

## Disease Control and Prevention in China in the 20<sup>th</sup> Century and Prospects for the New Millennium

Sheng-Nian ZHANG, Zhuo-Bao LIU and Zu-Wei GU

*Shanghai Center for Disease Control and Prevention, PRC*

### Abstract

**In the first part of the paper, the main achievements and experience of disease control and prevention in China during last 50 years are described. Infectious diseases and parasitosis have been successfully controlled and prevented and people's health enhanced owing to the establishment of an effective system of public health, the launch of a campaign called "Patriotic Public Health", immunization planning, and the improvement of economic and environmental conditions. In the second part, the challenges to public health in China are presented. The threat from old and emerging infectious diseases, especially sexually transmitted diseases, a sustained increase in the prevalence of chronic non-infectious diseases (cardiovascular diseases, tumors and diseases of the respiratory system), environmental problems and the health problems of aging are discussed. Finally, strategies for disease control and prevention in the new century is suggested.**

**Key words:** public health, prevalence, mortality, disease control and prevention, achievements, problem, strategy, 21<sup>st</sup> century

### Introduction

A Chinese old saying teaches us that reviewing the past helps you to know the future and standing on top allows you to see more distant. At the beginning of the new millennium, reviewing the achievements and experience of disease control and prevention in China in the 20<sup>th</sup> century gives us encouragement and inspiration. Recognizing challenges and opportunities stimulates people to go forward. Looking into new missions and countermeasures gives people confidence in the future.

#### *1. Achievements and experience of diseases control and prevention in new China*

In the first half of the 20<sup>th</sup> century in old China, infectious diseases, parasitosis, and endemic diseases were rampant. During those years, 1,156,000 persons died just from plague, and about one million people from smallpox. In 12 provinces, 10 million people had schistosomiasis (1). During the last 50 years, since the foundation of the People's Republic of China, there has been very successful control of the prevalent infectious diseases and an enhancement of the people's health. Throughout China, the mortality rate was 25 per 1,000 in the 1950's which was reduced

to 6.57 per 1,000 in the 1990's (2). The infant mortality rate decreased from 200 per 1,000 to 31.4 per 1,000 at the end of the last century (3), and the average life expectancy increased from 35 in 1949 to 70 in 2000 (4), respectively. Three indexes of health in Shanghai have already attained the level of partially developed countries in the world. For instance, life expectancy increased from 58.14 in the 1950's to 78.44 at the beginning of 2000, infant mortality decreased from 83.96 to 6.03 per 1,000, pregnancy and maternity mortality rate decreased from 275.56/100,000 to 11.35/100,000., respectively (5). The standardized mortality in the Shanghai population decreased during these years, from 1328.71 per 100,000 in 1953 to 467.99 per 100,000 in 1997, decreased by 65% (6). These data vividly show the great achievements in disease control and prevention in new China.

#### 1.1 Establishment of an effective 3-tiered system of health and disease control

At the beginning of the foundation of new China, a 3-tiered system of health and disease control was established step by step throughout China and it has been under the administration of the Ministry of Public Health of the central government. The system includes health and anti-epidemic stations in the provinces, regions and counties, and in large-scale enterprises and mines; the committee for patriotic public health campaign; maternity and child health care centers; centers for control of different specialized diseases such as occupational diseases, endemic diseases, tuberculosis, and leprosy, and institutes for health control such as for food hygiene, environment health, school hygiene and so on in the provinces and cities. There is also entry-exit inspection and quarantine bureaus at the ports and airports.

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Reprint requests to: Zu-Wei GU

Department of Environmental and Occupational Medicine, Shanghai Center for Disease Control and Prevention, 1380 Zhong Shan (W) Road, Shanghai 200336, P.R. China

TEL: +86(21)62758710-197, FAX: +86(21)62957458

E-mail: ldyxzz@online.sh.cn

Among these developments, the health and anti-epidemic stations are the major centers for technical instruction, supervision and guidance as well as centers for the organized management of diseases and epidemic reports. In 1952, there were only 481 agencies for health and disease prevention in China, increasing to 5903 in 1997 and the number of staff member also increasing from 15,750 to 218,717, increased 11.3 and 12.9 times, respectively (7). The Establishment of a system for disease prevention enhanced the capacity for quick response to health emergencies. For example, in Anhui Province in 1991, in the areas of the Yangtze River, the Nen River and the Shounhua River, the heaviest flood in the history of China occurred, however, there was no epidemic (8).

