

Environment and Health Management for Climate Change in China

Volume III—Evaluation of Workforce Competency and Training Needs on Environmental Health



MDG Achievement Fund

Environment and Health Management for Climate Change in China

**Vol 3 - Evaluation of Workforce Competency and
Training Needs on Environmental Health**



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Preface

Since the founding of new China, the Chinese government is very concerned about people's lives and health, and the development of public health including environmental health. The government has always been adhere to the implement of health service policy of "prevention first" in spite of laying special attention to respective sanitation work in different history period. The urban and rural outlook has been changed greatly through carrying out the patriotic public health campaign, and some epidemic disease has been controlled and eliminated.

Since the policy of reform and opening to the outside world was exercised in the 1980s, China's social economy has maintained the high-speed development momentum. The large population base with continuously accelerating urbanization process, rapid economic development and extensive economic growth method, has made China's resource and environmental problems more and more prominent and the pollution situation more serious. Environmental pollution has spread from inland to offshore areas, from surface water to underground water and from ordinary pollutants to poisonous and harmful ones. It seems that there is point source pollution and area source pollution together in existence; household pollution plus industrial discharge result in more serious situation; various new and old pollutions as well as secondary pollutions aggravated environmental pollution and led to unprecedentedly complicated phenomenon.

Meanwhile, Health damage caused by environmental pollution is aggravated, environmental health problems has been very prominent. China environmental health problems presented by a large population, long exposure time, variety exposure routes, high concentration of pollution, the difficult elimination of effects on the health caused by accumulated historic polluting problems, the significant difference between urban and rural areas. Not only traditional environmental health problems have not been solved, but also the modern environmental health hazards and risks increases

seriously. Rapid economic development paid a heavy price to environmental resources, as well as a greater price to human health. To completely solve this problem, an effective management and policy system for environment and health are urgently needed to solve these problems.

Presently, China's environment and health management work has been great attached importance by government; environment and health management in recent years have been strengthened, too. In November 2007, China released the National Environmental and Health Plan, which clearly identifies the need for capacity development in the leadership and management of environment and health and provides a valuable framework to support new policy development aimed at mainstreaming environment and health issues onto the development. The Plan pays particular attention to the need to improve the government's capacity to utilize a range of risk management tools including health risk assessment through a greater focus on monitoring, information management and education and community engagement. In doing so, it also provides an opportunity to assess environmental health workforce competency and training to meet these needs. Currently, key areas in environmental health in China include: enhancing strategic visioning and direction-setting skills through critical thinking and analysis, political effectiveness, and organizational and team development; enhancing the performance outcomes of the essential services of environmental health; promoting and improving the delivery of environmental health services to communities.

The challenge for China is to ensure its workforce has the capacity to address the impacts of both rapid developments in ways which build on existing strengths yet learn and adapt from others. Countries like the US, UK and Australia have experienced similar challenges albeit utilising differing pathways in education, training and governance. These experiences and lessons will help China in its current assessment and potential redesign process.

But now, environment and health overall management remains low because of

weak basis of China environment and health management, which can't meet the current demand for work. To further enhance the environment and health management, an intensive training is urgently needed for currently environment and health practitioners. Before the training, however, an evaluation of workforce competency and training needs on China's environmental health is needed to define the training contents and targets.

Section1 Current profile of environmental health workforce

China began to engage in management on environment and health in 1950s and copied the model of Soviet Union. Public health colleges were established in six universities in 1953 and health quarantine stations were also established at province, city and county level as well as in railway system and state-owned enterprises. Professional staff engaging in monitoring on public health and quarantine was assigned for public health & quarantine stations.

In late 1970s, along with the ever increasing environment pollution, governments at all levels established environmental protection bureaus. The functions of environment monitoring and environment protection were transferred from public health & quarantine station to environmental protection bureau.

Today, the major part of environmental health management remains the health system. Other systems, such as ministry of environmental protection, have relevant organizations responsible for corresponding work.

1 Institutional settings and their responsibilities correspondence to environmental health work in China

1.1 Within the system of Ministry of Health

There are 15 agencies under the Ministry of Health of the People's Republic of China. Among them, Disease Control and Prevention Bureau and Health Supervision Bureau are related with environmental health. Following the Ministry of Health, provinces, municipalities and autonomous regions have set up health departments (bureaus), city and county-level units are also equipped with Health Bureau. There are corresponding bureaus (departments) in charge of the environmental health work at different levels; however, difference exists in the organization settings.

Chinese Center for Disease Control and Prevention (China CDC) is a nonprofit institution working in the fields of disease control and prevention, public health management and provision of service. China CDC is committed to strengthen research on strategies and measures for disease control and prevention; organizes and implements control and prevention plans for different kinds of diseases; carries out public health management for food safety, occupational health, health related product safety, radiation health, environmental health, health care for women and children, among others; conducts applied scientific research; provides technical guidance, staff training and quality control for disease control and prevention and public health services throughout the country; acts as national working group for diseases prevention, emergency relief, and construction of public health information systems.

Disease prevention & control centers at provincial, city and county levels are under the administration of China Disease Prevention & Control Center and are led by public health authorities at relevant levels. However, disease prevention & control centers of various levels can provide guidance to each other. China CDC and the centers at provincial level engage in both management function and science of research. The main functions in the environment and health field is as follows: i) stipulating relevant laws and regulations, rules, norms and provisions on environment and health, providing scientific basis and technological support, and evaluating the implementation results; ii) monitoring and researching relevant diseases and influences by environment factors on human health, drawing up prevention strategies and control measures, evaluating the results of prevention and control measures, investigating emergent pollution cases and the damages to public health, and providing technological support for emergent public health accidents; iii) collecting and providing environment and health information and consulting service, as well as participating in public health promotion work and activities on environment protection.

In China, all provinces, municipalities, autonomous regions and city- and

county-level units are provided by health supervision, to assume supervision of the national health information collection, collation, analysis summary.

Health supervision bureaus at all levels are responsible for supervising foods, disinfection products, drinking water and safety products related to drinking water according to law; supervising public places, occupation, radiation, school health according to law; supervising infectious disease prevention and control work in accordance with the law; supervising medical institutions and blood collection agencies and their practitioners' practicing activities, rectifying and standardizing the medical services market, fighting against illegal medical practices and illegal blood collection and supply, as well as other assume duties according to laws and regulations, etc.; And there are corresponding law enforcement teams to be responsible for specific operations.

The main responsibilities of CDC and health supervision bureaus at different level are listed in the following tables.

Table1 Main Responsibilities of CDCs of Different Levels

Contents	Nation level	Province level	City level	County level
Disease Prevention and Control	Development of planning, programming; Development of standards and methods; Organizations to carry out monitoring and epidemiological investigation; Research and evaluation of prevention and control strategies and measures	Development of planning, programming; development of standards and methods; Organizations to carry out monitoring and epidemiological investigation	Implementation of planning, programming; Carrying out monitoring and report; Organizations to investigate and dispose; Evaluation the effectiveness of prevention and control	Implementation of planning, programming; Completed the task for disease control and prevention; Carrying out monitoring, investigation, management and effect assessment
Disposal of Public Health Emergencies	Development of programming; Provide technical support; Organize and	Development of programming; Provide technical support; Organize and	Commitment and implementation of the tasks; Provide technical support;	Commitment and implementation of the tasks; Organize and train team;

	train team; Provide information of prediction and early warning; Tracking developments of the incident; guidance and supervision	train team; Organization and implementation of monitoring and report; prediction and early warning; guidance and supervision	Organize and train team; Organization and implementation of monitoring and report; prediction and early warning; track the development of the incident	Organization and implementation of monitoring and report; prediction and early warning; track the development of the incident; Provide information; Disposal the incident
Monitoring and Controlling of Health Risk Factors	Organization and implementation of plan and program; Monitoring and evaluation guidance; study of the prevention strategies and control measures	Organization and implementation of plan and program; Implementation of prevention strategies and control measures; accident disposal organization	Organization and implementation of monitoring; guidance and participation of accident disposal; participate in disease diagnosis and identification	Monitoring, report and intervention; participation of accident disposal;
Health Education and Health Promotion	Planning; Participate and manage project; Development of materials; Supervision, inspection and evaluation of the activities' effects	Planning; Participate and manage project; Development of materials; Implication of the plan; Supervision, inspection and evaluation of the activities' effects	Implication of the plan; Release the materials of activities; Implication of the plan; Supervision, inspection and evaluation of the activities' effects	Implication of the plan; Release the materials of activities; Implication of the plan; Evaluation of the activities' effects

Table2 Main Responsibilities of Health Inspection Bureaus of Different Levels

Level	Main Responsibilities
Nation level	Development of policies, plan and standards; Organizations, guidance and supervision; Inspection, supervision of local health agencies; Organization, coordination, supervision of major cases; Organization of national health inspection sampling; Health administrative licensing and accreditation; Analysis of information of health inspection of the whole country; Organization of training; Organization of publicity and education of health laws and regulations.
Province level	Development of policies, plan and standards; Organizations, guidance and supervision;

City and County level	<p>Health administrative licensing and accreditation, daily supervision; Organization, coordination, supervision of major cases, participate health protection; Sampling for health supervision; Inspection, supervision of local health agencies; Organization, coordination of health agencies of different levels; Personnel qualifications, organizations qualifying examination; Organization of training; Summary, verification, analysis and report of information of health inspection; Organization of publicity and education of health laws and regulations; Coordination and guidance within the railway area, transport, civil aviation department of health supervision.</p> <p>Health administrative licensing; Inspection of public health; Inspection of medical health; Guidance and supervision; Summary, verification and report of information of health inspection; Receive complaints of violations; Organization of publicity and education of health laws and regulations.</p>
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1.2 Ministry of Environmental Protection and other ministries

1.2.1 Ministry of Environmental Protection

In 1998, China Environment Protection Administration (hereinafter referred to as SEPA) was established. In order to solve the serious environment problems, SEPA exerts more and more emphasis on environment protection and public health. Since mid-1990s, a serious of investigations on environment and health have been carried out and relevant laws and public health on environment and health have been stipulated. In 2005, SEPA established Environment and health Monitoring Division under the Scientific Standards Department to further specify working principles on environment and health. Currently, emphasis is being put on basic investigation on environment and health, establishment of the legal system, research and stipulation of management norms and evaluation standards, etc. Environment protection authorities at provincial level or below haven't established relevant organs in charge of management on environment and health now.

Environment monitoring is the basis for environment protection and foundation of enforcing environment protection laws and regulations as well as the inevitable means of carrying out environment and health management work. The environmental monitoring in China began with the monitoring of the main rivers, lakes and reservoirs, and then stepped into the monitoring of urban air quality and the evaluation of environmental pollutants in human body. At present, China has 2,389 environment monitoring stations and a total staff of 46,000 employees, so China has established the initial environment monitoring network and can carry out various kinds of environment monitoring works nationwide. The regular reporting system also has been established and various kinds of environment quality monitoring reports are compiled and submitted on a regular basis.

