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Cost and Effectiveness of Regulating Infectious Disease Control in Rural China

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ABBREVIATIONS

TB	Tuberculosis
STI	Sexually Transmitted Infectious
CNPC	China's National People's Congress
AIDC	The Act for Infectious Diseases Control
MoH	Ministry of Health
CCDC	China's Center for Disease Control

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EXECUTIVE SUMMARY

Introduction

Infectious diseases are still recognized as severe public health problems at present in China, especially in poor rural areas. About 24% of total disease burden in terms of DALYs was attributed to infectious and maternal health problems. In 1999, the mortality rate from infectious diseases for rural people living in poor counties was 2-3 fold of that for people living in high and middle-income counties. Since the late 1970s, the changing social and economic contexts have encouraged the government to adopt legislative instruments rather than sole political command system in steering and administering infectious disease control programs. However, little is known about the effectiveness and costs of implementing regulatory activities in infectious disease control. This study was undertaken to assess the effectiveness of selected infectious disease control legislation and to estimate actual and required costs for implementing the regulation.

Methods

Data came from review of existing documents, interviews with regulators and health providers, and questionnaire survey. Document review and key informant interviews were to collect information for mapping the regulation, assessing AIDC effectiveness, and qualitatively identifying influential factors of AIDC implementation. Facility-based questionnaire surveys were to investigate opinions of public health providers about AIDC and to collect data for estimating implementation costs of AIDC. In Key informant interview, 5 national level legislator, health officials, and public health experts were selected. The field work was conducted in 3 counties from Shandong and Shanxi Provinces. A total of 24 health officials and health facility leaders from county and township health facilities were selected for the interviews. In questionnaire survey, 151 health workers in county anti-epidemic stations and township health centres were selected. In the three counties, county health bureaus, county anti-epidemic stations, and township health centres, were investigated for cost estimation.

Four categories of indicators were designed and investigated, including indicators for mapping the regulation, for estimating actual and required costs of implementing AIDC, for assessing effectiveness of AIDC, and for identifying influential factors. Question guides and questionnaires with the indicators were used for data collection. The data were collected by staff from two universities and a provincial centre for disease control. Effectiveness of implementing AIDC was mainly assessed with the views of interviewees. Costs were estimated through a four-step procedure.

Results

Legislation has becomes one of the most important means for government in infectious disease control. The "dual role" that health authorities, anti-epidemic stations, and township health centres were both regulators and regulatees existed in the AIDC implementation system.

AIDC was thought of being essential and important for infectious disease control in a transitional economy by the national level officials and public health experts. During the interviews, they demonstrated the achievements from three dimensions: reduction of prevalence of infectious diseases, operation of immunization program, and establishment of reporting system. More than 50% of county and township health workers reflected that after implementation of AIDC, changes had taken place in terms of establishment of regulatory teams, departmental coordination, and use of new technologies in infectious disease control programs. More than 2/3 of the health workers investigated responded that after AIDC implementation, behaviors of health providers and administrators had been improved in infectious disease control. Interviewees from the three counties expressed the similar assessment about effectiveness of AIDC. Two third (17/24) of the interviewees reflected that implementation of AIDC had positive effects on reduction of infectious disease prevalence. Two third (16/24) said that the AIDC kept child immunization program operating in the right track under a changing environment.

On average, a total of 297,000 yuan was spent on implementing AIDC and 465,000 were

required for all required regulatory activities in a county, about 40% of gaps existed between actual and required costs. Labour costs accounted for majority of the total costs of implementing AIDC. The estimated actual cost accounted for 2.7% of health budget in the same time period. If costs required could be covered, the proportion of health budget contributing to regulatory activities would be 4.2%. Approximately 1 yuan was required for fully covering the costs of regulatory activities.

National officials and public health experts identified three main problems in implementing AIDC: the coordination between governmental departments could be improved; propaganda of the legislation was not effective, and the practicability of AIDC should be increased. All of the interviewed officials and leaders from county and township health facilities reflected that budgets for AIDC regulatory activities were not adequate. Health workers indicated government budget deficit, capacity of regulators, and departmental coordination were the major problems.

Conclusions

During China's economic transition from a planned economy to a market economy, legislation has become an increasingly important instrument for steering and administering infectious disease control programs. The AIDC has contributed to continuously reduction of overall prevalence of infectious diseases, improved manpower and reporting system for infectious disease control, and improved behaviours of health providers in managing and delivering infectious disease control activities. Costs for implementing AIDC were relatively lower, accounting for a small portion of health budget. For fully delivering regulatory activities, additional budgets were needed. Inadequacy of government financial support, departmental coordination, and practicability of the AIDC were identified to be the main factors influencing implementation of AIDC more effectively.

1. INTRODUCTION

Over the past five decades, infectious diseases have been effectively controlled in China, which has been attributed to the great improvements of health status of population. Improvements of living conditions, active and strong government interventions in health sector, and introduction of advanced technologies of prevention and treatment are the most often mentioned determinants of the success [1,2].

However, infectious diseases are still recognized as the severe public health problems at present with following evidences. Firstly, burden of infectious diseases account for high proportion of total burden of diseases. About 24% of total disease burdens in terms of DALYs were attributed to infectious and maternal diseases [3]. Some diseases, for example, tuberculosis (TB) and hepatitis, constitute large proportion of disease burdens. It was reported that number of death caused by tuberculosis accounted for 1.3% of total deaths in 2000, ranking number 9 in top 10 causes of death in rural area [4]. Nearly 10% of Chinese populations are HBs-Ag positive [5]. Secondly, infectious diseases are more severe in poverty area and among the poor than that in developed area and among the rich. In 1999, mortality rate of infectious diseases for rural people living in poverty counties was 19/100,000, 2-3 fold of that for people in high and middle-income counties [6]. Thirdly, some infectious diseases relapsed and new infectious diseases were becoming epidemic. Sexually transmitted infectious (STI) and schistosomiasis that had been effectively controlled during 1960s-1970s come again in recent years. One of the most severe diseases, AIDS, has become a serious public health problem at present and will be a seriously potential disease burden in China. By the end of June, 2001, a total of 26,000 HIV positive cases and 1,100 AIDS patients were officially reported [7].

