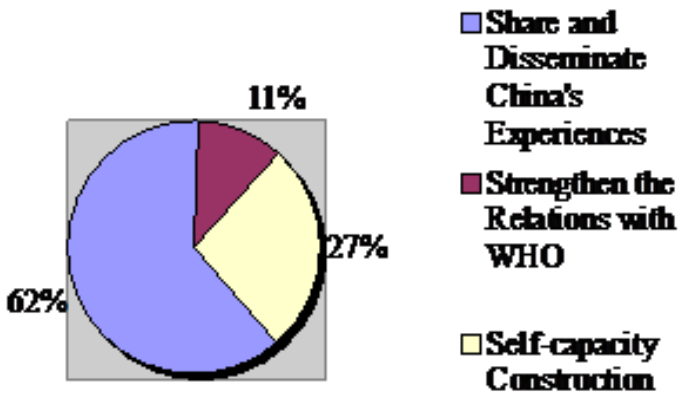


Figure 2 Functions of International Communications

Project members are actively engaged in networking with colleagues within the filed through CUGH, World Health Summit, Thailand Prince Mahidol Annual Conference (PMAC), and China -Harvard - Africa Tripartite Partnership Workshop and other international conferences. They hope to deepen mutual understanding and seek long-term partnerships with each other so that international community could have profound understanding on GHSP project as well as on global health study at Peking University. A lot of progresses have been made: we have discussed to build a global health practice base with Myanmar non-governmental organization "Health Poverty Reduction"; we have exchanged ideas about teaching and research cooperation with American academic institutions "Academy Health"; we have considered network cooperation with Canadian Coalition for Global Health Research; we have exchanged global health thoughts with teachers and students from Health and Global Policy Institute of Japan; we also work as one of the three executive committee members in the China-Harvard-African Tripartite Health Cooperation Network. All these indicate that our role in the global health field has been much more recognized by external academia.

2.2 Exerted Impact at Three Levels

The implementation of the project has exerted great influences at national level, institutional level and individual level.

1）National Level

Not long after China's global health strategy research project being launched, the development of such a strategy has been put on NHFPC's agenda and has become one of its key priorities. In the newly issued *"Healthy China 2030 Planning Outline" and "13th Five-Year Health Plan"*, developing and implementing a national global health strategy have been listed as support and safeguard measures. Global health strategy approach suggestions proposed by our project have been highly consisted with these two national policies, demonstrating both NHFPC and the government's tremendous political will in global health. Meanwhile, NHFPC International Cooperation Department has considered our institute as an important think tank for its

participation in global health policy and governance, and will maintain good cooperative relations with us in capacity building and policy consulting on major global health issues.

2）Institutional Level

Global health discipline has been approved to authorize doctor degree in Peking University in 2016[1], and has become one of the two major-supported "high-peak" disciplines in School of Public Health, Peking University. *13th Five-Year Plan of School of Public Health, Peking University* clearly recognizes "the huge need of developing global health discipline" and "the lack of global health research and global health talent", and indicates that "Peking University have the responsibility and ability to take a lead in global health development" and should set a goal to establish world-class global health teaching and research platform.

During the project, we take good use of the interdisciplinary characteristics of global health, and have effectively integrated resources from Peking University and other institutions at home and abroad. The resource integration was based on the School of Public Health and opens to other relevant units and disciplines at Peking University and other institutes, and has greatly promoted the interdisciplinary cooperation.

3）Individual Level

The project has played great role in improving the research, teaching and policy consulting ability of the team members, among which young scholars have grown most rapidly and have become school's backbone in global health teaching and research. In addition, a range of capacity-building activities (global health certificate training course, global health diplomacy executive training course, global health textbooks and curriculum development, global health network activities and public accounts) have been carried out at different levels covering experts, young scholars and students from different disciplines and institutions, and has greatly upgraded participants' the knowledge and skills in global health policy development and governance.

3. Reflections and Suggestions

3.1 Reflections

1) Reflection on interaction and integration between researchers and policymakers

China's global health strategy research was conducted in a very unique context. Relevant officials of NHFPC were invited by the research team to join the research design at the initial stage of the project, Soon, the strategy was put on the agenda of NHFPC. Later, the research team was requested to assist in drafting global health strategy policy document. That is to say the research team needed to combine the strategic research and policy drafting into one task. This dual role makes the research team more closely tied to the decision-making, and enables them to better understand the authorities' expectations and needs. The NHFPC, using its government agency's authority organized its own departments and officials and experts from other ministries to review the research work, thus greatly facilitated the dialogue and interaction between the research team and government officials. This practice has proved that the integration of researchers and decision makers contributed to better understanding and

[1] Self-set "secondary discipline out of catalogue" in PKU

recognition of research findings by government departments, and has played a catalytic role in transforming research results into policy. Originally, whether the government would like to use research findings, how will the government adopt these findings and when will the government convert the research into a national policy is unknown. Now, NHFPC has made the development of China's global health strategy a top priority, and decided to issue the Strategy as soon as possible. It can be said that the integration of researchers and government officials has accelerated this process. Moreover, we are pleased to see that the development and implementation of China's global health strategy has been included in the highest level of national policy documents.

This integration has surely posed a challenge to researcher team. The team strived to achieve a good balance between ideal strategy that academic research pursues and the practical solutions that policy document concerns with. It also took into account a variety of opinions in the system and kept a balance between theses opinions and the basic view of the research team. The implementation of the China's global health strategy research provided with the research team a rare learning opportunity.

2) Reflection on the New Trend of China Global Health Network

Three years ago when China Global Health Network was established, there was not any national global health network or any platform that can hold national health activities, except the newly established China Consortium of Universities for Global Health. Therefore, we apply for GHSP's support to help China set up a global health network to provide an open platform to promote inter-disciplinary, cross-sectoral, and multi-stakeholder exchange and cooperation for scientific research, capacity building, advisory services, and related production and trade among global health institutions home and abroad. The concept of global health has gained extensive popularity and attention in China due to the establishment of the Network as well as the activities carried out in the first year, in particular the annual conference that had a huge influence. Consequently, similar platforms and organizations, such as "Global Health Branch of Chinese Preventive Medicine Association", "Global Health Institute, Xi'an Jiao Tong University", "Global Health Forum of Peking University Medical Forum", have been set up rapidly in China.

The emergence of these institutions and platforms demonstrate that global health concept has successfully obtained people's attention and the relative teams and institutions have gained rapid growth in China, a development that was beyond our expectation and deserve to be celebrated. However, some planned activities of these institutions are overlapping. For example, they all plan to hold large-scale conferences, resulting in competing with each other for domestic and international expert resources and causing participants being scattered into different meetings. This trend constitutes new challenges to the development and function of the global health network in the future of which we must be highly aware.

3.2 Suggestions

1) Follow-up actions for the Strategy's Next Step: Promoting the Whole of Government Global Health Strategy

"Healthy China 2030 National Plan" was issued at a time when the research on China's global health research entered to the last stage---"Proposed China's global health strategy" came into

being as the output of the research. The Healthy China plan clearly indicates the great necessity to “implement China’s global health strategy”, making strategy development an urgent task. In order to launch the Strategy as soon as possible, NHFPC decided to issue a sectoral strategy in its own name. Therefore, it is one of the key tasks of China's global health is to develop a cross-sector and cross-department strategy on the basis of the health department document in the future. In this context, we suggest that China and the UK continue to cooperate and support the development of a “whole of government” "global health strategy" as a follow-up activity to the GHSP project. In this way, the concept of “Health in All Policies” could be materialized in China’s engagement in global health governance and the goal of “implement China’s global health strategy” set in *the Healthy China Plan* well achieved.

2) Next steps for the Network’s Following Work: Researching on its future Development Trend under the new situation Challenge

Facing challenges posed by the rapid growing number of institutions / platforms / alliances for global health in China, there is a need for the China Global Health Network to reposition itself within this new situation, and to examine how to interact with these emerging institutions. Only by doing so can the Network achieve effective coordination, complementary advantages, optimal use of resources, and avoid duplications. Moreover, the Network should think about what kind of organizational reform and operation mode is needed in the future to sustain its unique role in China’s global health. We recommend that GHSP supports China Global Health Network’s activities in this direction in order to achieve its sustainable development in the end.

OP302 Fudan University School of Public Health

Output 302 Centre of Excellence in Global Health Policy Development and Governance in China: Sub-project by School of Public Health, Fudan University
Final Report

Abstract
China UK Global Health Support Programme (i.e. GHSP) was initiated by China Ministry of Commerce and the UK Department for International Development, aiming to improve China's capacity in global health participation and make joint efforts to the global health cause. School of Public Health (SPH), Fudan University won the bid to become a core implementation institution working on the project of Excellence in Global Health Policy Development and Governance (GHSP-CS-OP3-02). The projected initiated in May 2014 and has been completed by now.

1. Project design and content

The project aims to raise the SPH/GHP's capacity to participate in China's global health policy development and governance and help Fudan University SPH to become a core supporting institution in China's global health work with the support from the China UK Global Health Support Programme. The SPH/GHP's capacity was strengthened through policy research, education and training, capacity building and knowledge dissemination in the long term. SPH/GHP is expected to grow into a globally prestigious think tank to serve the Chinese government, other developing countries and international organizations.

Five work packages were developed based on the project objectives, namely health issues research (WP1), training and knowledge dissemination (WP2), policy consultation (WP3), capacity building (WP4) and project management (WP5). The work packages covered the following areas: establishment of global policy development and governance mode and China's contribution, summarizing the defects in China's previous global health participation and setting up China's national global health strategy, education and training program development covering policy makers, researchers, health service providers and students to improve their capacity to develop better global health policy, dissemination of the project outputs to all stakeholders and improvement of government officials' and researchers' capacity to better participate in global health initiatives.

Five international institutions participated in the project, namely School of Public Health, Fudan University, China; Global Health Institute, Duke University, the United

States; Hanoi School of Public Health, Vietnam; National Institute of Parasitical Diseases, China; Xinjiang Medical University, China.

2. Project outputs and effects

1. Work package 1: major health issues research

Work package 1 focuses on the research of major global health issues and health systems with 14 research reports completed.

Nine prioritized health topics important to China and global public health were selected, including non-communicable diseases, HIV/AIDS, tuberculosis, tropical diseases, maternal and child health, child malnutrition, essential drug system, smoking and climate change. We analyzed China's related policy and intervention measures in the past 20 years through literature review, qualitative expert interview and onsite visit. We discussed China's contribution in solving global health problems and improving global health outcomes, summarized the experience in China's global health work based on the previous analyzing results and explored the value of China's experience to the post-MDG world.

Secondly, we conducted research on the role of emerging countries, developing countries and NGOs in global health. **1) Newly emerging countries' role in global health governance: taking Brazil, India, South Africa and Russia as example.** The study focuses on the experience of these four countries' participation in global health based on data collected from literature databases, NGOs and research institutes websites and expert interview and tries to provide suggestions for China's global health participation. **2) Vietnam's decentralizing HIV/AIDS prevention and control strategy.** The study evaluated and validated the effect in HIV/AIDS treatment capabilities of the decentralization of antiretroviral treatment services to primary healthcare providers through random-control trial design. The study results also indicate the importance of health personnel's CD4 testing abilities in primary providers to ensure the quality of the antiretroviral service. Through this study, the authors also suggest more evidence to support the 24-month treatment and the establishment of a new HIV/AIDS treatment protocol. **3) NGOs' role in global health.** The study systematically analyzed NGOs' role in global health and global health governance, NGOs' position in governments' global health strategy, NGOs' project management experience and the development status of NGOs in China through literature review, thematic content analysis and in-depth interview. The study confirmed the existence of a global health governance structure dominated by major countries, international organizations and large NGOs and suggested China's participation in this structure.

In addition, we conducted SWOT analysis for China's global health strategy plan. **1) China's contribution to global health: analysis of the China Medical Team (CMT) in a global perspective.** The study overviewed China's major contribution to global health, described the growth way in global health governance participation and the international community's perception on China's medical aid. The study results indicate limited international community's perception on China's medical aid and other global health activities. The authors suggested to strengthen the South-south cooperation and the support to domestic universities in global health activities, attach more importance to capacity building through the advancement of CMT program, strengthen the building of local health system, develop the multi-level cooperation between China and other countries receiving health aid and improve the implementation of health aid programs. **2) SWOT analysis of China's global health capacity and strategy.** Through 50 years'

development, China has grown from a country receiving health aid to one providing health aid and China's health diplomacy has grown from unilateral to bilateral, multilateral and international cooperation with both achievements and lessons, strength and drawbacks. The study proposed several suggestions for China's global health strategy, namely establishment of China's global health strategy fit to its international role and orientation, strengthening the high-level global health talent cultivation and setting up a uniform health diplomacy organization system with clear work allocation and requirements.

2. Work package 2: training and knowledge dissemination

We made the following achievements in terms of knowledge dissemination. 1) We developed and continued to maintain a global health website to disseminate the project outcome and frontier global health information. 2) We published 29 Chinese and English papers (including 7 SCI papers) and authored one textbook listed in the Thirteenth Five-year plan of China's National Health and Family Planning Committee *Environment and Global Health* based on the achievements of WP1. 3) We organized the 2014 High-level Dialogue between China and UK in Global Health. 4) Two young researchers in the project team attended international conference. 5) The core members of the project team attended altogether 6 international conference and made oral presentation to disseminate our project outcomes. 6) We conducted onsite visit to two African countries for the first time, laying foundation for future cooperation.

We made the following achievements in terms of training. 1) We successfully organized 3 training programs on global health practice with 256 trainees. Around 20% of the trainees were policy makers and government officials at national and provincial level. The major training content included basic concepts in global health, related working and researching methods in global health practice and case study from the OP302 project. We invited senior professors in global health field from prestigious universities both from China and abroad, previous officials and policy makers in the United Nations and WHO and experts with rich global health practice from related research institutes to work as trainers in the training programs. During 3 training programs, over 40 professors, officials and experts gave lessons and 3 training textbooks were produced. 2) Production of MOOC course *Introduction to Global Health* on Coursera and Chinese university MOOC platform (one of the top MOOC courses showed in the Chinese university MOOC website homepage). The MOOC course attracted 4212 attendees in the first lesson. The attendees actively took part in the after-class discussion with around 400-person time in the discussion section.

3. Work package 3: policy consultation

We produced **10 policy brief drafts**, including 7 published ones, based on the achievements of WP1. We also developed **the Green Book *China's Experience and Strategy in the Perspective of Global Health Governance*** (tentative title). The Green Book focuses on the topic of national capacity-centered global health governance, summarized China's experience in health governance and tried to find ways to better disseminate China's experience to other developing countries, improve the current global health governance mechanism and to deeply participate in global health governance in the future. We have already signed a publication contract with a press and the Green Book is now under revision.

4. Work package 4: capacity building

The project sponsored 6 team members to receive 2-3 months' training and 6 to receive 203 weeks' training in certain U.S. universities, WHO headquarters, International Agency for Research on Cancer (IARC), World Bank headquarters, the Global Alliance for Vaccines and Immunization (GAVI), etc. The training offered our team members the opportunity to participate in global health activities and governance practice and provided great help for them to conduct global health research independently in the future.

By the end of the year 2016, all the activities in the project has been successfully completed according to the project schedule.

Chapter 1 Background

China had achieved profoundly the improvement of health for its people with limited financial and human resources over the past 60 years since the founding of the People's Republic in 1949. These achievements were due largely to the development and implementation of appropriate health policies emphasizing primary healthcare, infectious disease control and strengthening grass-root healthcare networks, as well as the development and implementation of other astute public policies such as education, nutrition, water and sanitation as well as poverty reduction. While China's health development has changed significantly, global health challenges have also been evolving rapidly. In recent years, Chinese government agencies and international philanthropic organizations/ communities have recognized that experiences/best practices and lessons learned from China's health development over the past six decades could be relevant and very useful in supporting the achievement of Health-related MDGs and post-2015 sustainable health development in low- and middle income countries, as China is playing a more and more important role in supporting these countries' socio-economic development. In the meantime, there are demands to strengthen the capacity of Chinese institutions engaged in global health activities by utilizing Chinese resources and experiences.

Against this background, Ministry of Commerce of People's Republic of China, in collaboration with Department for International Development (DFID) of United Kingdom Government, has recently launched "Global Health Support Programme (GHSP)", which is a China-UK partnership contributing to improved global health policy and outcomes. The programme will help China improve its contribution to global health and achieve the potential of its collaboration. GHSP is implemented from 2012 to 2017, with a total budget of £12 million. Four outputs will be achieved through a series of planned activities: 1) Increased ability to distil, disseminate and apply Chinese experience in improving health outcomes and strengthening health systems; 2) Improved understanding amongst Chinese officials and researchers of best practice in international health development cooperation (including bilateral and multilateral); 3) Enhanced ability of Chinese officials and researchers to contribute to global health policy and governance; 4) Pilot partnerships to apply China's experience and international best practice in development cooperation in low income countries (including at least one Asian country).

To achieve the outputs above, GHSP selected several programme implementing agencies (PIAs) through open bidding. As a selected tenderer, Fudan School of Public Health held one sub-project of this output, and award number is GHSP-CS- OP302.

The objectives of this project is to improve selected tenderers' capacities of global health policy development and governance with support from GHSP, and become the core supporting centre of excellence in China's participation in global health policy development and governance. Selected institutions could strengthen their long-term capacities through policy and academic research, organization and participation of national and international trainings and exchange, international conferences, etc. They can disseminate China's successful experiences, cultivate a number of government officials and researchers with the background knowledge of global health, and provide technical support for Chinese government on developing national global health strategies and participating in global health affairs. Meanwhile, selected tenderers should conduct positive pilot tests on global health knowledge dissemination, including

domestic and overseas exchange and communications (develop websites and publish bulletins, etc.) and experience sharing (organize annual meetings, workshops, and seminars, etc.).

The centres of excellence in global health policy development and governance in China will mainly organize 4 types of activities, including:
1. Activities related to improving capacities of research and analysis. Including: 1) Major global health issues, revelations of policy development and governance system to China will be summarized; 2) Researches will be conducted on the organisation structure of main developed countries, international organisations, emerging nations and international Non-Governmental Organizations' participation in global health policy development and governance, and their corresponding capacities, as well as the revelations to China. 3) Researches will be conducted on the organisation structure of China's participation in global health policy development and governance and corresponding capacities.

2. Activities related to knowledge dissemination and training capacity enhancement. Including: 1) Multi-channel dissemination of global health policy development and governance experiences; 2) Short-term training materials on global health policy development and governance will be conducted, as well as corresponding trainings.

3. Activities related to improving capacities of policy consulting and influence. Including: 1) Policy briefs will be provided for the Chinese government, with the contents of global health policies, participation in global health governance and emerging global health issues, etc. 2) Technical briefs and proposals will be provided for the Chinese government, with the contents of global health policy, participation of global health governance and emerging global health issues, etc. 3) Special policies and technical briefs will be developed according to the request of NHFPC or 2Ministry of Commerce.

4. Activities related to team capacity building. Including: 1) Health government officials and researchers will learn and summarise lessons and experiences on global health development through study tours, secondments and conference participations. 2) Personnel involved in programme implementation will learn and summarize lessons and experiences on global health development through workshops, etc.

By the end of this programme, selected tenderers shall have finished works and tasks listed below. 1) Selected tenderers shall have put forward relevant proposals for China's national global health strategy development. 2) Selected tenderers shall have conducted relevant researches on policies of China national global health strategy. 3) Selected tenderers shall have produced key outcomes of global health, including relevant researches, and short training courses, seminars and policy advice on global health for policy makers and researcher consultants. 4) Selected tenderers shall have cultivated their own Chinese high-level staff with great contributions to global health technical and policy work. 5) Selected tenderers shall have been capable of putting forward constructive advices for the establishment of China Global Health Network, together with actively exploring. Then will have functions and deliver global health analysis, consulting services, policy advice and short training courses for government officials and researcher consultants.

Chapter 2 Project design and content

1. Background and objectives

Over the last fifty years, China's global health activities have included work with international agencies, the provision of international medical teams/aid to developing countries, and the development of multi-country collaborations; however, these activities are fragmented and inconsistent with its rapid socio-economic development, reflecting limited institutional capacity of global health and the absence of an overall national global health strategy.

The proposal aims to improve SPH/GHP's capacities in global health policy development and governance with support from GHSP, so it becomes one of the core supporting centres of excellence within China in global health policy development and governance. SPH/GHP will strengthen its long-term capacities through policy related research, education & trainings, capacity building, and knowledge dissemination. As a result, SPH/GHP will develop an international reputation as one of the foremost think-tanks in this area for the Chinese government, other developing countries, and international organizations.

Specific objectives include:
1) To map global health policy development and governance patterns, and identify China's contribution.
2) To summarize China global health activities' experience and lessons learned, and to formulate a national strategy in global health.
3) To develop multi-stakeholder education and training programs to enhance the capacity for policy-makers, researchers, health care providers and students to better understand global health, and to formulate sound global health policies.
4) To disseminate the products of the centre of excellence in global health policy and governance to multi-stakeholders, including domestic and international, through websites, publishing bulletins, conference, seminars, workshops, etc.
5) To improve researchers' capacity in global health, in order to facilitate more participation in global health affairs.

2. Main activities

This project will have multiple activities, organized into the following five work packages (WPs): research (WP1), education, training and knowledge dissemination (WP2), policy consultancy (WP3), capacity building (WP4) and project administration (WP5).

These work packages will map global health policy development and governance patterns and identify China's contributions; summarize China's global health activities and lessons learned, and help to formulate a national strategy in global health; develop multi-stakeholder education and training programs to enhance the capacity for policy-makers, researchers, health care providers and students to formulate sound global health policies; disseminate the products of the centre of excellence to multiple stakeholders; and improve government officials' and researchers' capacity in global health in order to facilitate stronger participation in global health affairs.

3. Expected outputs

Expected outputs include global health publications in international and domestic journals, policy briefs and the green paper, and additional capacity building activities

designed for researchers and policy makers. The host institute ultimately aims to develop an international reputation as one of the foremost global health think-tanks for the Chinese government, other developing countries, and international organizations.

Table 1 Outputs of the five work packages

Work area	Work Type	Name
Work package 1 (WP1): activities related to improving capacities of research and analysis	1.1 Research report on major global health issues (WP1-R1)	
	Research report	8 reports
	1.2 Research on global health system (WP1-R2)	
	Research report	3 reports
	1.3 SWOT analysis of China's global health capacity and strategy (WP1-R3)	
	Research report	1 report
Work package 2 (WP2): activities related to knowledge dissemination and training capacity enhancement	2.1 Global health knowledge dissemination (WP2-K1)	
	Website	● one website
	Publication	● 50 academic papers
	Meeting organized	● High-level Dialogue between China and UK in Global Health
	International dissemination	● Travel grant for two young researchers to attend conference
		● Dissemination of OP302 outputs through 5 exchange activities, including an onsite visit to two African countries
	2.2 Global health training (WP2-K2)	
	Training	Organizing 3 training programs on global health practice during 2014 to 2016
	Course development	Developing one MOOC course
	Textbooks	Writing one textbooks on global health
Work package 3 (WP3): activities related to improving capacities of policy consulting and influence	Policy briefs	10 policy briefs
	Green Book	One Green Book on global health
	Policy consultation	Agency contract signed with governments in global health field
Work package 4 (WP4): activities related to team capacity building	Training	Long-term training (2-3 months) ● Ten team members
	Training	Short-term training (2-3 weeks) ● Ten team members
Work package 5 (WP5): project management	Work report	● Annual report

Work area	Work Type	Name
		● Final report

Chapter 3 Objectives fulfilment

From May 2014 to December 2016, all the activities in the project has been successfully completed according to the project schedule. See more details in Table 2.

Table 2 Objectives fulfilments in all work packages

Work area	Work type	Name	Objectives fulfilment
Work package 1	1.1 Research report on major global health issues (WP1-R1)		
	Research report	● China's NCD prevention and control strategy and its post-2015 work route ● China's experience in HIV/AIDS prevention and control, its post-MDG role and strategy within the global community ● China's tuberculosis prevention and control strategy and its post-2015 expectations ● Implications of China's schistosomiasis prevention and control strategy to that in African countries ● China's post-2015 work route and global health strategy in safe abortion ● Report on child malnutrition intervention and its implementation in China ● Process and future strategy of China's essential drug system ● Report on smoking control in China: difficulties, drawbacks and future expectation ● China's strategy towards health risks caused by climate change	Completed (9 reports)
	1.2 Research on global health system (WP1-R2)		
	Research report	● Research on roles of BRICS countries in global health governance, Shanghai ● Comparative analysis of HIV/AIDS prevention and treatment strategy between China and Vietnam, Shanghai	Completed (3 reports)

Work area	Work type	Name	Objectives fulfilment
		● Management mode of NGOs in different countries, Shanghai	
	1.3 SWOT analysis of China's global health capacity and strategy (WP1-R3)		
	Research report	SWOT analysis of China's global health capacity, Shanghai Analysis of China's health system in an international perspective, Shanghai	Completed (2 reports)
Work package 2	2.1 Global health knowledge dissemination (WP2-K1)		
	Website	● one website	Completed
	Publication	● 29 academic papers	Completed
	Meeting organized	● High-level Dialogue between China and UK in Global Health	Completed
	International dissemination	● Travel grant for two young researchers to attend conference	Completed
		Dissemination of OP302 outputs through forums etc.	Completed
	2.2 Global health training (WP2-K2)		
	Training	Organizing 3 training programs on global health practice during 2014 to 2016	Completed
	Course development	Developing one MOOC course *Introduction to Global Health*	Completed
Work package 3	Textbooks	Writing one textbooks on global health	Completed (including textbooks)
	Policy briefs	11 policy briefs	Completed (including drafts)
	Green Book	One Green Book on global health	Completed (draft with signed publication contract)
Work package 4	Training Training	Long-term training (2-3 months) ● Ten team members	Completed
		Short-term training (2-3 weeks) ● Ten team members	Completed
Work package 5	Work report	● Annual report ● Final report	Completed

Chapter 4 Project outputs and implementation effects

1. Activities related to improving capacities of research and analysis

1.1 Research on major global health issues (WP1-R1)

Nine prioritized health topics important to China and global public health were selected, including non-communicable diseases, HIV/AIDS, tuberculosis, tropical diseases, maternal and child health, child malnutrition, essential drug system, smoking and climate change. One senior expert from Fudan University in the related field was responsible for each health topic. The researchers analysed China's related policy and intervention measures in the past 20 years through literature review, qualitative expert interview and onsite visit. The researchers discussed China's contribution in solving global health problems and improving global health outcomes, summarized the experience in China's global health work based on the previous analysing results and explored the value of China's experience to the post-MDG world.

(1) Non-communicable diseases (NCDs)

This study was conducted to systematically examine the NCDs-related policies and strategies domestic and abroad, retrospect the experience of China in NCDs control, summarize the evolvement, achievements and challenges of China in NCDs control, and thus provide policy recommendations and strategy suggestions for Chinese government in global governance of NCDs to achieve the sustainable development goals (SDGs) of the United Nations

Particularly, literature review, expert consultation and second-hand data analysis were performed to summarize achievements and lessons of China in NCDs control. As a result, we found that the adjustment in NCDs control strategies was passive and largely lagged behind compared with the rapid epidemic of NCDs in China. Due to lack of policy supportive environment, multi-sector cooperation mechanisms and involvement of the whole society, the health sector in China had to work alone in NCDs control. Since the heath sector was unable to eradicate the social and environmental causes of NCDs alone, China was somewhat unprepared for the surging epidemic of NCDs. However, the success of several small-scale interventions has led the NCDs control towards the right direction, that is, to establish social environments conductive to health in a larger scale or nationwide. It was after the New Medical Reform initiated in 2009 that China turned to the right direction in NCDs control. By adopting a policy priority strategy, building a policy supportive social environment for NCDs control and embarking a series of nationwide interventions, the all-cause and NCDs mortality were rapidly decreased in the whole country.

China experience in NCDs control provides references for other low and middle income countries (LMICs), which may include: 1) integrity NCDs control into primary health care and build a control pattern based on grass roots institutes; 2) understand epidemic of NCDs and related risk factors through surveillance surveys; 3) legislation to decrease exposure to NCDs-related risk factors at population level; 4) select optimal measures and techniques to prevent NCDs; 5) focus on primary prevention of NCDs, particularly by health education and health promotion.

China should take advantage of its rich experience in NCDs control to play an important role in multilateral governance of global health to achieve the SDGs. The policy makers in China have recognized that the priority of China in global governance of NCDs is to decrease the diseases burden in domestic by improving NCDs control system, and then

to take the responsibility as a “big country” to involve and lead global health governance by sharing China experience in policy making and health reform in NCDs control with other LMICs, providing assistance in techniques, personnel and substances to other LMICs, and thus improve their ability to deal with the emerging waves of NCDs.

(2) HIV/AIDS

The present study focuses on the experience of AIDS prevention and control in China and the role and development strategy of China in the global AIDS prevention and control in the post-millennium age. Based on the systematic-analysis and review of the AIDS epidemic in China since 1985 and the transformation and development of the prevention and control policy, we analysed the challenges on application of China's AIDS prevention and control strategies in the world, especially in limited resources countries, and proposed the potential role of China in the post-millennium global AIDS prevention and control, the contribution it should make and the corresponding global development strategy, via using the literature review, the expert interview and the social epidemiological analysis method. The summarized Chinese experience in the HIV/AIDS prevention: it can utilize the advantages of our socialist system and the timely prevention and control strategies based on profound analysis of the epidemic under the condition of limited resource, including the attention of government leaders, government-led multi-sectoral effective cooperation, the wide participation and coverage of the national public health service system, and disease prevention and control system, to effectively control the transmission and spread of HIV/AIDS. We put the HIV/AIDS prevention as an important national issue, the government organized actively, the whole society participate, utilize the role of non-governmental organizations in AIDS prevention and control, strengthen the construction of AIDS surveillance network and expand the discovery and treatment of people living with HIV /AIDS and emphasize ART as key strategy for both treatment and prevention in particular.