In addition, the past 30-odd years have witnessed the establishment of automatic urban air quality monitoring system, automatic surface water monitoring system, and increased of automatic pollution source monitoring capability. In recent years, with various kinds of emergent environment pollution cases appearing more and more frequently, environment protection system have been equipped with a batch of emergency monitoring vehicles and portable monitoring instruments. The support system of emergency monitoring technology has been strengthened. In respect to local conditions, many provinces and municipalities have established dangerous source database and emergency prediction system. Some provinces and municipalities have established corresponding geographic information system and common pollutants database. In order to strengthen management on environment and health, the environment protection system also carries out investigations on environment pollution. In early 2008, the State Council started officially the first national pollution source investigation campaign nationwide. However, environment monitoring work related to public health is rarely carried out. The monitoring and information processing system on pollutants harmful to public health is not in place, so it's difficult to provide sufficient technological support to management on environment and health.

1.2.2 Other ministries

Management on environment and health involves many departments and it's difficult to solve the existing difficulties and problems in the environment and health field by only relying on one department. It's necessary for relevant departments to strengthen coordination and cooperation and gradually establish an environment and health monitoring & management system and working mechanism with clear allocation of work responsibilities among relevant departments.

Therefore, SEPA and Ministry of Health stipulated Coordination Mechanism of SEPA & Ministry of Health on Environment & Public Health Work in 2006 and established the organizational structure at four layers: National Leading team of Environment & Public Health Work, Allied Office, Expert Consulting Committee and Theme Working Team.

In order to faithfully strengthen coordination among relevant authorities in the environment and health management field and according to the requirements of National Environment and Health Plan (2007-2015), the Office of Ministry of Health and the Office of SEPA jointly issued Circular on Establishment of National Leading team of Environment & Public Health Work on Jan. 31, 2008 that is made up of 18 departments and divisions. The leading team is in charge of researching macro policies on management of environment and health and guiding development of management of environment and health. The secretariat is also established jointly by SEPA and Ministry of Health to undertake the operation and cooperation work.

According to the National Environment and Health Plan (2007-2015), the respective responsibilities of 18 departments are listed in Table 3.

Table 3 respective responsibilities of 18 departments

Department	Responsibility
Ministry of Health and SE PA	organization and coordination of national environment and health work, the establishments of laws, regulations and

	standards related to environment and health monitoring, information management, risk assessment and the emergency work of urgent public events caused by environment pollution
National Development and Reform Commission	coordinating and organizing to develop the macro management and controllable policies which are propitious to the harmonious environment and health development.
Ministry of Education	incorporating the environment and health knowledge into the relevant courses and special education contents, implementing the environment and health propaganda and education activities at schools;
Ministry of Science and Technology	incorporating the national major scientific and technological work of environment and health into national science and technology development programs and national technology plans;
Ministry of Finance	arranging necessary funds needed for the environment and health work, and strengthening financial management and supervision;
Ministry of Land and Resources	geological environmental protection, the monitoring and supervision of preventing pollution and excessive exploitation of groundwater;
Ministry of Construction	the preparation of urban and rural planning favorable for environment and health development, organizing and implementing water quality security of urban water supply, supervision and management of urban environmental sanitation, strengthening guidance and supervision of urban sewage treatment, and developing standards and norms related to relevant project construction, etc.;
Ministry of Communication	the development of the communication development plans and policies which will improve environmental and health protection;
Ministry of Water Resources	drafting plans of water resources protection, organizing the zoning of water function areas and the control of discharging sewage to the drinking water source and other water areas, also responsible for the unified management, monitoring and supervision of water resources (including aerial water, surface water, groundwater), examining the pollutant receiving capacity of water areas, and proposing advice to restrict the total discharge of pollutants;
Ministry of Agriculture	the related monitoring work of agricultural environment and agro-biological security;
Ministry of Commerce	the formulation of the relevant trade development programs and policies which are favorable for environment and health development;

State Administration of Radio Film and Television	propaganda of environment and health on radio and television;
National Bureau of Statistics	guiding the establishment of relevant database and information-sharing platforms;
State Administration of Work Safety	developing environment and health protection programs in workplaces and organizing their implementation;
Information Center Legislative Affairs Office of the State Council	conducting research, development and revision of laws and regulations related to environment and health;
China Meteorological Administration	organizing the monitoring and forecast of meteorology, also the joint meteorological prevention of major disastrous weather and forecasting air quality together with other departments, organizing related meteorological researches and providing related meteorological data
State Administration of Traditional Chinese Medicine	The applied researches on traditional Chinese medicine in environment and health areas.

2 Education background of staffs who engaged in environmental health

As mentioned above, environmental health officers are mainly working in the health system for the time being. There is no nationwide statistical analysis data about environmental health workforce, but the environmental health is one of the important parts of public health after all. So we can get the basic knowledge of the number and educational background of the present environmental health workers by referring to the whole human resource condition of the whole public health system.

According to “China Health Statistics Yearbook 2008” and “2007 National Economic and Social Development Statistical Bulletin” of each province, there are only 200,000 public health technicians nationwide in 2007, and the geographical distribution is uneven. As listed in Table 4, the number of health staffs in different province differed from 1.19 to 4.11 per 10 thousand populations. In relatively

developed eastern province, their populations are relatively larger, but the number of health staffs is relatively small. Among them, Anhui province has the smallest number. There are only 0.82 person in CDC and 0.38 in health inspection bureau per 10 thousand populations. While in western provinces, such as Qinghai, inner Mongolia, Xinjiang, the health staffs are relatively more than other provinces, but only 4 persons or so per 10 thousand populations.

Table4 Number of Health Staffs in Different Province in 2007

Province	Total population	CDC (health quarantine stations)		Health Inspection Bureau	
		Number	Proportion (per 10 thousand)	Number	Proportion (per 10 thousand)
Beijing	1633	3558	2.178812	1688	1.03368
Tianjin	1115	2017	1.808969	730	0.654709
Hebei	6943.2	10011	1.441842	4899	0.705582
Shanxi	3392.58	5888	1.735552	2272	0.669697
inner Mongolia	2405.06	6853	2.849409	2844	1.182507
Liaoning	4298	9721	2.26175	2726	0.634248
Jilin	2729.82	6955	2.547787	2171	0.795291
Heilongjiang	3824	7378	1.929393	3135	0.819822
Shanghai	1858	3186	1.714747	1254	0.674919
Jiangsu	7624.5	8847	1.160338	3968	0.520428
Zhejiang	5060	5058	0.999605	3634	0.718182
Anhui	6675.7	5452	0.816693	2517	0.377039
Fujian	3581	3782	1.05613	1014	0.283161
Jiangxi	4368.41	4907	1.123292	2166	0.495833
Shandong	9367	13525	1.443899	2604	0.277997
Henan	9869	18320	1.856318	5362	0.543317
Hubei	5699	8642	1.516406	2919	0.512195
Hunan	6355	9330	1.468135	3233	0.508733
Guangdong	9449	9715	1.028151	4664	0.493597
Guangxi	4768	6198	1.299916	2180	0.457215
Hainan	845.03	1493	1.766801	125	0.147924
Chongqing	2816	2333	0.82848	1312	0.465909
Sichuan	8127	10449	1.285714	3919	0.48222
Guizhou	3975.48	4674	1.175707	1663	0.418314
Yunnan	4514	7844	1.737705	2157	0.477847
Xizang	284.15	831	2.924512	29	0.102059
Shanxi	3748	6008	1.602988	2743	0.731857
Gansu	2617.16	4874	1.862324	2072	0.791698

Qinghai	551.6	1703	3.087382	563	1.020667
Ningxia	610.25	1216	1.992626	629	1.030725
Xinjiang	2095.19	6441	3.074184	1540	0.735017

The demand for public staffs is affected by local population and social-economic situation. So we should formulate appropriate staffing standards according to local practical condition. As defined in Tianjin 2001-2010 regional health planning, the Disease Prevention and Health Supervision Agencies' staffing standard is 2.4-3.1 / ten thousand population, of which Disease Prevention staffing standard is 1.4-2.1 / ten thousand population, Health Supervision staffing standard is 1.0 / ten thousand population; "The View of Beijing Government on Rural Health Development to Further Strengthen the Community Health Service" points out that during the "11th Five-Year Plan" period, the community health service centers (stations) should be equipped with public health technicians, in principle, one prevention/health care personnel per 2,000 population. The standard should be changed according to the development of socio-economic and demographic changes

In 2005, China has 25,798 sanitation supervisors of which the Health Supervision Inst has 17,125, the Health Supervision Inspection / monitoring / testing center 560, the CDC 8023. Those staffs were distributed in food health, cosmetics health, occupational health, public places' health, radiological health, school health as well as laboratory and other departments. According to different practice ranges, about 2/3 of the supervisors engaged in environment and health-related work. The details can be seen in Annex 3.

The composition of gender, age, education background and professional title of health staffs in CDC (health quarantine station) and the health inspection bureaus (Center) in different province in 2005 is shown in Annex 4 and Annex 5. According to the table, the educational background at different public health agencies is uneven. In CDC and health inspection bureaus, the proportion of undergraduates or higher education is 15.5% and 24.3%, respectively. In those agencies, junior college graduates and technical secondary school graduates are the main part; the proportion

is 74.0% and 68.5%. It is worth noticed that in economy relatively backward regions, the situation is worse. For example, the results of health agencies' human resources distribution study of Guangdong province in 2004¹ show: the Pearl River Delta(including Guangzhou, Shenzhen, Zhuhai, Foshan, Dongguan, Zhongshan, Huizhou and Jiangmen, its economy is relatively developed), which has only 38.49% of the whole population, the number of health staffs is 40.37% of the whole province, but about 90% graduates of the whole province were among them. While in the East, West and North of Guangdong province, highly educated staffs were lack significantly. The potential needs for highly educated staffs are strong. As a result, it is of great significance to carry out targeted continuing education to the existing personnel.

In addition, the distribution of health staffs is different in different level of health agencies. In higher level agency, the proportion of highly educated staff is also relatively higher.

In Ningxia CDC (province level)², there are 212 staffs in 2007. Among them, the number of staffs whose education background is Master, Undergraduate, junior college, technical school and high school and below is 4(1.89%), 76(35.85%), 57(26.89%), 40(18.87%), 35(16.51%) separately. Compared with the average level of whole country, the proportion of highly educated is bigger.

The personnel constitution of Xi'an CDC (city level) is similar with Ningxia CDC³. At 2006, there are 161 staffs in Xi'an CDC. Among them, the number of staffs whose education background is Master, Undergraduate, junior college, technical school and high school and below is 10(6.21%), 55(34.16%), 34(21.12%), 36(22.36%), 26(16.15%) separately. But in county level, the proportion of undergraduate and higher educated staff is significant small. For example, in Xi'an district, there are 538 staffs in county level CDCs. Among them, the number of staffs whose education background is Master, Undergraduate, junior college, technical

¹ South China Journal of Preventive Medicine, 2005, 31(5):75-76.