Infectious disease control programs are mainly conducted by county anti-epidemic stations, township health centres, and village clinics, in rural China. County anti-epidemic stations and township health centres are owned and managed by government. County health bureau executes the administrative responsibilities. The upper level health facilities provide technical assistance to the lower level health units. Three policy instruments are employed by the

government in administering and steering health sector including infectious disease control programs: administrative command, financial incentives, and regulations. Before 1980 during the planned economy, means of political command was mainly used and was seen effective. Since then, political administrations were weakened due to increase in financial autonomy of health facilities and dependence of health institutions on user fees. Public health funding policy was radically changed for public health programs from1985. Expenditures incurred in preventive care facilities were no longer fully covered by government budgets, user fees have become an important source of finance. In 1999, only 30% of incomes in anti-epidemic stations came from government funding [8]. In the meantime, effectiveness of financial incentive in managing health services was also reduced mainly because of limited capability of the government in funding public health services. In words, the social and economic contexts for using political commands to deliver public health services have been radically changed.

In line with the economic reform and weakened functions of the political command system, the development and implementation of legislation has become more crucial. In 1989, the China's National People's Congress (CNPC), the highest legislative body, passed the "The Act for Infectious Diseases Control (AIDC)", which is the first Act targeting infectious disease control in China. This is a sign that the government, under a changing context, is adopting a legislative method to regulate the delivery of public health programs. A number of supplementary regulations issued by line ministries and provincial governments were issued following this legislation.

A number of studies have been conducted to identify determinants of the health care system's performance in delivering infectious disease control services [9,10]. In general, the focus of these studies has been on delivery, financing, and management of the provision infectious disease services. Very little is known about the effectiveness and costs of implementing regulations related to infectious disease control. When legislation has become one of the most important means in the delivery and finance of public health programs, knowledge about the effectiveness and costs of the regulations implemented is needed. Against the above

background, this study was to answer the questions: what is the effect of the regulations on controlling infectious diseases, and how much was spent and required for implementing the regulations?

2. OBJECTIVES

The general objective of this project was to assess the effectiveness of regulations for controlling infectious diseases and to estimate the costs of implementing the regulations, with the aim of contributing knowledge and evidence in China's health legislative field.

Specific objectives of this study and assessment indicators were:

1) To map the actors and process of implementing regulations related to infectious disease control;
2) To estimate the costs of implementing the selected infectious disease control regulation;
3) To assess the effectiveness of the selected infectious disease regulation; and
4) To identify factors influencing the effectiveness of the regulations.

3. METHODS

3.1 Selection of the regulation

There are a number of regulations related to infectious disease control. These regulations are issued by either central government or provincial government. Provincial regulations, which are usually called local regulations, follow the principles and items defined in the regulations issued by central government. At national level, there are two types of regulations, in terms of the regulator concerned. One type is made by the highest legislative body, the CNPC; the other is issued by line ministries. The first type is the "mother regulation", which governs the regulations made by line ministries. In accordance with the relative importance of the regulations, in this study, national regulations were targeted.

Important national regulations related to infectious disease control include:

- Act of Infectious Disease Control (issue by CNPC)

- Act of Food Hygiene (issued by CNPC)
- Regulation of TB Control (issued by the Ministry of Health)
- Regulation of STI and AIDS (issued by the Ministry of Health)
- Regulation of Leprosy Control (issued by the Ministry of Health)
- National Projected Immunization Regulation (issued by the Ministry of Health)
- Regulation of Health Hygiene in Public Place (issued by the Ministry of Health)
- Public Funding Allocation Regulation (issued by the Ministries of Finance and Health)

These regulations were reviewed by five public health specialties and policy makers in order to select the regulation of focus for this study. According to criteria including level of the regulators, relative importance, relevant to infectious disease control, and public influence to other related regulations, the Act of Infectious Disease Control (AIDC) was recommended to be the regulation studied.

3.2 Data sources

Data came from review of existing documents, interviews with regulators and health providers, and facility-based questionnaire surveys. Document review and key informant interviews were undertaken to collect information for mapping the regulation, assessing AIDC effectiveness, and qualitatively identifying influential factors of AIDC implementation. Facility-based questionnaire surveys were used to investigate opinions of public health providers about the AIDC and to collect data for estimating the implementation costs of the AIDC.

3.3 Selection of study sites and subjects

At national level, 5 key persons were selected for interview. These people were closely related to the development and implementation of the AIDC: one from Health Division of CNPC (the Division Chief), two from the Ministry of Health (MoH) (one the former Director General of the Department of Disease Control and the other the Deputy Director General of the Department of Disease Control), and two from the China Center for Disease Control (CCDC)

(both public health experts).

The field work was conducted in Shandong and Shanxi provinces. Shandong is the second largest province with 90 population million in 2001, located in the east of China. There are 17 prefectures and 135 counties in the province. Shandong is a relatively strong and rapidly developing economy, with GDP per capita of 8673 Yuan (US$1,050) in 2001. However, the economic development across the counties varies. There were 400 county and above hospitals, 10,500 clinics, and 170 anti-epidemic stations in 2001. TB and STI are the common public health problems in Shandong. Shanxi Province is an economically under-developed province, located in western China. In 2001, Shanxi had a population of 36 million and a GDP per capita of 4,549 Yuan (530 US$). There were 91 county hospitals, 80 anti-epidemic stations, 2,026 township hospitals and 28,530 village clinics. Hepatitis B and TB are the major public health problems in this province.

In the Chinese rural health care system, a "county" is regarded as an entity that delivers and regulates health care services with the three-tier system of village, township, and county. According to the population size and numbers of counties in the two provinces, 2 counties (Pingyin and Guan County) from Shandong and 1 county (Zhenan County) from Shanxi were selected. Criteria of county selections were economic development and representative of infectious disease control in their provinces. The counties were selected by both researchers and provincial officials using these criteria. In each county, 3 townships were randomly selected according to their economic development. In summary, the study sites were 3 counties and 9 townships.