(3) Tuberculosis

Researchers used a systematic way to search in the Chinese and English databases for all relevant research studies, policy documents, program evaluation and statistic data about tuberculosis strategy in mainland China, which were published in English or Chinese from 2001 up to the search date. Researchers also used individual interviews of key stakeholders, including Chinese national and provincial policymakers and practitioners.

Experience of TB control in China: 1) High-level political commitment and full implementation. 2) Developing free policies, introducing incentives. 3) To carry out intensive health promotion and broad mobilization of social members. 4) High-performance of TB surveillance with improving the epidemic registration system. 5) Strategies and approaches to improve access and early diagnosis of TB. 6) Cooperation mode between general hospitals and tuberculosis dispensaries on tuberculosis control. 7) Implementation of the new “trinity” tuberculosis prevention and control model, consists of CDC, designate TB hospital and community health services centre. 8) Development of specific strategies controlling multidrug-resistant tuberculosis. 9) The management strategy of floating population and its effectiveness.

Suggestions for other countries and SDGs：1) The establishment of a sound TB control service system is an important condition for the standardized management of tuberculosis control. 2) The reduction of treatment costs from policy and the provision of standardized services are important guarantees to improve the discovery rate and cure rate. 3) Passive discovery supplemented by active detection of high-risk groups. 4) Human resources of primary health care is the guarantee of achieving policy objectives. 5) Different control systems should be put forward for different modes of TB transmission.

(4) Tropical disease

This study focuses on the similarities and differences between Chinese and African schistosomiasis control strategies, and summarizes the successful experience of schistosomiasis control in China and its possibilities for Africa regions. The obstructions for the prevention and control of schistosomiasis in Africa are as follows: 1) lack of strong policy and financial support; 2) lack of sound health care system and low coverage of chemotherapy; 3) unitary schistosomiasis control strategy.

For the problems and difficulties encountered in the prevention and treatment of schistosomiasis in Africa, China's schistosomiasis control strategies and measures have the following points for African countries to learn from: 1) strong government policy and financial support. Schistosomiasis prevention and control is a systematic project involving multiple departments, therefore, the government should coordinate the resources to ensure the integral, comprehensive and synchronous implementation of various schistosomiasis prevention and control measures. 2) Establishment and improvement of the primary health care system. Strengthening the capacity building of grassroots health services, especially the grassroots schistosomiasis prevention and control institutions, should be the focus of African countries to enhance the ability of schistosomiasis prevention and control. 3) Comprehensive prevention and control strategies tailored to local conditions. Distribution and epidemic intensity of schistosomiasis are heterogeneous across periods and regions. Schistosomiasis mansoni and Schistosomiasis haematobia are widely distributed in Africa. Central and West Africa have limited Schistosoma intercalatum distribution. The intermediate hosts, biomphalaria and bulinus, are water snails, control strategies can be focused on expanding the coverage of chemotherapy, supplemented by snail control in endemic areas. 4) Monitoring and phased assessment. Monitoring and assessment of the implementation of preventive measures on a regular basis is the key to use the latest evidence to continuously improve the control strategy. 5) International cooperation and assistance. African countries should take advantage of international assistance while shelving ethnic and national contradictions. Together, they should learn advanced techniques and experience for the prevention and control of tropical diseases, including schistosomiasis. In this way a benign circle can be formed to promote human health.

(5) Maternal and child Health

This study focused on safe abortion issues. Through literature review and case analysis, we summarized the domestic and international experience and lessons, which include: first, the successful implementation of legislation can guarantee the safety of abortion. Secondly, by providing free contraceptives to lower the threshold for getting contraceptive, to meet the need of majority for contraception. Third, through the post abortion program to improve the utilization of contraceptive methods and reduce repeated abortion. Of course China also have some lessons, such as the policy goal from

the beginning should pay attention to health and not pay attention to population control; the main participants of China contraceptive services are married and childbearing age women, so that there is a huge unmet need for young people. The universal accessibility and legalization of artificial abortion in China make the contraception convenient, and at the same time the lack of consultation leads the problem of high repeated abortion rate. Due to the family planning service system is independent, hospital system cannot obtain free contraceptives, which makes the contraceptive management in hospital is unavailable. It affected the fairness of contraceptive services in hospital. On this basis, policy recommendations for China and other countries to achieve SDG include: first, by strengthening the coverage of post-abortion care and contraceptive services to further reduce the repeat abortion rate in China and improve the accessibility of contraceptive services to all people, especially those unmarried childbearing people. Secondly, actively participate in the global action to promote women's reproductive health through safe abortion, share China's experience and lessons learned in the process of safe abortion policy, as well as that safe abortion policy must advance with family planning policies and reproductive health services, with other countries. Thirdly, to assist middle and low income countries to cultivate family planning technicians and management personnel. Fourth, provide contraceptive products and application packages being able to meet the international standards for the middle and low income countries. Fifth, support global health implementation projects on contraception promotion and safe abortion.

(6) Child Malnutrition

This research mainly focused on child malnutrition, and analysed the situation of global child malnutrition and specific country cases through literature review. The improved nutrition outcome of child under 5 years old in China was among the best in the world, most indicators of child malnutrition were significantly lower than other developing countries. In improving child malnutrition, China had mainly taken two approaches, one was through the development of a series of relevant laws and regulations and programmatic documents of child development, the other was to carry out extensively nutrition interventions and dietary behaviour change interventions for children, some nutrition interventions were implemented for nutrition surveillance of children at the national level. Research on child nutrition policy showed that the implementation of child nutrition policies requires the absolute support of the government and coordination between health department and other social development. It is suggested that in order to achieve SDG recommended actions included: 1) confirming the strategic importance of improving child malnutrition in global development. 2) Establishing cooperation framework and implementation mechanism at all levels of departments to supervise and ensure the effective implementation of policies. 3) Integrating the child malnutrition improvement policies into the overall social development policies to achieve the goal of coordinated development. 4) Strengthening the implementation of health and health management measures at all levels, including child nutrition monitoring, healthcare, etc. 5) implementing various child nutrition special actions to improve the overall level of child malnutrition.

(7) Essential drug system

This study was mainly focused on improving essential drug system in China, and therefore globally promoting the availability, affordability and rational use of essential medicines. The method of systematic review was used in the study. Literatures about the design and practice of essential drug system in typical countries were collected for

summarizing experiences. Policies and literatures about the progress and effect of essential drug system in China were retrieved to summarize the defects and experiences of Chinese system. Meanwhile, two cities in China and India—Shaanxi province and Delhi—were compared by using secondary-data analysis. The data was investigated using a standard methodology developed by World Health Organization (WHO) and Health Action International (HAI).

Results: (1) The practice in China illustrates that implementing National Essential drug system is a valid approach to improve the availability and affordability of essential medicines. (2) A comprehensive Essential drug system must be accomplished with the guidance of strategic planning. Not only the management of essential medicine list, but also supporting policies for the manufacturing, distribution, utilization, pricing, reimbursement, quality assurance and monitoring and evaluation of essential medicines should be contained. Meanwhile it must be coordinated with other reforms.

Strategies for the improvement of National Essential drug system are as follows. (1) Scientific selection of essential medicines. (2) Standardizing supply and distribution segment. (3) Improving and establishing a unified drug quality standard system. (4) Assessing reimbursement reasonably and optimizing reimbursement mechanism. (5) Implementing approval on imitating patent medicines learning from the experience of medicine compulsory approval system in India to reduce drug price. (6) Establishing a platform where retail pharmacies and hospitals can compete fairly. (7) Enhancing the publicity of National Essential drug system; strengthening training for standardization of diagnosis and treatment. (8) Establishing a system to monitor price and availability essential medicines learning from the standard methodology developed by World Health Organization (WHO) and Health Action International (HAI).

(8) Smoking

This study focuses on an important public health issue of tobacco prevention and control, and compares the tobacco epidemics and control measures among China and other Asian countries as well as BRIC countries through literature review, qualitative interviews and SWOT analysis. On that base, the study makes a comprehensive analysis on challenge and opportunities of China's tobacco control. A review of domestic research within past decade showed that most tobacco control studies were limited to cross sectional surveys and only a small part of them were intervention studies. Therefore, innovative research is very inadequate.

The study integrates the result of SWOT analysis into expert interviews and suggests policy recommendations for millennium development which also serves as reference for other countries. Recommendations includes: promoting national smoke free legislation; implementation of tobacco graphic warnings as soon as possible; adjusting the tobacco industry and tobacco control compliance system; encouraging alternative cultivation; involving smoking cessation treatment in the basic medical and health services; establishing a new mode of tobacco control communication and building the smoke free culture.

(9) Climate change

This subproject was designed to summarize the characteristics and policies that were helpful to address the health risks due to climate change in Chinese cities, and to develop the coping strategies for the post- Millennium Development Goals. The

followings are the helpful experiences and policy recommendations summarized by virtue of systematic literature review, meta-analyses, expert consultation and policy scenario analysis. First, when a heat wave or cold spell is coming, meteorological departments should increase the intensity and accuracy, health sectors should be well prepared for any emergency; noteworthy is that the health effects of a heat wave can last for 3 days and the health effects of a cold spell can last for two weeks. Second, it deserves consideration that central heating might be expanded to some places and advanced in time to reduce the cold-related disease burden. Third, the expansion of urban landscaping can effectively alleviate the health hazards associated with high temperatures (heat waves, etc.). Fourth, the elderly and low-income populations should be especially protected from the health hazards of climate change by virtue of feasible health resources, higher access to air conditionings and nutrition subsidies. Fifth, those measures to reduce greenhouse gas emission can produce health co-benefits through the improvement of air quality, consequently increasing the cost-effectiveness of carbon emission reduction policies; among various policies, the health co-benefits of improving the usage of clean energy (such as natural gas) and levying carbon tax are appreciably larger than those of improving energy efficiency.

In addition, the policy recommendation for other developing countries and for the post-Millennium Development Goals includes: (1) to intensify the visit, monitoring and supervision in climate change and public health; (2) to improve the capacity building to adapting climate change, and to expand the financing to addressing climate change in health sectors; (3) to conduct systematic health benefit assessment on various policies aiming to mitigate climate change, and to improve the multi-sector cooperation, especially with health sectors, in formulating climate-related policies.

1.2 Research on global health system (WP1-R2)

WP1-R2 focuses on the participation of developed countries, international organizations, newly emerging countries and international NGOs in global health policy development and governance, their capacities and its implication for China. The research methods including desktop research, literature review, Delphi expert interview, qualitative interview and onsite visits (e.g. attending international conferences or symposiums, academic visits and attending international or national level donation meetings) were employed in this part.

(1) The role of emerging countries in global health governance: Experience from Brazil, India, South Africa and Russia

This research focused on the experience of four emerging countries (Brazil, India, South Africa and Russia) in global health governance, aiming to provide reference for China' global health strategies. To collect information about their global health experience, we searched through bibliographic databases, relevant international organizations, website and expert consultation.

The four countries presented their own styles and roles. Brazil has relatively perfect global health diplomacy ideas, and established the national organization coordinating all the global health activities. In addition, it emphasis on health soft power, and intends to gradually achieve the leadership through norm guidance and idea influencing. India is oriented to satisfy the demands from recipient countries; it gives the priority to bilateral cooperation and respects the autonomy of recipient countries, cooperating with the recipient countries closely. Meanwhile, characterized by affordable drugs and vaccines,

India helped decrease drug prices in the international market; it emphasis on the training of local health workforce, health system strengthening, and health information technology. South Africa made efforts to improving health nationally, and health rights groups have also taken the important function in diseases prevention and global health policies. With attention to common development, it promotes the establishment of the African regional alliances for health. Russia attaches great importance to the multilateral relationship and long-term project, and flexibly makes use of all available opportunities to take participate in global health.

Inspiration to China: 1) blending global health into national diplomatic idea, and building global health diplomacy idea and policy consensus; 2) building inter-sector organization to manage and coordinate global health activities; 3) actively pursuing to be global leaders of technology and standards in the global health areas with rich experience, to advocate and promote relevant technical alliance and consensus; 4) changing from financial assistance to experience and technical cooperation, and carefully screening and promoting Chinese practice; 5) emphasis on cooperation between government and enterprise, and outputting health related products, technology and services; 6) focusing on the training of local health workforce and the health system strengthening, according to the demands of recipient countries and health system features,; 7) advocating global health issues based on the existing diplomacy platforms; 8) strengthening regional cooperation in global health field to realize common development.

(2) Developing countries：Decentralizing the provision of antiretroviral therapy to people living with HIV/AIDS in Vietnam

In light of the challenges facing HIV/AIDS prevention and control in country, and scale-up plans for ART services in regard of the significant decrease of donor resources, there is an urgent need for Vietnam to identify strategies to optimize the existing health system, and to transition to efficient government-led system with financially sustainable orientation. Decentralization of ART services comes as a remarkable strategy for ART services' scale-up towards sustainability. As the decentralization of HIV/AIDS care and treatment has been started in Vietnam since 2011, this study aims to examine the treatment outcomes of decentralized antiretroviral therapy services in 2015.

This study applied the quantitative method with retrospective data collection to gather secondary data available at service facilities and Provincial HIV/AIDS Centres (PACs) in Ninh Binh and Dien Bien provinces. Aggregate data is manually collected by health facility staff and will be used in this study as secondary. Reports of districts and provinces will be collected for the study purposes. Secondary data available at out-patient clinics (OPCs), PACs and commune health station (CHS) were collected using designated forms on treatment outcomes which would be compared duration between time points (6-month and 12-month after the ART initiation) between patients decentralized to communal level and patients at OPCs (non-decentralized patients). In order to evaluate treatment outcomes of patients in 2 provinces, the research team extracted data from all patients started ARV in 2013 – 2014 and were followed-up them at 6-month and 12-month time points. In total, there were total 1.106 patients were included (821 patients in Dien Bien and 285 patients in Ninh Binh).

Decentralization of antiretroviral therapy services brought better treatment outcomes for patients such as higher first line retention rate (97.1% vs. 84.6%, $p<0.05$ at 6-month

time point; 96.8% vs. 70.1%, $p<0.05$ at 6-month time point), average CD4 count (406 vs. 376, $p<0.01$ at 6-month time point; 442 vs. 409, $p<0.01$ at 12-month time point. Besides, the findings also showed the lower fatality rate among decentralized patients in both provinces (0.6% vs. 10/4% at 6-month time point; 1.1% vs. 11.6% at 12-month time point).

Healthcare providers from both provinces, especially those of PACs and CHS, showed a strong commitment to HIV/AIDS decentralization was the key advantage. The findings showed that the patients surveyed perceived HIV testing at CHS to be convenient and time-saving and they reported that the health care workers had a friendly attitude. The patient decentralization fills a gap in case management and service delivery in remote and mountainous communes where many people are very poor. However, the findings also showed that challenges for decentralized antiretroviral therapy services are stigma, unqualified staff and lack of evidence in of long-term treatment.

Significant treatment outcomes were shown with decentralization of ART services. However, in order to sustain of ART service quality at commune health stations, it needs of enhancing capacity of lower level staff for CD4 testing or developing mechanism and more evidence in 24-month time point.

(3) International experience and reference on CSOs and global health
The Civil Society Organizations (CSOs) have been playing an important role in the field of global health, which also represents a channel for countries' international experience. Through methods including literature review, thematic content analysis and interviews, this research focuses on the role of CSOs in global health, their governance tools, global health program management experience, and current status of development for Chinese CSOs. In light of international experiences, we suggest the Chinese government to support a few top CSOs to engage intensely in global health, build management and cooperation mechanism with CSO which will be considered as important complementary role. The government should attach more importance to the government-owned and affiliated and private-capital-supported (social elites) CSOs, guide and subsidize them to the international stage, to engage intensely in global health.

1.3 SWOT analysis of China's global health capacity and strategy (WP1-R3)
(1) China's Engagement in Global Health: Research on International Perceptions of Global Health and Chinese Medical Team Program
China has made the rare transition from aid-recipient to aid-donor, and in doing so has steadily increased its contributions to global health over the past few decades. While much has been written about China's health aid, little attention has been given to how this aid is perceived by the international community. This report provides an overview of China's major contributions to global health, outlines China's emerging participation in global health governance, and examines the effectiveness of China's health aid as perceived by the international donor community.

A review of the literature conducted to provide information on China's engagement in global health revealed a limited number of diverse perceptions from the international community on China's current activities and role in global health. To supplement the literature, in-depth, semi-structured interviews were conducted with global health professionals attending a conference in China. In addition, members of the international

community, local Tanzanian doctors, and the CMT leader in Tanzania were interviewed during a one week visit to Dar es Salam.

Responses from these interviews provided valuable insight on China's place in the international realm of global health and identified future opportunities to strengthen China's position in the global health arena. These included: continued South-South collaboration to develop strategic health agendas in low and middle-income countries (LMICs); increased support to Chinese universities to enhance their global health research and education activities and to enable them to strengthen the global health research and education capacity of LMIC universities; increased focus on capacity building within the CMT program to strengthen local health systems; enhance global, regional, and in-country collaboration between China and other donor countries to raise China's visibility in the international community, develop strategic relationships, and accelerate health aid projects; continue engaging Chinese public and private sectors in health aid activities to expand China's involvement in global health and better meet the needs of communities; and include global health in the development of the Belt and Road Initiative, taking advantage of this new infrastructure and framework to improve the health of populations affected by the initiative.

Better understanding of the international global health landscape and increasing China's participation in this community will serve to strengthen China's position in global health governance and improve the effectiveness of its already impressive health aid agenda.

(2) The SWOT analysis of global health capability of China

With the accelerating process of globalization, human should pay more attention on serious challenges of global issues. In the background of globalization, the worldwide community change priorities from traditional security to non-traditional security. The seriousness of global issues deeply raises the recognition and concern about the non-traditional security threats. And it highlights the urgency of global governance. Health governance is a necessary component of global governance. Nations take actions to solve the global health issues. It is not only the national responsibility, but also a part of national soft power. This paper studies the evolution of Chinese diplomatic policy, global health capability and strategy plan, offering suggestions for the future formation of Chinese global health strategy. The study aimed to introduce the development of global health and global health diplomacy. Mainly discussed in the area of Chinese foreign assistance and global health security. And analyze Chinese capability and strategy plan of the global health under the environment of Chinese socioeconomic and diplomatic policies. Based on the SWOT analysis, proposing suggestions for the establishment of future global health strategy of China.

The SWOT analysis include four aspects: strength, weakness, opportunity, threat. Integrating the current global health diplomatic position and characterize of China into two analysis perspective of strength opportunity and weak threat. Based on the organization structure, development and feature of strategy levels, summarize above perspective of main strength opportunity and weak threat.

Through fifty years' efforts, China has undergone a gradual transformation from a recipient nation of foreign aid to a donor nation. The health diplomacy transform its type from single to bilateral, multilateral and international collaborate etc. It forms a

multilevel, multi-position health diplomacy. There are success and strength, but also failure and challenge in the process since decades. Ultimately the study provides a series of prospective measures on global health capability and strategy plan of China: Clarify the position of health diplomacy, form a global heath strategy which conform to the national planning; Confirm the cultivate mechanism and path, accelerate the export of compound talents; Establish an integrate organization structure of Chinese health diplomacy, and clear orientation of specific function.

2. Activities on knowledge dissemination and capacity building through training programs (WP2)

2.1 Global health knowledge dissemination (WP2-K1)

Dissemination of WP1 outputs to governments (policy makers), national and international global health institute, related researchers and other stakeholders through various channels.

(1) Website

As one of activities for the dissemination of global health knowledge, the project team had thought about the frame and position of website in the context of the whole program since 2014. The professional website engineer was involved into the design and development of this website which focused on the core activities of this program. In November, 2015, the website had worked online at http://www.ghsp.fudan.edu.cn/. The website named as “China-UK global health support program in Fudan University -Centre of excellence in global health policy development and governance in China”. It included 5 sections: a. The first section of the program homepage presented a brief on the background, aims, main activities and outputting of this program. b. The second section of the program process focused on the core activities, international academic exchanges and other activities on global health such as OP102 and OP302 in our school. c. The third section of the program outputting showed the outcomes and paper to improve the dissemination of global health knowledge. d. The fourth section of the shared information posted all notices on the meeting or training program from this program and other global health programs. e. The fifth section of team members introduced the main researchers with the picture and words, which may improve the network of the scientific and teaching researchers on global health.

Our team members and the website engineer upgraded and improved the contents on our website timely. They always followed up, collected, filed and republished that hot information on global health from the important websites such as union nation, WHO, National Health and Family Planning Commission of China, Chinese Centre for Disease Control and Prevention, and helped to share that information to our visitors. All notices on the activities from this program and other global health programs were published at our website in time. Also, the activities and outputting such as manuscripts, brief policy and meeting reports were shared timely with the online format at our website. The important information including training projects listed obviously at our website. All working helped to enlarge the role of our program on the global health communities.

In 2016, our team developed a questionnaire, to improve its attraction and quality, on the first version of our website, and interviewed experts in the related fields. After the evaluation of its style, contents, attentions and etc., all experts did very positive responses on our website including richer contents, reasonable frame, timely updating and better information on global health. However, experts suggested that some details should be improved in the website design and did more on the dissemination of this

website. So we published more information on global health from other programs and Chinese public health to enrich the website of the second version. So far, our website is defined as the part of our program and focused on the dissemination of the governance for global health around our program tightly, which will improve the impacts of our website.

(2) Publication

The project team documented every research outputs and materials related to global health policy development and governance and disseminate them by publication. By the end of the project, 29 papers were published, including 7 SCI papers and 22 papers published on Chinese authoritative journals. See more details in Table 3. In addition, one article based on one of our research projects was published on Chinese Science News and our project team members authored one textbook listed in the Thirteenth Five-year plan of China's National Health and Family Planning Committee *Environment and Global Health*.

Table 3 List of publication

Title	Journal name	Publication information	Author name
Ambient air pollution, temperature and out-of-hospital coronary deaths in Shanghai, China	Environmental Pollution	2015, 203: 116-121	Dai J, Chen R, Meng X, et al.
Associations between size-fractionated particulate air pollution and blood pressure in a panel of type II diabetes mellitus patients	Environment International	2015, 80: 19-25	Zhao A, Chen R, Wang C, et al.
Genetic diversity of the Mycobacterium tuberculosis Beijing family based on multiple genotyping profiles	Epidemiology and Infection	2016, 144(08): 1728-1735	Liu Y, Wang S, Lu H, et al.
Lifestyle factors associated with childhood obesity: a cross-sectional study in Shanghai, China	BMC Research Notes	2015, 8(1): 6	Li L, Shen T, Wen L
Size-fractionated Particulate Air Pollution and Circulating Biomarkers of Inflammation, Coagulation, and Vasoconstriction in a Panel of Young Adults	Epidemiology	2015, 26(3): 328-336.	Chen R, Zhao Z, Sun Q, et al.
Socioeconomic Status and Physical Activity in Chinese Adults: A Report from a Community-Based Survey in Jiaxing, China	PLOS ONE	2015, 10(7): e132918	Chen M，Wu Y，Narimatsu H 等
The acute effects of outdoor temperature on blood pressure in a panel of elderly hypertensive patients	International Journal of Biometeorology	2015, 59(12): 1791-1797	Chen R, Lu J, Yu Q, et al.
International experience and reference on NGOs and global health	Chinese Health Policy	2016, 9(11):1-4	HOU Zhi-yuan, YAN Fei
Study on the roles of NGOs in global health	Chinese Health Policy	2016, 9(11):5-10	QIAN Yi, WANG Wei, ZHANG Ming-ji, et al.
Research on the governance tools of international NGOs participating in global health	Chinese Health Policy	2016, 9(11):11-17	GUO Min-lu, QIAN Yi, ZHANG Ming-ji, et al.
Government orientation and cooperation with NGOs in global health sector: Example of WHO, US and UK	Chinese Health Policy	2016, 9(11):18-23	HOU Zhi-yuan, LIN Sen-lin, ZHANG Ming-ji, et al.
Experience and references from typical international foundations in global health projects management	Chinese Health Policy	2016, 9(11):24-30	WANG Yong-yi, HOU Zhi-yuan, ZHANG Ming-ji, et al.
Analysis on the development strategy of the Chinese global health NGOs	Chinese Health Policy	2016, 9(11):31-39	ZHANG Ming-ji, HOU Zhi-yuan, QIAN Yi, et al.
Review on interventions and practice of tobacco control in China, 2006-2015	Journal of Environmental and Occupational Medicine	2016, 33(05): 461-465	HUANG Xin-yuan, ZHENG Pin-pin
Health economic evaluation of cancer screening	China Caner	2016, 25(02): 81-87	WU Fei, LIU Xiao-yu, ZHAO

Title	Journal name	Publication information	Author name
			Gen-ming, et al.
Summary of domestic and international smoking control legislation in public places	Chinese Journal of Health Education	2015, 31(10): 964-968	ZHU Zi-yan, ZHENG Pin-pin
Research progress on broad smoking rationalization	Chinese Journal of Health Education	2015, 31(12): 1168-1172	HUANG Xin-yuan, FU Wen-jie, ZHENG Pin-pin
Implementation of precision control to achieve the goal of schistosomiasis elimination in China	Chinese Journal of Schistosomiasis Control	2016, 28(01): 1-4	ZHOU Xiao-nong
Health economic evaluation of common NCD control strategies and interventions	Chinese Journal of Prevention and Control of Chronic Diseases	2015, 23(11): 865-869	LIU Xiao-yu, MO Miao, ZHAO Gen-ming, et al.
Successful NCD control cases in China and their implications	Chinese Journal of Prevention and Control of Chronic Diseases	2016, 24(03): 169-174	LIU Xiao-na, ZHAO Gen-ming, XU Wang-hong, et al.
History of China's NCD prevention and control	Journal of Public Health and Preventive Medicine	2015, 26(02): 79-83	LIU Xiao-na, ZHANG Hua, ZHAO Gen-ming, et al.
Research advance on health effects of second-hand smoke exposure in occupational groups	Journal of Environmental and Occupational Medicine	2016, 33(04): 403-407	HUANG Xin-yuan, ZHENG Pin-pin
China's experience on children malnutrition interventions	Chinese Journal of Child Health Care	2015, 23(07): 724-726	GUO Jun-fei, HE Geng-sheng
Review on China's post-abortion healthcare service delivery and its effect	Maternal and Child Health Care of China	2015, 30(32): 5717-5721	YANG Wei, LI Yang, WANG Sha-sha, et al.
Systematic review on the interventions in adolescent sexual and reproductive health in China	Chinese Journal of School Health	2016, 37(08): 1239-1243	CHEN Meng-qi, JIANG Hong, TAN Hui, et al.
Comparative analysis of NCD control strategy in China and Japan and its policy implications	Chinese Journal of Prevention and Control of Chronic Diseases	2016, 24(08): 593-596	XU Wang-hong, ZHANG Yong, WANG Ji-wei, et al.
Integration of spatial epidemiology and molecular epidemiology used for study on tuberculosis	Chinese Journal of Epidemiology	2016, 37(12):1684-1687	CHEN Wen-ming, ZHOU Qing-rong, MAO Hui-shu, et al.
Cause analysis of current situation of drug quality in China	China Health Resources	2015, 18(4):239-243	GU Min-na, YE Lu
Analysis of MSM population HIV/AIDS monitoring data in Taizhou during 2010 to 2013	Chinese Journal of Disease Control & Prevention	2014, 18(12): 1140-1142	WU Qiong-hai, LIN Hai-jiang, XU Yuan-yuan, et al.

(3) Organization of international conferences
We organized the 2014 High-level Dialogue between China and UK in Global Health with the attendance of policy makers, researchers and health professionals from the UK, China and other countries. All the attendees presented their research by conference speech, oral presentation or poster presentation and displayed the value of their research to global health policy development and governance in different countries and regions.

(4) Travel grant for two young researchers to attend global health conference
We offer travel grant for young researchers (assistant professors, lecturers and below) from developing countries and middle and western part of China to attend international global health conferences and meetings. Two young researchers were granted by the project. See more details in Table 4.

Table 4 Travel grant for two young researchers to attend global health conference

Name and institution	Conference name	Title of presentation
XIE Hui-lin, Xinjiang Medical University	Consortium of Universities for Global Health (CUGH) 2015 Meeting in Boston, the U.S.	
Nguyen Hoang, Hanoi School of Public Health, Vietnam	the 22nd Canada Global Health Conference in Montreal, Canada	Human resource in Health in low income settings: Lessons learnt of global health approach in Vietnam (poster presentation)

(5) International dissemination
These series of activities aimed to disseminate the knowledge and experience from OP302 project through conferences and forums including World Health Assembly, related international academic meetings, Forum on China-Africa Cooperation and Forum on BRICS Countries. Such international dissemination activities also helped the capacity building of the attending researchers. See more details in Table 5.