² Anhui Journal of Preventive Medicine, 2008, 14(3):203.

³ Journal of Preventive Medicine Information, 2008, 24 (7):557-559.

school and high school and below is 5(0.93%), 47(8.74%), 162(30.11%), 190(35.32%), 214(24.91%) separately, which is similar with the average level of whole country. In Mianyang CDCs (part of Sichuan province), the constitution of education background is also similar with the average level of whole country⁴.

Another problem that can not be ignored is that not all staffs of health agencies have received related medical education, especially in city and county level. For example, in Xi'an CDCs (including city and county level), there are 699 staffs. Among them, profession of preventive medicine occupy the proportion of 23.32% (163), profession of clinical medicine 21.60% (151), profession of nursing 4.58% (32), other un-medical profession 50.36% (352). The situation is similar in Mianyang city. In the 217 staffs who has junior college or higher education background, 32(14.75%) have the education background of preventive medicine, 41(18.89%) clinical medicine, 29(13.36%) health inspection, 7(3.23%) Chinese medicine, 2(0.92%) pharmacy, and 106(48.85%) un-medical profession.

⁴ Modern Preventive Medicine, 2008, 35 (1):84-85.

Section2 Overview of current training provided in China

Environmental Health is an important subject in public health and preventive medicine. So is a major professional course. Environmental science, environmental chemistry, environmental biology, environmental quality and evaluation are the principal courses in environmental science. From an environmental health point of view, environmental health training related courses and curriculums are still mainly within the field of public health and preventive medicine.

Since 1950s, China's environmental health education has experienced its discipline construction process: initiation, improvement and mature. In the early days of nation-building, environmental health teaching closely cooperate with Chinese government's health work policy "for workers, peasants and soldiers," "prevention first" and "health work in combination of public movement" and the urgent needs of improving living environment to prevent infectious and parasitic diseases. Training is mainly focus on the prevention of transmission of infectious and parasitic diseases, and related knowledge and skills of health measures. Students participated in public health movement, practiced disease prevention and environmental health improvement. As the health measures are effective, people's living environment and health has been significantly improved, many of the serious infectious and parasitic diseases have been under control. As China's economic and industrial development, the environmental pollution is increasingly serious, environmental health science gradually shifted its focus to the environment and human health, particularly to environmental pollution and its impact on the health and the health regulations and measurements. After the Third Plenary Session of the 11th, accompanied by the development of higher education, environmental health education has been developed rapidly. In the higher education of public health and preventive medicine, environmental health science is listed as a compulsory subject, and other medical curriculums also list relative knowledge of environmental health into their training requirements. In recent years, with in-depth research, environmental health science

has been differentiated into environmental toxicology, environmental epidemiology, environmental medicine, and other disciplines directions. Environmental science has not only trained a large number of undergraduate students, and is awarded with a master's and doctorate levels of academic qualifications.

Public health and preventive medicine professionals belong to medical professionals. In science professionals, there also exists a professional named environmental science that is related with environmental health. A large amount of high expertise equipped with basic theory, basic knowledge and basic skills in environmental health science are trained and able to undertake scientific research, teaching, environmental protection and environmental management in research institutes, universities, enterprise and administrative department.

1 Undergraduate education

1.1 Profession of public health and preventive medicine

In 1950s, China learned the education mode from the former Soviet Union and set up Pubic Health Department (school) in nine universities. In 1955, the Ministry of Health undertook higher medical institutions adjustment and professional settings adjustment, set up Public Health Department and Environmental Health teaching and research section in six universities: Beijing Medical College, Shanghai First Medical College, Shanxi Medical College, Wuhan Medical College, Sichuan Medical College and Harbin Medical College, according to teaching resources and geographical distribution.

According to the survey in 1984, there were 27 institutions of higher education established the Health Department, of which most of the schools have teaching and research section of Environmental Health. According to the statistics of the Ministry of Health Science and Education Division in 1988, there are 32 higher institutions set up Preventive Medicine or Health Professions, opened a environmental health course.

As is shown in the data of Academic Degrees Committee of the State Council and the Ministry of Education Graduate Office in 1998, public health and preventive medicine professionals are supposed to recruit 1,500 undergraduate students each year

Today, many medical undergraduates are enrolled in preventive medicine professional in 78 colleges all over China (see Annex 6, data in the tables of this chapter all from China Education and Research Network). 40-800 preventive undergraduates are enrolled in one college per year. After the outbreak of SARS, the total enrollment reaches 8000. It is estimated that there are about 6,000 graduate preventive medicine students per year.

It is unignorable that a considerable number of graduates choose to go abroad for further study each year. The graduates who choose to work is distributed in all directions of public health, some others have even chosen medicine sales, IT, the like which has little to do with public health.

1.2 Profession of environmental science

The same as public health and preventive medicine, environmental science experienced start-up, improvement and fast development stage since the founding of new China as well.

Nowadays, there are 189 institutions of higher education which enroll environmental science undergraduates all over China(details can be seen in Annex7).

2 Graduate Education

2.1 Profession of environmental health science

From 1950-1966, the number of graduate students who enrolled environmental health science is quite few due to the imperfect system and the lack of teachers of Chinese graduate education; the less completed studies due to various factors.

Ministry of Education issued the "Interim Measures of colleges and universities for post-graduate training (draft)" in 1953, which requires that all universities and colleges equipped with Soviet experts or better conditions for teachers should undertake the task of post-graduate training, so the health department of Beijing Medical University and other universities recruited a small number of graduate students. Graduate education was overall denied in 1966. From 1966-1977, graduate education ceased recruitment completely. China resumed graduate education in 1978. Under Ministry of Health, universities and colleges such as Beijing Medical University began to recruit environmental health science graduate student. Degree system has been established since 1st Jan, 1981, in that year the first batch of environmental health science graduate students received their master's or doctoral degree.

The State Council and the State Education Commission adjusted master's and doctoral professional in 1997, combined environmental health science and occupational hygiene science to one subject group. Today, there are 44 graduate student admission agencies enrolling for hygiene science and environmental health science, details includes in Table 5. The number of admitted is around 300 every year.

Table 5 The institutes which enroll the graduates of Occupational and Environmental Hygiene in China

Province	Institute
Beijing	Peking University Health Science Center, Capital Medical University, Chinese Center For Disease Control And Prevention, The Academy of Military Medical Science
Tianjin	Tianjing Medical University
Shanxi	Shanxi Medical University
Liaoning	Dalian Medical University, China Medical University
Jilin	Jilin Unversity
Heilongjiang	Harbin Medical Unversity
Shanghai	Shanghai Jiaotong University, The Medical College of Shanghai Jiaotong University, Fudan University
Jiangsu	Suzhou University, Nanjing Medical University
Zhejiang	Zhejiang Medical University, Zhejiang Academy of Medical Sciences
Anhui	Anhui Medical University
Fujian	SouthEast University, Fujian Medical University

Shandong	University of Jinan, Shandong University, Shandong Academy of Medical Science
Henan	Zhengzhou University
Hubei	Huazhong University of Science and Technology, Tongji Medical College, Huazhong University of Science and Technology, Wuhan University, Wuhan University of Science and Technology
Hunan	University of South China, Central South University
Guangdong	Southern Medical University, Zhongshan University,
Guangxi	Guangxi Medical University
Chongqing	Third Military Medical University, Chongqing Medical University
Sichuan	Sichuan University
Guizhou	Guiyang Medical University
Yunnan	Kunming Medical University
Shanxi	The Fourth Military Medical University, Xi'an Jiaotong University
Gansu	Lanzhou University, Lanzhou Medical University
Ningxia	Ningxia Medical University
Xinjiang	Xijiang Medical University

2.2 Other environment-related professions

Across the country, the environment-related professionals of graduate students are as many as 115, of which in addition to the environment-related health professionals, there are environmental science, environmental management, environmental safety and health, pests and the environment security and so on. Students who graduated and recruited each year are hundreds, or even thousands.

3 Continuing education

In the early nation-building, in order to solve the problem of serious lack of public health professionals, the training course of health personnel was established in February 1950 in Shanghai to train public health personnel in medical and health-service workers. At that time training included 10 professionals, environment health science was one of them. In addition, a variety of levels and forms of training and continuing education classes were organized in many places to improve environmental health professionals and technicians of the level of theory and practical working ability.

Because national public health professionals and technicians are with low levels of education and their knowledge structure is not suitable, approved by the State Education Commission and the Ministry of Health, from 1988 at the Beijing Medical University, Shandong Medical University, and other colleges and universities, college-level correspondence education in preventive medicine was offered, including a certificate of professional education and academic education. In the teaching program, environmental health science was one of the required courses. Beijing Medical University, as well as some of the local medical college teachers and health and epidemic prevention institutions of professional and technical personnel participated in face-to-face counseling, student thesis defense, and other teaching programs. According to statistics of Beijing Medical University in 2001, it had nearly 10,000 professional graduate certificate students, more than 1,200 college graduates, and 1600 students. Correspondence education of preventive medicine made an important contribution to improve the basic level environmental health technicians and enhance their professional capacity.

From 1952 to 1953, the Ministry of Health established health science training courses and trained environment health science teachers in Beijing, Shanghai, Shandong and other places. Moreover, other institutions of higher education have also held similar classes of teachers and education. The graduates of teacher and education classes became backbones and leaders of every medical college; this is the earliest continuing education basing on renewing knowledge after the nation liberation. Colleges undertook various topics of the environmental health training, for example backbone teacher education classes. In 1991, the Ministry of Health issued the "Interim Regulations on Continuing Medical Education", and called for the "new theories, new knowledge, new technologies and new methods" of training to the professional backbone with mid-level and above title. The medical colleges and environmental hygiene department (Teaching and Research Section), all levels of society for environmental science, health and epidemic prevention agencies and related disciplines undertook a great deal of teaching, and the continuing education of

environment health science has become daily teaching work, which is also the requirement of environmental health professionals and technicians improving their own technical level. In 2008, two hundred and fifty projects of national continuing medical education were implemented about public health and preventive medicine, of which a considerable portion of the work are closely related with environmental health. In addition to national continuing medical education programs, there were a number of provincial, city level and other levels of continuing education projects, which contributed to improve the ability of environment health science professional and technical personnel.

Section3 Current level of training specific to risk assessment

Environmental health risk assessment is the process that collects and uses science and reliable, well-designed toxicology, epidemiology and experimental study of the latest results, follows certain guidelines and evaluation of the maturing of the technology route, provides comprehensive qualitative and quantitative analysis and evaluation for adverse health effects of exposed people caused by some environmental hazards, and applies to environment management and decision-making.