At county level, two health institutions involved with implementing the AIDC - the county health bureau and an anti-epidemic station - were selected in each county. In each township, the township health centre was selected. For key informant interviews, in each county, 2 officials from the county health bureau, 3 managers and department heads from the anti-epidemic station, and 1 manager from each township health centre were selected. A total of 24 key persons were interviewed.

The health workers' questionnaire survey was conducted in the county anti-epidemic stations and township health centres selected. In the two counties of Shandong Province, 41 health workers from county anti-epidemic stations and 62 from township health centres were selected. In Zhenan county, Shanxi Province, 20 county anti-epidemic health workers and 28 township health workers were selected. The interviewees were directly related to work of infectious disease control.

Facility investigation (general information and cost estimation) by questionnaire was conducted in the health bureau, county anti-epidemic station, the biggest public hospital, and township health centre, in each county.

3.4 Indicators and data method

Four categories of indicators were selected to describe the regulation, estimate cost, assess effectiveness, and identify factors influencing implementation.

Regulation mapping For mapping the regulation studied, major indicators included: actors and process in developing the AIDC, relations between regulators and implementers, relations between AIDC and other complementary regulations, and responsibilities of various institutions in implementing and coordinating the regulations. Information on these indicators was obtained from review of existing documents and interviews with key national persons. The interviews were conducted by the study's major investigators.

Implementation cost The purpose of estimating the costs of implementing the AIDC was to examine the gaps between required costs and actual costs, aiming to provide information on how regulatory bodies and regulators are reimbursed. Cost information was used to address the question of whether the resources set aside for AIDC administration are sufficient. Thus, the cost in this study was defined as monetary values of resources consumed or needed for operating AIDC regulatory activities. According to this definition, two types of costs were estimated. One is the actual costs spent on regulatory activities, the other is the estimated

costs required according to defined activities in AIDC. In line with the responsibilities of various organizations defined in AIDC, regulatory activities conducted in each facility were defined and categorized. For each category of the regulatory activities, the itemized costs were estimated. A questionnaire on indicators of expenditure and volume of services was used to collect the information for cost estimation. Financial officers and managers in the selected facilities completed the questionnaires, based on financial records and discussions.

Effectiveness of the regulation The effectiveness of the regulation was mainly assessed by the interviewees through key informant interviews and the health workers' questionnaire survey. Three categories of indicators were used: 1) Opinions about the overall achievements in infectious disease control after implementation of AIDC, including reduction of infectious disease rate, immunization system, and reporting system; 2) Opinions about the changes in AIDC implementing facilities, including personnel, finance, coordination, and update of new technologies; and 3) Changes in behaviours of health regulators and providers after implementation of AIDC. A question guide was employed for key informant interviews, and a questionnaire for health worker interviews. The interviews were conducted by staff from universities and the provincial Center for Disease Control at the work place of the interviewees.

Influential factors Factors were classified into nine dimensions: budget, government commitment, quality regulatory implementers, departmental coordination, availability of inspective equipment, public education, operational feasibility of AIDC, and economic development. Information for this part was obtained from key informant interviews and focus group discussions.

3.5 Cost estimation

The AIDC implementation costs were estimated through the following four steps.

Step 1: Defining regulatory institutions and the regulatory activities – According to AIDC and discussion with legislators in central government, in rural areas, county health bureaux and

county anti-epidemic stations are the legal institutions implementing the regulations. In addition, township health centres are the quasi-regulatory institutions of AIDC implementation, because these health facilities actually take responsibility for some regulatory activities in practice.

In county health bureaux, the regulatory activities included:

- Developing an implementation plan;
- Organizing mass education;
- Coordinating collective actions;
- Supervising implementation; and
- Monitoring AIDC implementation.

The county anti-epidemic stations mainly conducted eight categories of activities including:

- Supervising and guiding implementation;
- Projecting the prevalence of infectious diseases;
- Organizing control programs;
- Dealing with endemic situations;
- Monitoring public hygiene;
- Organizing the immunization program;
- Providing technical assistance to other providers; and
- Reporting infectious cases.

Regulatory activities implemented by township health centres included:

- Projecting the prevalence of infectious diseases;
- Guiding village clinics;
- Organizing the immunization program; and
- Reporting infectious cases.

Step 2: Defining cost items – According to accounting items in institutional financial records, costs were classified into six categories:

- Salary;
- Transportation;
- Per diem for travel;
- Office supply;
- Communication; and
- Others.

Step 3: Investigation of actual cost – A questionnaire in which regulatory activities and cost items for each activity were listed was used to investigate the actual costs. In institutions where the financial reports could provide recorded expenditures by activities, the investigators completed the questionnaires with the recorded information. In those where financial records were incomplete or too rough, the investigators worked with the directors and accountants to complete the questionnaire.

Step 4: Estimation of required cost – The estimated actual costs derived from step 3 were presented to a panel of staff consisting of the director, department heads, and financial officer in each facility. The investigators coordinated the discussions about the required costs based on gaps between actual and required regulatory activities and the actual costs. The required itemized costs for each defined activity agreed by the panel were recorded.

3.6 Data analysis

The effectiveness of AIDC implementation was mainly assessed with the information from key informant interviews and the health worker questionnaire survey. Records from interviews were transcribed according to the dimensions of effectiveness. The frequency of health workers' responses to specific questions was used to then recorded.

4. RESULTS

4.1 The AIDC context

4.1.1 Aim of passing the AIDC

A market-oriented economic reform was thought to be the underlying context for passing the

AIDC, according to interviewees from CNPC and the MoH. Under a command economy system, political and administrative orders were effectively used for organizing and delivering communicable disease control programs. Interviewees indicated that the administrative function of the government for public health was weakened during the economic transition because of the increased autonomy of health facilities and relatively decreased public expenditures.