In addition, the core members of the project team conducted onsite visits to Kenya and Tanzania supported by the project sponsorship after 3 months' preparation. Fudan School of Public health had no formal cooperation relationship with any institutions in Africa, which made the visits even more meaningful. Kenya and Tanzania were selected as the target destination in consideration of the country's universities development, the Belt road strategy plan and local condition. Six professors from Fudan School of Public Health in the field of global health, healthcare management and health technology assessment, nutrition and health, maternal and child health, infectious diseases and chronic diseases, led by the deputy dean Professor. Yingyao Chen, visited University of Nairobi in Kenya and Muhimbili University of Health and Allied Sciences in Tanzania. The professors from Fudan School of Public Health introduced the outputs of the OP302 project and exchanged views on China's experience in global health and its value for African countries with researchers and teachers from the two African universities. The onsite visit provided the opportunity for the project team members to develop a deeper understanding of the local conditions and the prioritized health issues in Kenya and Tanzania, which would be helpful to establish future cooperation with African universities and made specific health intervention measures.

Table 5 List of international dissemination activities

Conference name	Attendees	Content of presentation
2015		
Forum on China–Africa Cooperation, Beijing	Four project team members (Yingyao Chen, etc.) from Fudan University	
Consortium of Universities for Global Health (CUGH) 2015 Meeting in Boston, the U.S.	Jiayan Huang, Fudan University	
2016		
China's global health forum: utilization of the universities' strength (organized by University of Washington) in Seattle, the U.S.	YIngyao Chen, Fudan University	• Chinese University Partnerships with Low Income Countries: Fudan activities (oral presentation)
Symposium on global health strategy (organized by Harvard University) in Boston, the U.S.	Gengsheng He, Pinpin Zheng, Fudan University	• Introduction on Fudan Global Health (oral presentation)
Association of Pacific Rim Universities (APRU) annual meeting in Sydney, Australia	Three project team members (Wanghong Xu, Pinpin Zheng, etc.), Fudan University	• Experience and successful cases in non-communicable diseases control in China (Wanghong Xu, et al. oral presentation) • Why are Chinese smokers unwilling to quit? Association between smoking rationalizations and intention to quit among Chinese males through a cross-sectional analysis (Pinpin Zheng, oral presentation) • Spatial analysis on tuberculosis notification in Zhejiang Province, 2005-2014 (Weibing Wang, et al. oral presentation)
Global health summit (organized by University of Hawaii) in Hawaii, the U.S.	Jiayan Huang, Fudan University	• Chinese University's contribution to Global Health (oral presentation)

2.2 Global health training (WP2-K2)

Training is a good channel to disseminate helpful experience from developed or developing countries and better deal with global health issues.

(1) Training programs on global health practice

We have successfully organized 3 training programs, which generally last for 5 days, during 2014-2016.

The major content of the training program, delivered through expert teaching, case study and onsite visits, consisted of basic concepts in global health and related methods for global health research and practice. The outputs of WP1 of the OP302 project was introduced into the case study section. The trainers differed according to the training emphasis of each training program.

We invited senior professors in global health field from prestigious universities both from China and abroad, previous officials and policy makers in the United Nations and WHO and experts with rich global health practice from related research institutes to work as trainers in the training programs. During 3 training programs, over 40 professors, officials and experts gave lessons and 3 training textbooks were produced.

During the year 2014 to 2016, 256 researchers, government officials received the training course through these programs (Table 6), 178 of which came from universities and colleges, 47 were policy-makers and government officials at national and provincial level and the rest came from research institute, press and NGOs.

Table 6 Trainees in the training programs during 2014 to 2016

Working institute	2014		2015		2016		Sum	
	No.	Proportion (%)	No.	Proportion (%)	No.	Proportion (%)	No.	Proportion (%)
Universities and colleges	73	79.35	51	69.86	54	59.34	178	69.53
Administrative organizations	12	13.04	20	27.40	15	16.48	47	18.36
Research institutes	7	7.60	2	2.74	13	14.29	22	8.59
Others	0	0.00	0	0.00	9	9.89	9	3.52
Sum	92	100.00	73	100.00	91	100.00	256	100.00

Program evaluation was conducted among all trainees regarding training content, trainers, teaching method, program arrangement before the end of each training program (the evaluation form is attached in the Appendix). The evaluation results were referred to when deciding the trainers for the next training program.

Three textbooks were produced based on the materials of three training programs during 2014 to 2016. See more details on the GHSP online system.

(2) *Introduction to Global Health*, MOOC course

Massive online open course (MOOC) is an online course designed to be interactive. Apart from traditional course materials (e.g. videos, reading materials, exercises), MOOC is going to build an interactive online forum, which provides students, professors, teachers and assistants with a convenient communication platform. This is a very popular distance education method. MOOC challenges and subverts the traditional education mode, and its information-based knowledge sharing methods are bringing new inspiration to universities' integration and knowledge sharing. The rapid development of MOOC is based on the background of learning resource reorganization, helping learners discover their greatest potential, giving everyone who wishes to get access to courses and certifications in elite universities.

Course objectives

Through this course, learners will understand the history and relevant concept of Global Health, get familiar with global disease burden, health determinants, major global health issues and response strategies for global public health emergency events. This course is suitable for all learners. Regardless of the academic background and expertise, everyone can participate in this course.

Course content

This course has a total of 10 modules. It aims to improve the health status globally and achieve global health equity, focuses on cross-border health issues, promotes full cooperation between different disciplines and equal treatment for the health issues of population from different regions, economic levels and races.

In terms of Faculty, the course of "The Introduction of Global Health" is led by Wen Chen, Dean of School of Public Health, Fudan University, equipped with a strong group of leaders of faculties and lectures and senior professors in different disciplines.

Course progress and achievement

After the process of preparation, lesson production, platform approval, the course of Introduction of Global Health was completed as scheduled, and launched at the coursera platform and Chinese universities MOOC platform.

The course was officially launched on September 29th, 2016 at the coursera platform. Two and a half months since then, there was a total of 264 students with 4 paid students who had completed the course. Most of the students were from Asia and students from China accounted for 80%. They were all female students and their age range was between 18-34, none of the students were currently studying at school; regarding the academic level, 50% of students had a high school certificate and other half had a bachelor degree, they were all in the workforce.

The course was also officially launched on November 28th, 2016 at Chinese universities MOOC platform. By the end of the course on February 13th, 2017, there was a total of 4212 students. During the opening of the course "The Introduction of Global Health" occupied the homepage of the MOOC website. Students participated in discussions actively, some posts had 78 times replies and 400 times reviews. We could not get the profiles of students because the backstage management of the platform was able to provide the information

After the online launch of "The Introduction of Global Health", the course was well received by many students, some of them left messages like: "Hello teacher, I am very happy to follow the course from Fudan School of Public Health on Coursera, this course, the introduction of global health was very attentively designed, I can feel the hard work teachers have devoted into the course. The modules in the course constitute the systematic framework and important knowledge points in public health research, and these were suitable for beginners to get the hands on the whole system. I am a student currently studying for exams, and I am very grateful for the contribution and devotion of all teachers…" Other student left massage like: "Teacher's lessons are organized and easy to understand, equipped with paragraph and pictures, I am really grateful…" Another student said: "I like this course, at the beginning I just want to take a look at the teaching videos, a couple of times later I realize this is very important to us, On the one hand, this course provides me some professional knowledge on health-related subjects that I don't really know. On the other hand, I feel great improvement in knowledge through discussing with other students who have selected this course and the teachers who teach the lessons in the discussion post areas…"

We found that the use of MOOC platform had many advantages through nearly two months of online operation: for instance, the study form, students was able to not only study online through computer, but also on their mobile phone. Teachers was also able interact with students, In addition, we were able to conduct an online survey with robust data analysis ability. The editing of subjective and objective questions became easier and more powerful.

3. Activities related to improving capacities of policy consulting and influence (WP3)

Global health issues and challenges were prioritized to be discussed when the project team developed policy and technology briefs targeted at governments including National Health and Family Planning Committee (NHFPC) and Ministry of Commerce. We required these policy and technology briefs to fit the country's long-term development and foreign aid strategy. The policy and technology briefs were developed with the joint efforts from experts from both China and abroad.

3.1 Global health policy briefs

Policy brief is a brief summary of a particular global health issue targeting at government policy makers and other people interested in related policies, involving the corresponding policy viewpoints and comments for alternative dealing strategies. SPH/GHP policy briefs, consisting of information on health issues, China's global health policy and activities, global health research (including this project) and global health capacity building, are required to reflect the rapidly changing hot spot issues and academic rigour as well. The policy briefs also paid attention to new policy and policy improvement in global health from WHO, World Bank, the United Nations and different countries. See more details in Table 7.

Table 7 List of policy briefs

No.	Policy brief title	Authors
1	Evolvement and Implications of Non-communicable Diseases Control in China	Wanghong Xu
2	Implications of Non-communicable Diseases Control Practice	Fei Wu, Wanghong Xu

	in Japan for China	
3	Role of China in Global Governance of Non-communicable Diseases: Policy Recommendations	Wanghong Xu
4	A Brief Report of China UK Global Health Support Program "China's exploration on Post-Abortion Care"	Ji Liang. Yang Li, Xu Qian
5	Cross-border AIDS Prevention and Control in Dehong Prefecture, Yunnan Province, China	Na He, Tiejun Zhang
6	Obstacles and Suggestions on Tobacco Control in China	Pinpin Zheng, Xinyuan Huang
7	"Salt Reduction" in China: Practice and Policy Recommendations	Wanghong Xu, Xiaona Liu
8	Including NGOs in global health strategy with the help of international experience	Fei Yan, Zhiyuan Hou
9	China's tuberculosis control strategy and experience	Weibing Wang
10	Policy suggestions for China's scientific response to health risks caused by climate change	Renjie Chen, Haidong Kan

3.2 The Global Health Green Book

The multidisciplinary team composed by experts from domestic and foreign universities will collaborate to formulate a global health green book which aims to sum up the experience and lessons of China's engagement in global health governance, and put forward suggestions on the how to improve China's global health strategy in the changed global context, particularly the new role of China in the emerging global health issues.

In late March 2016, with the support from PMO and experts, the research team mapped out the generic framework and the outline of the green book. Later on, the project team members review all the project report as well as a wide range of literature on global health governance, and formulated the writing plan. The writing working started from July 2016, during which the research kept exchanging and discussing on the manuscript content and viewpoints. For example, in September, the research group members participated in the seminar named "China and Global Governance" held by School of International Relations and Public Affairs, and made a presentation of "China participation in global health governance: experience and strategy" basing on the preliminary content of the green book. At the end of October, the pandect chapter was drafted with core theoretical proposition on "national capacity centred global health governance". During November and December, the team was refining and improving view on the content of the book. On 15 December, an advisory workshop was held in Beijing, and the suggestion and recommendation from the expert were incorporated in the book. By the end of 2016, the contract of publish were signed with Fudan University Publishing Press.

The book entitled "Chinese experience and strategy in Global Health" includes 16 chapters. Basing on a variety case studies, the book summarizes the experience and challenges in China's

involvement in health governance, and how China will further improve the global health strategy. The Chapter arrangements include:

Pandect Section: This section proposes the essential perspective and recommendation on China's involvement in global health governance, basing on the perspective of "national capacity".

International Section: This section contains 4 chapters, including review on the global health strategies of BRICS countries, the particular role of civil society in global health, and national health strategy of central Asia countries and Vietnam.

China Section: This section contains 11 chapters, including case studies of Chinese health strategies and prospect toward SDG in various fields, such as Diseases Prevention, maternal health, climate change, and so on. This chapter also discusses the distinct role of Chinese Medical Team Program.

4. Activities related to team capacity building (WP4)

WP4 aimed to strengthen the fundamental capabilities of working staff in SPH/GHP and offer help when building a centre of excellence in global health policy development and governance in China. The project provided long-term (2-3 months) and short-term (2-3 weeks) overseas training opportunities for core project team members, especially young researchers, to participate in the daily work in overseas universities, WHO/WPRO and other international organizations or pay visits to developing countries in Asia, Africa and Middle and South America and BRICS countries. The training reports, working plans and summaries from these researchers help to lay a solid foundation for their future access to global health activities and practices.

Six researchers received long-term (2-3 months) overseas training and six received short-term (2-3 weeks) overseas training. See more details in Table 8.

Table 8 List of capacity building activities

Name	Training institution	Time
Long-term training		
Fang Huang, NIPD	University of Maryland, the U.S.	2015.3-5
Wenhui Mao, Fudan University	Duke University, the U.S.	2014.6-7
Suzhen Guan, Xinjiang Medical University	California State University, Northridge, the U.S.	2015.10-12
Tiejun Zhang, Fudan University	International agency for research on cancer (IARC), France	2016.9-10
Zhiyuan Hou, Fudan University	WHO West Pacific Office, Philippine	2016.8-10
Lijuan Zhang, NIPD	WHO headquarters, Geneva, Switzerland	2016.10-12
Short-term training		
Ji Liang, Fudan University	Duke University, the U.S.	2015.8.15-29
Zhiqiang Qin, NIPD	Visit to Philippine (including schistosomiasis research and training centre in Leyte Province, Agriculture department in Tacloban city, Department of Veterinary Services of the Philippine Ministry of Agriculture, Department of Disease Control and Prevention of the Philippine Ministry of Health and WHO office in Philippine, etc.)	2015.12.7-22
Wanghong Xu, Fudan University	International agency for research on cancer (IARC), France	2016.5.21-6.8
Jiayan Huang, Fudan Univeristy	World Bank Group headquarters, Washington D.C., the U.S.	2016.7.8-28
Fei Yan, Fudan University	GAVI, Geneva, Switzerland	2016.9.16-28
Shuai Huang, NIPD	WHO West Pacific Office, Philippine	2016.11.2-12.17

5. Project management (WP5)

The project team consisted members from 5 institutions from 3 countries being responsible for various types of work, which brought great challenge to project management. A series of effective project management and implementation promotion practice were developed to ensure the effective and efficient advancement of the project schedule.

5.1 Work division and agreements among cooperating institutions

Five cooperating institutions involved in the project implementation with 4 of them sharing 55% of the project funding. The multi-institution participation requires a good communication and agreement reaching process in work division, task supervision and output driving. In terms of work division, Fudan University is responsible for the comprehensive project management (i.e. WP5) and the five work packages is completed with the joint efforts of all five institutions. Four cooperation agreement were reached to clarify each institution's responsibilities, expenditure policy and output requirements.

5.2 Meeting system to ensure project implementation

We established a meeting system to ensure the implementation of the project. The first one is the annual project management meeting with the attendance of all cooperating institutions to provide comprehensive guidance and coordination for the whole project. The annual project management meeting schedule consisted of annual report of project progress, project management training, supervision of project outputs and discussion.

The second one is the regular meeting held every month. Project team members checked the monthly work progress, allocated new tasks, discussed to solve problems and overcome difficulties and promoted the achievement of work packages during the monthly meeting. The minutes of meeting were made and sent to all cooperating institutions after the meeting.
The minutes of the annual project management meeting and the monthly meeting offered evidence of project management and supervision and could be considered as milestones during the implementation of the project.

5.3 Communications with foreign cooperating institutions

The major communication channel with our cooperating partners in the United States and Vietnam was email and the annual project management meeting. Work package 5 (WP5) working staff were specifically responsible for the email communication to ensure the effective opinion exchange between Fudan University and foreign cooperation partners though problems in information exchange with our partners from developing countries occurred from time to time.

Appendix: Financial reports (Omitted)

OP401 Global Health Institute of Fudan University (FGHI)

Output 401 Overseas Pilot Project on Maternal and Child Health in Myanmar and Ethiopia
Final Report

I. Background

Since signing the cooperation agreement with the Capital Regulation Service Center of the National Commission of Health and Family Planning of PRC in June, 2015, the Global Health Institute of Fudan University, working with Marie Stopes International (MSI), and Kunming Medical University (KMU) , carried out the activities in the project plan and completed the targets set in "Mission Statement of the Intervention Pilot Projects to Improve the Health Level of Maternity and Child in the Low-Income Countries in Asia and Africa". The targets include: (1) Establish health development and cooperation relations with the governments and local international organizations (MSIE and MSIM) in the pilot areas in Ethiopia and Myanmar; establish foreign aid project partnerships with KMU; establish training cooperation with China Medical Team and China Foreign Aid Hospital in Ethiopia (Results: A cooperation agreement, an analysis report of the current state of the country, and an annual report of the project implementation). (2) The intervention pilot projects in Ethiopia and Myanmar have achieved gratifying results (Results: Ethiopia final assessment report and policy briefing; Myanmar final assessment report; completion and operation of the Advanced Midwifery Practice Center of China-Ethiopia Friendship Hospital; complete training materials and teaching plan courseware, etc.). (3) Through the implementation of the pilot projects, Chinese institutions and personnel have enhanced their ability to design, implement and manage health development cooperation projects (Results: Internal reference for the method exploration of personnel dispatch, basic research and equipment procurement; establishment and operation of three project offices; operation management manual of the Senior Midwifery Practice Center of China-Ethiopia Friendship Hospital, etc.) (4) Enhance the ability of cooperation institutes and government departments in the pilot countries through project supervision, inviting chief implementors to take training courses in China, on-site inspection and face-to-face discussion (Results: On-site supervision feedback, midwifery training report, minutes of project communication meetings, internal reference report of the three-party cooperation and exchange). (5) Chinese personnel learned how to design and manage health development assistance programs and carry out effective international cooperation through project cooperation and taking part in various training activities (Results: Project implementation plan, training activity report, etc.).

II. Progress Report

(I) Task Source and Expectation

This task came from the " Mission Statement of the Intervention Pilot Projects to Improve the Health Level of Maternity and Child in the Low-Income Countries in Asia and Africa ". The expected tasks are as follows:

Expected results:
1. Establish development-related partnerships between institutions of China and low-income countries.

2. Enhance the ability to effectively use Chinese practices and experience to improve women's and children's health level through intervention.

3. Strengthen the ability of Chinese institutions and their personnel to design, implement and manage through effective intervention in pilot countries.

4. Strengthen the capacity of the relevant cooperation institutes and government departments of the pilot countries.

5. Learn how to design and manage health development assistance projects and carry out effective international cooperation.

Expected results:
1. Project implementation and evaluation report, including analysis of the current situation of the pilot countries, policy review, and evidence on the effectiveness of China's assistance in improving women's and children's health in foreign countries.

2. Provide evidence-based policy briefings for Chinese policymakers and the international agencies interested in China's health development assistance.

3. Summarize the lessons learned in the process of cooperation and provide a reference for future improvements in the methods of designing and implementing health development assistance projects in other countries.

4. Invite government officials and policymakers from other developing countries to take part in the experience promotion workshops. Publish peer-reviewed articles on international journals.

(II) Main Implementation Contents as Determined in the Project Assignments

1. Promote the participation of China in the development of global health, with main results including (1) improve Chinese agencies' ability to work in low-income countries through personnel dispatch and on-site supervision; (2) improve the professional capabilities of Chinese employees to carry out research and health intervention projects in low-income countries through training and trial practice; (3) support China's global health development plan by recording and summarizing experiences and improving evidence.

2. Apply China's practical experience and encourage the women in the pilot areas to make more use of RMNCH, with main results including (1) improve the awareness and demand for RMNCH through the social mobilization; (2) improve the accessibility of RMNCH by strengthening the connection between communities and medical service institutions; (3) improve the quality of RMNCH by training and supportive supervision.

3. In cooperation with the Chinese Medical Team, Fudan University established the Advanced Midwifery Practice Center in China-Ethiopia Friendship Hospital in Ethiopia to help Ethiopia train midwifery teachers.

(III) Activities and Progress of the Project Plan

1. Sign Cooperation Agreements

The project started to be formally implemented in July 2015, and negotiating and signing a cooperation agreement was the first step to establish the health development partnership. After nine rounds of negotiation, Fudan University and MSI, the project cooperation application agency, signed the cooperation agreement in November 2015. Fudan University commissioned KMU to take on the task to inspect and evaluate the pilot project in Myanmar and signed a cooperation agreement in October 2015 after five rounds of negotiation. Fudan University invested in equipment, trained teachers, set up an advanced midwifery practice center in the Tirunesh-Beijing Hospital and signed a cooperation agreement in April 2017.

2. Launch the Projects

(1) Work on the implementation plan: The meeting was hosted by Global Health Institute of Fudan University, the implementing agency. Over 20 researchers from MSI China, MSI Myanmar, MSI Ethiopia, MSI Australia, Health Research Institute of KMU and Fudan University project team attended the meeting. The meeting determined the project outcome indicators, basic investigation scheme, implementation tool design, supervision methods and project management formula.

(2) Analyze the national conditions in the pilot areas: Present an analysis report on the national conditions of Ethiopia and Myanmar by reviewing the basic national conditions and the current state of the health systems in the two countries. The report covers the social, economic and health status, as well as the supervision, financing, manpower, equipment, information and service delivery status of the health service systems in the two countries, focusing on the health of women and children and reproductive health. In September 2015, the project team held an expert consultation meeting, conducting on-site counseling with local experts on health service systems and issues related to maternal and child health in Myanmar and Ethiopia, and putting forward relevant suggestions. Based on the literature search results and the expert consultation results, the project team members revised the national condition analysis reports of Myanmar and Ethiopia and completed the Myanmar National Condition Analysis Report and Ethiopia National Condition Analysis Report.

(3) Build project offices: The implementation of this project involves three project offices. The first office is the OP401 project office (i.e. Shanghai Project Office) set up in June 2015 at the Global Health Institute of Fudan University in Shanghai, which is mainly in charge of the daily management work, including communicating with the different parties of the project, coordinating the relations between the project offices and the implementing and cooperating agencies, supervising the progress and output, helping with equipment purchase and financial management work, supervising and dealing with emergencies, etc. The second office is the Kunming Project Office, which is responsible for the on-site supervision and evaluation of Myanmar piolet project. It was set up in October 2015 at the Health Research Institute of KMU. The third office is the Ethiopia project office, which is in China-Ethiopia Friendship Hospital.

The personnel have been sent over working here for some time (from April 2016 to July 2017) and the Working Regulations of the Project Office has been worked out (see details in the policy brief-- *Path exploration of Chinese University employees overseas to carry out health development cooperation projects*).

(4) Signed the Memorandum of Understanding for cooperation with the governments of the pilot areas in Ethiopia and Myanmar (MOU)

The on-site implementation cooperation agency MSIE completed the renewal of MOU with the government of Gonji Kolela County, Bahir Dar Province, Ethiopia in October 2015. Due to Myanmar's general election, MSIM's MOU renewal with the Hlaing Thay Yar government in Yangon, Myanmar had not been completed until July 2016 (see "MOU in the two pilot areas of the two countries").

(5) Baseline Survey

A local qualified consulting company completed the on-site data collection work for the Ethiopia baseline survey in March 2016. The team from the Global Health Institute of Fudan University analyzed the data and wrote a report on it. Research team described the current situation of the respondents including their basic situations, their utilization of the maternal and postpartum health services and of contraceptive services, their knowledge of reproductive health, etc. They also analyzed the geographic, economic, cultural factors and other possible influencing factors. It was found that of the 301 women surveyed, whose mean age is 28.6 years, 67.8% had no formal education, 28.2% had primary school education, and no one received junior college or above education; most of the respondents (91.4%) are farmers; the average family yearly income per capita is 1577.8 Ethiopia Birr (the median number is 1250 Ethiopian Birr). The average number of family members is 4.5 (the median number is 4). Of all the 301 respondents, 299 received antenatal checkup (ANC), with more than 62.5% of the pregnant women received 4 times or more ANC, which were mainly provided by health care centers. 83.4% of the women delivered at health care centers, while 9.6% delivered at home with the help of traditional midwives. The reasons of not using skilled midwives were as follows: 1) 79.5% of the women said there was no enough time to go to health care centers; 2) 33.3% ascribed it to traffic inconvenience; 3) only 2.6% said they could afford skilled midwifery. More than 80% of the respondents utilized Postnatal Checkup (PNC), with 33.6% received PNC twice and 21.3% received PNC for 3 times or above. 81 of the 301 respondents received PNC within 10 days after delivery. Family planning is a common practice at that place. 91.7% of the respondents used a certain method to prevent pregnancy. County health offices, health centers and health posts have specific staff to manage and provide reproductive, maternal, newborn and child health (RMNCH), record RMNCH-related indicators and make reports at different levels. In addition, county governments and autonomous neighborhood associations (street/community/village) pay close attention to reduce maternal, newborn and child mortality rates. Women health advancement division (HAD) which take family as its basic unit assists the community health extension workers (HEW) track/record/report the health conditions of pregnant women/newborn/children under the age of five, organize health education events, carry out health promotion activities, stimulate the utilization of RMNCH service. Key persons in the know all agreed that mobilizing community participation, raising awareness and training health service providers have played an important role in increasing the utilization of RMNCH service.

They also thought that the lack of ambulance in health posts, the lack of daily health administrative personnel and health service providers, the lack of supplies and equipment, and the interruption of power supply hindered the utilization of RMNCH service. They suggested distributing small gifts, such as towel, soap, pen, pencil and exercise book to attract local people to RMNCH service (see "Ethiopia's Baseline Survey Report").

Ethiopia Baseline Survey has following limitations: The sample consisted of 201 women from accessible communities and 100 women from hard-to-reach communities. The survey may not cover communities that are extremely hard to reach, so it may not represent the overall situation of the women in Gonji Kolela County. In addition, respondents needed to recall their utilization of the RMNCH service when they gave birth to their youngest child. The delivery may have happened long time ago, so their statements may not be accurate, especially when they were not asked in detail. Due to budget constraints, we only interviewed 9 key persons in the know, so our information may not be complete (see details in the policy brief-- A discovery on the cooperative mode of crowd health survey conducted by Chinese universities in low and middle income countries).

Due to the reform of Health Care Institutions and the long time spent on ethics application, Myanmar's Baseline Survey hadn't been completed until June 2017 by University of Public Health, Myanmar (UPH for short), the commissioned unit. The survey consisted of 307 questionnaires for women and 6 cases of personal interviews. KMU project office reviewed and translated the questionnaires on the site while conducting mid-term evaluation in Myanmar and completed data entry and analysis and wrote a report after returning to Kunming. Since the Myanmar project had started 8 months before the on-site survey was done, it is more appropriate to take this survey as a status quo investigation for the needs and utilization of the women in the pilot areas for the RMNCH service rather than a baseline survey.

The on-site survey was carried out by 6 male students from UPH in Yangon. It was planned to survey 300 mothers with children under the age of 1, with local people and migrant people accounting for a half respectively. In fact, 307 women were surveyed, including 156 local women and 151 migrant women, from 16 different places in the Lidaya County. The KMU team reviewed each of 307 completed questionnaires one item after another and determined that these questionnaires were basically accurate and reliable. However, since Lidaya County has a population of nearly 1 million, who live in legal or illegal buildings with different conditions, or in shabby sheds. They are of high mobility and have very complicated situations, so it was impossible to do random sampling, and thus the 307 women cannot be considered a representative sample of the county.

The survey has the following major findings: The average age of the 307 women is 29.81 ± 6.44 years, ranging from 14 to 46 years old. There was no significant difference between the average age of local women and that of migrant women, but the education level of the local women is higher than that of the migrant women; 67.9% of the local women and 74.8% of the migrant women are housewives and only 5.8% of the local women and 4.6% of the migrant women are factory workers. The average annual income of the surveyed women is $509{,}142 \pm 266{,}095$ kyats (the lowest is 34,000 kyats and the highest 90,000,000 kyats), equivalent to 2,546 yuan RMB, with the local women's income higher than that of the migrant women. These women have

2.13±1.46 children on average (ranging from 1 to 9) and the youngest child of 60.3% of the local women and 78% of the migrant women is under one year old. One of the main contents of the questionnaires is the utilization of the RMNCH service when these women were pregnant with and gave birth to the youngest child, so it basically reflects the usage of RMNCH service from 2016 to 2017. 90.5% of the women took ANC (that is, 98.1% of the local women and 82.7% of the migrant women. The difference is statistically significant). The average number of ANC is 6.05±3.03 (6.95±3.04 times for the local women and 4.96±2.66 times for the migrant women. The difference is statistically significant). 86.58% of the local women and 61.79% of the migrant women took over four times of ANC (the difference between the two groups is statistically significant); only 37.6% of the local women and 26.8% of the migrant women took their first ANC within the first three months of pregnancy (there was no significant difference between the two groups). 75% of the local women and 49.6% of the migrant women delivered their youngest children at the medical institutions while 44.4% of the migrant women and 5.1% of the local women delivered at home (the difference between the two groups has statistical significance). The most quoted reason for not delivering at hospital was that "there was no enough time". More than one-third of the migrant women said the reason was that they "couldn't afford it". A few women said they thought it was "more convenient to deliver at home" or "there was no need to deliver at hospital". Among the women who delivered at home, 74.6% of the migrant women and 37.5% of the local women were helped by traditional midwives, while 62.5% of the local women were helped by maternity assistants or midwives who had received professional training. The difference between the two groups has statistical significance. The average cost of delivering at hospital was 200,000±245,000 kyats (median), that is, 200,000±315,000 for the local women and 150,000±177,500 for the migrant women. The higher the institutional level, the higher the cost, with 50,000±50,000 Kyat (for local women) and 40,000±15,000 Kyat (for migrant women) at Countryside Health Care Division, the lowest level. 89% of the local women and 58.9% of the migrant women received one ANC (the difference between the two groups has statistical significance). The average number of ANC was 3.15±2.23 (3.33±2.48 times for local women and 2.85±1.71 for migrant women. There is no significant difference between the two groups). 69.05% of the 307 women surveyed took contraception measures (76.3% for local women and 61.1% for migrant women. The difference between the two groups is statistically significant). Most women took contraceptive injections (75.6%) and contraceptive pills (17.2%) and a small number of women used other contraceptive methods. The main reason for not taking contraceptive methods is "wanting to have children". About 14% of them has unmet demand for contraception. 80% of the surveyed women thought that they had received health education and consulting when taking the first ANC; 84.4% of the women reported receiving health education and consulting in the first PNC, while only 28.1% of the women (32.7% of the local women and 23.3% of the migrant women) reported receiving health education within a month before the survey, with the major source of information coming from medical workers, doctors, relatives and friends. For future health education, majority of the women hoped that they could make face-to-face communication with medical workers. Their second expected source of information was IEC materials (see the "Myanmar's Status Quo Survey Report").