Environmental health risk assessment focused on the analysis of existing data and expert judgments. It includes all of the individual chemicals (mixtures) evaluation and research methodology, and it is an interdisciplinary methodology which integrates in research achievements of the epidemiology, toxicology, mathematics, health economics, health statistics and public management and develops on the combination of management and decision-making practice. From its definition, we can see that it is not a pure scientific research, but for environmental management and decision-making services.

Similarly, in China the training on environmental health risk assessment has gone through a gradual process of development.

1 Teaching materials construction related with environmental health

In early days after the founding of China, very few environment health teaching materials were published in China. Started in 1953, there were translation of the former Soviet Union health professional teaching materials; some schools were using the self-compiling environmental hygiene materials. In 1956, the Ministry of Health developed a compiling plan of higher education teaching materials, required to prepare teaching materials basing on the actual situation in China.

In the 1950's, there were 6 health professional teaching materials published, including environmental health science.

During “the Great Cultural Revolution”, health professional education has been reduced to three years. As a result of changes in the school system, teaching materials also needed corresponding changes. In 1976, departments of environmental health science of Shanxi Medical College, Sichuan Medical College, Harbin Medical College, Beijing Medical College, Wuhan Medical College and Shanghai First Medical College collaboratively compiled “Environmental Hygiene” for students to use. There are only 220,000 words in this concise book. Due to the smaller space, many of the content were compressed.

After resumption of college entrance examination system in 1977 in China, under the leadership of the Ministry of Health, “Environmental Hygiene (for undergraduate)”--or first edition—was published for undergraduates use, the editor in chief was Shanghai First Medical College, Beijing Medical College, Shanxi Medical College, Harbin Medical College, Wuhan Medical College, Hunan Medical College and Sichuan Medical College participated in compilation. 900,000 words were contained in this book. It systematically expounded the relationship between living environment and human health-- particularly the effects of environmental chemistry, physical factors, and biological factors on human health, sanitation standard-setting principles and methods, and environmental health measures; it added the monitoring of environmental health, preventive health monitoring and evaluation of the quality of the environment, etc. Through the school's teaching practice, "Environmental Hygiene" has been revised and enriched many times, became more and more perfect. In 2007, the sixth edition was published.

After 1980s, in addition to the Ministry of Health Planning publication of teaching materials, some universities compiled and published a number of teaching materials, training materials and reference materials for environmental health-related professions and professional teachers, students, researchers and Environmental health

professional and technical personnel use. For example, “Environmental Health Science”, published by Beijing University Medical Publishing House and compiled by Beijing University Health Science Center, took students' medical background, as well as people urgent needs for environment and public health knowledge into account, and expatiated on the relationship between environment and health. By contents editing and enriching, this book made an objective and accurate presentation for basic concept and theory of environmental health science. In addition, the book also provided separate chapter to introduce concerned contents such as: environmental genomics and proteomics, environmental health risk assessment, physical factors and health, environmental endocrine disrupting chemicals and health, environmental health promotion and education, which of them haven't been involved or involved little in existing textbooks

Table 6 listed different textbooks published in different historical period.

Table6 some of the environmental health-related teaching materials directory published in China

Name of the teaching material	editor	Publishing unit	Publishing time(Year)
Environmental Hygiene	Hansheng Hu		1953
Environmental Hygiene	the environmental health science education casses of institue of Beijing cadres of health education	People's Medical Publishing House	1959
Environmental Hygiene	Mingding Yang	People's Medical Publishing House	1961
Environmental Hygiene	Shanxi, Sichuan, Harbin, Beijing, Wuhan, Shanghai Medical College	People's Medical Publishing House	1976
Environmental Hygiene (first edition)	Shanghai first Medical College	People's Medical Publishing House	1981
Environmental Hygiene (second edition)	Zhilin Yao Bingheng Chen	People's Medical Publishing House	1987
Environmental Hygiene (third edition)	Zhilin Yao	People's Medical Publishing House	1996
Environmental Hygiene (forth edition)	Xuemin Chen	People's Medical Publishing House	2001
Environmental Hygiene	Xuemin Chen	People's Medical	2003

(fifth edition)			Publishing House	
Environmental Hygiene	Xuemin Chen		People's Medical Publishing House	2007
(sixth edition)			Publishing House	
Modern environmental health	Hongdao Cai		People's Medical Publishing House	1995
Environmental Hygiene	Lihua Wang		Publishing House of Ancient Chinese Medical Books	1990
Environmental Hygiene	Shiwen Cai		University of Science and Technology of China Press	1991
Environmental Hygiene	Zhengang Wang		People's Medical Publishing House	2000
Introduction to environmental health	Xinbiao Guo		Peking Medical College Press	2002
Environmental Hygiene	Fusheng Yuan		Chinese Academy of Medical Sciences and Peking Union Medical College Press	2003
Environment and Health	Shenggao Cheng Dezhong Dan		China Environmental Science Press	2006
Environmental Health Science	Xinbiao Guo		Peking University Medical Press	2006
Environment and Health	Zhenbang Jia		Peking University Press	2008

2 The content of environmental health risk assessment in related textbooks.

In the early days of the establishment of China, public health focused on improving the living environment, preventing the infectious and parasitic diseases, and imparting the medical knowledge and measures of preventing the infectious and parasitic diseases. As the infectious and parasitic diseases which do serious harm to the people being gradually controlled and the development of China's economic and industrial, environmental pollution is getting more and more serious, environmental health will gradually shift its focus on the relation of environment and human health, and the environmental health risk assessment (HRA) in the textbooks is taking more and more important position.

As referred before, the environmental health risk assessment is a comprehensive methodology developed recent years. However the knowledge described in the textbooks are all mature theory and methods, so environmental health risk assessment are rarely referred in the earlier environmental health textbooks.

The environmental hygiene (fourth edition) published by People's Medical Publishing House in 2001 only contains a small chapter which describes the constitution of the environmental health risk assessment and risk management (as the following fig1), and this portion was not taken as the key part in the syllabus but only as the content students' should be aware of.

As the Chinese government taking more and more emphasis on the environmental health risk , this part in the textbook are emphasized accordingly, for example Environmental Health published by Peking University Medical Press introduced the environmental health risk assessment as a separate chapter.

The book describes the basic conceptions, historical development and the components of environmental health risk assessment and also its each step (hazard identification, exposure assessment, dose-response assessment and risk characterization), also exemplify the use of environmental-health risk assessment in the public health work. This chapter contains more than 40 thousand words, which is several times more than other similar textbooks.

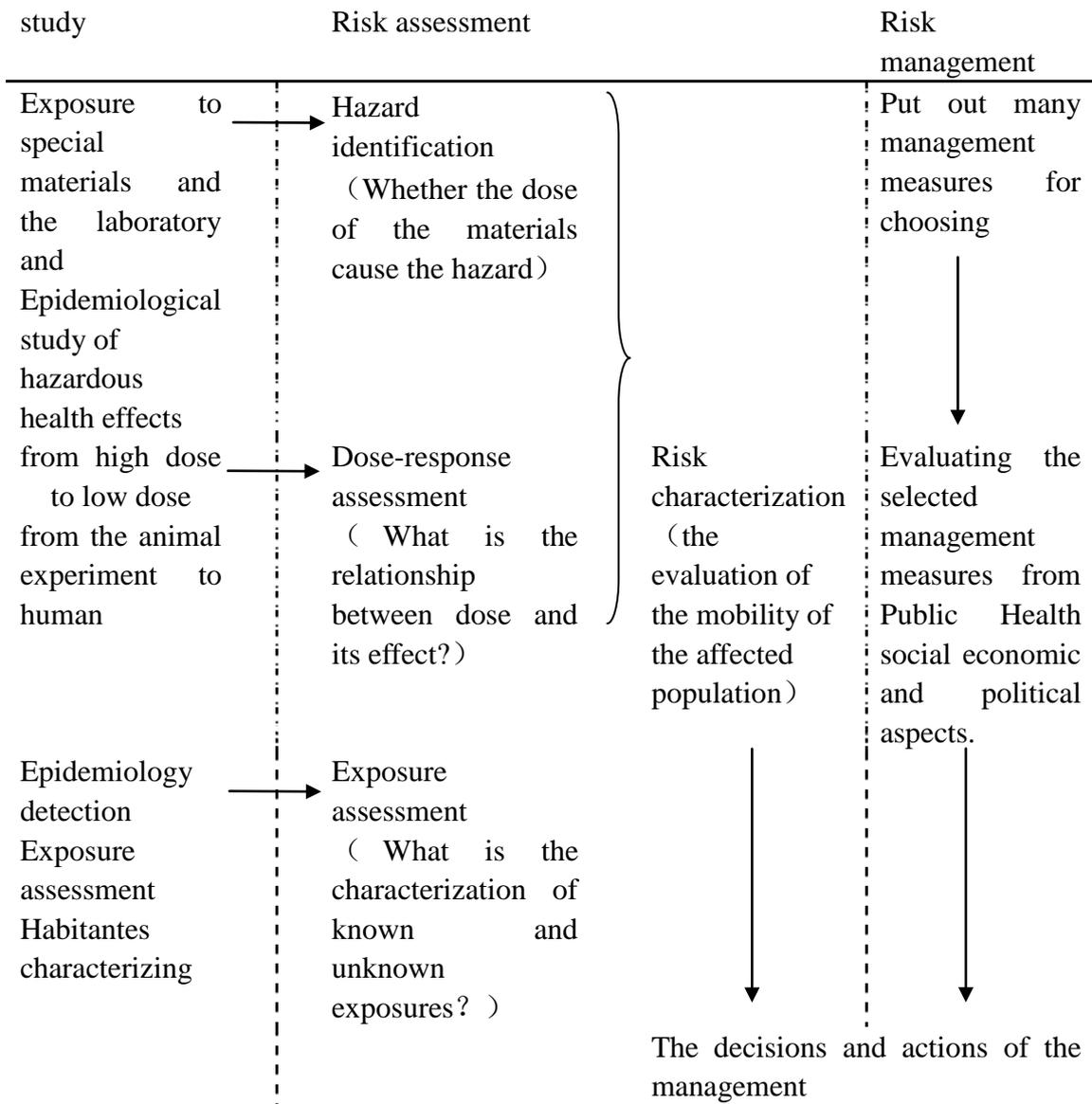


Fig 1 the constitutes of environmental health risk assessment and management

Section4 Current level of use and types of risk assessment in current professional practice

Since 1980s, all countries in the world have carried out environmental health risk assessment research. In recent years, China also attaches great importance to the study and implement of risk assessment work.

1 Basic contents of health risk assessment

Health risk assessment must apply latest development results and technologies of toxicology, epidemiology, statistics, monitoring science, etc. In general, health risk assessment is composed of four steps: hazard identification, dose - response relationship assessment, exposure assessment and risk characteristics.