> "Infectious diseases have been well controlled in our country through collective efforts since 1950. In the mid 1980s, it was found that some infectious diseases, for instance STI, came again and spread rapidly. It was also found that measures previously used for infectious disease control were less effective than before. We realized that the old command method would not work well under a changed social and economic context. In addition, use of the legislative system has been stressed after 1980, which made it possible to pass the AIDC. Our aim of passing and implementing the AIDC is to improve the performance of infectious disease control programs through regulating the behaviours of relevant organizations and individuals". [Interviewee from CNPC]

4.1.2 Process of passing the AIDC

Two of the national level interviewees who participated in drafting the AIDC related the process of development. Drafting AIDC took three years, beginning in late 1985. Those drafting the AIDC came from the Legislative Committee of CNPC, Ministry of Health, Legislative Bureau at State Council, and four provincial governments. Similar legislations implemented in other countries were referenced. During the drafting process, several meetings with representatives from other ministries, including Ministries of Public Safety, Agriculture, and Education, were organized. There were many debates concerning the Act items. For example, whether or not specific entities should be established for implementing AIDC was debated between Ministry of Health and other participating organizations. Participants from the health sector proposed that a specific entity be established for implementing the legislation. This did not achieve agreement between participating organizations and was not specified in the last version of the legislation. Another example is the debate about

responsibilities of Public Safety Departments (police) in implementing the Act. On one hand, participants from the health sector hoped Public Safety Departments could be closely involved to increase the enforcement power of the Act. On the other hand, participants from the police sector did not intend to be involved too much, stressing the limited technical knowledge they had. After repeated negotiation, the legislation was passed in late 1989.

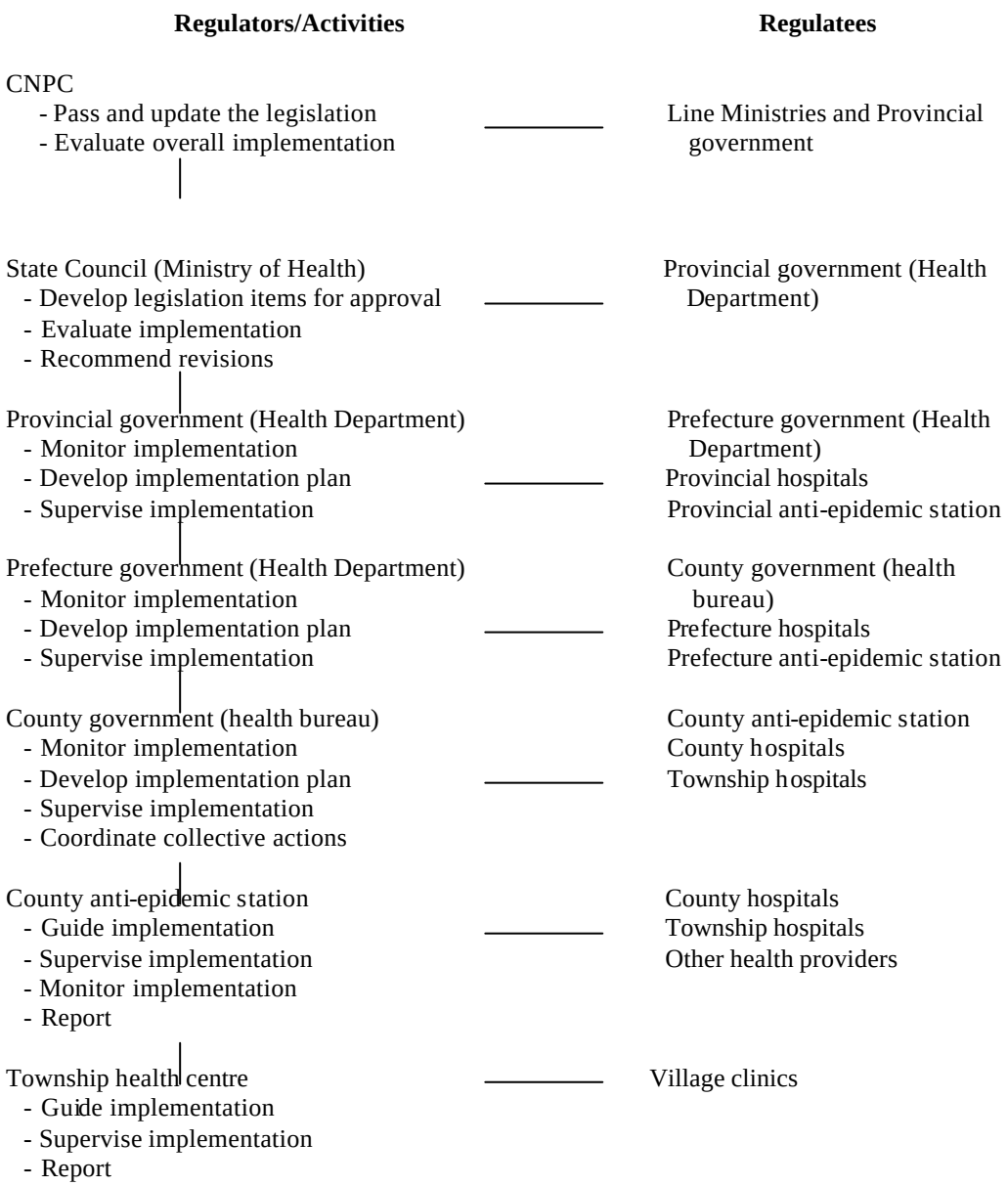
4. 1.3 Regulators and regulatees in implementing the AIDC

When this study was conducted, AIDC regulatory activities were implemented by a team, working for AIDC full-time or part-time, affiliated to health authorities (health bureau) and health facilities (anti-epidemic stations and township health centres), in study sites[1]. In terms of organization, regulators and regulatees were not clearly defined, according to the views of CNPC and MoH officials interviewed. One of the interviewees took the county-epidemic station as an example, indicating that while the anti-epidemic station is a regulator when it monitors other health providers, it becomes a regulatee when it is monitored by health bureau. They concluded that except for the highest legislative organization, CNPC, other organizations had dual roles of both regulators and regulatees in relation to AIDC implementation. They indicated that this phenomenon could also be seen in other regulatory areas, environmental protection being an example. The officials interviewed predicted that the "dual role" problem will be resolved within two years (by the end of 2004)[2] when Health Regulatory Departments at and above county level are established. Figure 1 demonstrates the relationship between regulators and regulatees.