3. The Implementation of the Intervention Pilot Projects

(1) Intervention Pilot Scheme

The intervention pilot scheme of this project is based on the "three-link strategy" of promoting

delivery at hospital, with a focus on strengthening the link between the communities and the health care institutions. The liaisons in Ethiopia were the HEWs and the HADs while the liaisons in Myanmar were assistant midwives (AMW). At the community and family level, this project took the method that had been successfully carried out in China, that is, removing the financial obstacles in hospital childbirth phase by phase and conducting social mobilization. In Ethiopia, we promoted the referral and rescue of high-risk pregnant women by providing poverty relief, while in Myanmar, we promoted standard ANC, hospital childbirth and PNC by offering cash subsidy. In terms of service quality, we adopted a supervision, evaluation and feedback mechanism to promote effective implementation, provided technical training and equipment to improve service quality, and promoted the usage of hospital childbirth by giving out child care blankets at the township health care divisions in Ethiopia and by renovating medical facilities in Burma (see the table below).

China's Experience	**China's Practice**	**Intervention Methods in the Pilot Areas**
Connect communities, families and women with medical institutes by community mobilization and referral service (The link of liaison)	Chinese rural traditional midwives shifted from providing traditional home midwifery to mobilize, publicize and help transfer pregnant woman to hospital to give birth.	Train local community workers to mobilize, publicize and transfer pregnant women to hospital for childbirth.
Eliminate financial barriers phase by phase to promote hospital childbirth (The link of community and family)	1. Cap the cost of hospital childbirth by providing project funding support to reduce the actual cost of hospital childbirth (1999 -) 2. Provide hospital childbirth poverty relief through project funding support (2000 -) 3. Hospital childbirth expenses are included in China's new rural cooperative medical insurance system (2006 -) 4. The promulgation of the national policy: Providing maternal subsidies in poor areas (2009 -)	1. Reduce the cost of hospital childbirth to the minimum through project funding; 2. Provide poor families with delivery-related assistance through project funding.
Supervision, evaluation and feedback mechanism, technical training and equipment supply (The link of service quality)	National and provincial maternal and child expert team	Experts from Fudan University, KMU and other domestic universities; MSI technology experts

(2) The Development of Intervention Tools

Comprehensively consider the social and cultural background and health care situation of Ethiopia, and actively transmit RMNCH knowledge in a variety of forms. The intervention tools developed by the Fudan University project team include “Ethiopia child care blanket", "Ethiopia maternal and child health calendar", "Ethiopia maternal risk signs poster" and "Ethiopia PNC list". Every intervention tool went through three rounds of counseling with local experts, including professional personnel in the field of women and children health care. All the tools

were translated into local languages.

When designing Ethiopia child care blanket, local culture was taken into consideration. The core content of baby health care knowledge was printed on the blanket in a reader-friendly way that combines words and pictures. The blanket was deeply loved by local people. The content was taken from the guidelines issued by World Health Organization, United Nations International Children's Emergency Fund, etc. and is in line with the local child care service regulations. The content includes breastfeeding, adding complementary food, items and time of vaccination, signs that indicate the children should be sent to hospital for rescue immediately, etc. The team produced and transported 3000 blankets over there. The project team applied for a patent for the design of the blanket in September, 2016.

Ethiopia maternal and child health calendar was designed to help women take ANC and arrange child physical examination in a timely manner. The poster not only has local calendar on it, but also shows the core content of maternal and child health care in graphics.

Ethiopia maternal risk signs poster mainly includes the signs of danger during pregnancy, which indicate that the pregnant women should be taken to hospital for treatment immediately. Those signs are presented in the form of pictures and simple texts. The post is widely displayed in public places and medical institutes.

PNC list is based on the maternal care guide issued by the World Health Organization and the local obstetric service guide. The list includes the general health situation and the situation of the reproductive system to facilitate supervision personnel to record and save the results after asking and observing the new mothers.

(3) The Implementation of Intervention in Ethiopia

The pilot China-UK GHSP project aimed to increase awareness and demand, access to and quality of RMNCH information and services for the population of Gonji woreda in Ethiopia. The project used a comprehensive approach with both supply and demand side interventions, which supported improvements in access and utilization of RMNCH services among the local population. Different capacity building activities/trainings were carried out as part of the supply side interventions. During the project, basic training was given to a total of 73 health care providers. Training included comprehensive Family Planning (FP), comprehensive abortion care (CAC), Basic Emergency Obstetric and Newborn Care (BEmONC) and expanded program of immunization (EPI), Helping Babies Breath and Implanon insertion. Moreover, refresher training on Implanon NXT was provided to 38 health extension workers (HEWs).

Moreover, so as to ensure that service initiation after each training, the project has invested in equipping six health centers and 26 health posts with sophisticated medical equipment and items brought from abroad/China and procured in-country. This included ultrasounds, infant radiant warmers, Digital fetoscope, home visit backpacks, digital thermometer, digital glucometer and generators. Currently, all six health centers located under the catchment of the pilot woreda are well equipped to provide comprehensive and quality RMNCH services to the community.

Awareness-raising and sensitization activities were carried out among different community members including HDAs, HEWs, pregnant mothers and religious leaders, so as to address the demand for RMNCH services. Different media/channels were used to reach the communities members including radio, market days and coffee ceremonies. As a result of, a total of, 9,891 women have used different methods of long acting FP. Of these, 82% of women opted for the three year implant called Implanon. Though the uptake of permanent methods is almost insignificant in the country, as a result of the tremendous awareness creation activities executed by community health workers, a total of 38 women and men have used permanent family planning methods in Gonji woreda. Though the number seems few, we anticipate that these 38 clients will be our ambassadors and change agents to generate further demand in their communities.

During the project, 66,616 safe motherhood services were provided to women and their babies, of whom 3,931 and 2,654 were pregnant women, attended ANC1 and ANC4 visits respectively. Likewise, of those who attended ANC 4 visits, 73% had delivered at a health facilities and 100% attended a post-natal visit. Furthermore, by establishing the maternal waiting areas, the project supported in improving the pregnancy outcomes of 981 pregnant mothers at risk. Currently all six health centers have well-equipped maternal waiting areas.

MSIE led a successful meeting with religious leaders from various districts in Gonji Kolella to dispel misconceptions on permanent FP within the local communities. Awareness was raised on RMNCH through thirteen radio transmissions, community health sessions and through the distribution of IEC materials. MSIE expanded quality services at public health facilities through one mobile team and initiated the coupon referral system for emergency deliveries. To improve the quality of RMNCH information and services, public facility health staff and volunteers received training in family planning (FP) provision and Basic Emergency Obstetric Care (BEmOC).

184 at-risk expectant mothers were transferred to MSIE's maternal and child health (MCH) Centre and all women survived. This is a great achievement recognized by all project stakeholders in the pilot area.

Detailed description of activities/outputs/outcomes

*1) Increasing **awareness** and **demand** for RMNCH information and services*

- In order to improve the awareness level of the community in RMNCH, a total of six community health education sessions were conducted in March 2016 and six sessions in June 2017. The main topics were the advantages of using FP, institutional delivery, ANC and PNC. In March 2016, total of 840 health development armies, 60 HEWs and 1,459 people from the community attended the session, of which 510 were pregnant. Following these sessions, 124 women attended their first ANC visit, 25 attended their fourth ANC visit and 178 were provided with tetanus vaccinations. In June 2017, 1,314 pregnant mothers attended the community health education session, of which 88 attended their first ANC visit and TT vaccinations, 142 attended their fourth ANC visit and TT vaccinations. In addition, 225 religious leaders, 46 TBA and 856 HDAs attended the sessions.
- In order to better link women with the services they need, the project built upon the

Ethiopian government's successful Health Extension Workers (HEW) programme and Health Development Army (HDA) programme by piloting innovative additional elements, including piloting home visits to women to encourage attendance at ANC visits and using a referral system to refer women to MSIE's MCH facility in Bahar Dar for deliveries.

- As support the community level awareness creation different promotion materials, with 2,600 T-shirts and caps distributed.
- Massive community mobilization using market days and community conversations (CC) were conducted. 750 participants participated in the CC & 13 permanent clients, 47 long term clients were served; ANC was carried out for 7 pregnant women. Drama, poems and music used during market days to convey RMNCH messages. Two mobilisation sessions were conducted at the local markets.
- Advocacy on the role of male counterparts for institutional Delivery & Family planning was carried out among 1,332 partners of pregnant mothers (919 in March 2016 and 413 in June 2017).
- During the project period, thirteen radio transmissions have been aired through the local radio to increase RMNCH awareness. In total, 26,947 printed materials on RMNCH were distributed, 9,000 of which were focused on RMNCH and FP.
- MSIE arranged meetings with religious leaders in February 2016, following their resistance to providing access to permanent FP services. In total, 101 religious leaders attended the meeting in February, where consensus was reached on the misconceptions around FP. Following the meeting, religious leaders educated the community on the advantages of FP, and satisfied clients were permitted to sensitise the community on FP. A follow-up meeting was held with 92 religious leaders in April 2017.

*2) Increasing **access** to RMNCH services*

- MSIE trained government services providers through a comprehensive FP training to all of the six health centres in the pilot woreda. As a result, long-acting methods were provided to 9,891 women.
- MSIE expanded quality services at public health facilities through one mobile team, who delivered 22 vasectomies and 16 tubal ligations.
- MSIE initiated the coupon referral system and in total, 184 high-risk mothers were referred to Bahir Dar MSIE MCH centre during the project for emergencies delivery.

*3) Improving **quality** of RMNCH information and services*

- MSIE FUDAN project team jointly with the woreda health office have organized training on Helping Babies Breath from June 9-11/2017 for 14 participants.
- Similarly training on Expanded Program of Immunization (EPI) was organized from June19-23/2017 for 9 participants.
- After receiving the backpacks from China, an orientation session on the use of the backpack was given to 56 HEWs. Moreover, detailed onsite training was given to the 12 HEWs who received backpacks from May 30-3/2017.
- So as to improve pregnancy outcome and reduce the maternal mortality rate in the pilot woreda, BEMONC training was delivered to nine midwives in April 2016.
- In order to improve the method mix at health centres supported by this project, Comprehensive FP training with emphasis on long acting and permanent family

planning was given to twelve nurses and midwives in February 2016.

- In November 2016, 12 Health Professionals were trained on Comprehensive Abortion Care for 12 days.
- Training was also provided to 840 Community volunteers and HDAs on demand generation for Comprehensive FP including Permanent Family Planning (PFP) in February 2016.
- The MSIE/FUDAN project team jointly with the woreda health office arranged refresher trainings in February 2016 on FANC & Implanon NXT for 38 HEWs and training on Implanon insertion for 17 HEWs in March 2016.
- HDAs specific performance review meeting was conducted in the month of June 2017. The main purpose of the meeting was to review their performance and to discuss on how to keep the moment after the phasing out of the pilot project. Total of 840 HDAs were attended the meeting.
- Quarterly supportive supervisions were conducted by MSIE to HEWs, and monthly joint supportive supervision was also conducted with woreda health office staff. This strengthened MSIE's partnership with the local health offices, and also highlighted some areas for attention, such as underdeveloped M&E systems, low community participation and low quality of services.
- 70 health professionals, including midwives, HEWs, the Head of the Health Centre, Woreda Health Head Officer and the RH focal person visited two health centres and one health post to observe best practice and lessons learned. These centres were selected based on high performance, acknowledged by the regional health bureau and the MoH.
- All Health Centre Heads, HEWs, midwives, RH Focal persons, Woreda Officers and the Woreda Administrator attended a quarterly review meeting, organised by MSIE. The highest performing centres were acknowledged and motivated, and a positive competitive environment was established.
- Six health centers established maternal waiting areas, with the capacity for a maximum of eight pregnant women in each waiting area. Client feedback was positive, citing the improvements in comfort and privacy while awaiting maternal health services. (See "The Completion Report on the Ethiopia Project")

(4) The Implementation of Intervention in Myanmar

In Myanmar, community publicists were mobilized by uniforms, regular meetings, family visit package, etc. They carried out ANC and PNC, group lecture and discussion and other activities to promote hospital childbirth and maternal and infant health care. The usage of the RMNCH service has been improved. The MSI clinic that was newly set up in October 2016 has provided contraception and reproductive health care service for 7988 persons, ANC subsidies to 3091 pregnant women, hospital childbirth subsidy for 8048 persons, and PNC subsidies for 4225 persons, which has greatly promoted the maternal health care. The service quality of elementary public service institutes has been improved by training, medical equipment supply, renovation of the delivery room, etc.

To increase awareness and demand for RMNCH services, 27 RMNCH promoters were recruited to provide home visits to mothers and education through group discussions with local women from the community. During the project period, a total of 13,951 ante-natal home visits to 6,894 ante-natal mothers and 13,903 post-natal home visits to 6,830 post-natal mothers were carried

out by RMNCH promoters. In total, 9,298 women participated in 1,799 community group discussions with education on family planning, safe motherhood, reproductive health problems and sexually transmitted infections including HIV/AIDS. In addition to the activities of RMNCH promoters, the MSI center team also conducted SRH awareness and demand generation activities in the community and reached 13,062 including 331 men and 12,731 women. Among them, 624 clients were under 20 years of age.

To improve access to services through improvements to the existing public health facilities, key government stakeholders were consulted, and refurbishment of two health centers took place. MS Myanmar's clinic continued providing the full-range of family planning services and other reproductive health services during this reporting period. A total of 9,095 clients received for the services of which 7,953 clients received family planning services and 1,043 clients received other reproductive health services in this reporting period. Through the referral support (reimbursement) program, a total of 18,253 mothers received support from the program of which 3,697 mothers got AN care supports, 9,312 mothers got child delivery support including both for normal delivery and caesarean section supports, and 5,244 mothers received for PN care supports from November 2016 to June 2018.

To improve the quality of RMNCH services, 23 private medical doctors received training in community family planning. The project team also organized GBV psychosocial support and counselling training workshop to project team members in August 2017. This training workshop was conducted together with a project funded by UNFPA. 10 project team members from GHSP project participated in the training. MCH Counselling Training to RMNCH promoters, Do and don't on MCH to community health workers and volunteers, Emergency Obstetric and Gynaecological Care Training to basic health staff, and, MSFP (Marie Stopes Family Planning), CCSPT (Cervical Cancer Screening and Prevention Training), MSMEM (Marie Stopes Medical Emergency Management), MSIP (Marie Stopes Infection Prevention) and TOT (Training of trainer) Trainings for services providers were provided. HMIS (Health Management Information System) for basic health staff, PEN (Package of Essential for Non-communicable Diseases) for mothers for basic health staff, Adolescent Reproductive Health for RMNCH Promoters and Role of Civil Society Organizations in RMNCAH for better collaboration with the community were provided in 2018.

The MSIM project team conducted progress review meetings in August 2017 and March 2018 with 50 representatives from township health department, RMNCH promoters, project team members and service providers.

Joint supervision and monitoring visits to project activities were conducted total seven times: one time in October 2016, four times in 2017 January, May, August, December and 2 times in 2018 February and May with the involvement of PMO, Fudan and Kunming Universities, township health department and MSI. During the visits, the midterm evaluation and final evaluation were conducted in May 2017 and May 2018 respectively and dissemination meeting was conducted in May 2018.

Detailed description of activities/outputs/outcomes

MSI Myanmar started all the field activities in July 2016, after gaining formal approval for Memorandum of Understanding (MOU) with Ministry of Health and Sports. The inception meeting with China-UK GHSP Strategic Oversight Committee, Project Management Office, Fudan University, Kunming Medical University and officials from Myanmar Government and partner organizations was conducted in October 2016 and MSI Myanmar opened the clinic and provided SRH services in the same month. After consultation with Township Health Department, the referral support (reimbursement) program to mothers was started in November 2016. Due to the delay in the initial year, the project was officially extended for another year (until June 2018) in May 2017.

1) Increasing **awareness** and **demand** for RMNCH information and services
Together with Township Medical Officer, MSI Myanmar conducted an advocacy meeting with 39 community leaders and village heads and oriented on project activities for their support and collaboration at the beginning of the project period.

To increase awareness and demand for RMNCH services, the project has recruited 27 RMNCH promoters who conducted home visits to mothers during their ante-natal and post-natal periods and group discussions with local women from the community. During this reporting period, a total of 13,951 ante-natal home visits to 6,894 ante-natal mothers and 13,903 post-natal home visits to 6,830 post-natal mothers were done by RMNCH promoters. During the home visits to mothers, RMNCH promoters provided health education to the mothers on Do's and Don'ts during pregnancy, danger signs of pregnancy, the importance of nutrition, hygiene and immunization, the importance of breastfeeding and post-partum family planning. In total, 9,298 women participated in 1,799 community group discussions and these women were also educated on the family planning, safe motherhood, reproductive health problems and sexually transmitted infections including HIV/AIDS. In addition to the activities of RMNCH promoters, the MSI center team also conducted SRH awareness and demand generation activities in the community and reached 13,062 clients including 331 men and 12,731 women. Among them, 624 clients were under 20 years of age.

In commemoration of International Workers' Day and World Population Day, MSI team participated these two special events by booth exhibition and conducting essay competition respectively. The booth exhibition, together with booth exhibitions of other organizations, was conducted at Township sports field on 1st May 2017 and about 500 people visited to the booth exhibition. Through the exhibition, the informational pamphlets about FP, safe motherhood and reimbursement program were distributed to the community. The promotional materials of project were also given as gifts to the visitors who participated in question and answer session on FP and SRH. The essay competition was conducted at MSI clinic, primary urban health center and secondary urban health center from 11 to 21 July 2017. The tile of the essay competition was based on the theme of 2017 World Population Day which was "Family Planning: Empowering people, Developing Nations." It was the open book type essay competition with the purpose of increasing awareness and knowledge World Population Day and importance of family planning. About 150 participants participated in this event and special gifts were given to all participants. Apart from the participation of these two special events, the project team also participated in International Women Day ceremony by exhibiting health informational booth which was held in Yangon city's people square in March. MSI center also

participated in world contraception day and 16 Days of Activism Against Gender-Based Violence Campaign by opening a booth exhibition in front of the center, primary urban health center, promoting health information by distributing health education promotional pamphlets near well-known bazaar in the township. Through the exhibition, the informational pamphlets about FP, safe motherhood and reimbursement program were distributed to the community. The promotional materials of project were also given as gifts to the visitors who participated in question and answer session on FP and SRH.

Since the beginning of the project, 101,700 units of printed IEC/BCC materials and target promotional materials have been produced and these materials were distributed to the community through Government health facilities, MSI clinic, through the special events and through the outreach activities of RMNCH promoters and MSI center team members.

2) Increasing **access** to RMNCH services
To improve access to services by improving the existing public health facilities, the project team discussed with the focal points from Township Health Department and prioritized the refurbishment and renovation of two health centers during the project period. The primary urban health center was selected for renovation due to its high client load with weak health facility amenities. The construction for the new delivery room and renovation of client waiting room and examination rooms of this center was finished at the end of August 2017. In addition, building of the new waiting area, new room partition, set up for instrument processing area and installation of steel window guard were supported in the secondary urban health center in the same period. Medical Equipment and supplies were procured according to procurement plan and distributed to government health facilities and MSI center in Hlaing Thar Yar Township.

MS Myanmar clinic continued providing the full-range of family planning services and other reproductive health services during this reporting period. A total of 9,095 clients received for the services of which 7,953 clients received family planning services and 1,043 Clients received other reproductive health services in this reporting period.

MS Myanmar started referral support (reimbursement) program to mothers since November 2016. The program provided referral support to the mothers for utilization of maternal health services provided by government health facilities (Township hospital, station hospital, urban health centers, rural health center and rural sub-centers). Through the referral support (reimbursement) program, a total of 18,253 mothers received support from the program of which 3,697 mothers got AN care supports, 9,312 mothers got child delivery support including both for normal delivery and caesarean section supports, and 5,244 mothers received for PN care supports.

3) Improving **quality** of RMNCH information and services
To improve the competencies and skills required for provision of quality family planning services to the community, MSI Myanmar organized a community-based family planning training workshop to general practitioners from the township on 27-28 June 2017. MSI Myanmar clinical and quality assurance team facilitated this training and altogether 23 general practitioners, medical doctors from private sector, participated in the training.

To improve the knowledge on gender, gender-based violence, to develop the counselling skills and effective communication between the client and provider, the project team organized GBV psychosocial support and counselling training workshop to 10 project team members especially to those who are dealing directly with community from 7 to 10 August 2017. This training workshop was conducted together with UNFPA project and 10 project team members from GHSP project participated in the training.

To increase capacity building of counselling skills in different scenarios on MCH (Maternal and Child Health) and to learn ways of effective communication between mothers and RMNCH provider, MCH Counselling Training was conducted in September 2017 for 27 RMNCH providers.

To improve the knowledge and to ensure they receive correct information on MCH, Do and Don't' on MCH training for community health workers and volunteers were conducted with coordination with Hlaing Thar Yar Township Health Department in November. Over 80 participants who are actively working within the township attended this training.

MSIM project team in coordination with township health department organized an Emergency Obstetric and Gynaecological Care Training for 50 basic health staffs in Hlaing Thar Yar in January 2018 to avert maternal death and disability due to emergency obstetric condition and to strengthen the knowledge and skill of basic health staffs in emergency obstetric care.

The project team in coordination with THD (Township Health Department), organized HMIS refresher training for BHS and THD and PEN for mothers (Packages of essential for Non-Communicable Diseases) in June 2018 to generate quality data and use that data for management decisions to improve health service provision in strengthen the knowledge and skills regarding the non-communicable disease related problems for mothers. Approximately 70 personnel from township health department and basic health staff participated in these trainings.

For capacity building for the community and RMNCH Promoters, "Role of CSO in RMNCAH" training and "Adolescent Reproductive Health" trainings were conducted in June 2018 respectively. During these trainings, 27 active health community volunteers and 27 RMNCH-Promoters participated in these training.

The project team have conducted regular monthly supportive meetings with RMNCH promoters since January 2017 to ensure the dissemination of simple and concise quality health information and to support the activities of RMNCH promoters. The reports from RMNCH promoters were also collected during the meeting. Mobile phones and home visit packages were provided to all RMNCH promoters to have better communication and referral linkage among clients, basic health staffs, local health facilities and MSIM.

To ensure the quality of RMNCH services in MSI Centre, MSFP (Marie Stopes Family Planning), CCSPT (Cervical Cancer Screening and Prevention Training), MSMEM (Marie Stopes Medical Emergency Management), MSIP (Marie Stopes Infection Prevention) and TOT (Training of trainer) Trainings for services providers of Haling Thar Yar MSI Centre between September and December 2017.

To ensure the SRH services delivered through MSI clinical team were of high quality, MSI Myanmar's quality assurance unit conducted a quality technical audit to MSI Hlaing Thar Yar clinic on 21 April 2017 by using the standardized tool used across MSI's global partnership. The clinic received the overall score of 88%. In addition, to check satisfaction of client upon the quality of services provided by clinic, four times of client exit survey were also conducted in February, May, August and November 2017. 120 clients involved in these surveys.

Joint supervision and monitoring visits to project activities were conducted two times in January and May 2017 with the involvement of PMO, Fudan and Kunming Universities, township health department and MSI.

The progress review meeting of the project was conducted in May 2017 with the participation of representatives from Chinese institutions, regional and township health departments, MSI and other stakeholders working on the MCH field. During their visit, Kunming Medical University team conducted mid-term evaluation activities in the project township from 21 to 25 August 2017. They conducted the interviews with project management team members, MSI clinic team members, RMNCH promoters, township health officials, basic health staff, and mothers from community.

To review the target and achievement, to identify the challenges and lessons learnt and to share the experiences and to provide the recommendations for more successes, the project team conducted the annual review meeting with representatives from township health department, RMNCH promoters, project team members and service providers on 12 August 2017. A total of 50 participants participated in this meeting.

To share experiences and lessons of RMNCH in Ethiopia, Myanmar and China and of the project, a dissemination conference was conducted in Shanghai from 20 to 22 September 2017. In this conference, four government officials including head of Maternal and Reproductive Health Department, Township Medical Officer and four MSIM personnel including MISM Country Director participated in this conference.

A six-month review meeting with local authorities was held twice with township general administrative office and township health department in January and October 2017 and officials from township administrative office, ward administrators and village administrators, township health department officials participated in these review meetings.

On March 25th 2018, MSIM together with Hlaing Thar Yar Township Health Department conducted the annual progress review and discussed about the project activities and achievement, lessons learnt, future workplan including training plan and quality improvement.

The final Evaluation for the project was conducted by KMU and Fudan team from 21 to 25 May 2018, during which, approximately 140 clients including mothers, MSI center clients, stakeholders and community members were interviewed. The preliminary findings showed that most of the women knew the importance of antenatal and postnatal care and institutional delivery and the majority knew at least three methods of contraception. The majority of

respondents received antenatal care and gave birth at a public health facility. RMNCH promoters played a key role in achieving this outcome through health education, peer influence, referral support /reimbursement and strengthened links and trust between health facilities and communities. There were also improvements to the service quality of health facilities. The findings also pointed out the remaining huge unmet need for maternal and reproductive health services in this Township with the largest migrant population in Myanmar.

The project Review Dissemination Meeting was conducted on 29th May 2018. During this meeting, the PMO, NHC, Fudan, KMU and MSIC from China and National Maternal and Reproductive Health Director and Township Health Department Staff together with MSIM team participated and discussed about the key achievements, lessons learned and possible sustainability of the project activities. MSIM will continue the clinic in Hlaing Thar Yar to maintain the momentum of delivering contraceptive services among migrants contributing to the reduction of unplanned pregnancies leading to unsafe abortion, with the support of 3MDG Fund. The Township Health Team is committed to maintaining and improving pregnancy care and institutional delivery by strengthening demand generation activities in cooperation with various partners and is eager to maintain their best performance achievement in the region. The project success story in improving institutional delivery will also be shared by National Maternal and Reproductive Health Director at the national level in MOHS. The township has been gaining much more attention in national MCH programming and other international donors due to the high unmet need and commitment to improvements by the Township Health Team. (See "The Completion Report on the Myanmar Project")

(5) Supportive Supervision for the Intervention Pilot Projects

Supportive supervision includes but not limited to providing technical support. Supportive supervision focuses on problem solving, coordinating team work, providing leadership, increasing the autonomy of health care service providers to monitor and improve their own performance so as to achieve quality output of the project. The specific purposes of supporting supervision in this intervention pilot project include:

1) Monitor and record the implementation of project activities; summarize the successful practice and make real-time record of the effects for those activities that go on well and are well received; find out the reasons why some activities are not carried out as scheduled, coordinate and promote these activities moving forward;

2) Learn about the local health system; understand the needs of local people; evaluate the applicability of the planned project activities all the time.

3) Evaluate if it's necessary to adjust project activities with a focus on the project objectives, combined with the implementation of the project activities and a further understanding of the local health system and the needs of local people, and provide evidence and scheme.

4) Feel the working attitude of the implementors, learn about their working methods by observing, experiencing and asking questions, so as to accumulate experience for exploring cooperation methods with international NGOs;

The methods of supportive supervision mainly include joint supervision, which enables mutual exchange, on-site supervision, which ensures finding out actual situation, and supervision feedback, which promotes rectification. During the intervention, Fudan University and KMU have conducted supportive supervision in Ethiopia and Myanmar for five times respectively (see the table below). The opinions and suggestions of each supervision have been conveyed to the local implementing agencies in the form of verbal communication and written feedback. The problems found in the supervision have been solved through consultation.

Supervision in Ethiopia	Supervision in Myanmar
No. 1: November, 2015	No. 1*: October, 2016
No. 2: April, 2016	No. 2: January, 2017
No. 3*: September, 2016	No. 3: May, 2017
No. 4: January, 2017	No. 4: December, 2017
No. 5: March, 2017	No. 5: February, 2018

* The third supervision in Ethiopia failed to be done as planned because the continuous anti-government activities caused by domestic ethnic conflicts had spread to the site of the project. The trip was canceled due to security consideration. The supervision was then done by phone call and email communication in September 2016. The first supervision in Myanmar was rescheduled to October 18, 2016 due to the Myanmar government election.

Supervision mainly had the following three effects. One was that we monitored the progress of the project, made a real time record of the implementation of the project and promoted the implementation of the project activities; the second was that we obtained knowledge and experiences, including the needs of the local people, the local health system, the working attitude, mode and effects of the implementors, the cooperation pattern with international NGOs, etc.; the third was that we offered adjustment suggestions for implementing schemes and activities based on the above-mentioned information.