In November 1998, in Shanghai 8 health and disease control agencies were united and reconstructed into one agency—the Center for Disease Control and Prevention at 2 municipal and district levels (9). This kind of union represents a model reform and improves the system of health and disease control (10).

### 1.2 Patriotic public health campaign changes sanitary and hygienic situation in China

The patriotic health campaign is a mass movement under government leadership, in collaboration with the agencies, and with the participation of the whole Chinese populations. It has been formed as a very effective model of public health and has a special Chinese character. It has been documented in the Chinese constitution and has become a basic government policy (11). In the 1950's, eradication of 4 hazards (flies, mosquitoes, mice, and cockroaches) was the central mission of this movement. In the 1960's, the control of water (waste and drinking water) and faeces, improving the quality of drinking water, reconstructing toilets and livestock farms, redesigning cooking furnaces and ameliorating the environment became the main points (12). In the late 1970's the important objectives were controlling environmental health in the cities, further emphasizing water control and reconstructing toilets in countryside, and health education for the entire populations of China. According to the statistics, by the end of 1997, the water supply system had benefited 850 million people, 25.4% of excrement and urine was treated, the treatment rate having doubled compared with that in 1992 (13). As a result of executing the WHO Healthy Cities Project since the late 1980s in China, currently, in big cities and regions of China health education agencies have been established and the "Healthy City" award was given to 156 of 616 cities in China (25.3%) (14). Regulations forbidding smoking in public areas were issued in 78 cities, and 10 cities such as Beijing etc are the cities without tobacco advertising (13).

### 1.3 Distinguished success in the planned immunization of all children in China

Since 1950, under the leadership of the Ministry of Public Health, health and anti-epidemic staff members have visited families and conducted inoculations with the smallpox vaccine and BCG, the inoculation rate against smallpox reaching more than 90%. Since 1955, in Shanghai and Beijing, planned preventive inoculation was initiated. In 1958, preventive inoculation had become popular in China (3). In 1978, the Ministry of Public Health sent out a "A Notice on the Enforcement of Planned Immunization and issued the "National Regulation of Planned Immunization Practice", in brief 4 vaccines (tuberculosis, smallpox, pertussis-diphtheria-tetanus and poliomyelitis vaccine) to prevent

6 diseases, was published. Children under 7 years old should have been inoculated according to the planned immunization (15). In 1980, China officially participated in the "Expanded Program on Immunization, EPI" sponsored by WHO (16). In 1990, the inoculation rate in children with the corresponding ages reached 85% (8). In 1992, inoculations against viral hepatitis were included in the planned immunization (15).

Beijing, Shanghai and other big cities have always played a pioneer role in preventive inoculation. For instance, in Shanghai the inoculation rate against whooping cough, poliomyelitis, measles and BCG was 80% in the 1970's, and 99.8% in the 1990's, taking first place in China.

The popularity of immune inoculation has helped to decrease vaccine-preventable infectious diseases to the lowest rate in the history of China. In 1961, smallpox was eradicated in China; 17 years earlier than throughout the world (15). In 1995, paralysis polio was wiped out (8). The incidences of 4 kinds of vaccine preventable diseases in children as measles decreased by 90% compared with before the planned immunization (8). In Shanghai, diphtheria and poliomyelitis have not occurred during the last 21 and 11 years, respectively. The incidence of measles and whooping cough were controlled to less than 1 and 0.3 per 100 thousand during the last 14 and 10 years, respectively (5).

### 1.4 Decrease in the incidence of infectious diseases over the time

The reported incidences and mortality of viral hepatitis A and B were the highest in 1970, but due to vaccination, efforts of health workers and application of antibiotics they have decreased every year, at an average rate of 13.72% and 11.73%, respectively. In 1978, the total incidence of infectious diseases was 2364.90 per 100,000, decreasing to 192.11 per 100,000 in 1999 (8). In the 1990's, the reported incidences of infectious diseases decreased by 95% compared with those in 1970 (17), and their lethality decreased by 40% as compared with the 1980's. In the ranking of causes of death, infectious diseases used to occupy 2<sup>nd</sup> place, but have now moved down to 8<sup>th</sup> place (18). Taking Shanghai as an example, in the early 1950's, the incidence of acute infectious diseases was very high, 3,309.49 per 100,000. Currently, after 50 years it is 226.48 per 100,000, a decrease of 93.15%, the mortality having decreased from 64.55 per 100,000 to 0.44 per 100,000, a reducing of 99.32%. The incidence of lung tuberculosis decreased from 7,500 per 100,000 in the 1950's (the highest in China) to less than 80 per 100,000 in the 1990's, a decrease of more than 99%. Twelve (plague, forest encephalitis, smallpox, relapsing fever, tsutsugamushi disease, kala-azar, diphtheria, anthrax, schistosomiasis, brucellosis, epidemic typhus, and poliomyelitis) of 25 infectious diseases rampant in the first half of 20<sup>th</sup> century have been successfully eradicated, 8 infectious diseases (leptospirosis, rabies, measles, epidemic encephalitis B, whooping cough, malaria, dengue fever) have been eliminated and 5 infectious diseases (viral hepatitis, dysentery, typhoid and paratyphoid fever, scarlet fever and epidemic hemorrhagic fever) have also been basically controlled (5).