[1] At the beginning of 2003, in the two counties of Shandong Province, it was proposed to establish a body specifically responsible for implementing regulatory activities, including AIDC, following the national and provincial guideline of reorganizing health organizations. This new Health Regulatory Department will be an independent institution carrying out all regulatory functions previously undertaken as stated in this report. In Zhenan County of Shanxi Province, such a body will also be established, although the proposal for this is not clear at the time this report is being prepared.

[2] Interviews were conducted in November 2002.

Figure 1. Regulators and regulatees in the AIDC



Most of the interviewees from both national and county organizations raised one advantage and two disadvantages of the "dual role" regulatory system. The advantage was that resources for implementing AIDC regulatory activities and provision of infectious disease control services within a health facility could be shared. One disadvantage was that enforcement of the regulation could be affected because the organization was not a specific regulatory body. Another disadvantage was that regulatory activities and provision of health services could be mixed, which would reduce the legislative power of regulatory activities.

4.2 Basic information about the study counties

The social and economic conditions of the three counties varied, as indicated in Table 1. Pingyin County's economic development, in terms of per capita GDP, was close to the average for Shandong Province, but Guan County was half the average provincial level. Zhenan County in Shanxi Province was designated as a National Poverty county[3] with much lower economic development. The infant mortality rate in Zhenan was higher than in Guan and Pingyin. However, maternal mortality in Pingyin was much higher than in the other two counties in 2001.

Table 1. Major indictors in the three counties in 2001

Indicators	Pingyin	Guan	Zhenan
Population (10,000)	36.2	73.5	28.4
Number of townships	11	17	25
Number of villages	345	753	421
Per capita GDP (yuan)	8645	4168	2088
Government revenue (10,000 yuan)	15190	10110	3895
Per capita income (yuan)	3099	2177	1438
Infant mortality (‰)	13.74	14.65	16.30
Maternal mortality (1/100,000)	58.50	16.46	21.04

Table 2 shows the major indicators of health resources available in the three counties. In the two counties of Shandong, numbers of village clinics in 2001 decreased after the government initiated a programme of clinic mergers. The per capita government budget for health was closely related to overall economic development of counties. Pingyin's and Guan's government health budgets per capita were double that of Zhanan. Shares of government budget for preventive care ranged between 14-30%, with the highest percentage in Zhenan.

[3] The national government identifies counties with extremely low economic development and allocates a special subsidy for the basic living needs of the population in those counties. Most of the National Poverty counties are located in western China.

Table 2. Availability of health facilities, staff, and government budget in 2001

Indicators	Pingyin	Guan	Zhenan
Number of county hospitals	2	3	3
Number of county anti-epidemic stations	1	1	1
Number of township health centres	11	18	25
Number of village clinics	153	225	282
Government Health Budget (10,000 yuan)	1052.8	1920.5	327.8
For preventive care (10,000 yuan)	195.2	269.2	96.7
% in health budget	18.5%	14.0%	29.5%
Health budget per head (yuan)	28.8	26.1	11.5
Preventive care budget per head (yuan)	5.3	3.7	3.4
Number of health workers			
In county anti-epidemic station	62	87	29
In township health centre	409	953	426
In village clinics	480	1091	457

The ranking of infectious diseases in the top 10 causes of death declined between 1985 and 2000. In Pingyin, infectious diseases as a cause of death were ranked eighth (3.3%) in 1995 and ninth (2.4%) in 2000. Infectious diseases as a cause of death were ranked sixth in 1985 and seventh in 2000 in both Guan and Zhenan. Infectious diseases were more influential on health in the two poor counties.

The projected immunization program (four vaccines for six infectious diseases) was well operated in three counties, with coverage of more than 95% of projected populations. This program had been extended to hepatitis B, with wider use in the two counties of Shandong.

Table 3 lists officially reported prevalence rates of selected infectious diseases. These four diseases were regarded as the main infectious diseases by local health staff interviewed. Prevalence rates of smear-positive tuberculosis (TB) appeared to decline in Pingyin and Zhenan and increased in Guan from 1990 to 2000. TB prevalence in Zhenan was much higher than in the other two counties. Prevalence of hepatitis showed a rapid increase in Zhenan, but this was attributed to improvement of the case reporting system by the health staff interviewed. Prevalence of dysentery could be surely said to be decline from 1985 to 2000 if the reporting system was improved across the board.

Table 3. Prevalence rates of selected infectious diseases (1/100,000)

County	Disease	1985	1990	1995	2000
Pingyin	TB (smear positive)	na	68	na	35
	Hepatitis	24.5	189.3	48.1	24.7
	STI	na	na	na	14.4
	Dysentery	284.9	147.5	49.7	39.1
Guan	TB (smear positive)	na	77	na	96
	Hepatitis	73.5	18.9	22.2	7.1
	STI	na	na	na	0.3
	Dysentery	48.3	10.1	14.6	1.5
Zhenan	TB (smear positive)	na	140	na	116
	Hepatitis	36.8	36.0	108.1	98.6
	STI	na	na	na	8.9
	Dysentery	77.3	19.3	25.1	35.5

na: data not available

4.3 Effectiveness of the AIDC

4.3.1 Overall achievements of the AIDC

The AIDC was thought of as being essential and important for infectious disease control in a transitional economy by the national level officials and public health experts. During the interviews, they demonstrated the achievements from three dimensions: reduction of the prevalence of infectious diseases, operation of the immunization program, and establishment of a reporting system.