Hazard identification is the first step of health risk assessment. It is a qualitative evaluation stage. Its purpose is to determine whether the chemicals being evaluated will produce health hazards and the characteristics of harmful effects in a certain contact conditions based on epidemiological and toxicological studies. Dose - response relationship assessment is the quantitative assessment between environmental chemical exposure and its adverse health effects. It is the core of health risk assessment. The evaluation information may come from crowd epidemiological survey, but mostly from animal experiments. Exposure assessment needs to determine the level (dose) of exposure and the characteristics of the crowd. It is an integral part of the risk assessment process because if there is no exposure to the crowd, no danger exists. Risk analysis is based on the qualitative and quantitative assessment results gained from the above-mentioned three phases, making a comprehensive evaluation on the health risk of environmental existent chemicals, analyzing and judging the possibility and uncertain factors of the outbreak of some health risks in the crowd.

2 Current environmental health risk assessment in China

China's current research on risk assessment is mainly based on the United States Environmental Protection Agency's "Environmental Pollutants Health Risk Assessment Guidelines".

In 1986, the U.S. Environmental Protection Agency provided the "Environmental Pollutants Health Risk Assessment Guidelines", and revised them according to the development of science. Now, it is composed of five parts: ① Carcinogen Risk Assessment Guidelines; ② Exposure Assessment Guidelines; ③ Mutagenicity Risk Assessment Guidelines; ④ Developmental Toxicology Health Assessment Guidelines; ⑤ Chemical Mixtures Health Risk Evaluation Guidelines. These guidelines require regular revise and publication. They provide environmental health related staffs with guidance for developing and using risk assessments. They also provide basic information to the public about the government's risk assessment methods.

Nowadays, the work of environmental health risk assessment in China is consistent with the guidelines of the U.S. Environmental Protection Agency. The whole progress is composed of four steps hazard identification, dose - response relationship assessment, exposure assessment and risk characteristics. But because of the complexity of the whole progress, disease prevention and control agencies under province level seldom take systemic risk assessment work. In universities and science research institutes, there also are some experts engaged in risk assessment related work caused by various environmental factors.

Section5 The evaluation of the work abilities and demands of the environmental health staffs in China

At present, the environmental health work in China has received the government's high emphasis and has been enforced in recent years. But because of the thin basis of environmental health work in China, the whole level remains still low, and can not fulfill the demand of present work. In order to develop the level of environmental health management, it is urgent to enforce the training to the present environmental health staffs. We used the Delphi method in our survey to find out the work abilities of the present environment and health staffs and the real demands of the training.

1 Study methods

Delphi method, used in our survey, which is known as an expert survey method, is one of the popular methods used to predict or assess the law and trend of some-thing. In order to realize or study something, Delphi method takes the un-quantitative information of the experts' knowledge, experience and intelligence by means of mailing questionnaires survey to consult with the special experts about the questions of a selected fields, and asks the experts write down the comments and send back. After several rounds (generally more than two rounds) of information exchange and feedback, as the experts' comments coming to the same and the prediction and evaluation to the objects can be made according to the comprehensive comments of the experts.

Delphi method was first used as a visual forecast method, which accompanied people's request of re-realization and effective prediction of intuitive forecast method. As Delphi method being constantly used and improved, people began to use it in the prediction and management fields. Although Delphi method has its own limitations, it is also an effective method in solving some special problems that the sociology and

public health can not solve.

Request of experts choosing:

The experts chose in our survey are someone who have been participated in the environmental health work for many years (more than 10 years), and much experienced. However we do not do special requirement about the post title of the experts. Considering the different level of work in different regions, we chose the experts from different departments (the officials from the Ministry of Health, officials from Provincial, municipal CDCs and health supervisions, the officials from the capital and also other provinces, the officials from the eastern provinces and also the middle and west provinces).

Main questions in the questionnaire:

1.1 Do you know the conception of “environmental health risk evaluation”?

A never B ever heard, but not familiar C familiar D very familiar

1.2 Is there any specialized agency responsible for environmental health risk assessment related work in your institution?

A yes B no

1.3 Is there any assigned person responsible for environmental health risk assessment related work in your department?

A yes B no

1.4 With health and environmental protection getting more attentions, is it necessary to establish specialized agencies or persons in charge of environmental health risk assessment related work in our country?

A yes B no

1.4.1 If you chose “A”, then when should we establish them?

A in 2 years B in 2-5 years C in 5-10years D after 10 years

Please specify the reasons of your choice

1.4.2 If you chose “A”, then which one of below should be the most basic level?

A province B prefectural C city D county

Please specify the reason of your choice.

1.4.3 If you chose: “B”, please specify the reason of your choice.

A presently, it's not necessary

B it has been included in related departments' work.

C others (please be specific) _____

2.1 How do you think of global warming and its affects to human health?

A no effects

B leading to the changes of the distribution of insect-borne diseases

C leading to the increased prevalence of water-borne diseases

D leading to the increase of the occurrence of allergic diseases

E leading to the increasing morbidity of extreme climate-related diseases (such as heat stress, cardiovascular disease)

F others (please be specific) _____

2.2 Nowadays, global climate changing is receiving increasing attention. Whether it is necessary to set up specialized agencies or personnel to be responsible for environmental health risk assessment related work in our country?

A yes B no

2.2.1 If you chose “A”, then when should we establish them?

A in 2 years B in 2-5 years C in 5-10years D 1 after 10 years

Please specify the reasons of your choice

2.2.2 If you chose “A”, then which one of below should be the most basic level?

A province B prefectural C city D county

Please specify the reason of your choice.

2.3.3 If you choose “B”, Please specify the reason of your choice

A presently, it is not necessary

B it has been included in related departments' work.

C others (please be specific) _____

3.1 The main source of the knowledge of present environmental health staffs are:

- A the accumulation of knowledge in school
- B the theoretical study during the work
- C the accumulation of experience during the work
- D impartment of the colleagues during the work.
- E others (please be specific)_____

3.2 Could the knowledge learned by current environmental health related staff meet the needs of the work?

- A yes
- B no

3.2.1 If you choose “B”, which training is needed?

- A Environmental health-related theoretical system
- B The actual work practices and procedures
- C the basic method of environmental health risk assessment
- D the progress of environmental health risk assessment
- E others (please be specific)_____

3.3 For training environmental health staff, which way of below should be taken?
(Multiple choice)

- A self-study by published training materials
- B training together
- C experts lectures
- D simulation practice
- E others (please be specific)_____

2 Results of the survey

2.1 Basic information of the experts

2.1.1 The constitutes of the experts

20 questionnaires were sent out and 16 recovered. The experts participated in our survey are from the Ministry of Health, the provincial CDCs and health supervisions from Beijing, Zhejiang and Shanxi. The general conditions are as follows:

Table 7 The basic information of the experts

		Number
Area	Ministry of Health	1
	Beijing	7
	Zhejiang	4
	Jiangxi	4
Gender	Male	11
	Female	5
Title	Senior	9
	Intermediate	6

The average age of the 16 experts is 42.8 ± 6.0 years old (min 32, max 55), and the average years participating in environmental health work are 16.1 ± 5.7 years (min 9 years, max 25 years). The main tasks of these experts are mainly environmental supervising, developing the environmental health-related norms and standards, licensing the environmental health-related administrative licenses, and organizing or coordinating the sudden environmental events' control and treatment, etc.

2.1.2 the factor of the experts' authority

In the survey the authority factors mainly based on the self-evaluation, which are mainly decided by two factors , one is the level of familiarity of the experts with the problems which were evaluated as 0.2, 0.4, 0.6, 0.8, 1.0 separately, according to "not familiar, not too familiar, general familiar, more familiar and very familiar"; the other one is decided by the level of the influence from the theoretical analysis, practical experience, the knowledge of peers and the intuitive selection during the decision process(the evaluated scores are as follows). And we chose the average of the two as the authority factor during the survey.

In our survey, the authority factor was 0.80, which is a higher authority score, indicating the survey results are reliable.

Judgments	Level of impact		
	senior	intermediate	junior
Theoretical analysis	0.5	0.4	0.3
Practical experience	0.3	0.2	0.1
Peers knowledge	0.1	0.1	0.1
Intuitive selection	0.1	0.1	0.1

2.1.3 Experts' positive factor

The experts' positive factor is the recovery rate and the response rate of the problems. In our survey, we recovered 16 questionnaires, and the recovery rate is 80% which is not very well. However in the recovery questionnaires, the response rates of the problems are 100%, indicating that related experts having a higher concern about our survey.

2.2 Results

2.2.1 The problems about "environmental health risk assessment"

In all surveyed experts , 11 said general familiar with the conception of health risk assessment , the other 5 said they have been heard of but not familiar with it.

Comprehending the experts answer, most experts believe that as Chinese environmental problems are more and more severe, it is needful to enforce the environmental health risk assessment work in the present days along with the health and environmental protection work are further being enforced. At present there are related departments in charge of the environmental health risk assessment within the ministry of health, but in the provincial and city level CDCs and health supervisions there are no special departments in charge of the health risk assessment related work.

As the environmental problem in China is one of the problems waiting for

immediately solved, the experts believed that it is necessary to set up special constitutes and officials to charge of the health risk assessment work so as to lead the environmental health work in the right direction. In order to focus the workforce in the daily work and enforce the authority of health risk assessment, the departments established shall not be too grass-roots level.

2.2.2 the problems about the “global climate change”

As the officials engaged in the environmental health work for many years, all the surveyed experts realized the climate changes may induce hazardous effects to human including the change of distribution of insect-borne diseases, the increase of water-borne and allergic diseases, and the increasing rate of the extreme climate related diseases such as heat stress and cardiovascular disease . Also the experts believed China should enforce the related research and management of the climate changes in the present days when all the other countries are putting increased attention to climate changes.

8 experts in 16 believed that it is necessary for China to set special agencies to charge the climate changes related environmental health risk assessment work, and it is not useful to set similar departments in the grass-roots level agencies in order to realize the objection of leading the environmental health work. And at the same time, other 8 experts believe it is not necessary to set special agencies and persons for the environmental health work because these problems have already been covered in the present work of related agencies.

2.2.3. Knowledge source and demands of environmental health related staffs

In order to realize the related knowledge source of the environmental health staffs, special related questions were set in the questionnaire. The results were that 5 person times said the source is “the accumulation of knowledge in school days”, 13 person times said “the theoretical study during the work”, 13 person times said “the accumulation of experience during the work”, and 5 person times said “impartment of the colleagues during the work”.

All the experts thought the present knowledge mastered by the environmental health staffs can not meet the need of the practical work and should be increased by further training. The contents of the training were as follows according to the frequency of selected: the basic method in the environmental health risk assessment, the progress of environmental health risk assessment, the practice norms and procedures of environmental health risk assessment, and the environmental health related theoretical system .

As for the forms of training, the experts tended to prefer focused training, experts' lectures and simulated practice to the self-studying such as training materials and network studying.

3 Discussion

The key prerequisite of Delphi method is choosing a suitable expert group which has a good representation. In our survey, although the recovery rate of the questionnaire was not high, the experts participated in the survey are all have been engaged in the environmental health-related work for many years, and all from different levels and different areas of the public health agencies. So its authority factors and positive factor are high, and the representation is good.