### 1.5 Elimination or control of 5 kinds of parasitosis

Before the foundation of PRC, China was an area with a high prevalence of 5 kinds of parasitosis (schistosomiasis, malaria, kala-azar, nematodiasis, hookworm and roundworm), the prevalence of schistosomiasis was rampant in 12 provinces, more than 400 counties. Owing to complex countermeasures undertaken during the last 50 years, according to data in 1995, schistosomiasis

has been eradicated in 5 provinces, and its prevalence has been controlled in about 300 counties, and the number of patients has decreased by 92.79% (19). The number of new malaria cases per year has decreased by 99.83%; kala-azar and nematodiasis have basically been eradicated in the most prevalent provinces (20–22). The incidence of hookworm and roundworm diseases has substantially decreased. For example, in 1995, 759,000 patients with schistosomiasis were detected by a general survey (24% of total population in epidemic regions), this disease was basically eradicated in 1975, and in 1985, no new cases of acute infection had occurred during the previous 5 years. Nematodiasis was basically eradicated in 1981. It was declared that, in Shanghai, malaria and nematodiasis were eradicated in accordance with the corresponding national standards in 1986 and 1996, respectively (5).

#### 1.6 Exited effects of early prevention, early detection and early treatment of malignant tumors

In the late 1950's, a network of malignant tumor control was first established in Shanghai and in the 1970's, agencies for the control of cancer were set up. The system for malignant tumor reporting and registration has been relatively standardized. In the 1980's, the popularity of science, and propaganda and education for the whole population were promoted vigorously, and, since then, malignant tumor patients in the late stage have been hospitalized and given the terminal care. In the 1990's, based on tumor screening, the program for early prevention, early detection and early treatment has been executed more effectively and its effect is obvious. Based on a comparison with the standardized mortality rate (SMR) of cancers between the periods of 1973~1975 and 1990~1992 in China, the SMR of cancer of cervix uteri decreased by 65%~78% both in the cities and the countryside. Nasopharyngeal cancer—by 33%~39%, esophageal cancer—by 44.34% in the cities and 14.16% in the countryside, female breast cancer—by 5.24%~12.60% (23). According to Shanghai statistical data, in 1995, the incidence of lung cancer was 76.1 per 100,000 and 30.6 per 100,000 for males and females, respectively, increasing over time. The incidence of cancer of the cervix uteri decreased from 64 per 100,000 50 years ago to 3.8 per 100,000 at present. Based on tumor disease and death registration data in the periods of 1972~1974 and 1993~1994, over about 20 years, in Shanghai, the incidence and mortality of esophageal cancer decreased by 65.37% and 62.9%, respectively. Stomach cancer—by 36.7% and 20.3%, liver cancer—by 22.2% and 21.4%, nasopharyngeal cancer—by 10.9% and 25.2%, respectively (23, 24). The rate of early detection of mammary cancer was 20.6% in the 1980's, and 30.5% in the 1990's, that of rectal cancer being 16.7%, a 3-fold increase. The improvement in the rate of early detection rescues the life of about 10,000 cancer patients every year. This also reduces the proportion of tumor deaths in the total number of death on average by 0.1%~0.2% per year (23–24).