We encountered the following problems during the supervision in Ethiopia. Ethiopia fell into the state of emergency in the middle of the project, so the supportive supervision failed to be carried out as planned, especially that senior personnel could not go to the site to supervise; MSIE had no obligation to present data to the representatives of Fudan University stationed in Ethiopia, which caused trouble for monitoring and evaluation; the suggestions provided by Fudan took a longer time to be implemented and had less effect than expected even if they were approved by the implementers (see the details in the policy brief -- The Application of Supportive Supervision in the Intervention Pilot Projects).

Problems in the supervision in Myanmar included: (1) The independence of supervision had been affected to a certain extent: We were asked to report to MSI about our supervision plan beforehand, including the institutes we had planned to survey and the subjects we had planned to talk to. Those plans could not be carried out before they were approved by MSI. For example: sometimes MSI was not willing to arrange for us to supervise the places we had planned to go. It always arranged for us to go to the same place. In addition, MSI had to present each supervision plan to the government. Only after we got the approval from the government could we carry out our plans. (2) MSI was reluctant to follow some of the suggestions given by the supportive supervision teams. (3) It had to meet more requirements and take a longer time to

obtain business visas for Chinese personnel. Express handling was often needed. (4) Project funds management should not only meet the requirements of the PMO, but also the requirements of the Chinese implementing agencies. The coordinating work was complicated. For example, the abroad insurance fee could not be reimbursed due to school management regulations so it had to be borne by individuals.

(6) The Role of the Advisory Committee in the Intervention Pilot Projects

This project has set up an advisory committee, whose members are Chinese experts on China's RMNCH practical experience and global health care practical experience. The meeting on "intervention pilot projects of improving maternal and child health in Asian and African low-income countries by applying China's practical experience" (GHSP-CS-OP4V01), a China-UK global health support project, was held successfully in Beijing on Nov. 2, 2016. A total of more than 20 people attended the meeting, including experts from GHSP-TAG expert group, GHSP project office, National CDC Maternal and Child Health Care Center, Maternal and Child health Care Association and Family Health Care Association, director of the East Asia Office of UK Health Unlimited, director of MSIC Office, and experts from Zhengzhou University, KMU and Fudan University. At the meeting, the experts presented their opinions and suggestions of the middle-phase results of the maternal and child health care intervention pilot projects overseas. Experts suggested that it was also a gain to focus on the realization of goals in the process of first "going out"; applicability should be considered in sharing China's experience and it is necessary to evaluate their needs to ensure the project meets the focus and strategy of the development of health care in the recipient countries; the effect of sharing China's experience needs to be assessed in long-time pilot projects. It is necessary to make timely adjustment and suitable technological treatment in line with the actual situation; the assistance to maternal and child health care development should focus on extreme poverty group and extremely poor children should be given priority; foreign aid project should pay attention to strategy—different strategies will lead to different effects; health care assistance work should keep pace with the times and the implementors should have patience and good attitude.

On June 3, 2017, the project team hosted the second advisory meeting in Shanghai. A total of over 20 people attended the meeting, including officials from the Project Funds Management Office of the National Commission of Health and Family Planning of PRC, GHSP TAG, East Asia representatives of UK Health Unlimited and representatives from MSI, project team members from KMU and Fudan University. The main purpose of this meeting was to listen to the experts' summary of the work in the pilot areas in Ethiopia and opinions and suggestions of the work in the pilot areas of Myanmar to form follow-up strategies and policy recommendations for the GHSP pilot projects abroad. At the meeting, the Global Health Institute of Fudan University, the implementing unit, and MSI and KMU, the two cooperating units, introduced the overall progress of the project so far, background information of the two pilot areas, the challenges and reflections, etc. respectively. Members of the TAG shared their opinions and offered their suggestions about the issues of concern. Experts believed that the project itself was a kind of experience for China, so we should record the implementing process, the problems found in the process and the solutions we found as they were; we should actively explore and summarize how to arouse the enthusiasm of the local government, the working passion of the local technicians and the desire of local residents to use the health care services; we should conduct multi-dimensional evaluation and study, make a deep digging of and

summarize the implementing paths of universal value, and enhance the theory level of project output; we should enhance our ability to conduct country comparative study, find out a truly effective implementing path to carry out international health care development cooperation, and provide beneficial reference for China's foreign aid projects in the field of RMNCH.

4. Ability Construction of the Chinese Members of the Project Team in Global Health Practice

(1) Participate the Related Trainings of GHSP

Three team members took part in the policy briefing training course organized by GHSP project office on July 4 and 5, 2015. They got a comprehensive understanding of the purpose, characteristics and writing requirements of policy briefing. After listening to the experience of several experts in policy briefing writing, they felt that it would be of great help for them writing OP4V01 series policy briefing.

One team member attended "the 7th global health care diplomatic training course" organized by the School of Public Health of Peking University and the Graduate Institute Geneva in mid-July 2015. The theme of the course was "global health governance and international health development aid".

(2) The Training Activities Organized by OP401

This activity aimed to improve the ability of project researchers to engage in global health research abroad. The project team evaluated the needs by means of personal interviews and group discussion in Sept. 2015 as planned. The following several aspects of training needs were found out. First, culture and health: Understand the local cultural background and enhance transcultural survival ability, especially the three major religions in the working areas, i.e. Christianity, Islam and Buddhism; Second, regulations and laws: Learn about the system, laws and related local projects in the countries where the projects are carried out to ensure that our work in the pilot countries is legitimate and can be combined with local health care work; Third, diplomacy and national security: Chinese project personnel must understand China's diplomatic policy and related knowledge in national security to ensure that the project is going in the right direction; Fourth, global health care theories and practice: Enhance Chinese research team's ability to study foreign aid projects and global health care problems and the ability of writing briefings; Fifth, project management: In order to efficiently carry out the project, we must also learn various skills in personnel management, contract negotiation, equipment procurement, project process and results management, etc. Sixth, other supplementary abilities: Other related practical knowledge and skills.

From Sept. 2015 to Aug. 2017, we organized 17 lectures, 7 joint lectures and 5 individual counseling, and arranged team members to attend 3 lectures organized by other units, with a total of 320 person-times. Researcher ability training plan and implementation summary is shown in Table 1. Notices, summaries, training materials, lecturers' profiles and signing-in sheets related to all the training activities.

We obtained the feedback from the researchers about the ability training courses by the means of questionnaire. The full score is ten. Overall evaluation (average): 8.9 points for content design rationality; 8.5 points for form design; 8.8 points for organization; 8.7 points for time arrangement and 9.1 points for lecturers. The feedback was given from several aspects such as

necessity, practicability, richness of the content, benefits. The average points ranged from 7.6 to 9.7. Researchers said these training courses, whether organized by this project office or by other units, has enhanced their ability to conduct global health research from different aspects, especially the ability to carry out research in pilot countries.

Table 1: The Content, Schedule and Implementation of Ability Training Courses

Subject	Content	Experts	Date	Number of Participants	Training Methods
1. Culture and health: Understand the local cultural background and enhance transcultural survival ability, especially the three major religions in the working areas, i.e. Christianity, Islam and Buddhism	The development history of Christianity and the medicine-related ethic issues in its culture	Cao Shengjie, Shanghai Christianity Association	Feb. 2, 2016	10	Host a lecture
	The development history of Islam and the medicine-related ethic issues in its culture	Bai Runsheng, Shanghai Islamic Association	Feb. 29, 2016	13	Host a lecture
	The development history of Buddhism and the medicine-related ethic issues in its culture	Fan Lizhu, director of the Social Development Research Center of Fudan University	Mar. 6, 2017	24	Host a lecture
	The culture and customs in African countries	Priscilla, an African student studying in China	Sep., 2015	18	Host a lecture
	Cross-cultural perspective of anthropology: Based on the insight and thinking of field research	Pan Tianshu, College of Social Development and Public Policy of Fudan University	Aug. 24, 2017	16	Host a lecture
2. Regulations and laws: Learn about the system, laws and related projects in the countries where the projects are carried out to ensure that our work in the pilot countries is legitimate and can be combined with local health care work	The political, economic and diplomatic policies in the pilot countries	Yohannes, consul general of Ethiopia's consulate in Shanghai	Apr. 13, 2016	26	Host a lecture
	The society, politics and economy under Buddhism background in Myanmar	Xiong Liying, East Asia Office of Doctors Without Borders	July, 9 to 11, 2016	21	Host a lecture
	The health care system and health care development plans of the pilot countries	Yihun M. Alemu, Bahir Dar University, Ethiopia	Oct. 10, 2015	6	Host a lecture
	Health care projects of Doctors Without Borders in Myanmar's border region	Zhang Jun, director of the East Asia Office of Doctors Without Borders	Apr. 13, 2016	26	Host a lecture
	International legal knowledge	Xing Na, China Executive Leadership Academy Pudong	Jun. 19, 2016	16	Host a lecture

3. Diplomacy and national security: Understand China's diplomatic and national security policy to ensure that the project is going in the right direction	China's diplomatic policy and international relations	Liu Genfa, China Executive Leadership Academy Pudong	Jun. 18, 2016	16	Host a lecture
	Relevant knowledge about China's national security	Liu Genfa, China Executive Leadership Academy Pudong	Jun. 18, 2016	16	Host a lecture
	A report about the international situation of ISIS	Professor Wei Liunan, a former Chinese diplomat in France	Nov. 18, 2015	2	Listen to a lecture
	International communication ability	Liu Genfa, China Executive Leadership Academy Pudong	Jun. 18, 2016	16	Host a lecture
	Diplomatic rules and consular protection	Liu Genfa, China Executive Leadership Academy Pudong	Jun. 23, 2016	3	Jointly host a lecture
4. Global health care theories and practice: Enhance Chinese research team's ability to study foreign aid projects and global health care problems and its ability of writing briefings	The international status of contemporary global health	Xu Tongwu, an expert on Global health projects	Jun. 21, 2016	4	Jointly host a lecture
	China's global health strategy	Xu Tongwu, an expert on Global health projects	Jun. 21, 2016	4	Jointly host a lecture
	The requirements and standards of GHSP's briefings	Xu Tongwu and Wu Jian, experts on Global health projects	Jun. 22, 2016	4	Jointly host a lecture
	International experience in measures for supporting universities and research institutes to carry out overseas teaching and research	Experiences of DUKE university, JOHN HOPKIINS, Columbia University, Washington University, UCLA, TULANE, Clemson University, etc.	Jun. 20 and 22, 2016	4 4	Jointly host a lecture
	Impact assessment methods	Marin NG, Washington University	Jun. 22, 2016	4	Jointly host a lecture
5. Project management: Learn professional management skills to ensure the efficient implementation of	Personnel management	The Personnel Department of Fudan University and some multinational enterprises	Dec., 2015	3	Individual counseling
	Contract negotiation	Global Health Project Office	2015	2	Individual counseling

projects	Equipment procurement	The Department of Assets Management of Fudan University and related enterprises	Jan., 2016	3	Individual counseling
	Project process and result management, etc.	Project office	2016	2	Individual counseling
6. Other supplementary abilities: Other related practical knowledge and skills	Diplomatic etiquette	Liu Genfa, China Executive Leadership Academy Pudong	Sep., 2015	18	Host a lecture
	The conditions of Ethiopia (An introduction of Gonje Kolella, the project research sample county; an introduction of Bahir Dar University, a potential cooperation unit of the project)	Yihun M. Alemu, Bahir Dar University, Ethiopia	Oct., 2015	6	Host a lecture
	Tips for foreigners living in Ethiopia (knowledge and skills of living and working in plateau and tropical areas; knowledge and skill about maintaining personal safety)	Bahir Dar University, Ethiopia; Chinese Medical Team in Ethiopia	Oct., 2015 and Jan., 2016	6 2	Host a lecture; Individual counseling
	Emergency handling when living abroad	America Study Center of Fudan University	Apr. 26, 2016	1	Attend a lecture
	A workshop about Chinese companies entering Africa (Standing high, striding forward, win-win cooperation, and common development)	Shanghai People's Association for Friendship with Foreign Countries (Shanghai International Convention Center)	Jun. 7, 2016	3	Attend a lecture

5. Advanced Midwifery Practice Center established at Tirunesh-Beijing Hospital

Fudan Institute of Global Health, together with Ethiopia-China Friendship Hospital (also known as the Tirunesh-Beijing Hospital) and the Chinese medical team stationed at the hospital reached a consensus before they signed a Memorandum of Understanding to build a professional midwifery training center. Afterwards, based on professional standards, TBH developed a construction plan for the new training center. The plan was approved by relevant Department of Ethiopia in July, 2016 and in January, 2018 the construction was completed.

On the other hand, faculty from the Departments of Clinical Medicine, Nursing and Public Health of the Shanghai Medical College, Fudan University finished three rounds of training and supervision of the midwife trainers with the Advanced Childbirth Simulation System, providing demonstrations for professional Ethiopian midwives to make the most of the system in the multidisciplinary cooperation in midwifery training.

In January, 2016, the first round of training for Ethiopian midwifes was conducted at the Advanced Midwifery Practice Center of Fudan's Department of Nursing. The teaching crew consisted of faculty from the university's nursing department, veteran midwives, senior obstetricians, and head-nurses of the neonatal unit from the university's affiliated hospitals, who had prepared the course carefully by jointly developing a detailed teaching plan. During the six-day training course, 18 subjects including spontaneous delivery, dystocia, prolapse of cord, postpartum hemorrhage, preeclampsia, and neonatal asphyxia resuscitation were taught to the five Ethiopian birth attendants. The training was designed to help the trainees strengthen their capacity to conduct the simulation training on their own in a step-by-step manner.

In December of 2016, supervised by the teaching crew from Fudan, two Ethiopian midwives who attended the first round launched the second round of training at the practice center to a group including three new Ethiopian trainees, an obstetrician from the Chinese medical team and a project officer from the Ethiopian Midwifery Association. This round, which lasted for six days, focused on three typical cases, such as dystocia, postpartum hemorrhage and preeclampsia in line with the high-risk situations. At the same time it was set to strengthen trainees' skills in neonatal resuscitation, nursing and transfer. This training, featuring real-time clinical scenario which could only be handled by a multi-disciplinary team (MDT), greatly enhanced Ethiopian team's capability to operate modern midwifery training equipment. After this, they themselves were able to create different clinical scenarios for their trainees.

The third round was held in the newly-built Advanced Midwifery Practice Center in Ethiopia-China Friendship Hospital in January, 2018. During the five-day training, an Ethiopian midwife from the second round was responsible for organizing the course, while a Chinese doctor from the medical team played a supporting role. And Chinese midwifery training worked as supervisors throughout the process. Methods such as interactive teaching, grouping, Q and A, and clinical practicing were applied to strengthen the five Ethiopian students' skills in operating the simulators. They were also trained to deal with all sorts of complicated situations they might encounter in the future. This round of training received positive feedback from the Ethiopian midwifery professionals who hoped to strengthen their cooperation with the Fudan team for the future of the practice center. They also looked forward to further technical support and material assistance from China so they could maintain a sound operation of the center.

Taking full advantage of the simulation system, the three rounds of training have featured close teamwork in a MDT setting. The trainers' efforts have contributed to progress in the midwifery practice center at TBH where 15 Ethiopian midwives received training. During the process, detailed training books including a laboratory manual were developed in Chinese and English languages for both trainees and trainers. And on top of the training plans and evaluation protocols they prepared for the training, the faculty had designed teaching courseware in English. After the training, they released seven newsletters and created a short film in both Chinese and

English languages to summarize the first and second rounds. Furthermore, a research paper entitled An Evaluation of the Simulation-based Training for Skilled Birth Attendants: A Pilot Study (a manuscript), which was written to evaluate the outcome of the training, received the Best Paper Award for its outstanding summary at the 2017 International Health Conference held by St Hugh's College, University of Oxford from June 29 to July 1 ,2017.

The successful conclusion of the training and supervision marks the official operation of the Advanced Midwifery Practice Center at the Ethiopia-China Friendship Hospital. It is our hope that the Ministry of Health of Ethiopia would strengthen its cooperation in healthcare with China by extending support to the training center so local midwives could learn more from their Chinese colleagues. These efforts will contribute to enhance the capacities of maternal and child health services in Ethiopia and to reduce the country's maternal and neonatal mortality rates.

III. Achievements and Influence

The major achievements of this project include 1. improving China's involvement in global health development; 2. promoting utilization of the health facilities for reproductive, maternal and child health by in the pilot areas by sharing China's experience; 3. exploring a sustainable health aid model which aims to "teach people how to fish instead of simply giving them fish" with cooperation with the Chinese medical teams and the hospitals constructed with the aid by the Chinese government.

3.1 Improving China's involvement in global health development

3.1.1 The Chinese agencies' involvement and influence in low-incoming countries has been promoted through sending personnel and conducting field supervision. To specify, one researcher has been sent by Fudan University to the Project's Ethiopia Office, working for 17 months or 460 days altogether; The short-term on-site training, supervision and evaluation sessions which lasted 151 days have been held by Fudan University in Ethiopia and Myanmar; 274 days by Kunming Medical University in Myanmar; There are 46 Chinese people involving the overseas pilot work among who 33 from Fudan University and 13 from KMU.

3.1.2 The Chinese personnel' expertise in conducting research and health intervention projects in low-incoming countries has been promoted through their work in the training and pilot projects. 32 training sessions with 6 different themes (culture and health, institution and laws, diplomacy and national security, global health theories and practices, project management and others) have been carried out which have trained 320 person-times. In these outbound pilot projects, 46 Chinese professionals have managed to accomplish all the project goals despite various difficulties and challenges.

3.1.3 The projects have provided supporting evidence to China's global health development plan by collecting data from the pilot projects. The 2 years of project implementation have been recorded with details, which have resulted in 5 reports to the Chinese government including *A Study on the Ways for Chinese Universities to Dispatch Personnel Overseas to Implement Health Cooperation Projects, A Study on the Modes for Chinese Universities to Co-conduct Health Surveys in Low-income Countries, A Study on the Ways for Chinese Universities to Procure and Transport Aid Equipment, A Study on Application of Supportive Supervision in Intervention Pilot Projects, Trilateral Cooperation and Exchange: Sharing Knowledge and*

Expertise in Project Implementation to Promote Further Cooperation. A brief report to the Ethiopian government has been completed focusing on the project achievements and advice for sustainable development, based on the project carried out in Ethiopia. (See the details in the policy brief -- Promote safe motherhood in rural Ethiopia).

3.2 Promoting utilization of the health facilities for women, children and reproductive health by the women in the pilot areas through taking the advantage of China's practices

3.2.1 The major achievements and influence of the pilot project in Ethiopia

In Nov. 2015, with the support from the Chinese, British and Ethiopian governments and co-hosted by Fudan Global Health Institute, Marie Stopes International (MSI) and the county government of Gonji Kolela Woreda, Ethiopia, the pilot project in Ethiopia was launched in Gonji Kolela Woreda, 90 kilometers away from the West Gojam District of Bardarda, the capital city of Amhara Province. The project aimed at reducing the maternal death rate through promoting utilization of the Reproductive, Maternal, Newly-born and Child Health (RMNCH) facilities taking the advantage of China's evidence-based practices. To be specific, local communities have mobilized women and their families to be connected to nearby health facilities, eliminating their financial barriers to access maternal first aid and reinforcing monitoring and supportive supervision. Women and children living in Gonji Kolela Woreda enjoy inadequate health facilities, whose health status is generally lower than that of the national average level: there are only 6 health centers and 26 health service stations (one health center is supported by 4 or 5 health service stations, serving 25 thousand people or so.) in Gonji Kolela Woreda with a population of 150 thousand, where there is no hospital at the county level. Altogether 17 midwives and 56 health expansion workers (HEWs) are serving in Gonji Kolela Woreda, among whom 2 to 4 midwives are working at a health center and 2 medical workers at a health service station.Fudan University conducted an effectiveness evaluation program in June 2017, before the project was due on schedule, which included collection of regular monitoring data, a questionnaire survey on the 6 health centers, 12 group interviews to the national office of MSI, the on-site office, the Health Ministry of Ethiopia, the Finance Ministry of Ethiopia, the Magistrate of Gonji Kolela Woreda, the Health Bureau of Gonji Kolela Woreda, the religious leaders, the community volunteers and the pregnant women and 6 in-depth individual interviews. The findings showed that the implementation of the project has greatly improved local people's awareness on maternal and child health with better access to information and service concerned and progress in quality of health service, which have been elaborated in the *Final Assessment Report on the Ethiopia Project*.

The major achievements and influence of the Ethiopia project include:

- Utilization of health service has been improved. To illustrate, during implementation of the project, 74% of the pregnant women in Gonji Kolela Woreda have been provided with antenatal care at least once at their respective health center, compared with the average 58% in rural Ethiopia. The ratio of the pregnant women who have received antenatal care at least four times has increased to 47% after the implementation of the pilot project from 5% before while the average ratio in rural areas nationwide is 27%. Before the implementation of the project, 28% delivery received aid from proficient midwives at medical service providers while 30% with assistance by HEWs at the county level. However, in Ethiopia's fiscal year 2009 (or from July 2016 to June 2017 when the project was implemented), 50%

delivery procedure was conducted at health centers while 5% at MSI Maternity and Child Health Center, which meant 55% at health care institutions excluding delivery service provided by HEWs, while on average 21% pregnant women received delivery service from doctors, nurses, midwives, medical workers and HEWs in rural Ethiopia.

- The maternal and perinatal mortality in Gonji Kolela Woreda has been reduced. In Ethiopia's fiscal year 2009 (or from July 2016 to June 2017 when the project was implemented), 11 newborn died while 29 in the fiscal year 2008 (or from July 2015 to June 2016, whose the first half was before and the second half after the implementation of the project). According to the survey by MSI Ethiopia Office, 5 pregnant and lying-in women died during the 19 months (from Dec. 2015 to Jun. 2017) when the project was implemented while the number for the previous year was 13. This decline of maternal mortality, according to the key insiders, has been achieved largely due to the free transfer and emergency care provided by the project which has served 184 pregnant and lying-in women in critical conditions by transferring them to the designated obstetrics emergency service where they were offered medical treatment for free from their respective health centers at the village level.
- The practices, outputs, achievements, effects and suggestions of the pilot project have been reported to the local government as policy briefs when the project was completed (See the details in the policy brief -- Promote safe motherhood in rural Ethiopia) and the major points include:
- Making more efforts to motivate the local community to promote local people's health. More work should be done to inspire local management committee members, religious leaders, HEWs and health development forces to contribute to mobilize the local residents to improve their awareness of health.
- Medical workers including all health professionals,such as midwives, nurses, medical officials, health management and HEWs should be stimulated through offering them with regular and on-demand in-service training and coaching programs.
- HEWs should be encouraged to carry out home visiting with the basic antenatal and postnatal health care facilities, whose confidence would be enhanced through capacity training.
- Collection, processing and quality of data should be improved through in-service training and on-site supervision.
- Efforts should be made to explore the way to turn clinic service facilities owned by non-governmental organizations into obstetrics emergency centers as a supplement to health service offered by public medical institutions and to raise money to purchase fuel and maintenance service for the transfer ambulances.
- The community-based RMNCH program and the transfer service funded by the pilot project should be extended to Gojjam Zonal City and even Amhara Province. With support from the Health Ministry of Ethiopia, Ethiopia may seek more financial aids through China-Africa Cooperation Forum.

3.2.2 The major achievements and influence of the pilot project in Myanmar

The pilot project in Myanmar was carried out from Oct. 2016 till Jun. 2018. Kunming Medical University conducted the final assessment the pilot during the last 10 days of May 2018. The assessment team has spent 5 days on doing individual interviews at six local medical service institutions and six local communities with 141 people including managers of the medical

institutions, medical staff and pregnant and lying-in women, verifying the accounts by the institutions on maternal health care and birth control service and collecting further data.

The major achievements and influence of the pilot project in Myanmar include:

- Health care service has been utilized more often. According to the quantitative data by the local government and MSI, both the rate and number of hospital delivery has increased in the county where the pilot has been conducted. To be exact, hospital delivery rate has risen to 53% in 2017 from 29% in 2015 when the pilot did not start; and other indicators of maternal and child health care service usage have all increased including the ratios of the pregnant women receiving prenatal care at least once, four times or more, receiving the first prenatal care service within the first three months of pregnancy and postpartum housecall at least once. Most interviewees confirmed that the majority of the local women would give birth to their babies at medical agencies instead of their own homes.
- The local women and community's trust on and engagement with the official medical agencies have been promoted. 30 local volunteers have been employed to popularize reproduction health knowledge and promote women, newborns and children's health, among whom 27 people still stick to their responsibilities, who have been very proud of themselves because they have been respected and supported by the local people for their satisfactory work. Both the local communities and women's health awareness and the trust and connection between the local communities and official medical care providers have been greatly improved while the local women have became aware of the access to health care, which has resulted from home visits, health lectures and transfer treatment by the health promoters. The achievements have shown that China's "Tricyclic Mode" to promote maternal and child health has been applicable in local communities in Myanmar, which has also been affirmed by the health officials in Myanmar.
- Despite the achievements, the evaluation findings have shown that the pilot has not been able to remove all the obstacles cutting the access to maternal and reproduction health care facilities. To illustrate, it is still difficult for the women living in the poorest regions to benefit from the project while the local demand for contraception and birth control service has not been met to a great extent due to the large population, which has reflected the conflict between the few projects and much demand. Therefore, we suggest that MSI continue their efforts in the county where the pilot project has been implemented by seeking other sources of support while Kunming Medical University complete the policy brief on the practice of the pilot in Myanmar for the Ministry of Health and Sports of Myanmar to introduce the pilot model to more places.

3.2.3 The major achievements and influence of the Advanced Midwife Center at the China-Ethiopia Friendship Hospital

- Exploring a sustainable health aid mode which aims to "teach people how to fish instead of simply giving them fish": The project has piloted the way for the Chinese universities, the hospital constructed with aid from China and the Chinese medical team to collaborate in carrying out health projects. For instance, at the -Beijing Hospital, the local government has funded the building to house the Midwife Training Center; Fudan University has committed to exploring a sustainable health aid mode which aims to "teach people how to fish instead of simply giving them fish" with its aid in establishing the software and hardware at the Midwife Training Center of the China-Ethiopia Friendship Hospital,

training 15 teachers and presenting the relative teaching materials such as a full set of teaching plans, materials for 12 skill training programs and a complete administrative manual; it has also been a pioneer in carrying out cooperative health aid projects by cooperating with the 18th, 19th and 20th Chinese medical teams in project management and faculty training. It is worth mentioning that the launch of the Midwife Training Center at the China-Ethiopia Friendship Hospital and its training sessions has acquired attention from the Health Administration of Addis Ababa, the capital of Ethiopia and the local administration.

- Drawing international attention through publicizing the achievements of the project: In order to publicize the practices and outputs of the project, Prof. Hu Yan attended the "China-Harvard-Africa Seminar on Global Health Network" hosted by Harvard University focusing on the challenges and opportunities that China and Africa have been facing in the field of global health, the aims and objectives of establishing the China-Harvard-Africa Global Health Network and the strategies on how to collaborate in carrying out global health projects at Harvard, the U.S. during Apr. 27th-30th, 2016. Prof. Hu Yan reported on the Ethiopia Midwife Train-the-Trainer Program sponsored by the GHSP-CS-OP4-V01 project and showed her audience the VCR, which has been spoken highly of by the participants from Harvard, Africa and China.
- Associate Prof. Zhao Ying from Fudan Nursing School in charge of the Ethiopia Midwife Train-the-Trainer Program in Ethiopia was invited to attend the "International Health Conference 2017" hosted by St. Hugh's, Oxford University, during Jun. 29th-Jul. 1st, 2017. She delivered a report on "An evaluation of the Simulation-based Training for Skilled Birth Attendants in Ethiopia Midwife Train-the-Trainer Program"at the workshop on public health which was attended by 194 professionals on the morning of July 1st. The Ethiopia Midwife Train-the-Trainer Program has been awarded the only "First Prize" named after Mr. Richard Peto, a senior professor at Oxford, who has extended his regards and praise to the research and contribution made by the Fudan team in the field of global health.

3.2.4 Promoting international exchange and publication

Fudan Global Health Institute held the Interim Project Report Meeting in Shanghai, from Sep. 20th to 22nd, 2017, aiming at sharing China's success and practices in its maternal and child health care efforts and summarizing both the experience and lessons of the pilot with more pilot countries. More than 40 people took part in the event coming from the Maternal and Child Health Service Department, International Cooperation Department and Project Fund Supervision and Service Department of the then Population and Family Planning Commission of China, DFID China Office, United Nations Fund for Population Activities (UNFPA), Chinese Academy of Social Sciences, Peking Union Medical University, Reproductive Health Division of Maternal and Child Health Council of Ethiopia, Maternal, Child and Reproductive Health Division, Public Health Department of the Health Ministry of Myanmar, Amhara Health Bureau of Ethiopia, West Gojam Municipal Government of Ethiopia, Gonji County Government of Ethiopia, Public Health Office of Hlaing Thar Yar, Rangoon, Myanmar, Marie Stopes International Ethiopia Office, Fudan University and Kunming University. Based on the findings of the pilot projects co-conducted by China, Ethiopia and Myanmar on maternal, child and reproductive health, the participants discussed and summarized the policy suggestion on the cooperative projects between China and Ethiopia and Myanmar to meet the new challenges.