The staff of all levels in China's environmental health departments are aware of the urgency of the environmental health risk assessment work, but as the work ability is not enough, it is necessary to make corresponding adjustments on the establishment of the agencies and staff. We need further study in order to fortify this work.

Our survey found that the knowledge of current environmental health-related staff can not meet the needs of the environmental health risk assessment work, related training are needed urgently.

It is worth noticed that the present survey about the available sources of current knowledge shows “the accumulation of knowledge in schools” takes the low position

in the present knowledge constitute, far lower than" the theoretical study during the work " and " the accumulation of experience during the work ", which suggested that in the current education, the environmental health risk assessment should be adjusted to make it more suitable to the actual work.

As for the forms of training, the experts tended to prefer focused training, experts' lectures and simulated practice, which suggested we should emphasize the role of the experts who master the cutting-edge knowledge of environmental health risk assessment from colleges, universities and research institutions and the practical experience of experts who has long been engaged in related works.

Because of the experts' busy work , we reduced the number of questions in the investigation in order to avoid unnecessary loss, which also resulted in the unsatisfactory results that the contents are not very rich in our investigation.

**Section 6 International developments in environmental health
training and practice**

(Provided by foreign experts)

Section 7 Current Environmental Health Related Curriculums in China

The environmental health related curriculums are mainly offered in the profession of preventive medicine in China. 77 universities that enrolled undergraduate students all offered related curriculums with their own characterized training objects, credit requirements and courses.

1. Training object

In general, the objects of undergraduate education of preventive medicine were to train the talents who can meet the needs of economic construction and social development and own the abilities of practical work, teaching and research talent. Different training objects are proposed by different universities based on their respect situation and social demand.

1.1 Peking University

The preventive medicine in Peking University followed the training model of “enhancing the basic education, emphasizing the education of comprehensive abilities, and strengthening the training of social practices”. Through the training, the students can master the knowledge of natural science, basic medicine, clinical medicine and preventive medicine; and master the basic thoughts and methods of public health work. The abilities that are expected to master are as follows:

- ①The ability to prevent, diagnose and treat common diseases;
- ②The ability to study the health impacted factors and to propose interventions based on the judgments of health risks and injuries;
- ③The ability to judge the population health requirements, to organize public projects, and to put forward the management and policy proposals;
- ④The ability to carry out the preliminary science researches and write research papers and reports;

⑤ The ability to read and translate the related English literatures; to communicate and write the abstracts in English;

⑥ The ability to acquire information and analyze the data using modern technology;

⑦ The ability to communicate with colleagues.

1.2 Lanzhou University

The students should master the basic knowledge and theories of basic medicine, clinical medicine and preventive medicine, receive the basic trainings of diagnosing, treating, and detecting, and own the abilities of ant-epidemics, disease-controlling, common disease-treatment, primary health care, health education and medical science research.

The graduated students should master the following abilities:

① Master the basic preventive medical knowledge and technology, and the methods of literature retrieval, computer and statistical analyses. Be familiar with the theories of basic medicine and clinical medicine, and the preventive and treating technologies of common diseases;

② The ability to investigate and study the risks using the hygiene and statistical methods, to proposal and practice the effective disease controlling methods;

③ The ability to detecting and supervising the working and living environment and food safety;

④ Be familiar with the national health strategies, policies and regulations;

⑤ The ability to read related English literatures and books;

⑥ The ability to carry out the scientific research based on the practical needs.

⑦ Master the physical skills, foster the good habits of physical exercise, reach the national physical standards and keep the mental and physical health.

1.3 Beihua University

Beihua University located the object of preventive medicine on the fostering high-quality public health staffs for the public health agencies of above country level.

2. Credit requirements and curriculum

2.1 Credit requirements

The undergraduate educations in China are based on high school with the five year university period. The credit requirements in different universities are about 200 teaching-hours.

For example: The credit requirement in Peking University was 217, in which theory and practice classes were nearly 165 (76.0% of the whole), elective courses were above 26(12.0% of the whole), and compulsory teaching practices were 26(12.0% of the whole).

While the credit requirement in Tianjin Medical University was 231, in which compulsory courses were nearly 170, elective professional courses were 19.5, elective public-courses were 19.5, elective art-courses were 2, military training courses were 2, and clinical and professional practices were 20. Only the students who completed the entire credit requirement can receive the bachelor degree.

Other universities all have their own different requirements. i.e. the credit requirements of Fudan University, Wuhan University, Beihua University and Lanzhou University are separately 185, 176, 200 and 215 scores.

2.2 Curriculums

The curriculums of preventive medicine consisted of 3 parts: cultural basic courses, professional basic courses and professional courses. Cultural basic courses contained humanistic quality education and science education. Professional basic courses contained medical basic courses and clinical medical education. Professional courses contained the basic theories, methods and technologies of preventive medicine. The proportion of the three parts was nearly 2:2:1. For example, in the 165 credits of Peking University, cultural basic courses are 60 scores (36.4%), professional basic courses are 71.5 scores (43.2%) and professional courses are 33.5

(20.4%).

2.2.1 Cultural basic curriculums

The objects of the cultural basic curriculums were to make the undergraduate students qualified with the quality of the ideological and moral to engage in the public health career and the dedication for the preventive medicine career and the protection of people' health, strict research style and innovative spirits, and the ability to master related knowledge when graduate. The specific curriculum is different in different universities (details in Annex 8), but all of them consisted of the following curriculums: China's modern history, politics, history of medicine, medical psychology, medical ethics, English, mathematics, chemistry, physics, computer science and so on.

All these curriculums were finished in first 1 or 2 years.

2.2.2 Professional basic curriculums

In need of the medicine knowledge in the practical work, professional basic curriculums take relative large portion of the whole courses in the present Chinese undergraduate education of preventive medicine, which ensure the students to master the basic knowledge and technology of basic and clinical medicine, master the whole process of the life, the morphology of the diseases and the function changes, and master the diagnoses and preventive methods of common diseases.

The main curriculums contain: anatomy, histology and embryology, physiology, biochemistry, immunology, genetics, pathology, pharmacology, pathophysiology, diagnostics, internal medicine, surgery, obstetrics and gynecology, pediatrics, infectious disease and so on.

All these curriculums were finished during 2 to 3 years in the middle of the undergraduate education period.

2.2.3 Professional curriculums

Professional curriculums contained the basic theories, methods and technologies

of preventive medicine. Through the professional curriculums studies, students should master related knowledge and the ability to solve the problems in the work.

The main curriculums contain: hygiene statistics, epidemiology, toxicology, women and child health, occupational hygiene, environmental hygiene, nutrition and food hygiene, social medicine, health education and health promotion, health law, health services management and so on.

Because of the specialty of the preventive medicine, the teaching of professional courses must be based on the basic medical knowledge. The professional education should be located in the last 1 to 2 years of the whole undergraduate education. In order to enhance the low grade students' understanding about the professional, some universities such as Peking University set the course 'introduction to preventive medicine' to foster the students' enthusiasm of the professional.

3. Environmental health related curriculums

Environmental hygiene was the main course in environmental health related curriculums which was also called environmental health in some universities.

The teaching tasks of environmental hygiene were to make the students be qualified with basic knowledge and skills for engaging the practical work, lay the foundation for the teaching and research works of environmental hygiene.

The teaching hours in different universities were different. As listed in table 8, the teaching hours of environmental hygiene were from 64 to 126 hours, with the average hours of 87. The proportion of lecture teaching to practice was 3:2.

Table 8 The teaching hours of environmental hygiene in different

Universities			
University	Total hours	Lecture teaching	practice
Peking University	72	32	40
Beihua University	90	50	40
Tianjin Medical University	126	81	45

Wuhan University	72	54	18
Lanzhou University	90	54	36
Xi'an Jiaotong University	64	40	24
China Medical University	92	48	44
Mean	87	51	36

The content details of environmental hygiene in different universities were all contained: indoor and outdoor air hygiene, water sanitation, soil health, housing and public health, cosmetics and household chemical health and so on, the proportion of which may be different in different universities. In china, most universities use the *Environmental Hygiene* published by the people's health publishing house as the textbook for teaching. Even the textbook is different, the contents and the structure is also similar, which may be the main reason of the similarity of teaching contents in different universities. Table9 as follows list the teaching and practical contents of Environmental Hygiene in Peking University.

Table9 The contents of Environmental Hygiene in Peking University

Lecture		Practice	
Contents	Teaching hours	Contents	Teaching hours
Introduction of EH	2	Determination of Formaldehyde in Indoor Air	4
Atmosphere Hygiene	6	Determination of NO ₂ 、SO ₂ in the air	4
Water Hygiene	8	The measurement of CO、CO ₂ in indoor air and the determination of COHb in blood	4
Environmental quality assessment	2	Determination of lysozyme in saliva	4
Environmental risk assessment	2	Determination of hexavalent chromium in tap water	4
Soil Hygiene	4	Discussion—survey of air pollution	4
Household and public place hygiene	4	The measurement of residual chlorine and the hardness in the tap water	4
Environmental epidemiology	4	Discussion—choice of water source	4
		Water sampling: Measurement of dissolved oxygen and nitrogen in the water	8

From the table we can understand the atmosphere and the water hygiene take the main part in the teaching process, lecture hours of which are almost half of the whole teaching hours. Nearly all the practice was related with atmosphere and water hygiene. The environmental risk evaluations take small portion during the teaching period.

In china, the food hygiene was included in the “nutrition and food hygiene” but not included in the environmental hygiene. Nutrition and food hygiene was also a important portion of the preventive medicine, which has the similar credit requirement with Environmental Hygiene. Food hygiene related contents is about 50% of the whole contents.

4. Pedagogical Approaches

As other subjects, the present most important pedagogical approaches were still class lecture supplemented by practice. Besides, PBL (problem based learning) model was used in the environmental hygiene related courses in some universities.

4.1 Lecture

Lecture was the most common method in the education, in which the students can understand the structure and the keys of the knowledge. The advantages of teaching were more students, more information, cheaper, more convenient and more systemization, which can ensure more students receive more knowledge in relative short time.

The leading disadvantage of this traditional teaching method was less individual, more difficult for the students playing the main role in the class, and crowding out the time and space of the students’ self-learning and thinking.

4.2 Practice

As to the courses required skills training, the teaching almost was auxiliary with practice, in order to deepen the students’ understanding to the knowledge. Because of the students’ initiation during the practice training, it can be more easily to activate

the students' initiation during the learning, comparing with the traditional teaching model.

On the other hand, practice needs some reagents and equipments which may increase the cost of the teaching. According to the individual teaching conditions, the curriculums are characterized in different universities. For the environmental hygiene curriculums, practice covered 25% of the whole teaching hours, which covered up to 50% or so of the courses in Peking University and China Medical University.