#### 1.7 Preliminary success in the control and treatment of chronic cardiovascular diseases

The control of chronic diseases was initiated relatively recently, however, its success is very evident due to hard work during the last 10 years. Changes in adverse habits such as cigarette smoking, alcoholism, an unbalanced diet (high carbohydrates, high salts, and high fat), lack of movement and mental stress, and health promotion activities to prevent chronic diseases are accepted by most people and have become commonly recog-

nized (28, 29). In Beijing Capital Steel Company from 1974~1988, owing to behavioral change, the incidence of apoplexy decreased from 155 per 100,000 to 58 per 100,000, and the mortality decreased from 84 per 100,000 to 18 per 100,000 (28). Exploring a model for the control and treatment of chronic diseases in the community in Jiangsu Province and Tiazin City has achieved a good result (30). Since 1994, 50,000 residents in each street community from 20 districts and counties in Shanghai have been evaluated as standards for the control and treatment of cardiovascular and cerebrovascular diseases. A general community screening of 48,335 residents over 35 years old for hypertension was carried out. Through multiple level management and health interventions, the proportion of the hypertension patients under medical surveillance increased from 67.3% to 75.6%, with a decrease in systolic pressure in patients with hypertension of 10 mmHg on average and a decrease in the incidence and mortality of apoplexy by 15% and 38%, respectively (31).

In addition, in the field of control of occupational diseases (32–36), the organization of emergency and rescue teams (37, 38), vital statistics, the establishment of an information system, scientific research (34, 40–42), apparent achievements were made.

### 2. Challenges and opportunities faced in the new century

#### 2.1 New threat from infectious diseases

The vaccine-preventable infectious diseases have been almost totally controlled, but not throughout the whole country. For example, in some areas, the incidence of old infectious diseases such as epidemic haemorrhagic fever, viral hepatitis B and tuberculosis is still considerable. The number of epidemic haemorrhagic fever cases in China makes up 90% of the total cases in the world (43). The number of tuberculosis patients occupies second place in the world and the number of deaths from tuberculosis is more than the total number of deaths from all other infectious diseases in China during the last 10 years (44). Some infectious diseases which have not occurred for several decades, are now re-emerging, for example, sexually transmitted diseases (STD) disappeared for 30 years, but occurred again in the 1980's, increasing at an annual rate of 20% in the 1990's (16). Dengue fever was occurred rarely during the last 30 years, however, since the 1980's, epidemics have broken out several times in Guangdong and Hainan Provinces (17). In addition, during the last 20 years, 32 emerging infectious diseases were discovered, and more than half of them has occurred in our country. For example, the first case of AIDS in China was detected in 1985, and in 1997, the spread of AIDS entered a period of fast growth (45, 46). At the end of September 2000, AIDS patients were spread over 31 provinces, cities administered directly by the central government and autonomous regions in China. According to reported data, there are 20,711 infected cases and 741 patients, and from them 397 patients have died (43). We will still be under a severe threat of infectious diseases in the new century.

#### 2.2 Sustained increase in the prevalence of chronic non-infectious diseases

Since the 1970's the incidence, prevalence and mortality of chronic diseases has increasing year by year, and the rate of increase is accelerating. Since the 1980's, the mortality of cardiovascular and cerebrovascular diseases, tumors, and diseases of the

respiratory system have remained the first three causes of death in the total population. In the 1990's, the prevalence of chronic diseases was already 25%, the loss of life expressed in years of potential life loss (YPLL) due to chronic diseases made up 63% of the loss of life in the total population (4). The disability-adjusted life years (DALY) made up 58%, and the medical care cost was about 20,000 million Chinese Yuan per year (48). Due to the multi-causality, high incidence and persistence of chronic disease, their control should become the new mission for disease prevention in the whole of the 21<sup>st</sup> century in China.

### 2.3 Injuries as an important problem of public health

As in many developing countries, the occurrence and death from injuries have been very severe in recent years. In total, the incidence of injuries is about 1860/10<sup>5</sup>, and mortality is nearly 65/10<sup>5</sup> (44). In 1995, 20.7 million people were injured in China, about one fiftieth of the total population, and about 8.7 times as many as in the United States (50). Among them, 700,000 died, 1.2 million had a dysfunction, and 400,000 had a disability, resulting in an economic loss of 3000 million Chinese Yuan. Mortality from suicide and from motor transport vehicle accidents occupied the first place in the world (51–53). Injury became the first and second causes of death in adolescence. In 1998, injury was the first cause of death in the 1–14 and 15–39 age groups in Shanghai. In the new century, injury control will be an essential new sector in control and prevention of diseases.