> "Reported incidence rates of infectious diseases have continued to decrease in recent years. We cannot tell how much of the decrease is attributable to the AIDC, but it is sure that we could not achieve this without implementation of this legislation. You can imagine after public health facilities have to generate part of their revenues through user fees from the mid 1980s, how it is necessary to regulate health providers in delivering essential public health care. The AIDC could play a more important role in infectious disease control if it had been better implemented". [Interviewee from MoH].

> "The child immunization program in rural areas has been negatively affected since the late 1970s because of the disorganization of the collective economy. This situation changed after the implementation of the AIDC. In the AIDC, responsibilities of organizations and individuals are clearly specified. The regulators can take legal action to address problems in immunization

programs if they want, because they now have legislative backing". [Interviewee from MoH].

"I think the infectious disease reporting system is the first computerized reporting system in the health sector. The reporting system is very important in infectious disease control. It helps us to deal both timely and properly with epidemic situations and formulate a disease control plan. Since the mid 1990s, I can know the situation of infectious disease prevalence in each county from my computer". [Interviewee from CCDC].

Interviewees from the three counties expressed a similar assessment of the effectiveness of the AIDC. Two-thirds (17/24) of the interviewees reflected that implementation of the AIDC had positive effects on the reduction of infectious disease prevalence. Two-thirds (16/24) said that the AIDC kept the child immunization program operating on the right track under a changing environment. Seven of nine directors/department heads from anti-epidemic stations indicated the highly positive impact that the AIDC had in establishing a reporting system.

Health workers in the questionnaire survey related the control of selected infectious diseases to implementation of the AIDC, as shown in Table 4. In Table 4, the percentages are proportions of health workers attributing effectiveness of disease control to AIDC implementation. Nearly 90% of the health workers thought that one of the important achievements of the AIDC was an established reporting system (Table 5).

Table 4. Infectious diseases for which control was improved after AIDC implementation

Diseases	County health workers (%) n=61	Township health workers (%) n=90	Total (%) n=151
Poliomyelitis	80.65	77.78	78.95
Measles	64.52	66.66	65.79
Hepatitis	51.61	42.22	46.05
Hemorrhagic fever	48.39	42.22	39.47

4.3.2 Resources for infectious disease control

The national level interviewees summarized three types of resources that had been increased since implementation of the AIDC. First, government commitment had been increased. Legislative members at each level of the People's Congress would monitor implementation of

the AIDC periodically, which would lead government to pay attention to infectious disease control. Second, regulatory teams were established. Although it was a pity that regulatory entities were not independently established, at least specific teams were available for implementing regulatory activities. Third, support from other departments was strengthened. Infectious disease control was no longer the responsibility of the health sector alone; other sectors, including the Departments of Public Safety and Education, were involved. Interviewed health officials and staff from county and township health facilities interviewed had similar views.

More than 50% of county and township health workers reflected that after implementation of the AIDC, changes had taken place in terms of establishment of regulatory teams, departmental coordination, and use of new technologies in infectious disease control programs (Table 5).

Table 5. Assessment of the effectiveness of the AIDC, from health worker interviews

Changes	County health workers (%) n=61	Township health workers (%) n=91	Total (%) n=151
Improved reporting system	89.02	86.67	87.62
Established AIDC team	56.10	90.00	76.23
Improved departmental coordination	43.90	65.00	56.43
Improved use of new technologies	31.71	62.50	50.00
Increased preventive health workers	41.46	36.67	38.61
Increased budget for preventive care	9.76	31.67	22.77

4.3.3 Changes in behaviour of health providers after AIDC implementation

Table 6 presents the views of health workers about the changes in health providers' and administrators' behaviour related to infectious disease control activities after AIDC implementation. More than two-thirds of the health workers investigated responded that after AIDC implementation, the behaviour of health providers and administrators had been improved in infectious disease control.

Table 6. Changes in behaviour of health providers

Behaviour change	County health workers (%) n=61	Township health workers (%) n=90	Total (%) n=151
After AIDC the Health Bureau has:			
Increased commitment on preventive care	59.76	90.00	77.73
Improved monitoring of infectious disease control	71.95	93.33	84.65
After AIDC the Anti-epidemic Station has:			
Improved monitoring and supervising of infectious disease control	85.36	88.33	87.13
Increased resources for infectious disease control	54.88	79.17	69.31
After AIDC other health providers have:			
Improved the immunization program	78.05	95.00	88.12
Reported the infectious cases more timely	85.37	94.17	90.59
Improved treatments on infectious disease patients	59.76	80.83	72.28

4.4 Costs of implementing the AIDC

4.4.1 Implementation costs in county health bureau

Averages of actual and required costs for operating regulatory activities in health bureaux are presented in Table 7. The gap between actual and required costs was 20,000 yuan, or 40% (with one figure of minus 60%). The regulatory activity with the biggest gap was the organization of mass education, which has been clearly specified as one of the responsibilities of the health bureaux.

The ratio of actual costs over required costs was higher (74.7%) in Pingyin (the rich county) than in Guan (55.9%) and Zhenan (50.9%). This indicates that the gap between actual and required costs was bigger in poorer counties.

Table 7. Actual and required average costs in health bureaux by activity (yuan)

Activity	Actual (A)	Required (R)	A-R	A/R (%)
Develop implementation plan	1 776	2 776	1 000	63.98
Organize mass education	1 388	5 902	4 514	23.52
Coordinate collective actions	6 164	11 656	5 828	52.88
Supervise implementation	19 699	28 479	8 780	69.20
Monitor implementation	1 816	2 116	300	85.82
Total	30 843	50 929	20 086	60.56

Table 8 reports the estimates of costs by items. Labour costs accounted for a large proportion of the total costs. In order to fulfil the required activities, additional resources were needed for

all items.