The participants from Myanmar proposed their objectives with their national efforts to achieve SDG:

- keeping a high rate of hospital delivery sustainably (according to China's experience);
- enhancing enforcement of the related policies on sex and reproductive health and rights;
- strengthening the application of the information management system facilitating generating, sharing and utilizing of knowledge (according to their appreciation of the Chinese decision-making system on information management);
- promoting usage of long-acting contraceptive methods as a birth control measure (Myanmar should learn from China's practice in popularizing the intrauterine devices while China could benefit from Myanmar's experience in introducing postpartum contraceptive methods since the launch of its "Two-child Policy");
- making joint efforts to promote youth's sex and reproductive health through mutual learning and exchange;
- accelerating construction of public health agencies (according to their appreciation of China's maternal, child and reproductive health facilities);
- improving the fund-raising and incentive mechanism of the service provider (as one of Myanmar's policies on health care full coverage in the future);

The participants from Ethiopia proposed their objectives with their national efforts to achieve SDG:

- improving the quality of pregnancy and birth care;
- establishing a system of child health care (according to their appreciation of China's system of child health care);
- strengthening capacity building.

The participants from China has proposed their suggestions on cooperation focusing on maternal and child health: 1. sharing its experience in improving maternal and child health through full coverage; 2. conducting technical training and exchange programs; 3. sharing its practice with details in healthcare reform; 4. learning from Myanmar and Ethiopia on their practice of promoting youth's reproductive health and popularizing postpartum contraceptive methods.

3.2.5 The pilot projects have drawn great attention from the departments in charge of the pilot countries.

Four heads of the International Cooperation Departments of National Health Commission of China have been engaged respectively in the co-supervision process, the conclusion meeting and the final seminar of the Myanmar pilot. Besides, the officials from the Maternal and Child Health Department of National Health Commission of China have respectively attended the Interim Report Meeting making face-to-face communication with the government officials from Myanmar and Ethiopia in addition to their presence at the final seminar. On the other hand, the leaders from the Maternal and Child Health Department of the Ministry of Health and Sports of Myanmar and the Health Department of the Ethiopia pilot province have been to China to conduct on-the-spot observation and study about China's three-level system of maternal and child healthcare and healthcare system at the primary level in addition to participating in the communication event of the pilot projects.

IV. Experience, lessons, inspiration and suggestions

4.1 Sharing China's experience during the implementation of the pilot projects

4.1.1 How to understand China's experience in its maternal and child healthcare

The point is "Exploring the development path against China's conditions based on the international practices", which means China has committed to explore the way to adapt the international practices to the Chinese reality to achieve its best effect. The major characteristics of China's mode include:

- Abiding by its international commitments (to the MDGs) as a major power: China, a big nation with a population of 1.3 billion, with its endeavors, has made great progress in improving the health of its women and children, which has also been a significant contribution to the world. According to WHO's estimation of maternal mortality (WHO, 2015), the maternal mortality rate in East Asia was 95 per 100 thousand in 1990 while the figure would be 51 if China had been excluded. On the contrary, the figure was 27 in 2015 while 43 without China being counted. These data showed that China has made great progress in reducing the pregnant and lying-in women deaths from 1991 to 2015, which has been a significant contribution to reducing maternal mortality in East Asia and even the whole world.
- China's unremitting efforts with its step-by-step from-pilot-to-extension mode to implement the pilot projects: the Safe Motherhood Pilot funded by international institutions in 1998, the special program aiming at reducing maternal mortality and eliminating incidence of neonatal tetanus that has been extended gradually in the rural areas from 2000 to 2012 as a key project sponsored by the Chinese government. The 15 years of hard work of extending the pilot projects of promoting hospital delivery in all the pilot provinces have been the efforts to break through the restrictions of the current policy by taking the advantage of the special policy of the pilot projects.
- The tailored measures to solve the existing problems: the measures taken in different regions vary according to the specific problems against the actual context in the ways and practices to encourage hospital delivery in local communities, to change midwives' responsibilities, to carry out transfer and first aid procedures on pregnant and lying-in women, to improve quality of pregnancy and birth care in rural areas by supporting aid by the urban areas.
- Efficient enforcement: the policy to promote hospital delivery has been effectively put into practice with effective supervision and clear accountability, which has been achieved through adopting multiple measures and mechanisms: internal oversight by the local health administration, mutual inspections among provinces, supportive supervision by experts, external assessment, flexible regulatory instrument and accountability mechanism.

4.1.2 How to spread China's experience?

- The relation between the international evidence and China's experience should be clarified. China's case should be analyzed based on a summary of the international evidence from the audience's perspective, convincing people that it is for public welfare before elaborating how China has achieved it.
- China's experience can be tailored only when the needs and capabilities of the recipient countries are fully understood. When carrying out cooperative health projects abroad, it is important to have a good understanding about the followings: discrepancies in health administration, social and cultural differences, conflicts in ethic and law, efforts in the run-up to projects (completing reports on national conditions, reports on national

comparisons, carrying out on-site investigations and symposiums before project design and review and approval of project biding documents from the aspect of ethics of different countries) and the adjustment period during the process of project implementation.During the implementation of the pilot project in Myanmar, its health administration system has been going through a series of reforms: the previous unified administration system has been halved: clinic medical service and public health service, which has called for changes in the project interventions. Besides, the Health Ministry of Myanmar has made new requirement that printing any IEC/BCC materials has to be approved by its Maternal and Reproductive Health Department, which has increased the workload and time cost of the pilot. It is advised that sufficient time be spent on acquiring a clear picture of the recipient countries' health systems and their reform plans during the project design and the initial period of implementation when carrying out health cooperative projects.

- The balance between China's influence and the recipient countries' needs should be pursued. While China is sharing its experience as the successful international evidence, aid projects should be based on the principles of responding to the recipient countries' proposals, inviting the recipient countries' participation and meeting the recipient countries' needs since the Chinese culture believes in "giving other people what you enjoy". China should offer what the recipient countries really need for sustainable development based on the recipient countries' achievements, showing China's sincerity in its aid that reflects the extra values of China's aid.

Suggestion No. 1: The comparative studies about national policy-making process should be carried out, in which China's pragmatic practices of gradual extending pilot reforms, pooling resources to tackle the bottleneck problems, establishing tailored mechanisms and implementing effective supervision have been highlighted.

4.2 A changing external environment for aid projects

4.2.1 The key to the success of aid projects is paying close attention to the recipient countries' security

A security evaluation program has been completed in the pilot region in Ethiopia which has been concluded with a security manual for the staff working in Ethiopia before they were sent there who have always stayed close contact with the Chinese officials stationed in international organizations and the Chinese embassies for timely security information and emergency aid. For instance, the state of emergency caused by racial conflict in Ethiopia in Oct. 2016 has resulted in the recall of the Ethiopia project personnel, suspension of the on-site supportive oversight and change and absence of the local health officials for half a year.

4.2.2 The conflict between the local social and cultural conventions and health intervention measures should be properly dealt with depending on the local government.

The sterilization operation service offered by MSIE, a partner of the project, upon the local government's demand, has been opposed by the local religious power, which has led to its suspension for one month because of the local people's distrust in the project caused by the rumors. With support from the local government, the conflict has been settled through negotiations with the local religious leaders: replacing the sterilization operation with other long-acting contraceptive methods.

Suggestion No. 2: A help information network for China's aid projects should be established for releasing safety information, providing information on local services and bodyguard service, professional consultation (e.g. customs brokerage) and emergency evacuation.

4.3 The influence of the aid project partners' internal regulations on the implementation of the projects

4.3.1 How to find the local partners? It is important to balance effective implementation and controllable supervision.

The local people who are good speakers of both English and the local dialects with rich on-site working experience in international projects or the local officials who have received training internationally are the best partners. It is necessary to reach agreement through negotiations on all the cooperation details including the financial terms, the possession of the project outcomes, the supervision mechanism during the implementation of the projects, the specific outputs and their formats. These negotiations may be very time-consuming but the projects should not be launched before everything is settled.

4.3.2 How to resolve the policy conflict between the projects and their organizers? It is suggested that the general principles should be stick to with proper flexibility.

On the one hand, it is necessary for the partners to abide by the general principles although it is inevitable for the partners coming from different nations and entities to contradict with each other in their internal administration policy; on the other hand, the general principles should enjoy proper flexibility to allow the partners to manage the projects with their own internal standards without breaking the basic principles in order to reduce extra human cost, which aims to keep the projects to continue.

4.3.3 How to manage the health cooperative projects abroad? The management costs tend to be large due to the differences in the relative institutions and systems between the implementation parties, partners, management and sponsors.

Generally speaking,establishing on-the-spot offices to supervise project implementation has proved to be more efficient with comparisons of the efficiency of overseas and domestic offices. In China, the universities directly subordinate to the Ministry of Education can go through exit formalities much faster than those provincial colleges. On the contrary, the provincial colleges are not entitled to invite experts from other institutions to join their on-site instructions. For instance, the staff in Kunming project office are not able to go to Myanmar freely. In addition, three specific project management modes have been proposed:1.working with the experienced international non-governmental organizations (MSI) with supervision and management during implementation to reduce risks; 2. commissioning third-parties to complete such individual tasks as baseline assessment and customs clearance of equipment to improve working efficiency (e.g. customs clearance of the large-scale aid equipment for the Ethiopia-Beijing Hospital) while participation in realtime oversight by the responsible party is strongly suggested in order to guarantee quality (e.g. Kunming University got involved in the baseline assessment in Myanmar project); 3. carrying out supervision (one field monitoring every month and one field supportive instruction every three months) and assessment (midterm and final) during implementation to know about the effects.

4.3.4 Three cases of coping with conflicts and risks

Case 1: The permanent contraception and birth control service offered by the Ethiopia project by MSIE has been opposed by the local religious groups, which has led to suspension of all the services because of the local people's distrust in the project. Working with the local government, MSIE held a meeting with the local religious leaders elaborating on the project's significance, objectives and formats to resolve their misunderstanding and bias on the long-acting and permanent contraception and birth control service through dialogues between MSIE and religious leaders, which has achieve mutual understanding and trust. The project has eventually won full support and high recognition from the local community and religious leaders.

Case 2: Kunming Office has failed to have the experts from the Myanmar Institute of Yunnan Academy of Social Sciences to join in the mid-term on-site assessment in the Myanmar pilot project despite Fudan Office's requirement because of the policy bottleneck: according to China's relative regulations, no institution or organization is not entitled to have anyone working at other institutions at the same level to as a member of the delegation going abroad. To illustrate, Kunming Medical University cannot have the experts from Yunnan Academy of Social Sciences in their delegation going abroad under the condition of applying for passports and visas for business instead of private purpose. Therefore, the project had to eventually give up the experts from Yunnan Academy of Social Sciences in spite of great efforts while the experts working for the institutions at the lower level have not been put into the delegation due to the time limit. Moreover, the newly-released *Notice on Strengthening Management of Applying for the Going-abroad Plans 2018* by the Foreign Affairs Office of KMU has further increased the time and human costs to implement projects efficiently, which clearly spells out that all the delegation members should be the staff of the delegation organizer instead of employees of other institutions.

Case 3: KMU has commissioned a professor at University of Public Health of Myanmar, an individual instead of an organization to complete the field investigation at the Myanmar project with Fudan Office's approval. However, the Kunming Office had to pay the UPH professor by first drawing his consulting fees in RMB every month and then exchanging the money into U.S. dollars since the KMU financial department is not entitled to pay individuals abroad, which has not only increased workload but also caused payment risk.

Suggestion No. 3: A consultation platform on China's going-out policy should be set up for three purposes: 1. to identify and summarize the problems; 2.to provide possible realtime consultation and help; 3.to call for reforms of the regulations on foreign affairs or to give special policy privileges to the staff working for the outbound projects against the context of China's "One Belt, One Road"Initiative and the global health development.

4.4 The project achievements are decided by the efforts made by the project implementer.

4.4.1 Choosing the project implementer through public bidding will bring in the implementer's identification with the project and stimulate great devotion by either the individuals or the teams.

In order to pick out the institution with both willingness and capabilities to get involved in the project, the project has issued invitation for bid. Similarly,open recruitment process has been adopted to recruit the field project manager who are expected to possess both willingness and capabilities to devote into the global health cause. With the "initial intention" to be engaged in

global health development through joining in international organizations, the resident staff at the Ethiopia project sent by Fudan University has spared no effort to explore, learn and take challenges in their positions, who have made important contributions to the implementation and conclusion of the Ethiopia project. The project manager for MSI, a partner of the project, has also been selected through open and competitive recruitment process at the project site. The project manager used to be a health administrator in a neighboring county who has always determined to contribute to carrying out maternal and child health programs.He, therefore, found the favorable position for the use of his skills where he spent 20 days at the project site every month doing tailored jobs and he has been to all the villages in the pilot county during the implementation period, regarded as a teacher by the health staff at the primary level.

4.4.2 The project efficiency and effects are decided by the characteristics of the project implementer.

Both the implementer, a Chinese university, and the partner, an international non-governmental organization, are neutral and professional. The former is skilled in project design, supervision, instruction and evaluation while the latter enjoys good cooperative foundation with the local government and is capable to provide professional service locally through its staff who are speakers of the local dialects. With their respective advantages, all the project objectives have been successfully completed. At the same time, the project has also contributed to reducing the local maternal and newborn mortality through increasing utilization of health care facilities with the measures to promote connection between the recipients and health services and improved execution supported by continuous supervision.

4.4.3 Proper incentives for the staff plays an important role in improving project effects.

The incentives for project staff vary but the Ethiopia project has provided the long-term resident staff with high wage and good allowance who are expected to keep contact with the project manager and the office in home country to acquire appropriate support to be stimulated to conduct exploratory research. Multiple tailored incentives should be adopted to stimulate the local health workers without breaking the local laws and regulations, such as equipping with uniforms and professional service devices, carrying out competition among the health staff at the village level, offering both moral encouragement and material rewards to those with outstanding performance and providing the opportunities of receiving external training with travel allowance. However, there has been no effective exit mechanism to keep the local medical workers motivated though the related suggestions have been submitted to the local authority as policy briefs or through meetings with the concerned administration in addition to the training programs on equipment operation and free medical treatment for the pregnant and lying-in women in poverty offered by MSI after the end of the Ethiopia project. On the contrary, the Myanmar project will be carried on with the fund from “Three MDG” , which is expected to find further financial support from other local sponsors.

Suggestion No. 4: 1.The Global Health Cooperative Development Fund should be set up and its implementer should be identified through open tendering process. 2. China Global Health Talent Pool should be established whose staff will be recruited through the proposed global health talent recruitment website. 3. The exit mechanism should be integrated into the entire project design, which focuses on match with the local policies or other related projects, since the global health cooperative projects can achieve sustainable good results only if they are funded

sustainably.

V. Project Expenditure (Omitted)

Appendix: Core Deliverables of the Subcontract by Fudan Global Health Institute OP4V01 (Omitted)

OP402 National Institute of Parasitic Diseases (NIPD) of the Chinese Centers for Disease Control and Prevention (China CDC)

Output 402 Overseas Pilot Project on Malaria Control in Tanzania Final Report

Contents

1 Summary

China-UK-Tanzania Pilot Project for Malaria Control (hereinafter referred to as Pilot Project), an essential part of new health-development cooperation project, started by National Institute of Parasitic Diseases Chinese Center for Disease Control and Prevention （NIPD）as the host, Ifakara Health Institute (IHI) in Tanzania as the cooperation partner and 12 other cooperative institutions or units at home and abroad of UN. Rufiji in southern Tanzania was selected as an intervention site in the Pilot Project. According to the WHO-T3 strategy with the Chinese experience in malaria prevention and control, local-tailored strategies and models were explored in the intervention areas. The main activities of the pilot project were officially launched on April 2, 2015, and ended smoothly on June 30, 2018.

Based on the project design as well as approved work plan, the following activities have been achieved in Rufiji. 1) Baseline household survey: a total of 9,369 people were randomly selected to conduct household surveys including questionnaire and malaria-infection examination, and health-service surveys of all 13 health institutions and 22 community interviews in the pilot area were completed; 2) Community mobilization: a total of 500 local government leaders from 36 villages were invited for the project advocacy, and five specific community mobilizations with about 10,000 people's health education and on-site consulting services were accomplished; 3) Capacity building: Sharing the experience of the Chinese community, recruiting 37 field staff, establishing mobile stations of malaria microscopy and grassroots teams of prevention and control based on community and health institutions, completing the software design of the malaria case information reporting system based on the mobile client; 4) Vector surveillance and control: 36 representative surveillance sites were selected for Anopheles sinensis surveillance, and more than 30,000 Anopheles samples were collected. Cooperated with the Tanzania National Project, about 50,000 long-lasting mosquito nets were distributed; larval killing in some areas was carried out to effectively reduce the risk of local malaria transmission; 5) Active case screening and treatment: a total of 46 rounds of community screening with 38,878 high risk population were screened and treated timely; more than 19,000 high-risk population in 6 villages were treated with Chinese medicine (DHA-PPQ); 6) Quality control and supervision: a total of 12 on-site supervisions, 5 financial special supervisions, and 3 external audits were carried out; 1,497 blood samples were reviewed on site; more than 7,000 blood samples were collected, and more than 10,000 vector samples were shipped to NIPD for molecular identification; 7) Summary and evaluation: internal evaluation (led by Duke University), mid-term evaluation (led by WHO), external evaluation (led by DFID), final

evaluation (led by WHO) and other series of assessments were accomplished; relevant partners were invited to conduct regular project summary and discussion every year; 8) Multi-institutions Cooperation and communication: China sent a total of 6 batches (including 5 domestic partners) with a total of 32 person-time to provide on-site technical support. In exchanges and cooperation with Chinese Embassy in Tanzania and the Tanzania Ministry of Health and Social Welfare, more than 120 international experts participated in the project design and implementation.

The main achievements of the project: first, the burden of malaria in the pilot area was significantly reduced; second, the experience of malaria prevention and control in China was effectively promoted; third, it set successful examples for China's participation in and support for malaria prevention and control in Africa; fourth, the effectiveness of prevention and control caught the international community's eye. Through field interventions in the past three years, the malaria infection rate in the high-incidence community of the pilot project decreased by 85.4% (from 36.88% to 5.38%), and the infection rate in the low-incidence community decreased by 70.1% (dropped from 15.92% to 4.68%). Malaria deaths in the intervention community have fallen to very low levels (no reports of malaria deaths in health facilities during the intervention). In addition, China and Tanzania jointly established a platform of malaria control and elimination cooperation on the African continent, set up a sharing and dissemination mechanism on project results, timely shared the experience, technology and products of malaria control and elimination in China, and proved the feasibility of eliminating malaria in Africa.

1.1 Background

China and African countries have a long history of health cooperation. Chinese government has dispatched medical teams to African and other developing countries since 1960s, and established 30 anti-malaria centers in Africa in recent years. Malaria was once prevalent seriously in China, which significantly hindered the socioeconomic and political development of the country. However, China reached the remarkable achievements during 60 years' unremitting efforts on malaria control programme. To summarize, the Chinese key experiences, governmental leadership, capacity building, intersectoral cooperation and community-based engagement played a very important role in malaria control. Application of an integrated, evidence-based approach with the local-tailored strategy and measures targeted to the malaria epidemiological profiles is one of the Chinese key approaches on the fight againstmalaria.

Looking back in time, Tanzania has indeed made important progress toward ensuring access to malaria control interventions over the past years; however there are many challenges hindering the country to reach and sustain a policy of universal coverage with effective curative and preventive services. Leveraging existing partnerships and effective engagement of the community in malaria control will be critical for the future of malaria control in Tanzania. However,, making sure that malaria is properly diagnosed, adequately treated and monitored will not be an easy task. This requires strengthening of the health system at all levels, particularly on access, quality and to top it all, strong integrated surveillance system. There are reported limitations with the availability, the quality of services and even on how cases are being handed, reported and followed up with a lot of discrepancies in numbers between districts.

The China-UK-Tanzania Pilot Project applied an integrated, evidence-based approach with the local-tailored strategy and measures targeted to the malaria epidemiological profiles, broad community-based participation and health system improvement for malaria cases testing, treating and tracking. The final goal of the pilot project was to explore appropriate mode and mechanism to effectively reduce the disease burden of malaria based on the existing local system, which could be scaled up and used in other regions.

1.2 Goals and objectives

1.2.1 General objectives

To reduce malaria disease burden by over 30% in comparison with that at the beginning of the project in the pilot area, through strengthening capacity of malaria control at local level by implementation of Chinese experiences in combination with WHO-T3 strategy in the pilot areas.

1.2.2 Specific objectives

a) To strengthen the community-based interventions by adopting WHO-T3 strategy in the pilot areas for: (i) increasing parasitological examination rate (T1), (ii) improving the standard treatment of confirmed and unconfirmed malaria cases (T2), and (iii) improving the malaria case tracking including case reporting and management (T3).

b) To strengthen the capacity building in establishment of entomological and parasitological surveillance response system as well as information tracking systems, through (i) increasing the participation of community and partners in control of malaria, and (ii) training local health staffs and better use of existing facilities.

c) To evaluate the cost-effectiveness of implementation of Chinese experiences in combination with WHO-T3 strategy and the community-based interventions in the pilot areas, through (i) base-line survey, mid-term assessment and final assessment, and (ii) appraisal of pilot outputs by external committee.

d) To summarize the lessons and experiences from this project and make recommendations for future foreign aid policy of China government.

1.3 Project contents

1.3.1 Project contents

a) To strengthen community-based interventions using WHO-T3 strategy in the pilot areas

b) To improve the malaria cases early diagnosis and treatment by setting up mobile test stations as well as introducing electronic reporting system in the pilot areas

c) To increase the parasitological examination rate of cases to over 85%, 90% in the high incidence and low incidence communities, respectively

d) To increase the standardized treatment rate of malaria cases over 80%, 85% in the high incidence and low incidence communities, respectively

e) To increase the foci treatment rate of malaria cases to over 80%, 90% in the high incidence and low incidence communities, respectively

f) To carry out MDA or preventive medicine for high risk population in combination with reducing the local vector capacity

g) Chinese field work team on-site support: During the peaks of malaria transmission seasons, Chinese experts will stay in the pilot areas working together with local health staffs to provide technical assistance and supervision on the local malaria control activities especially testing,

treatment and tracking of malaria cases, vector monitoring and surveillance, laboratory capacity building, etc.

1.3.2 To strengthen capacity of malaria control in the pilot areas

a) Training of local health staffs and volunteers
b) Strengthening of diagnostic laboratories
c) Development of surveillance network
d) Strengthen local health education, promotion and community mobilization

1.3.3 To evaluate cost-effectiveness of implementing WHO-T3 integrated with Chinese experiences and community-based interventions in the pilot areas:

(1) Baseline survey

Household surveys, health facilities surveys, malaria vector surveys and drug-resistance surveys were carried out before intervention started.

(2) Mid-term evaluation

The mid-term evaluation was carried out after one year when the project started for further improving the strategy as well as the control activities in the pilotareas.

(3) Final evaluation

The final evaluation of whole project was conducted by external expert and summarized by special seminars.

(4) Workshops were held

a) To analyze the cost-effectiveness of pilot approach through WHO-T3 integrated with Chinese experiences for reducing the malaria disease burden in the pilot areas.
b) To assess the feasibility and applicability of Chinese experiences from this pilot project.
c) To summarize the experiences and lessons from this collaborative project and make policy recommendations for both governments.

(5) Monitoring and Evaluation

Baseline data was collected from both pilot and control communities before the introduction of the proposed interventions. This was followed by mid-term evaluation one-year after commencement of the project implementations for further improving the strategy.. End-line evaluation was conducted at the end of project by external experts in order to assess the whole project. A difference-in-difference methodology was used for this purpose.

1.4 Project approach

This project was an intervention study with two representative separate pilot communities (each with about 10,000 catchment population) receiving the proposed interventions and two comparable communities (similar incidence, population, health system supply, socioeconomic, etc.) serving as control sites. One pilot community with malaria incidence of more than 20% and comparable community as well as one pilot community with malaria incidence less than 5% and comparable community were selected from Rufiji district. The pilot and control communities were finally decided based on the baseline survey. The difference-in-difference design analysis was undertaken to evaluate the impact in the pilot areas.

The gosl of this pilot project was to support Tanzanian government's implementation of WHO-T3 strategy appropriately with application of Chinese experiences and assess its impact on malaria control in the pilot areas. The main pitfalls observed in the implementation of WHO-T3 strategy were; insufficient drugs supply and other facilities, limited knowledge of health service providers,limited services allocation for patients, especially among the poverty stricken populations and the less developed information system restricting timely detection and treatment of malaria cases. Therefore, this project intended to improve malaria cases diagnosis reporting treatment and tracking using the China's "1-3-7" model. (Figure 1).

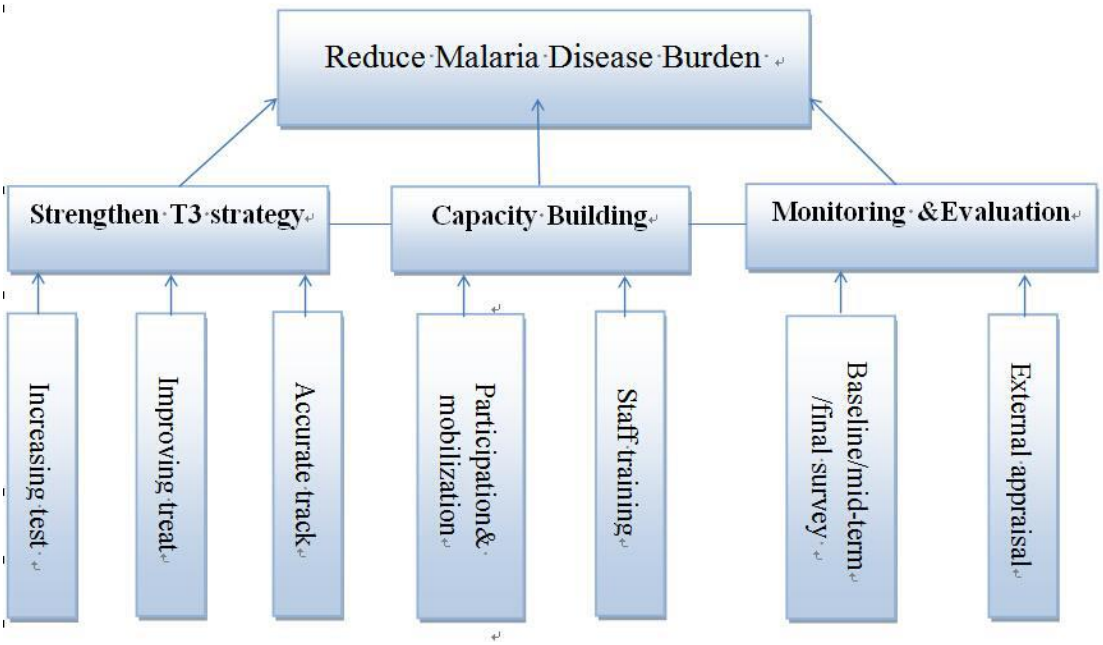


Figure 1. Technical approach of the project

1.5 project management

1.5.1 Project management mechanism

The project was managed strictly according to the GHSP Programme Management Manual (PMM), and the corresponding management mechanism was established from four aspects: administration, business, finance, supervision and evaluation. Project setup research team responsibility group, expert advisory group and project secretary group.Team responsibility group was responsible for project design, organization, implementation, and supervision and summary. The team responsibility group was composed of 21 experts, including 1 overall responsible person, 5 cooperative project leaders, 5 sub-project leaders, and 10 sub-project cooperation leaders. The CGE was responsible for providing advice on business, finance and management, as well as providing technical guidance and supervision. The CGE consisted of nine experts, including one team leader, two deputy team leaders, three business experts and two financial experts and 1 management expert; The secretarial group was responsible for the project organization, coordination, liaison and daily managementas well as providing support to

the overall project leader and the expert group. It was composed of 5 members, including a team leader, a management secretary, a business secretary, and a financial secretary (Figure 2).

Figure 2. Project management team composition

For financial management, in strict accordance with the requirements of GHSP maunal for the accounting standards, accounting systems, relevant financial and economic regulations and related provisions of institutions, and in light of the characteristics of the project, relevant financial management systems were formulated to be responsible for organizing, to carry out the financial management and accounting work of the project, to regularly standardize the financial accounting and management work, to inspect the use of project funds, and to urge the project to complete its work tasks according to the budget and schedule, to ensure safety of the project assets and achieve social benefits.

In the aspect of supervision and evaluation management, a series of monitoring systems have been established, such as the project annual evaluation system, mid-term evaluation system and the final evaluation system. The project progress report, inspection and supervision were conducted once every six months. Each cooperation unit reported the progress of the project regularly. The aim was to solve the existing problems and difficulties in a timely and coordinated manner.

1.5.2 Collaborating partners

This project was led by NIPD, coordinating 20 domestic and foreign cooperation partners. There were 10 domestic partners, including the Embassy of China in Tanzania, the Chinese Medical team in Tanzania, the Shandong Institute of parasitic Disease Control and Prevention, Anhui CDC, Guangxi CDC. Yunnan Provincial Institute of parasitic Disease Prevention and Control, Sichuan CDC, Chongqing CDC, Guangzhou University of Chinese Medicine and Guilin Pharma of Fosun Pharma; and 4 partners from Tanzania including IHI, MoHSW, NMCP, NIMR; and 6 international partners including WHO headquarters and country office in Tanzania, Swiss Tropical Diseases and Public Health Institute, Duke University Institute for Global Health, the Cameroon University of Witwatersrand, the Global Malaria Control Organization and Gates Foundation. The project team consisted of more than 80 technical team of experts from 10 countries, including 18 PhDs, 16 researchers/professors. Research fields included global health, disease control, epidemiology, vector surveillance and control, social science, health statistics and financial management.