### 2.4 Severe adverse effects of environmental problems on health

Because of large areas of poor selenium in 8 provinces and an excess of fluorine in 10 provinces, 45% residents are living in areas with a lack of iodine, and although the great improvements have been made, the absolute number of endemic diseases is still startling. Moreover, with the development of the market economy in recent years, some rules and regulations for occupational health and diseases are incomplete and delayed resulting in an increase in occupational diseases in recent years. In the 1990's, cumulative number of pneumoconiosis patients was about 500,000, equal to the total number of pneumoconiosis patients in other countries in the world (54). The incidence of acute occupational intoxication is still high without diminishing, and some new occupational diseases are occurring (55). In addition, industrial pollution has resulted in environmental pollution, and hazard of toxic chemical pollution, red tide, acid rain, warm room effects, and defect in the ozone layer will become more serious (56).

### 2.5 Eminent health problems of aging

In 2000, the proportion of the population over 60 and 65 years old reached 10% and 7%, respectively which accords with the world standard of aging countries. China has become a typical aging society and the speed of aging is higher than that in many developed countries. For example, in Sweden the aging speed is the highest in the world, and the increase in the proportion of aged persons over 65 years old from 7% to 14% took 85 years, but in China it happened within 27 years. This means that by 2020, the proportion of aged persons in China will be equal to that in the United States (57). To face a series of health problems, how to transform the prolongation of life expectancy into active life expectancy, and to execute healthy aging will be one of the serious problems with which China may be afflicted at least during the first 50 years of the new millennium.

### 3. Goal and strategy for disease control and prevention in the new century

Goal: ①Prevention and control of disease, injury and disability. ②Improvement of the whole Nation's health level and quality of life. ③Promotion of sustained development of the Nation's economy.

National Conditions: ①Our country has a vast territory, and health resources are dispersed and uneven. ②With a huge population, the absolute number of diseased people is large. The aging of the population and changing of the disease spectrum are rapid. ③At the initial stage of development, with a weak economic foundation, the legal system needs to be perfected.

Therefore, it is impossible to realize the goal mentioned above by only the health department alone, nor by extra investment, it can only be accomplished as follows: ①Strengthening government leadership. ②Involvement of the whole society. ③Adopting an integral prevention and control model of low investment but high efficiency.

The following strategies may be necessary:

—Persisting in the principle of putting prevention first, formulating policies and regulations for public health emphasizing on the primary prevention and increasing the public health budget are very urgent. A disease prevention and control program as a part of the national economic development program should be elaborated. All of this will provide support and guarantee for the implementation of the policy and the strategy.

—Organizing a central leading group composed of personnel from the different departments concerned and an expert consulting group, setting up a system of centers for disease control and prevention at national and provincial levels, establishing our own laboratory with a pathogen species bank, and serum and gene banks, perfecting a local three-tier disease control and prevention network, as well as forming a professional team with the knowledge of management, information, disease prevention, research, training and service are suggested.

—Establishing a National Health Promotion Committee involving the government, the various departments concerned and the whole society, which may provide technical guidance and may also coordinate the working system with the district's community and country's villages and towns as the main objective, and general doctors as the main power, for the purpose of controlling risk factors and high risk people and of carrying out health intervention and promoting self-protection.

—Conducting health education in teen-agers. Implementing a nutrition program for the public. Integrating community health promotion and a target disease prevention project. Giving priority to the rural areas and western regions of our country and to people at high risk.

—Setting up and perfecting step by step a system of disease surveillance-management-evaluation and policy making. Adjusting the present surveillance system. Improving the distribution of the surveillance system. Increasing the high technical content in methods of the surveillance. Developing a biology-behavior science surveillance model. Hence, raising the surveillance efficiency and quality.

—Strengthening the prevention and control of infectious diseases, endemic diseases and occupational diseases, especially attaching importance to vaccine research for emerging infectious diseases. Setting up a rapid-response network for emergent accidents. Raising our ability for disaster-relief and disease prevention. Paying attention to the prevention and control of

infectious diseases and endemic diseases in the rural areas and in the western regions. Drawing up and implementing the program for this.

—Actively carrying out the prevention and control of chronic diseases, non-infectious diseases, mental disorders, injury and poisoning. Persisting in the principle of early prevention, early diagnosis, and early treatment. Meanwhile, sticking to the principle

of removing risk factors and basic prevention. Carrying out early screening for chronic diseases, non-infectious diseases, health education and risk factor intervention.

The 21<sup>st</sup> century will be a new era with great achievements. We shall strive to make our contributions to the whole mankind. “Healthy For All”, the goal set by the WHO, will be realized in China.

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