Table 8. Actual and required average costs in health bureaux by item (yuan)

Item	Actual (A)	Required (R)	A-R	A/R (%)
Salary	13 388	21 129	23 220	63.36
Transportation	5 673	9 547	11 620	59.42
Travel per diem	1 347	2 900	4 660	46.45
Office supplies	4 503	7 670	9 500	58.71
Communication	3 381	5 783	7 206	58.46
Other	2 550	3 900	4 050	65.38
Total	30 843	50 929	20 086	60.56

4.4.2 Implementation costs in county anti-epidemic stations

Overall, actual costs met 54% of required costs in anti-epidemic stations (Table 9). The biggest gap was in dealing with infectious disease endemic situations (20%). Compared to required costs, the actual costs spent on the immunization program were relatively adequate (78%). Across the three counties, the ratios (A/R) were very similar.

Table 9. Actual and required average costs in anti-epidemic stations by activity (yuan)

Activity	Actual (A)	Required (R)	A-R	A-R (%)
Supervise and guide implementation	8 819	15 039	6 220	58.64
Project prevalence of infectious diseases	840	1 999	1 159	42.01
Organize control programs	7 307	13 255	5 948	55.13
Deal with endemic situation	1 215	6 237	5 022	19.48
Monitor public hygiene	8 964	17 657	8 693	50.76
Organize immunization program	6 879	8 872	1 993	77.54
Technical assistance to other providers	1 802	3 035	1 233	59.35
Report	1 727	3 129	1 402	55.21
Total	37 553	69 224	31 671	54.25.

Table 10 presents the costs by item. Labour costs dominated the total costs. Transportation was also a major cost item.

Table 10. Actual and required average costs in anti-epidemic stations by item (yuan)

Item	Actual (A)	Required (R)	A-R	A/R (%)
Salary	18 736	36 600	17 864	51.19
Transportation	11 660	16 987	5 327	68.64
Travel per diem	2 180	5 454	3 274	39.97
Office supplies	2 880	5 887	3 007	48.92
Communication	1 500	2 497	997	60.10
Others	697	1 800	1 103	38.72
Total	37 553	69 224	31 673	54.25

4.4.3 Implementation costs in township health centres

In townships, as indicated in Table 11, the ratio of actual costs over required costs was higher than that in county health bureaux and anti-epidemic station. Although the biggest gap was on projection of infectious disease prevalence, the absolute amount of cost was much lower on this activity than on others[?] in township health centres. In addition, due to the variations of responsibilities the different health facilities undertook, average costs actually incurred and required were lower than county health facilities. In each township, an average of 2000 yuan was needed to implement required regulatory activities.

Table 11. Actual and required average costs in township health centres by activity (yuan)

Activity	Actual (A)	Required (R)	A-R	A/R (%)
Project prevalence of infectious diseases	91	916	825	9.93
Guide village clinics	1 421	2 196	775	64.71
Organize immunization program	1 701	2 229	528	76.31
Report	1 106	1 175	69	94.13
Total	4 319	6 516	2 197	66.28

As shown in Table 12, labour and transportation were the main cost items in township health centres.

Table 12. Actual and required average costs in township health centres by items (yuan)

Item	Actual (A)	Required (R)	A-R	A/R (%)
Salary	2 751	3 186	669	86.34
Transportation	483	1 116	539	43.27
Travel per diem	327	828	420	39.49
Office supplies	531	880	330	60.34
Communication	196	438	207	44.74
Other	31	67	31	46.26
Total	4319	6516	2197	66.28

4.4.4 Average implementation costs in a county

The calculations of costs in Table 13 were made based on the average costs presented in Tables 8, 10 and 12. Those costs indicated an average level of costs in a county for the health bureau, anti-epidemic station, and all township health centres. Because the regulatory activities were implemented in these three types of health facilities, the costs can be taken as the total costs both actual and required in a county.

With the population and health budget information presented in Tables 1 and 2, in a county,

the share of regulatory costs in the total health budget and regulatory budget per capita were calculated as shown in the last two rows of Table 13. The estimated actual cost accounted for 2.7% of the health budget in the same time period. If costs required could be covered, the proportion of the health budget contributing to regulatory activities would be 4.2%. Approximately 1 yuan per capita was required to fully cover the costs of regulatory activities.

Table 13. Summary of average actual and required costs for a county

Item	Actual (A)	Required (R)	A-R
Salary	177 927	226 587	48 660
Transportation	42 932	85 682	42 750
Travel per diem	20 858	52 238	31 380
Office supplies	35 526	60 197	24 671
Communication	15 269	31 494	16 225
Other	4 890	9 251	4 361
Total	297 303	465 501	168 198
% of health budget	2.7%	4.2%	1.5%
Per capita (yuan)	0.64	1.01	0.37

Note: Costs have been multiplied by the average number of township health centres in the three counties.

4.5 Problems in AIDC implementation

National officials and public health experts identified three main problems in AIDC implementation. First, coordination between governmental departments could be improved (MoH officials interviewed). Implementation of the AIDC was the responsibility of the whole government, not a single sector (health). Even if departmental coordination had been improved after implementation of the AIDC, it was not enough. Second, propaganda on the legislation was not effective (CNPC Official interviewed). Over the past two decades, a number of legislative acts, including several on health, were passed by the CNPC. The common problem was that some of this legislation, including the AIDC, was not disseminated effectively to the general public. This influenced the effectiveness of the AIDC. Third, the practicability of the AIDC should be increased (MoH officials and CCDC experts). It was felt that some items in the AIDC were not practical, which increased the difficulties experienced when regulators implemented it.

All of the interviewed officials and leaders from county and township health facilities

reflected that budgets for AIDC regulatory activities were not adequate. They thought the budget constraints had influenced implementation of this legislation. Nearly 60% of the interviewees raised another problem, that public education on the legislation was inadequate. They stressed that the implementation needed cooperation from all individuals. Lack of propaganda resulted in the public's lack of awareness of the importance of the legislation. About half of the interviewees wanted the government to pay more attention to this issue.