4.3 PBL Teaching

The key of PBL teaching was “problems based learning”, which was very different from the passive teaching method. PBL teaching method created the teaching concept centered with students and directed by the teachers. PBL teaching emphasized more on capability cultivation than impartation, more group discussion than class lecture. PBL teaching changed the former teaching model which focused on the textbooks learning, and aimed at “developing the ability to handle the knowledge”. It tried to make full use of all the resources to solve the problems, and to encourage the students' self-learning. In the process of PBL teaching the teachers become the guider of the learning.

The advantages of PBL teaching are:

① fostering the students self-learning ability, and reflecting the students' characterization.

②enhancing the skills practice ability and the communication between students and teachers, and stimulating the students' innovation.

③reflecting teachers' role as guiders during the knowledge learning not just the knowledge imparters.

Section 8 Comparison and future directions of Curriculum training

With the development of economic globalization, the environmental issues have also become a global problem. Health damage caused by environmental pollution has no longer limited to a particular country or region, showing the trend of globalization. Under this situation, countries around the world has stepped up its emphasis on environmental health issues, environmental health related curriculums has also more and more attention.

1. Comparison of current curriculums

Although curriculums related to environmental health existed in all countries, there are some difference in their settings and teaching methods.

1.1 curriculum settings

In the training process of the environmental health in foreign countries, all curriculums are divided into 5 parts, including the grounding theoretical knowledge, science knowledge, broad ranging topical knowledge, governance/management knowledge and interpersonal / professional skill based knowledge. The grounding theoretical knowledge is the preliminary knowledge of health and environment Science, its main contents are courses related with public health, health promotion, the sustainable development of environment, et al. Science knowledge includes natural science knowledge, for example, chemistry, biology, ecology and so on, sociology and law are also included. Broad ranging topical knowledge means the nature, effects and assessment of the air, water, noise and the like. It also includes food hygiene, the management of pollutants, and assessment of health effects. Governance/management knowledge is the subject about establishing policies,

legislation and administration. However, the interpersonal / professional skill knowledge is the courses majoring in verbal/written communication, ethics and supervising plans, with the purpose of cultivating students' skills of solving problems.

In China, curriculums for preventive medicine can be divided into three parts: humanities grounding courses, professional grounding courses and professional courses. Humanities grounding courses are the education of humanities and natural science; professional grounding courses are the basic curriculums of basic medicine and clinical medicine; professional courses refer to the basic theory, methods and skills in work related to public health and preventive medicine.

Even though there are some differences in curriculums of environmental health training, environmental health curriculums in China and abroad both are not restrict at specialized courses related with environmental health itself, but combine the extensive basic education and professional education of public health together, thus students can obtain better professional substructure and extensive knowledge of other corresponding disciplines, and then students are provided with diathesis related with environmental health. Although both of China and foreign countries' environmental health training set up a series of curriculums, such as ideological and ethical quality, cultural quality, occupational quality, physical constitution and psychological diathesis, to cultivate super-dietetics and overall evolutionary talented personnel. But there are relative less contents of occupational quality education related with environmental health in courses of colleges and universities in China.

Compulsory curriculums are many more than selective courses, which is one of the characteristics of Chinese environmental health training. In the undergraduate education of China, the compulsory credits are more than selective credits, and there are only a few optional courses. As a result, there are few chances existing for students to select. Since problems related to environmental health are complex and comprehensive, more freedom of choice should be given to students.

As to the curriculum settings in Chinese undergraduate education, just a few courses can reflect the new ideas, new trends and new developments in environmental decision-making and environmental initiatives in time and sensitively, making the course content difficult to keep pace with the development of the times.

What's more, courses concerned with environmental policy are not enough in Chinese environmental health education. Nowadays, environmental protection campaign is a political movement. The formulation and implementation of social policy have direct impact on the generation and solution to environmental problems. So courses concerned with environmental policy can not be ignored during environmental health education.

1.2 Pedagogical Approaches

From the pedagogical approaches used in environmental health training themselves, there are no significant difference in China and foreign countries. All countries adopt the approaches such as: didactic lectures, discussion project, practice and PBL teaching methods, but there are still some differences in the idiographic teaching progress.

At present, Chinese environmental health education are based on didactic lectures, and supplemented by practice. As mentioned above, the proportion of lecture hours in environmental health courses is around 60% in average. Among them, Peking University is the only one whose proportion of lecture hours is less than 50%, while Wuhan University shares the highest proportion, amounting to 75%.

Discussion and PBL teaching which are the active learning methods are used in Chinese environmental health education, but the proportion of them is relatively small. For example, the curriculum of environmental health in Peking University has only y two discussion courses: "The sanitary survey of air pollution" and "water sources selections". They only took up the 10% of the whole teaching hours.

While PBL teaching was not the true PBL teaching which was served as the supplement of the whole training and was located in the last stage of undergraduate training. In the PBL teaching, the students proposed their interested problem and then solved it under the direction of the teachers. During the whole PBL progress, one student only took part in the one case, so the advantages of the PBL teaching were not fully reflected.

2. Develop Directions of Chinese environmental health curriculums

In order to find out the develop directions of environmental health curriculums, we chose 16 public health graduate students for a small survey of assessment on their environmental health related trainings during their under-graduated period.

2.1 Overall assessment

Since environmental health is one of compulsory curriculums of preventive medicine, all the 16 surveyed students received the related training during the undergraduate period. And they all made the overall assessment for the curriculum.

The score of 16 students for the curriculum is 7 to 9 (1 represents the worst, 10 represents the best). The average score is 7.81. From the result it can be seen that the students were satisfied with the course to some extent. But it is worth noticed that these students have no working experience and there was no uniform scoring standard, so the students gave the score only according to their own subjective feeling.

2.2 Evaluation for the contents setting

When the contents setting is evaluated, it is defined that if the contents were “out-dated and redundant”, then the score is 1, and if the contents were “up-dated and keep up with cutting-edge research”, then the score is 10.

From the results, it can be seen that two students gave the score of 5, but at the same time, two gave 9. The average score was 7.25. When talking with them, it's understood that most of students were satisfied with the contents setting. The reason to give low score was due to their unsatisfying with the lack of novelty and the out of touch with the practical work.

2.3 Evaluation on the teaching hour's arrangement

The results indicated that the students' ideal teaching hours were close with the current arrangement, which suggested that the current teaching hours arrangement of the environmental health was suitable.

But the students all thought that the proportion of practice and didactic lectures should be 1 to 1. The traditional teaching method--didactic lectures can impart large number of knowledge to the students in the relatively short time and its cost is low. So didactic lecture is the most important part in current teaching model. However during the practice training, the students could participate in personally and be more impressed, so the practice training is a more welcome teaching model.

2.4 Evaluation on the practicability of the curriculum

When the practicability of the curriculum is evaluated, it is defined that if the contents were "out-touch with the practice", then the score is 1, and if the contents were "closely related with the practice", then the score is 10.

From the results, the average of the score was 6.38 ± 1.15 , with the lowest 4. Although the students have no working experience, they came to their conclusion from their understanding of the related work, which suggested that it should be enhanced that the students' knowledge of the real environmental health work based on the theatrical study during the progress of training.

2.5 The develop direction of the curriculum

The following conclusions can be concluded from the survey:

1. The introduction of the cutting edge knowledge should be increased so as to let the students understand the development direction of the subject.
2. The class lecture hours should be reduced appropriately, the proportion of practice and other pedagogical approaches should be increased.
3. The correlation of training progress with the practice work should be enhanced in order to make the curriculums more practical.

Section 9 Recommendations to Chinese Government

1. To enhance the building of environmental health staffs

Presently, China's environment and health management work has been great attached importance by government; environment and health management in recent years have been strengthened, too. Higher requirements should be delivered to environmental health staffs in order to have a better environmental health work. But up to 2007, there are only 200,000 public health technicians nationwide, and the geographical distribution is uneven. This situation restricted the development environment and health management to some extent.

To match with current environment and health work, the building of environmental health should be enhanced. The number of staffs should be enlarged, especially the ones who had higher education background.

In addition, due to the status that staffs with higher education background is concentrated in province, city or high level of agencies or the region that its economy is relatively developed, relative policies should be developed to encourage personnel with higher education background to work in basic level agencies and economically backward regions.

2. To enhance the in-service education of environmental health staffs

At present, the composition of education background of staffs in health agencies is not ideal. In CDC and health inspection bureaus, the proportion of undergraduates or higher education is 15.5% and 24.3%, respectively. In those agencies, junior college graduates and technical secondary school graduates are the main part; the proportion is 74.0% and 68.5%. In economy relatively backward regions, the situation is worse, even some staffs of health agencies never received

related medical education.

Due to above reasons, workforce of current staffs can not meet the needs of environmental health work. To improve this situation rapidly, the in-service education of environmental health staffs should be enhanced.

As to say the training contents, the emphasis should be laid on the basic method in the environmental health risk assessment, the progress of environmental health risk assessment, the practice norms and procedures of environmental health risk assessment. The environmental health related theoretical system also should be involved. Focused training, experts' lectures, simulated practice and other popular training forms should be selected during the training progress.

3. To improve current environmental health training

Current situation of environmental health is not optimistic. Environmental health related staffs thought that only a little of knowledge came from the accumulation of knowledge when in school. The overall evaluation on the training coursed by the graduates without related work experience is not satisfied yet.

Current environmental health training should be improved especially in following areas, including to increase the proportion of introduction of cutting edge knowledge so as to let the students understand the development direction of the subject; to reduce the class lecture hours appropriately and increase the proportion of practice and other pedagogical approaches during training progress; to enhance the correlation of training progress with the practice work in order to make the curriculums more practical.