2 Main results

2.1 Baseline survey

2.1.1 Household surveys

Two intervention communities (Chumbi and Ikwiriri) and 2 control communities (Bungu and Kibiti) were selected from 4 Ward in the Rufiji pilot area. A baseline survey on 9,369 people was completed in the Rufiji area. In 2015, 7,064 people underwent microscopic examination for malaria parasite dectection. The effective blood count was 6,829, of which 903 were positive, with a total positive rate of 13.22 (903/6,829). The positive rate of blood test for 4 Ward in the pilot area was from high to low: Chumbi (18.73%) > Bungu (16.95%) >Kibiti (12.94%)>Ikwiriri (5.57%). The comparison between intevention communities and control communities: there was no significant difference of malaria prevalence rate between Chumbi and control community, while difference of positive rate was statistically significant between Ikwiriri and control community.

2.1.2 Health facilities survey A total of 13 health facilties were surveyed in the Rufiji pilot area; 10 were clinics (dispensaries)(lower level of medical institutions) and 3 were Health Service Center (Health Center, HC). 8 health facilities were run by the government, 3 by social groups, and 2 by private clinics. In terms of staffing, the number of employees in each health facility ranged from 2 to 43, and the composition of different categories of health facilities varied; the public clinics run by the Government had more personnel. In a survey of the level of competence of medical personnel, 69.23% of the heads of medical institutions were clinicians, 21-50 years old, and 46.15% of them were under 10 years and more than 20 years of practice. The results showed that there was no significant difference in the level of diagnosis and treatment between health facilities. Health facilities run by the government had more resources and facilities.

2.1.3 Drug-resistance surveys

A total of 110 blood samples of filter paper were selected for nested PCR, to identify the mutation of artemisinin resistance related to K13 gene and the mutation at locus 86 and 1246 of chloroquine resistance related gene pfmdr1.

There were 9 samples with electrophoretic bands of the first batch of 14 pf positive specimens, and there were 11 samples with electrophoretic bands for mdr1-1246 loci identification and 14 samples with electrophoretic bands for k13 identification for mdr1-86 loci identification, respectively. The positive samples were sequenced and the results were compared, none of the 14 falciparum malaria samples showed any mutations at the 3 above loci.

The second batch of 96 mRDT positive samples were identified by k13 mdr1-86 and mdr1-1246 loci. All the samples were identified with electrophoresis bands.

The preliminary test results showed that 11 of the 110 samples had mutation at the pfmdr1-86 locus, with mutation rate of 10.00%, 4 mutations at pfmdr1 -1246 locus, and the mutation rate was 3.64%. It suggested that artemisinin resistant protozoa had not been found in the pilot area.

2.2 Capacity building

2.2.1 Development of an electronic reporting system for malaria cases

An electronic malaria case reporting system, (ODK Collect v1.14.1) was developed based on Open Data Kit technology. The system is used to collect epidemiological information of malaria reported cases by primary line investigators of malaria control and prevention. Case information is collected by primary health workers via a portable terminal system (such as a smartphone or tablet) or desktop (desktop or laptop) via internet and transmitted to the server set up in IHI. Through the calculation of malaria control data collected by the information administrator, the malaria epidemic situation in different areas is analyzed, so that the real-time information transmission and sharing of malaria epidemic situation can be realized. At the same time, it provides information technology support for further effective malaria control. The e-reporting system for malaria cases has implemented download, installation and registration functions based on web, Android and Apple multi-platform applications and online / \offline data acquisition function.

2.2.2 Training of larviciding technicians

Before carrying out Anopheles larviciding activities in the pilot area, the project conducted field training for staff on epidemic focus disposal and larviciding techniques. A total of 50 people, including 13 specialists as trainer and 37 staffs or local volunteers as trainee, participated in the training on how to find Anopheles larvae breeding sites according to environmental characteristics, and how to prepare spraying equipment and operate larviciding sprayers, etc, to ensures the quality of larviciding in potential breeding sites.

2.2.3 Case management training for medical workers and volunteers

The project carried out on-site case management training to local clinicians, medical staffs and volunteers at the IHI office in the Rufiji region, from August to September 2015. A total of 37 field staffs recruited, including 21 on-site investigators and 4 community nurses and 4 community doctors, were trained by 13 trainer experts, 5 from China and 8 from IHI, for 6 days theoretical learning and 8 days practical learning. The training included project objectives, technical routes and basic skills such as case management for intervention, vector control and health education. which laid a solid foundation for the baseline survey, monitoring and follow-up of malaria intervention and control in the pilot area.

2.3 Health education

2.3.1 Development of health education materials

The project developed health education materials which were popular and acceptable to the local community. Banners, T-shirts and exercise books were preferred as test materials among the many locally popular health materials. Each health education material contained information on malaria prevention, treatment or standardized use of antimalarial drugs (key information). The project tested health education materials: a total of 20 people, 16 health staffs in a medical institution and 4 teachers in a middle school, participated in the pretest of the health education banners. Their satisfaction rate was 80%, 90% and 100% on the design of banner, the simplicity of the information, and the usefulness to themselves respectively. Main recommendations on the improvement for health education banners was to: (1) increase the font size; (2) reduce the length of the banners and increase the width; (3) specify the core information; (4) hang it in public places. Main suggestions for promoting exercise books was to: (1) increase the number of pages; (2) increase the paper size; (3) place the core information on the cover rather than inside; (4) replace the original picture of map with malaria-related images; (5) reduce the hardness and thickness of the paper; and (6) develop more health education materials.

2.3.2 Community health education

Informed consent and mobilization of more than 500 government and health cadres from 36 administrative villages in 4 pilot communities were completed. 5 mobilization meetings for cadre and mass mobilization meetings were held in two pilot communities (Chumbi/ Ikwiriri), covering 225 cadres and masses in 15 administrative villages. By introducing the main contents of the project and the measures of prevention and control, the health education activities greatly improved the cognition of the community and health service personnel on the malaria control project.

The project successfully organized malaria control health education and mass mobilization activities on World Malaria Day 2016 in the pilot areas, during which the project carried out malaria screening, treatment and prevention counselling for nearly 3000 people. The participation of key partners (MoHSW, the Liverpool School of Tropical Medicine, etc.) facilitated multisectoral collaboration. At the same time, Tanzania's official mainstream media, The Guardian, reported in detail and affirmed the contribution of the China-UK malaria pilot project to the local community.

2.3.3 School Health Education

Through training the students and taking the form of "Small hand holding big hand", the project made students propagate their families after returning home and improve their parents' knowledge of malaria control. More than 200 T-shirts with malaria control slogans, 800 exercise books and 1,000 copies of calendar with anti-malaria knowledge were distributed to students in local schools.

2.4 Set up malaria mobile test stations

The project set up 4 malaria mobile test stations in the Rufiji pilot area, with each station consisting of 4-5 people. . At the test stations, blood samples were collected from patients to make thick and thin blood films for examination of malaria parasite. Rapid Diagnostic Tests (RDTs) was used for rapid detection and standard antimalarial therapy was given to positive

patients.

2.5 Case management

2.5.1 Focal screening and treatment

Rapid screening and treatment of malaria cases was undertaken as the main intervention measures, which has greatly reduced the malaria burden in intervention areas. Malaria-prone areas were identified in a timely manner through analysis of epidemiological data from local health facilities and results of vector surveillance, Then relying on the mobile test stations, most highly burdened population were screened and treated with standard antimalarial therapy. A total of 46 rounds of active case screening and treatment on 38,878 people were carried out, and 9,907 malaria cases were detected, with 25.48% positive rate. Among them, 9,540 cases were treated with a treatment rate of 96.00%.

2.6 Malaria vector control

2.6.1 Malaria vector survey

In 4 Ward of the pilot area, 9 villages were selected for each Ward, and 3 households were selected for each village, a total of 108 households were selected. Malaria vector surveillance was carried out using mosquito bucket traps and Centre for Disease Control (CDC) miniature light traps.The results showed that the distribution of the vector Anopheles was very complicated, and most of them belonged to the Anopheles gambiae group, followed by the Anopheles funestus group, and a few of Anopheles coustani. Malaria vector density peaked in May, with An.arabiensis (53.14%) being the dominant species, followed by An.merus (22.13%). The plasmodium sporozoite positive rate detected by ELISA varied among different species of Anopheles, ranging from 0.0 to 8.83%.

2.6.2 Indoor residual spraying (IRS)

The program failed to pass the impact assessment of Tanzania environmental protection department and get approval of IRS, for the reason that the pilot area belong to Tanzania National Nature Reserve. So the IRS activity was not implemented.

2.6.3 Distribution of long-lasting insecticide nets (LLINs) (Aactivity 1.3.5)

From May 15th to 30th of 2016, the project actively cooperated with NMCP, MoHSW and other partners to distribute about 50,000 LLINs in 36 villages, fully covered in the pilot area.

2.7 Departmental cooperation

2.7.1 Chinese experts on-site technical support

According to the work plan, the project nationwide selected experts in malaria laboratory, epidemiology, malaria vectors control, information systems and geographic systems, through the recommendation of cooperation units, interviews and evaluation, etc. A total of 6 batches of 32 person-times of Chinese experts were sent to Tanzania, mainly participated in and supported baseline surveys, vector surveillance, rapid case screening and treatment, establishment and pretest of case information systems, distribution of LLINs, reviews of blood slide, health education and other field activities. At the same time, supervision of the project implementation and financial management were conducted.

2.7.2 Advocacy on local government

The project activities was carried out not only with the project responsibility agencies, but also many international organizations and research institutions. The project team exchanged and discussed the project progress and cooperation plan with WHO, DFID, the Embassy of China in Tanzania, the Chinese Medical team in Tanzania, MoHSW, NMCP and other important partners in a timely manner, which has enhanced the partners' understanding of the project and improved the local work network of the project.

2.8 Quality control and assurance

2.8.1 Reviewed blood slides

A total of 1,497 blood slides were randomly selected from the high transmission community (HTC) (Muhoro) and the low transmission community (LTC) of the pilot are (Ikwiriri) for lab test quality control. The microscopic reviews were assumed as the golden standard for cases detection to compare the differences between the results of the original microscopic, RDT test and the microscopic review of the results of malaria diagnosis.

There were 679 (45.36%) slides from high malaria area (Muhoro) and 818 (54.64%) from low malaria area (Ikwiriri). At the same time, the results of microscopic examination and RDT test were collected.

The results showed that the positive rate of Plasmodium falciparum in microscopic examination (20.64%) was higher than that in original examination (16.30%) ($P < 0.0001$), and lower than that in RDT (25.45%) ($P < 0.0001$).

Through the correlation statistical analysis, we drew the preliminary conclusion that RDT had a superior performance to microscopy for malaria cases detection in the pilot areas. To consider the cost-effectiveness, RDT alone seem work better in the HTC than in the LTC.

2.8.2 Project supervision

During project implementation, in order to identify and solve problems in time and ensure the quality of project activities, chinese field work team cooperated with Tanzanian experts to supervise the development of project activities, such as malaria vector surveys, household surveys, community health promotion, rapid case screening and treatment, LLINs distribution and project funding use as well as other related activities. A total of 16 on-site and financial management supervision, 1 internal audit, 1 interim evaluation, 2 external evaluations, and 1 final evaluation were completed. The problems found in each supervision were notified to the implementers in writing or oral form, for timely rectification.; At the same time, through internal audit, external evaluation,mid-term evaluation and final evaluation, the implementation strategies were further improved, which has actively promoted the project progress.

2.8.3 Project evaluation

2.8.3.1 Internal evaluation

The project management team invited Duke Global Health Institute (DGHI) to conduct an internal evaluation of the project in June 2016, to investigate the intervention measures such as health education, staff training, case screening and treatment, and vector surveys, etc. The evaluation conclude that the pilot project is an important opportunity for China and Tanzania to work together to reduce malaria morbidity and mortality in a high-burden region in eastern

Tanzania and to test whether China's successful malaria control experience can be replicated in the region. So far, the project has made good progress in many areas through interventions, and all stakeholder groups contacted are willing to share their impressions of the project and make recommendations. DGHI summarized the responses of partners to project inputs, and used their input to propose further improvements in project implementation. These suggestions provided a good opportunity for partners to participate in the project. By better informing and engaging all project partners, the project is more likely to have a lasting impact at the national level in Tanzania and to provide more lessons for other African countries in malaria control.

2.8.3.2 External evaluation

(1) First external evaluation

In February 2017, the project invited e-Pact Consortium to conduct an external evaluation of the project implementation. The evaluation team interviewed the experts of the tripartite cooperation unit of the project, evaluated the report and financial implementation during the project implementation process, and formed an external evaluation report of the project.

(2) Second external evaluation

In May 2018, the project assisted the evaluation team to complete the second evaluation activities, such as expert interviews, activity reports and financial performance.

(3) Mid-term evaluation

In order to further improve the mode of project cooperation, optimize the implementation scheme and promote sustainable development, NIPD and IHI jointly undertook the activity from 20th to 24th October 2016, inviting more than 30 people from 16 partners, such as SOC, PMO, WHO and DFID, to carry out the mid-term investigation and summary of the project. The evaluation results showed that the project was progressing smoothly and the results were positive.Through the joint efforts of all parties, relevant data showed that the incidence of disease in the pilot area decreased significantly and the intervention effectiveness was significant.

(4) Final evaluation

In order to timely evaluate the implementation and summarize the local-tailed sustainable model, according to the original design of pilot Project, project team invited an external evaluation team including Dr. Maru Aregawi from GMP of WHO, Dr. Christian Lenger from Swiss Tropical Diseases and Public Health Institute, Dr. Rita Njau from WHO Tanzania Office, Dr. Renata Mandike from NMCP in Tanzania and Tambo Enest from Cameroon University of Witwatersrand (secretary of the evaluation group) as well as other experts to conduct the final evaluation of China-UK-Tanzania Project between May 3rd and May 7th, 2018. The evaluation activities was carried out jointly with project field supervision at the same time.

Through the field intervention in the past three years, the final survey results indicated that in the pilot area, a low-to-medium epidemic level areas at the time of baseline survey, . the malaria incidence has been reduced by 85.4% in the high incidence community (from 38.88％to 5.38％), the malaria incidence has been reduced by 70.1% (from 15.92% to 4.68%) in the low incidence community, and mortality rate of malaria was reduced to very low level (No malaria deaths were reported by health institutions during the project intervention).

2.9 Achievement of key goals

2.9.1 Application of WHO-T3 Strategy

Based on the basic conditions of the pilot communities and the WHO-T3 strategy, the project carried out pre-mobilization among the local residents; Through establishing vector surveillance sites and developing information reporting systems, the monitoring platform for local malaria vectors and cases was established; Potential high risk foci of malaria were identified with malaria case data collected weekly from local health institutions, combined with vector monitoring results; Mobile test stations were established in high-risk areas for rapid case screening and treatment of local residents, and the patients were followed up via telephone. The intervention in the pilot area progressed smoothly, and remarkable effectiveness of prevention and control malaria has been achieved.

2.9.2 Malaria burden

The overall objective of the project was to reduce malaria disease burden by 30% in comparison with that at the beginning of the project in the pilot area. At the end of the project, the results showed that the malaria burden in the pilot area had actually decreased by more than 80%, fully achieving the expected goal of the project.

2.9.3 Parasitological examination rate

The project's expected goal was to increase the parasitological examination rate of malaria cases to over 90%. At the end of the project, the results showed that the parasitological examination rate had actually increased to 98%.

2.9.4 Standardized treatment rate

The expected objective of the project was to increase the standardized treatment rate of malaria cases over 85%. At the end of the project, the results showed that the standardized treatment rate rate had actually increased to 98%.

2.9.5 Foci treatment rate

The expected overall objective of the project was to increase the foci treatment rate of malaria cases over 80%, at the end of the project, the results showed that the foci treatment rate had actually increased to 80%.

3 Project impact

3.1 The intervention effect remarkable

Through the field intervention in the past three years, the final survey results indicated that the malaria incidence has been reduced by 85.4% (from 38.88％to 5.38％) and 70.1% (from 15.92% to 4.68%) in the high and low incidence community respectively. And mortality rate of malaria cases has been reduced to very low level (No malaria deaths were reported by health institutions during the project intervention). The main vector control intervention (LLINs coverage and usage) of the pilot project contributed about 70% to the reduction of malaria infection in the residents, and the Chinese experience (active case monitoring and treatment technology) contributed more than 30% to the reduction of malaria infection in the population.

3.2 Sharing Chinese experiences and developed local tailed model

Through sharing the Chinese (1-3-7 model)experiences for malaria control and elimination, the pilot project has developed the community-based screening and treatment strategy on weekly basis (1-7 malaria Reactive Community-based Testing and Treatment approach), which greatly reduced the local malaria burden.

3.3 Building the foundation for sustainability

By drawing on the experience and lessons learned from other international cooperation projects in Africa, the project regarded sustainable development of prevention and control model as a key requirement at the beginning of the project design. Through the pilot project intervention measures, the project has trained a number of professional and technical personnel, and established faculty force for the pilot area. Two Tanzanian experts have also been funded by the Chinese government's Young scientists Project (TYSP), to work and study in China for one year.

Based on the China Disease Surveillance system, the project has successfully set up and run a malaria case report management information system in the pilot area, , and planned to continue to improve its application in other areas. The system is expected to form the basis of the Tanzania Disease Surveillance platform. The pilot project is now supported by the Gates Foundation for Sustainability, and the second phase of the project is scheduled to start in October -November 2018, which will lay the foundation for the promotion of malaria prevention and control in Tanzania.

3.4 Set up an effective platform for Cooperation

The pilot project regularly communicated project progress with WHO, DFID, Embassy of China in Tanzania, the Chinese Medical team in Tanzania, MoHSW, NMCP and other important partners in a timely manner, which promoted the understanding of the project, and improved the project work cooperation network and the exchange platform.

3.5 A new model of health cooperation

In the past foreign aid projects, most of the projects were based on bilateral cooperation. The project initiated a new model for foreign aid in Tanzania as a trilateral cooperation project among China, UK and Tanzania, with UK providing funding support, China providing technical support, and Tanzania being deeper understanding of the local health, economy, culture customs, with more experience on how project activities can be carried out effectively on the ground. In the process of carrying out the project activities, the three parties learned and supported each other, which made the project run smoothly and effectively, and achieved a good effect of cooperation.

3.6 Developing an innovative mode for public health foreign aid

The pilot project adopted the mode of cooperation between NIPD and local research institutes. The two sides have a direct dialogue: For the work plan, both sides of the cooperation formulated prevention and control plan through communication and discussion, according to which the scheduled activities were gradually implemented, such as data collection, evaluation **o**f prevention and control effectiveness; In the aspect of funding, the project funds had to be managed and approved by the PMO rather than the government, which was. From NIPD, the funds weresent directly to the IHI account, so as to reduce the intermediate links, avoid

embezzlement and misappropriation of the funds, and ensure that the funds are used in the work of prevention and control.In terms of personnel, NIPD selected experts from all over the country through various forms，such as cooperation unit recommendation and interview evaluation, etc, and set up many batches of field work teams according to the requirement of field activities. Considering maintaining of the stability of some experts, the form of on-site rotation for 2-3 months was opted to promote the progress of the project steadily.

3.7 The pilot project received extensive attention from international community

Chinese scientists are actively involved in global malaria control and prevention, and in pilot projects, the experience of malaria control in China has been promoted and implemented. The remarkable results achieved have received wide attention from the international community, at the side event on the theme "country-led malaria eradication initiatives, promoting universal health coverage" sponsored by China and co-sponsored by eight countries, including Sri Lanka, Myanmar and Australia, during the 71st World Health Assembly.

4 Problems and challenges

4.1 Project annual work plan

Because of various reasons, such as the delay in starting the project, the lack of timely disbursement of funds and the suspension of material procurement, and so on, some field interventions have been intermittent, and have not been completed as scheduled in accordance with the approved work plan; At the same time, due to the complexity of environmental impact assessment procedures in relevant government sectors in Tanzania, some interventions such as indoor residual spraying cannot be carried out.

4.2 Project funding transfer

When the project was launched in 2015, the“Consultation Service Contract” was signed. In 2016, after the change from business tax to value added tax in Shanghai, Taxation Bureau defined the project as a business activity. Therefore, VAT and additional charges were levied on the activities of NIPD and IHI, and foreign currency exchange controls were carried out at the same time. In order to successfully disburse the project’s overseas funds, NIPD has provided the Inland Revenue Department with a large amount of material to prove the public welfare and non-profit nature of the project within two years, including PMO related support materials, including the PMO WeChat Public number Newsletter, Tanzanian state reports and major domestic media press releases. Although successfully completed tax exemption filing, each funds allocation still required to make a single special application to the tax bureau. At the same time, project funding applications, verification and disbursement usually took at least one month to get approval. Therefore, it was difficult to get the field work funds in place timely.

The project financial personnel discussed with the officials of the tax collection and management department many times and suggested that the project contract for foreign aid should be marked with "donations", "sub-grants" and other public welfare expenses, and avoid using the names of value-added tax items such as consulting and technical services, etc, to achieve a more smooth flow of funding tranfer.

4.3 Project procurements

The project management had very detailed requirements on the content, quantity, price and procedures of material procurement, , which made it difficult for all parties to reach consensus in a short period of time. As a result, the process of revision, examination and approval of the annual material purchase plan and feedback were too complicated and lengthy. In addition, there were certain objective differences in procedure of material procurement between the two countries, resulting in slow progress in procurement of materials.

4.4 Project lab test

After the launch of the project, a large number of blood samples and vector samples were collected from household surveys, rapid case screening and treatment, vector surveys activities, etc. However, due to various reasons such as the high cost and technology of laboratory testing in Tanzania, the laboratory test has not been completed in time.

4.5 Chinese staff visa permission

At present, Chinese domestic visa procedures are complex, and it takes two months or more for on-site staffs to obtain visas under the normal procedures whichseriously restricted the timely arrival of on-site staffs.

4.6 The capacity of Chinese team

A stable field work team is one of the keyfactor for success in the implementation of project activities, however, the Chinese field team has frequently experienced team member change. At the same time, due to visa and other reasons, the Chinese field work team usually just stayed for 2-3 months once a time on site, which made it was diffcicult to complete the planned activities in the field.

5 Project expenditure (Omitted)

Appendix: List of core outputs (Omitted)

OP403 Chinese Center for Disease Control and Prevention (China CDC)

Output 403 Overseas Pilot Project on Improving Public Health Capacity of Sierra Leone
Final Report

I. Overall Situation

Our center has actively undertaken the Public Hygiene Assistance to Africa since 2014. In order to continue to support Sierra Leone to improve the public hygiene capabilities, enhance China's foreign aid capabilities in public hygiene, and to further deepen China-UK cooperation, our center in September 7, 2016, signed C*onsultation Service Contract for China-UK Global Project Health Support Project* with PMO (Project No.: 202708, Contract Name: Assistance to Sierra Leone to Improve the Public Hygiene Capacity, Contract No.: GHSP-CS-OP4-D03, Contract Term: September 2016 - January 2018). Based on the benign cooperative foundations between China and Sierra Leone and between China and the United Kingdom, China CDC recommends carrying out the exploration project by assistance to Sierra Leone with the support of GHSP project to improve the public hygiene capabilities. Based on the contents of the contract, our center has been actively promoted the organization and implementation of the projects, so as to successfully complete all tasks.

II. Project Progress

Activity I: Feasibility studies on the pilot projects of the prevention and control of major infectious diseases (policy and technical assessment)

(I) Activity Content

A senior hygiene policy expert (1), an infectious disease expert (1), a laboratory expert (1) and a project management expert (1) were selected and assigned to Sierra Leone to work for 1 month with a view to learning about the hygiene policies, the status of the health care system, the disease control strategy, the resource requirements, the international partners, and the project progress and to carrying out the feasibility study over the design and implementation plans of the pilot projects of the prevention and control of major infectious diseases such as hepatitis B vaccine vaccination for the newborn.

(II) Information on Completion

With the invitation of the Ministry of Health and Sanitation of Sierra Leone, Wang Xiaochun, the researcher, Qi Xiaopeng and Zhang Guomin, the vice researchers and Zhang Honglong, the assistant researcher of our center from February 18 to March 4, 2017, (hereinafter referred to as “the working team”) went to Freetown of Sierra Leone for the investigation and assessment of the existing status and the actual needs of the public hygiene of Sierra Leone. While working in Sierra Leone, the working team met with 7 health officials including the chief medical officer of the Ministry of Health and Sanitation and visited 6 international organizations and agencies resident

in Sierra Leone, attended 4 related conferences, organized 1 symposium meeting and visited 3 hospitals in different levels in downtown of Freetown of Sierra Leone and China- Sierra Leone Friendly Bio-Safety Laboratory in Jui (about 25 km from the downtown), and held 1 meeting respectively with the front test team of the China-Sierra Leone bio-safety stationary laboratory, furthermore, the working team met with Wu Peng, Ambassador Extraordinary and Plenipotentiary of the People's Republic of China and Shen Xiaokai, Commercial Counselor for reports for several times and communicated the operation of the stationary laboratory and the Phase II technical cooperation project for the next three years (2017.7–2020.6), and the current operation status and problems of the stationary laboratory, the study of tropical disease of the West Africa, the operation and maintenance mechanisms of the Prevention and Control Center after its completion, the evaluation over the existing status and demands of the public hygiene system and the disease control and prevention of Sierra Leone, the demonstration project of the timely inoculation of the first needle of newborn hepatitis B vaccine and the malaria prevention and control in Sierra Leone; moreover, the working team also held China-Sierra Leone Hepatitis B and Malaria Prevention and Control Seminar, invited 8 eight health officials of Sierra Leone to visit China and sent 3 Chinese experts to work in the Ministry of Health and Sanitation of Sierra Leone and the international organization and others, a total of 9 work items, finally, the working team successfully completed the site inspection work. See the summary report for details.

Activity II: Laboratory test and talent training (construction of laboratory capability)
(I) Activity Content
The technological experts(3) from China CDC or the provincial disease control center were selected and assigned to work for Sierra Leone for 1 month and continue to carry out the pathogen detection and test of infectious diseases such as Ebola hemorrhagic fever based on P3 laboratory, so as to establish a technical reserve for the detection of primary infectious diseases (including new infectious diseases such as Zika virus disease) in Sierra Leone and conducted the collaborative collaborations with PHE and other British partners in the field of laboratory.

(II) Information on Completion
The establishment of the capabilities of the laboratory for the tests and monitoring of major bacterial infectious diseases such as cholera and typhoid fever and the capabilities of the laboratory for the tests and monitoring of parasitosis with the dominated type of malaria is the focus of assistance to the Sierra Leone laboratory of China disease control center during the post-Ebola period. From September 15 to October 8, 2017, Liang Xiaoli, researcher responsible for infectious disease of the center, Yin Jianhai, assistant researcher of Parasitosis Institute and Wang Lili, assistant researcher of the global public hygiene center) went to Sierra Leone to advance the establishment of the test capability of major infectious disease laboratories in Sierra Leone and collaborated and exchanged with UK Public Hygiene Agency (PHE) and other UK partners, furthermore, such researchers conducted special training on the laboratory inspectors of Sierra Leone, assisted the e laboratory for normal operation and maintenance. The main activities carried out were as follows:

Investigation on the actual situation of Sierra Leone: 3 experts systematically investigated the basic public hygiene system, the prevalence of major infectious diseases, the operation and maintenance of China-Sierra Leone Friendly Bio-safety

Three-tier Laboratory with the main activities as follows: participating in the national laboratory partner coordination meeting organized by the Hospital of the Ministry of Health and Sanitation of Sierra Leone and the laboratory management department to learn about the progress made by the Sierra Leone public hygiene Experimental Alliance on the monitoring of epidemic disease after debris flow and the construction of the quality management system for the laboratory, and also to discuss the development plan for the future; participating in the weekly emergency response meeting organized by the Ministry of Health and Sanitation of Sierra Leone to actively understand the status and operation of the public hygiene system of Sierra Leone and the epidemic in the area under the monitoring; visiting the sites of Makeni to investigate the current status of the medical health system and to provide an important basis for gaining insights into the operation and management of local medical health system and for actively participating in the construction of the local public hygiene capabilities.

Laboratory exchanges and cooperation carried out: (1) Dr. Marcus and Bausch, two experts from the public hygiene rapid support team of the United Kingdom visited China-Sierra Leone Friendly Bio-safety Three-tier Laboratory. The two experts were introduced the scale and level of the stationary laboratory, the work carried out, and the bio-safety protection, and exchanged views on their respective work to be carried out, (2)visiting PHE's laboratory in Makeni of Northern Province constructed with support to understand the work conducted by the laboratory, and staffing and training conditions.

Establishment of laboratory operation flow: Based on full investigation, the construction and the test flow of the bacteriology laboratory was determined, the construction and the test flow of the parasitosis test laboratory was determined and the operation and management schemes were developed for the project. (1) Developing the laboratory test schemes and the flows for vibrio cholera and typhoid fever typhoid fever salmonella, preliminarily completing the laboratory test schemes and the flows for vibrio cholera and typhoid fever typhoid fever salmonella, the important enteric pathogenic bacteria and conducting the testing over the stool specimens of diarrhea patients. (2) Preliminarily completing the laboratory test schemes and the flows of parasitosis with the dominated type of plasmodium test, and initially completing the program document (the first draft), the quality manual (the first draft), and work instruction (the first draft) relevant to the parasitosis test laboratory with the dominated type of plasmodium test, and collecting the SOPs from Plasmodium Microscopic Test of the WHO and (3) Formulating the project management manual, in order to make sure the project can be smoothly implemented, and all personnel can conduct the laboratory-related work in accordance with requirements in a better manner, and carry out financial management, material management, and publicity, the project management manual was specially formulated to make sure the laboratory and the project can operate normally.