Table 14 presents percentages on health workers' responses in the questionnaire survey to questions regarding AIDC implementation. Government budget, capacity of regulators and departmental coordination were identified as the major problems in implementing the AIDC.

Table 14. Problems in implementing the AIDC identified by health workers

Changes	County health workers (%) n=61	Township health workers (%) n=90	Total (%) n=151
Government budget			
Adequate	9.68	40.00	27.63
Inadequate	90.32	60.00	72.37
Capability of the regulators			
Good	30.65	55.56	45.39
Poor	69.35	44.44	54.61
Departmental coordination			
Good	25.81	48.89	39.47
Poor	74.19	51.11	60.53
Understanding of the AIDC by the public			
Good	16.13	5.56	9.87
Fair	75.81	76.67	76.32
Poor	8.06	17.77	13.81
Practicability of the AIDC			
Good	6.45	21.11	15.13
Fair	77.42	77.78	77.63
Poor	16.13	1.11	7.24

5. DISCUSSION

During China's economic transition from a planned economy to a market economy, legislation has become an increasingly important instrument for steering and administering infectious disease control programs. The AIDC, passed by the highest legislative body in the late 1980s, has contributed to the continuous reduction of the overall prevalence of infectious diseases, improved manpower and reporting system for infectious disease control, and improved

behaviours of health providers in managing and delivering infectious disease control activities. Costs for implementing the AIDC were relatively low, accounting for a small proportion of the health budget. To fully deliver the regulatory activities, additional budgets were needed. Inadequacy of government financial support, departmental coordination, and practicability of the AIDC were identified to be the main factors influencing the effectiveness of AIDC implementation.

The "dual role" of regulators was not only a phenomenon in the implementation of the AIDC, but also in the implementation of other health legislation, including the Food Hygiene and Safety Act, and the Drug Administration Act. While this system could save overall operating costs, as felt by the national officials, it would result in conflicts of interest within related health facilities. For example, being the major regulators of health legislation and providers of preventive care, county anti-epidemic stations are responsible for delivering both regulatory activities and health care services that are regulated by the legislation. This means regulators working in anti-epidemic stations should regulate part of the work conducted by those anti-epidemic stations. Because those regulators are paid and administered by the anti-epidemic stations, this could negatively affect the implementation of the legislation. This is a legislative system problem in which the roles of regulators and health providers were not clearly defined in the legislation. The national government has taken action in recent years to try to separate the regulators and health providers. It is believed that the effectiveness of health legislation implementation would be improved after separation.

It is hard to quantify the effectiveness of the AIDC in infectious disease control with regard to how much of the reduction in infectious disease prevalence can be contributed to it. From the interviews and observations that overall prevalence of infectious diseases has declined, the effectiveness of the AIDC was concluded qualitatively. Although infectious disease control programs have been affected by the economic reform, prevalence, mortality and death rates of infectious diseases have continuously decreased over the last two decades. In 1989, the reported prevalence, mortality and death rate of infectious diseases were 338/100,000, 0.76/100,000, and 0.23%, respectively, declining in 2000 to 186/100,000, 0.26/100,000 and

0.14%, respectively [11,12]. Between 1990 and 2000, reported prevalence decreased by 10.6% annually [1].

The assessment of AIDC effectiveness made by the interviewees and health workers in this study is sound and credible. This is reflected in the following evidence. First, health financing reform has imposed difficulties for public health programs. A reduction of public expenditures and the escalation of costs of health inputs pushed the government to introduce user fees as one means of generating revenues for public health facilities. This radical change in financing mechanism has had the effect of encouraging public health providers to favour provision of the more profitable services [13,14]. Most infectious disease control activities do not generate market revenue, which would discourage health providers from providing such services. The AIDC could, to some degree, correct the problems resulting from changes in the financing pattern, through enforcing the implementation of necessary infectious disease control programs.

Second, the political and economic contexts for infectious disease control have changed. Between 1950 and 1980, the strong political system was extremely successful in delivering public programs including control of communicable diseases. Financial decentralization and the weakened role of government in both economic and public sectors have reduced the effectiveness of using political command in administering public health programs. As found in pollution control, legislation has now become necessary for the government to deliver its public interventions [15].

Lastly, legislation is closely linked to equipment, personnel and improvement of working conditions. For example, expansion of the public sector workforce is controlled by the government. Increasing the workforce in the public sector requires the advance permission of the government. The AIDC provides a strong rationale for health facilities to recruit health manpower for the implementation of infectious disease control activities. In addition, with the legislation, the regulators can ask for resources/equipment to improve working conditions.

Relative to the potential effectiveness of the AIDC, costs both actually spent and required are low. This is mainly because most of the regulatory activities are labour-intensive and labour is not expensive in the health sector. In the average 260 yuan per capita spending on health for the rural population in 2000 [16], the actual cost of AIDC implementation per capita accounted for only 0.23%. It is hard to say whether this proportion spent on AIDC implementation costs (0.23%) is greater or less than the proportion of total disease burden reduced by the AIDC, but we can be sure that in poor rural areas where the population still bears a heavy burden of infectious diseases, implementation of the AIDC should be very cost-effective.

The gap between actual costs and required costs for implementing the AIDC is large in terms of proportions of cost coverage, but is small in terms of absolute monetary values. A 0.4 yuan (US$ 0.05) increase in per capita budget would meet the requirements of full implementation of the regulatory activities of the AIDC. Although public funding is constrained at present, it is possible for the government to finance the deficit through redirecting resources or increasing the government budget.

Problems in implementing the AIDC identified in this study are consistent with findings in other studies [17,18]. Budget deficit is the most common problem mentioned in such studies. While their findings support the estimations of actual and required costs for implementing AIDC in this study, we believe that, aside from the financial issue, the capability of regulators and coordination between relevant departments are also crucial to the success of AIDC implementation. This means that budget problems cannot be the only excuse for regulators not to fully accomplish the regulatory activities; other dimensions related to the effectiveness of AIDC implementation should also be emphasized.

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