Establishment of bacteriology and parasitosis test laboratory: After several times of communications, the bacteriology and parasitosis test laboratories, the spatial positions of the bacteriology and parasitosis test laboratories were finalized, and the laboratory cleaning and the space layout planning were completed. The test equipment for the laboratory was provided under limited conditions, and the reserves of reagents for bacteria-related tests was further inspected and sorted.

Implementation of training and simulation exercises: (1) Participating in the systematic theory training of stationary bio-safety three-tier laboratory, observing the simulation exercise conducted by the team in accordance with the P3 laboratory test flow and providing recommendations for training and simulation exercises as an observer. (2) Explaining and giving the training on the bacteriology and parasitosis experiment flows so as to help the personnel of the Chinese party and the party of Sierra Leone for understanding and mastering the experimental flow.

Participating in visiting activities of Peace Ark; participating in the preliminary screening and triage of the patients with infectious diseases who had the willing to seek medical advice at Attouga Stadium, and actively cooperated with the medical staff of Peace Ark for hygiene and disease prevention and education as well as medical visits to the debris flow -stricken victim settlement and home for the disables.

At the beginning of the project design, the seriousness of the situations of local staff of Sierra Leone was not fully taken into account. Due to the short residence time of 3 experts in Sierra Leone, it was difficult to cultivate a person from the party of Sierra Leon qualified for the work in P3 laboratory.

Activity III: The experts were selected and assigned to work in Sierra Leone to explore the establishment of the international partnership and to assist the local implementation of infectious disease prevention and control.
(I) Activity Content: a senior public hygiene consultant (1), two infectious disease experts (2), and one laboratory expert (1) were selected and assigned to work in Sierra Leone in two batches with each of 2 talents and once every 3 months, they were specifically assigned to work in the National Office of Sierra Leone, or the National Ministry of Health and Sanitation of Sierra Leone, or other international organizations.

(II) Information on Completion
With the invitation of the Ministry of Health and Sanitation of Sierra Leone, and with the assistance from the Sierra Leone Office of the Center for Disease Control of the United States and the China Office of the Center for Disease Control, Shen Tao, vice researcher of our center went to Sierra Leone to assist the US-Sierra Leone live epidemiology training project from October 17, 2016 to January 9,' 2017, with the main three tasks as follows: First, providing guidance for the trainees of the first-line epidemiology project (Frontline FETP) co-hosted by the US-Sierra Leone, and second, collecting the relevant information for China-Sierra Leone project concerning the timely inoculation of the first needle of hepatitis B vaccine for newborn to be carried and third, participating in external joint assessment meetings and communicating with the related departments of Sierra Leone for exchange and other tasks.

Shen Tao provided the technical guidance for the trainees involved in the frontline epidemiology project, exchanged the ideas with Tushar Singh, a long-term instructor of the US CDC for Sierra Leone Frontline FETP and defined the recent work arrangements. The activities that would be involved in the discussion mainly included FEFET's training workshop of the second phase held from October 30 to November 5, and the professional guidance work was arranged; Shen Tao assisted three instructors from AFENET for the guidance over mails and site work for the trainees of Sierra

Leone. During the period of providing guidance for the trainees of phase II Frontline FETP of Sierra Leone, Shen Tao arrived in 12 of all 14 regions of Sierra Leone, with the guidance provided for 18 trainees(a total of 20 trainees in Phase II) including the investigations of the outbreak of Lassa fever, rubella and measles and of cases of rabies, suspected cases of yellow fever, cases of acute flaccid paralysis, maternal deaths, etc., and the analysis of infectious disease monitoring data, the implementation and conclusion of the quality of the monitoring data report of medical institutions and the analysis of the timeliness. After the end of Phase II training, four suggestions were made for the overall training work. Participating in the joint external evaluation over Sierra Leone: participating in the joint external evaluation (JEE, Joint External Evaluation) over Sierra Leone with global hygiene security agenda (GHSA, the Global Health Security Agenda) as an observer to collect information for China to participate in the work of JEE working team of GHSA or accept JEE's evaluation and to provide advice for participating in the evaluation. 13 experts of the JEE working team were from organizations and departments such as Center for Disease Control of the United States, the World Health Organization, the Food and Agriculture Organization of the United Nations, the African CDC, and the Ministry of Health and Sanitation of Liberia. JEE activity lasting for 5 days included four-day presentations and 1-day on-site visit. The presentations and discussion sessions were conducted in 19 areas respectively; and the presentations took the form of slide presentations that lasted for approximately 15 minutes, followed by questions and supplements by the experts of JEE working team and others, and finally, the self-grading and the preferential areas of action were discussed and confirmed. The site visits included The 34th Military Hospital and Connaught Hospital, Central Public Hygiene Reference Laboratory (in the field of public hygiene) Njala University Laboratory (in the field of animal hygiene), entry points (Lunge International Airport and Kambia Land Entry and Port), and emergency response command center. Finally, combined with the report contents, materials and evidence provided, as well as on-site visits, the evaluation scores were displayed after discussions of JEE team and then the final scores were determined after discussing with experts of Sierra Leone. The evaluation team sent the evaluations including feedback to Sierra Leone after 10 days, which would be discussed and revised before being released to GHSA website.

With the invitation of the Ministry of Health and Sanitation of Sierra Leone, Liu Qiyong, researcher and Zhang Honglong assistant researcher of our center arrived in Freetown, the capital of Sierra Leone, on August 15, 2017 to provide technical support for the construction of a National Public Hygiene Agency in Sierra Leone. After arriving at Freetown, the experts at first came to the Economic and Commercial Counselor's Office of the Chinese Embassy in Sierra Leone and reported the main tasks in Sierra Leone to Shen Xiaokai, the Counselor and also successively visited the chief hygiene officer of the Ministry of Health and Sanitation of Sierra Leone, the director of the Hospital and Laboratory Service Department, the director of the Hygiene Bureau of the West District of Freetown, and the Department for International Development (DFID), the Public Hygiene of England (PHE), and Center for Disease Control of the United States (US CDC) and other international partners and furthermore, they visited 10 primary medical hygiene institutions and second and three-tier hospitals of different types in the suburbs and urban areas of West District and Makene, the capital city in the northern province of Bombali to understand the disease diagnosis, reports, laboratory tests, planned immunization and hygiene care of women and children and others.

The experts systematically studied a series of important reports and documents published by the Ministry of Health and Sanitation of Sierra Leone. Based on the understanding of the actual needs of the Ministry of Health and Sanitation of Sierra Leone and the participation of international organization, the experts actively explored the direction and fields of deep cooperation for the China disease control center in supporting the establishment and development of National Public Hygiene Agency in Sierra Leone. Furthermore, during the stay in Sierra Leone, the experts played the advantage in specialty, and cooperated with the experts of the working team of China disease control center in Sierra Leone in the on-site disinfections at the victims settlements and disaster sites in Freetown suffered from debris flow and flood. The activity had achieved good social responses, for which, the special reports were made on the Official Account of Xinhua Africa jointly hosted by local newspaper and Africa General Branch of Xinhua News Agency. During the stay in Sierra Leone, the experts also participated in many meetings organized by Sierra Leone, such as National Hygiene Safety 5-year Action Plan Development Workshop, Steering Group Conference of the Ministry of Health and Sanitation of Sierra Leone, the Sierra Leone Multi-Department "Same Health Day" Commemorative Conference, and Weekly Epidemic Analysis Conference of the Ministry of Health and Sanitation of Sierra Leone held in EOC, namely, Conference of Emergency Preparedness, Resilience and Response Group of the Ministry of Health and Sanitation of Sierra Leone(EPRRG) and the National Day Reception held by Chinese Embassy stationed in Sierra Leone; furthermore, the experts also actively promoted the phase II project of the technical cooperation of stationary bio-safety three-tier laboratory, the visit of 8 officials of the Ministry of Health and Sanitation of Sierra Leone, and the planning of the implementation of activities held in Freetown such as the international seminar of the timely inoculation of the first needle of newborn hepatitis B vaccine. On October 21 and November 11, 2017, Liu Qiyong and Zhang Honglong returned to Beijing after successfully completing the on-site work. See the specific summary report for the details.

Four talents were originally sent to work in Sierra Leone for three months, since no special consideration was given to the management of the international organization in advance, one talent failed to go to Sierra Leone, see the lesson for the specific reasons. After negotiating with PMO, the activity of one talent was adjusted to the supervision activity of Sierra Leone.

Activity IV: the talents were selected and assigned for exchange in and visits to China
(I) Activity Content: The hygiene officials and technicians (8) who were likely to work in the national public hygiene agencies of Sierra Leone were invited and selected to visit China and receive the training for a period of 10 days to help them understand the disease prevention and control and emergency response system in China, the operational mechanism and the development history.

(II) Information on Completion
With the invitation of China Disease Control Center, 6 people as the delegation of the public hygiene of Sierra Leone during November 12-19, 2017 visited China. The delegation was composed of Dr. Foday Mohamed Dafae, head of the disease control bureau of the Ministry of Health and Sanitation of Sierra Leone and three officials of the Ministry of Health and Sanitation of Sierra Leone (the director of the disease

control bureau, the senior permanent secretary, and the chief medical officer) and the directors of the hygiene bureaus of three provincial districts(Kainema District, Bangbali District, Port Loko District). The visit was funded by China-UK global hygiene support project with a view to investigating the status of the construction of the public hygiene institutions at all levels in China and exchanging the experiences on infectious disease prevention and control, providing reference for Sierra Leone to establish a national public hygiene system, and further exchanging and discussing the construction of the center for tropical diseases in West Africa.

The preparatory work for this visit to China took three months, including the preparation of invitation materials, the identification of personnel visiting to China, scheduling of visits, coordination of relevant agencies and departments, and handling of procedures concerning the visit to China, which was prepared by the global public hygiene center, one worker was responsible for local coordination and contact in Sierra Leone. After arriving in Beijing with tight schedule, the delegation met with the experts of the planned immunization center and the maternity and child care center affiliated to our center to learn about the implementation of the plan immunization and women and children's hygiene in China; the delegation visited Beijing Bio-institute Biological Products Co., Ltd. to learn about the introduction to company profiles and products, and to visit hepatitis B vaccine workshop; and the delegation visited Changping Park of China Disease Control Center to learn about China Disease Control Center, the infectious disease monitoring system of China, and infectious disease monitoring and control situation of China and the development of the public hygiene emergency system of China and visited the epidemic consultation room, the medium biological control room of infectious diseases, and the laboratory of the National Influenza Center, and had discussions with experts of the virus disease institute who had worked at Sierra Leone; the delegation visited Hunan Province Disease Control Center, Yueyang Disease Control Center, Yueyanglou District Disease Control Center, DongMaoling Community Hygiene Service Center, and Yueyang No.2 People's Hospital to learn about the organizational structure and main work of the public hygiene organizations at the provincial, city and county levels, to exchange the experience in the prevention and control of major infectious diseases, and to watch the demonstration of functions of the infectious disease reporting information system and also visited laboratories, emergency facilities, as well as community prevention inoculation clinics and met with leaders of the International Division of the National Hygiene and Family Planning Committee, both parties expressed the willingness to further strengthen the cooperation in the field of public hygiene, and conducted the in-depth discussions on the direction of cooperation in public hygiene between China and Sierra Leone; finally, the delegation held talks with the global public hygiene center and conducted the seminar on Phase II Project of China-Sierra Leone Laboratory Technical Assistance under construction in Sierra Leone and the construction of a research and prevention center for the treatment of tropical diseases in western Africa with China’s assistance.

During this visit to China, the foreign delegation learned about the compositions and divisions of labors of China disease control system from the state to the provincial, municipal, and district/county levels, exchanged the working experience in infectious disease prevention and control, visited the construction of the laboratory and emergency facilities and the integrated hospital and community hygiene service center to understand the public hygiene function. In addition, by visiting the vaccine

production base of Beijing Bio-institute Biological Products Co., Ltd., the foreign delegation had a deep impression on the medical hygiene products. At present, the government of Sierra Leone is organizing the establishment of the National Public Hygiene Agency (NPHA), which is scheduled to be officially launched in January 2018. The visit to China will provide an important reference for the establishment of NPHA in Sierra Leone, and will play an active role in deepening the cooperation in public hygiene between China and Sierra Leone.

It planned to invite 8 people to visit China in June, since the fact that CMO was unable to fix the date of visit to China, and finally canceled the plan for coming to China due to physical reasons, only 6 people came to China in November finally, for the test, one was chief nurse officer who cancelled the visit due to family reasons and the other was director of West District Hygiene Bureau who have to cancel the visit due to conflicts with activities of foreign affairs.

Activity V: Convening project launch, progress report and summary meetings and visiting to Sierra Leone for project supervision
(1) Activity Content
Organizing and participating the arrangement of project work, expert training, technical discussion and other related meetings, and inviting relevant experts to provide technical support and at the same time, identifying project problems and solutions n order to grasp the progress of project implementation, so as to summarize the project implementation experience in a better manner, and 3 main management personnel for the project went to Sierra Leone for a seven-day supervision.

(II) Information on Completion
The steering team consisting of 4 experts from China Disease Control Center visited Sierra Leone on January 14-16, 2018 for the onsite supervision of the technical assistance project in Sierra Leone conducted by China Disease Control Center, wherein the steering team was composed of Dong Xiaoping, Director of the Global Public Hygiene Center of China Disease Control Center, Lu Jinxing, secretary of Lu Jinxing of Infectious Disease Institute, Cao Jianping, deputy director of Parasitosis Institute and Wang Xiaochun, researcher of Global Public Hygiene Center. Through supervision, the steering team learned about the progress and problems of the project and provided the on-site technical support, and made recommendations for the next step. The steering team inspected the current operation status of P3 laboratory, and examined the preparation of the bacteria and parasite laboratories to be built in the China-Sierra Leone Friendly Hospital and visited China-based Sierra Leone Medical Team working in China-Sierra Leone Friendly Hospital and exchanged ideas with the team leader and some of the team members and expressed the willing to get support of the medical team during the implementation of the project; in addition, the steering team held a symposium with the talents dispatched by China Disease Control Center to learn about the suggestions from everyone on project implementation and management, so as to make the necessary preparations for the implementation of the project. The steering team visited Samba, director of public hygiene agency in Sierra Leone. Director Samba introduced the construction of National Public Hygiene Agency in Sierra Leone and gave the acknowledgement to China Disease Control Center in the support to the construction of the National Public Hygiene Agency and special thanks to 2 experts from China Disease Control Center in 2017 (note: the two also gave support in the China-UK global hygiene project) for their dedicated support

to the construction of the National Public Hygiene Agency in Sierra Leone, and Director Samba expressed that he would fully cooperate with Sierra Leone Office of China Disease Control Center in promoting the implementation of the project; the steering team had the full discussion with Brima Karbo, chief medical officer of the Ministry of Health and Sanitation of Sierra Leone, Foda Dafee, Director of Sierra Leone Emergency Operation Center and Disease Control Bureau on the overall situation of the project, future work arrangements, the challenges for the construction and the supports required and also the steering team met with Ambassador Empress Wu Peng of China's Embassy in Sierra Leone and Counselor Zhang of Business Office. The steering team respectively and comprehensively reported to Ambassador Wu Peng and Counselor Zhang the work that the China disease control center had conducted and planned to be constructed in Sierra Leone, as well as the problems faced; and the steering team met with the workers of Sierra Leone Office of the Center for Disease Control of the Unites States. The director of the CDC Sierra Leone Office introduced current work of the Center for Disease Control in Sierra Leone and expressed the support for the implementation of the work of disease monitoring in Sierra Leone and the malaria prevention and control. The steering team introduced the purpose and main activities of the ongoing China-Sierra Leone Technical Assistance Project, and expressed the wish that US CDC team could provide support in the area of capability construction.

III. Effectiveness and Impact

(I) The technical communication mechanism among major international partners such as China CDC, the Ministry of Health and Sanitation of Sierra Leone, the UK, and the United States was initially established to enhance the mutual trust and understanding.

(II) The actual needs on the construction of the national public hygiene capacity in Sierra Leone were comprehended and the feasibility of the pilot projects of the major infectious disease prevention and control was demonstrated, and the suggestions on the functional positioning and main business areas of the tropical disease center were provided for the reference of relevant departments.

(III) The capacity of the Chinese experts to participate in global hygiene governance was enhanced by selecting and assigning 1 expert as a teacher to work in the site epidemiology training project in Sierra Leone and selecting and assigning 2 experts as technical advisors to participate in the establishment of a national public hygiene agency in the west district of Freetown, which also expanded the international influence of China-UK cooperation.

(IV)The good foundation was laid for building the capacity for Sierra Leone, cultivating hygiene management and technical backbone talents for Sierra Leone National Disease Control Center in the future and for learning about the operating mechanisms of infectious disease and chronic disease monitoring, prevention and control, and emergency system in China through visits to China, for jointly exploring Sierra Leone's initiatives and plans to improve the capabilities of its National Public Hygiene Agency, and for the cooperation project in China-Sierra Leone disease control center for the next step.

(V) The cooperative experience of China-UK in Sierra Leone hygiene was systematically summarized, providing references for further expanding the international influence of China-UK cooperation.

IV. Lessons Learned and Suggestions for Enlightenment

(I) Implementation experience

1. Establishing a good communication and coordination mechanism and obtaining the approval from competent organization and leaders in charge

In the early stage of project application, the relevant information was reported to the International Division of the National Hygiene and Family Planning Committee in advance and after the project application was successful, the letter was formally sent to our committee, namely, *Report of Center for Disease Control on the Implementation of China-UK Global Hygiene Support Project*, to report the project implementation plan and cycle, and to receive the recognition and support of the competent organization; During the implementation of the project, the progresses of the work were reported to the competent leader for several times, and the discussions on the detailed implementation plan for the next step were given; During the implementation of the project, the relevant departments and directly controlled departments were vigorously and closely communicated to gain understanding and support and the experts were actively selected and assigned to support the completion of various tasks. During the application and implementation of the project, our center communicated closely with PMO, reported the progress of the work on a regular basis, communicated the encountered problems in a timely manner and, and jointly discussed the solutions, in this way, the solid foundation for project implementation was laid.

2. Setting up the dedicated department and the dedicated person in charge

For the project, the Global Public Hygiene Center of China Disease Control Center was determined as the specific unit for implementation and the person was specifically assigned for project management and implementation. Under the guidance of the project management manual designated by PMO, the project was

successfully launched. The executive team for the project was composed of 13 members, 11 of which had the senior professional titles, 1 of which had the mid-level professional title, and 1 had the junior professional title with the professional backgrounds covering multiple fields and clear divisions of responsibilities among team members.

3. Focusing on cooperation and innovation

In the early stage of implementation, the contact with international organization agencies such as PHE, CDC, WHO, and UN was closely established by the use of the good international partnership established during the previous work period for exploring new areas of cooperation.

(II) Lessons

1. The approval procedure for the going abroad should be started as soon as possible

Since China-UK project to be implemented is the specific measure to support Sierra Leone's improvement of the capability of public hygiene, and to implement the relevant policies and activities of the country, the activity of going abroad had to be carried out under the overall arrangements of China's government, furthermore, the activity was the foreign affair involving in visits to foreign countries or inviting the visits to China, namely, the approval procedures were cumbersome and took a long time. Due to insufficient preparation time, the supervision of Sierra Leone was temporarily postponed to January 2018; 3 experts who were sent to Sierra Leone to carry out laboratory tests and talent training worked for only 21 days rather than 1 month as planned; and the activity inviting the visits to China were postponed until November other than June as planned. The activity of foreign affairs involved the contact with the foreign party to determine the activity schedule, the request of the invitations, the internal review of the center, and the application to the health and planning committee for approval, the whole of which was complex and the steps interlocked with each other. Any problems in one link would affect the smooth implementation of the entire activity. Therefore, the plan should be made as soon as possible to reserve enough time for the application of the activities concerned.

2. It should take the initiative to arrange and plan for the international cooperative activity

For Activity II, 4 experts was selected and assigned to work in Sierra Leone, explore the establishment of the international partnership and assist the local government in the development of infectious disease prevention and control. The experts were planned to be sent to West District Hygiene Bureau of Freetown of Sierra Leone, the World Bank, Public Hygiene of England, or Sierra Leone Office of Center for Disease Control for working for 3 months. However, the experts in the Sierra Leone Office of Center for Disease Control were diplomatic identities, due to security concerns, the agreement with each other was not reached even after several communications.

According to the provisions of the World Bank on the global internship project, the internal procedures for entering the World Bank to work are complex and have not been handled. Therefore, it was no longer considered to send experts to work in the World Bank and the Sierra Leone Office of Center for Disease Control, but the plan was temporarily adjusted to send to experts to work in the West District Hygiene Bureau of Freetown of Sierra Leone.

The arrangements of Chinese experts selected and assigned to work in office of the third country of the international organization were far more complicated than expected. Due to the seriousness of the problem that was not anticipated in the previous period, the arrangement that one expert would be sent to Sierra Leone for 3 months failed, it recommended to give the early planning and leave sufficient time for formalities and give more communications with the third country office of the international organization to obtain the approval in the Phase II project.

In addition, the force majeure happened. The major debris flow disasters in the capital of Sierra Leone had some resistance to the successful implementation of the project, namely, the implementation of the activity plan such as visits to China had been postponed.

3. The subsidies to experts were too low

Since China-UK project did not support the payment of allowances of foods and public sundries for experts to Africa during the non-working days, and the expert consulting fees allowed to be issued were also subject to strict standard limits, the established subsidy standard at the time of project application is only 650 RMB Yuan / person/day which had to be deducted high tax due to the expert consultation fee standard. The experts generally responded that the grant level was relatively low, much poorer compared to the subsidies to experts in Sierra Leone for the projects of the Ministry of Commerce during the same period. In order to enhance the enthusiasm of experts to work in Africa, it is suggested that the tax level should be considered in the Phase II project and the standard of the labor service fee for experts should be raised.

(III) Suggestions for the next step

1. It is recommended that China-UK global hygiene project continues to support the China Disease Control Center to carry out the activities that support the improvement of national public hygiene skills of Sierra Leone

The government of Sierra Leone is organizing the establishment of the National Public Hygiene Agency (NPHA) of Sierra Leone. NPHA is a subsidiary under the direct control of the Ministry of Health and Sanitation and is administered by the chief hygiene officer (CMO). NPHA will put into operation in early 2018 with the

organization composed of 1 director and 2 deputy directors mainly for the planning and development of six areas: 1.Public hygiene monitoring;2. National public hygiene reference laboratory;3. Emergency preparation and response;4. Public hygiene research; and 5. Health promotion;6. Public hygiene human resource development . It is recommended that China-UK cooperate with each other to support the construction of the National Public Hygiene Agency in Sierra Leone:(1) The Chinese experts will be selected and assigned to work in six areas of NPHA; (2)The cooperation for focusing on the disease control and prevention project will be reached, such as comprehensive malaria prevention and control project.; (3) It will conduct the staff capacity construction, and develop the professional training plan. The experts of Sierra Leone will be invited to visit China, to receive the education of a master's or doctoral degree, or the Chinese experts (it is recommended to conduct the activities of training courses relying on the stationary laboratory, combined with the Phase II project of the technical cooperation) will be sent, and the cooperation between Sierra Leone and the UK will be reached for the training of the decision-making leadership ability of the public hygiene, the training of on-site epidemiology, the training of laboratory ability and the training of the capability of major infectious disease prevention and control.

2. The sound public hygiene aid mechanism is established

For the implementation of public hygiene foreign aid work through projects, the feeling of inadaptability is more and more clear. The suggestions are as follows: the first is to establish an integrated and unified leadership mechanism and set up an operation executive agency; by the model and experience of countries such as the United Kingdom, the United States, and Australia, it needs to establish a special foreign aid management department; a public hygiene foreign aid agency, for which, the Center for Disease Control of China should be responsible for the relevant work. And the government should increase the staffing for the public hygiene foreign aid work; it also needs to establish a long-term and stable public hygiene foreign aid special fund as soon as possible and the public hygiene foreign aid fund management mechanism to substantially promote the public hygiene foreign aid work. The second is to establish the treatment standard that corresponds to international public hygiene, since the public hygiene foreign aid is a government action, it is recommended that public hygiene foreign aid personnel should be given the diplomatic status with the treatment the same as that of the personnel sent by the Ministry of Foreign Affairs and the Ministry of Commerce; for the public hygiene personnel with outstanding performance and excellent assessment results during overseas work, their performance should be taken as the reference for the promotion and use of cadres, while the recommendation and hiring by breaking the rule should be given in the special technical review or appointments, etc. The third is to train and select the public hygiene foreign aid personnel with plans. It is recommended that the counselor at the embassy or business office of a recipient country should set up a hygiene officer

to send senior hygiene officials to the Ministry of Health and Sanitation of the recipient country, and to send experts of technical cooperation to the local public hygiene agency and to send international employees of China nationality to the international organization; it is recommended that the China Disease Control Center should establish a public hygiene foreign aid personnel training management center, and select the disease control institution in China for the construction of the public hygiene training base for foreign aid personnel to carry out the mobilization, organization and training of the foreign aid reserve and establish the normal talent selection mechanism to form the backup expert database for different fields.

3. Preliminary suggestions for the cooperation of other public hygiene projects: (1) Based on the technological resources of the bio-safety stationary laboratory, several pilot hospitals are selected, and Chinese laboratory expert works at the sentinel hospital, responsible for the training relevant to the laboratory test technology and the laboratory management, with the assistance combined with hardware and software, it provides guidance for improving the technological and management capabilities for laboratory test. (2) Given the fact that one of the main causes of death of children under the age of five is malnutrition, it may consider to extend China's nutrition package to the capital region, but the it is a potential challenge for the nutrition package as a kind of food to pass the WHO pre-qualification (PQ). (3) 5 community hygiene centers and secondary hospitals in the West District are selected as the pilots with the focus on strengthening the prenatal diagnosis examination and nursing capabilities for pregnant women as well as postnatal care and treatment capabilities in medical institutions, including upgrading the hardware facilities and providing necessary drugs and diagnostic reagents, training midwives and nurses, strengthening community education and working to reduce the maternal mortality. (4) The maternal death monitoring and response system should be strengthened. In order to significantly reduce the maternal and child deaths, the Sierra Leone government has implemented the President’s Recovery Priorities (PRP), and established and improved the maternal death monitoring and response system in line with the smooth implementation of this plan.

4. Management advice

(1) It needs to establish the backup expert database for NPHA with the support from China Disease Control Center, and screen the backup experts from provincial level disease control centers and national disease control centers, such kind of experts should not only have professional knowledge and proficiency in foreign languages, but also be willing to work in Freetown for 1-2 years. The experts assigned to a foreign country should communicate the progress of the work with the domestic alternative experts on a regular basis, allowing the candidate to track the progress of NPHA construction. (2) The experts should be selected and assigned to work in NPHA. NPHA is scheduled to be officially launched in early 2018 and the Chinese

experts are expected to join and provide technical support. At present, the foreign aid funding of the Ministry of Commerce is supporting the Phase II project of technical cooperation, and 10 experts are dispatched to work in Sierra Leone every six months, and two experts can be considered to participate in the construction of NPHA, which should be planned as soon as possible. In addition, at the beginning of the construction of the African Disease Control Center, the Chinese government provided the cash assistance of US$2 million and supported China expert to join the work as an international employee. By reference to such mode, it is recommended that the National Ministry of Commerce can provide the cash assistance for the construction of NPHA and support the cost of hiring Chinese experts. (3) The experts are selected and assigned to work in the Ministry of Health of Sierra Leone. It is understood that JICA has the member working as a CMO assistant in MoHS and DFID provided funding to hire one person as the secretary of CMO of the Ministry of Health and Sanitation of Sierra Leone. The Chinese government has annually provided a large amount of funds as assistance for Sierra Leone, it is recommended that the embassy communicates with the Ministry of Health and Sanitation of Sierra Leone to agree that the Chinese expert works as a CMO secretary in the Ministry of Health and Sanitation of Sierra Leone. (4) The experts are selected and assigned to work at China Embassy in Sierra Leone. At present, there are 3 hygiene teams of China working in the field of hygiene assistance to Sierra Leone. With the gradual implementation of China's public hygiene foreign aid strategy, China's assistance to Sierra Leone will be more systematic, in-depth and comprehensive, and it is recommended to set up a post of hygiene counselor in the embassy to coordinate the China's hygiene assistance work in Sierra Leone.

V. Project Expenditure (Omitted)

VI. Miscellaneous

Thanks to China-UK Global Hygiene Support Project provides the funding support for China Disease Control Center to support the activity of raising the public hygiene capacity construction in Sierra Leone and thanks to the strong support of the center leadership for the project; thanks to the experts for the on-site and technical guidance provided for the project and thanks to the careful guidance and assistance of Wang Xiaohua, director of PMO and Teacher Chen Xun during the execution of the project, and their rigorous work styles and modest attitudes, from whom we have benefited a lot.

Annex: (Omitted)

1. List of output documents
2. Settlement details of the activities