Annex 1 No. of staffs in Regional Disease Prevention and Control Centers(epidemic prevention station) in the year 2007

area	total	health technicians							Other technicians	managers	Skilled workers
		Licensed		registered		pharmacists	technicians	others			
		subtotal	(Assistant) licensed doctors	licensed doctors	nurses						
total	197209	148512	83697	68892	9978	2731	26293	25813	13300	15456	19941
east	70913	53291	29883	25017	2983	863	10592	8970	5021	5825	6776
middle	66872	49598	26089	20960	3896	1135	7998	10480	5086	5232	6956
west	59424	45623	27725	22915	3099	733	7703	6363	3193	4399	6209
beijing	3558	2035	1151	1062	111	12	411	350	522	706	295
tianjin	2017	1518	686	540	68	9	297	458	79	246	174
hebei	10011	7406	3864	2987	224	144	1270	1904	835	660	1110
shanxi	5888	4620	2600	2111	275	66	664	1015	427	377	464
inner Mongolia	6853	5621	3765	3128	222	80	724	830	312	451	469
liaoning	9721	7378	4370	3461	418	97	1503	990	545	953	845
jilin	6955	5218	3196	2752	341	113	713	855	400	713	624
heilongjiang	7378	5659	2889	2332	263	76	964	1467	426	651	642
shanghai	3186	2249	1280	1167	86	8	611	264	323	229	385
jiangsu	8847	6649	4071	3641	437	159	1241	741	604	851	743
zhejiang	5058	3904	2150	1921	143	48	1127	436	343	420	391
anhui	5452	4106	2355	1956	290	67	844	550	422	377	547
fujian	3782	3058	1859	1636	146	40	559	454	116	155	453
jiangxi	4907	3673	2069	1761	456	92	659	397	368	281	585
shandong	13525	10977	6334	5315	490	164	1638	2351	915	679	954
henan	18320	12744	5672	4175	833	320	1846	4073	1677	1343	2556
hubei	8642	6668	3413	2814	805	182	1213	1055	580	669	725
hunan	9330	6910	3895	3059	633	219	1095	1068	786	821	813
guangdong	9715	6970	3461	2732	720	164	1708	917	666	817	1262
guangxi	6198	4650	2666	2356	522	116	918	428	310	516	722
hainan	1493	1147	657	555	140	18	227	105	73	109	164
chongqing	2333	1705	951	840	66	17	442	229	122	283	223
sichuan	10449	7758	4865	4158	364	81	1487	961	647	832	1212
guizhou	4674	3811	2510	2075	169	51	560	521	158	337	368
yunnan	7844	6202	4071	3365	482	96	779	774	380	378	884
xizang	831	657	437	304	18	5	76	121	24	47	103
shanxi	6008	4333	2170	1708	301	110	750	1002	399	625	651
gansu	4874	3618	2035	1587	366	71	624	522	288	373	595
qinghai	1703	1358	746	604	214	34	232	132	95	76	174
ningxia	1216	939	614	563	49	10	185	81	93	82	102
xinjiang	6441	4971	2895	2227	326	62	926	762	365	399	706

Annex 2 No. of Regional Health Supervision staffs in 2007

area	total	health technicians			other technicians	managers	Skilled workers
		subtotal	health supervisors	others			
in sum	72732	55446	48747	6699	4048	7982	5256
east	27306	20500	17808	2692	1468	3277	2061
middle	23775	18375	15858	2517	1626	2109	1665
west	21651	16571	15081	1490	954	2596	1530
beijing	1688	1203	1120	83	29	375	81
tianjin	730	530	526	4	5	159	36
hebei	4899	3569	2888	681	442	389	499
shanxi	2272	1812	1571	241	204	120	136
inner Mongolia	2844	2401	2196	205	135	204	104
liaoning	2726	2121	1908	213	147	300	158
jilin	2171	1728	1533	195	76	235	132
heilongjiang	3135	2534	2146	388	144	288	169
shanghai	1254	979	965	14	70	123	82
jiangsu	3968	3143	2881	262	173	471	181
zhejiang	3634	2760	2399	361	199	445	230
anhui	2517	1960	1791	169	167	178	212
fujian	1014	733	666	67	32	94	155
jiangxi	2166	1676	1555	121	113	188	189
shandong	2604	2120	1906	214	134	188	162
henan	5362	3695	2827	868	589	546	532
hubei	2919	2280	1989	291	185	289	165
hunan	3233	2690	2446	244	148	265	130
guangdong	4664	3258	2467	791	236	706	464
guangxi	2180	1677	1605	72	96	220	187
hainan	125	84	82	2	1	27	13
chongqing	1312	985	911	74	32	225	70
sichuan	3919	3042	2691	351	123	502	252
guizhou	1663	1310	1258	52	51	196	106
yunnan	2157	1509	1393	116	122	325	201
xizang	29	20	20	0	5	2	2
shanxi	2743	2043	1638	405	119	346	235
gansu	2072	1449	1316	133	142	306	175
qinghai	563	477	450	27	25	23	38
ningxia	629	480	465	15	48	44	57
xinjiang	1540	1178	1138	40	56	203	103

Annex 3 the number and composition of health supervisors in the year 2005

branches	health supervisors				Composition (%)			
	total	Health Supervision Bureaus (centers)	Health and Inspection / monitoring / testing center	CDC	total	Health Supervision Bureaus (centers)	Health and Inspection / monitoring / testing center	CDC
seperated by divisions	25798	17215	560	8023	100.0	100.0	100.0	100.0
food health supervision division		5066	397			29.4	70.9	
cosmetic health supervision division		240	1			1.4	0.2	
occupational health supervision division		1040	5			6.0	0.9	
public places' health supervision division		1910	15			11.1	2.7	
radiation supervision division		231				1.3		
school health supervision division		447	10			2.6	1.8	
testing		22	5			0.1	0.9	
others		8259	127			48.0	22.7	
seperated by occupational range	25793	17210	560	8023	100.0	100.0	100.0	100.0
integrated health	8302	6181	104	2017	32.2	35.9	18.6	25.1
food health	6910	3875	293	2742	26.8	22.5	52.3	34.2
drinking water health	338	202	5	131	1.3	1.2	0.9	1.6
cosmetics sa	272	189	2	81	1.1	1.1	0.4	1.0
occupational sanitation	870	612		258	3.4	3.6		3.2
public places' health	1847	1149	22	676	7.2	6.7	3.9	8.4
radiation protection	249	163	3	83	1.0	0.9	0.5	1.0
school health	538	284	11	243	2.1	1.6	2.0	3.0
infectious disease administration	776	390	3	383	3.0	2.3	0.5	4.8
others	5691	4165	117	1409	22.1	24.2	20.9	17.6

**Annex 4 The Gender, Age, Academic Qualifications and Titles Constitute of
Disease Prevention and Control Center (epidemic prevention station) Personnel
in the year 2005**

classify	health technicians							
	subtotal	licensed	pharmacist		Testing staffs	others	Other technicians	manager
		(assistant) doctors	licensed doctors					
total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
by gender								
male	51.2	59.0	60.6	33.2	38.4	43.9	49.6	56.9
female	48.8	41.0	39.4	66.8	61.6	56.1	50.4	43.1
By age								
Under 25	3.8	1.6	1.1	4.6	4.1	8.1	6.4	2.9
25-34	29.3	24.9	19.9	31.4	31.7	37.2	31.5	20.3
35-44	35.9	37.4	38.5	32.8	35.8	32.8	33.0	34.5
45-54	26.2	29.6	32.9	27.8	25.4	19.3	24.3	34.8
55-59	4.2	5.6	6.4	2.8	2.6	2.2	4.2	6.6
60 and above	0.7	0.9	1.1	0.6	0.4	0.3	0.6	0.9
By working experiences								
Below 5years	8.7	5.8	4.9	7.6	10.3	13.9	11.8	5.5
5-9 years	13.8	11.6	8.6	15.8	15.4	17.2	14.7	9.1
10-19years	32.5	32.1	31.1	30.4	32.4	33.6	31.2	27.5
20-29years	29.3	31.7	33.7	32.4	27.8	25.0	28.0	34.3
30 years and above	15.7	18.8	21.6	13.8	14.2	10.3	14.3	23.6
by academic qualification								
Doctor	0.1	0.1	0.1		0.1	0.0	0.5	0.1
Master	0.9	0.9	1.1	0.1	1.5	0.4	1.2	1.0
College graduates	14.5	16.8	19.2	5.4	17.4	8.2	10.5	16.3
Junior college graduates	34.6	36.1	36.1	27.5	36.5	30.6	32.2	39.3
technical secondary school	39.4	38.9	37.3	45.6	36.5	42.0	23.6	23.6
High school	7.8	5.0	4.3	15.4	6.0	14.5	21.8	14.2
Junior school and below	2.8	2.2	1.9	6.0	2.0	4.3	10.2	5.5
by professional technique title								
senior	1.5	1.6	1.9	1.1	1.5	1.3	2.7	2.6
vice-senior	5.9	7.8	9.3	2.1	6.4	1.8	2.3	6.2

medium	32.9	38.9	45.4	20.2	38.2	17.6	13.5	22.7
junior	36.0	39.1	36.8	41.4	36.2	28.8	21.8	20.4
assistant	14.0	9.7	3.7	27.1	11.9	23.8	17.5	10.8
others	9.7	2.9	2.8	8.0	5.8	26.6	42.1	37.3
By appointment positions								
senior	0.8	1.1	1.3	0.1	0.8	0.2	0.5	1.4
vice-senior	5.5	7.3	8.7	1.8	5.8	1.7	2.4	6.7
medium	32.2	38.2	44.7	20.2	36.8	17.4	14.4	24.5
junior	37.3	40.2	38.3	42.1	38.4	30.2	25.7	23.0
assistant	14.4	9.9	3.8	27.6	12.5	24.4	18.9	11.6
others	9.7	3.3	3.1	8.3	5.6	26.1	38.2	32.7

Annex 5 The Gender, Age, Academic Qualifications and Titles Constitute of Health Supervision Institutes Personnel in the year 2005

classify	health supervision Inst(Centers)			health supervision testing(monitoring,inspectin)Inst		
	health technicians	Other technicians	managers	Health technicians	Other technicians	managers
total	100.0	100.0	100.0	100.0	100.0	100.0
by gender						
male	61.5	53.4	61.4	53.3	50.8	62.1
female	38.5	46.6	38.6	46.7	49.2	37.9
By age						
<25	4.6	9.1	4.0	5.3	6.7	3.3
25-34	30.9	35.1	24.6	34.4	29.7	19.6
35-44	40.4	35.3	39.6	36.1	42.6	40.5
45-54	21.4	18.0	28.1	20.8	17.9	31.4
55-59	2.5	2.1	3.3	2.7	3.1	4.6
≥60	0.3	0.3	0.3	0.6		0.7
By working experiences						
<5years	9.6	16.3	7.8	7.5	10.3	7.2
5-9 years	13.9	16.6	11.2	18.4	15.4	9.2
10-19years	36.6	32.7	32.4	37.0	31.8	27.5
20-29years	28.1	25.4	32.7	25.7	33.3	37.3
≥30 years	11.8	9.0	15.8	11.5	9.2	19.0
by academic qualification						
Doctor	0.0	0.0	0.0			
Master	0.7	0.4	1.1	0.5		
College graduates	23.6	17.9	28.9	11.0	14.4	14.4
Junior college graduates	40.2	37.6	42.7	35.1	26.7	46.4
technical						
secondary school	28.3	18.5	17.7	33.6	25.6	24.2
High school	5.5	19.0	7.2	16.4	26.2	11.8
Junior school and below	1.6	6.6	2.2	3.4	7.2	3.3
by professional technique title						
senior	1.6	2.3	2.2	0.8	4.1	6.5
vice-senior	6.6	1.8	7.2	4.5	1.0	4.6
medium	33.5	15.1	26.4	21.1	16.4	20.3
junior	32.9	22.0	18.5	32.3	20.0	28.1
assistant	11.6	16.8	9.5	20.8	27.2	11.8

others	13.8	41.9	36.2	20.7	31.3	28.8
By appointment positions						
senior	0.9	0.2	1.4	0.6		
vice-senior	6.1	1.8	7.6	4.1	1.0	3.9
medium	33.4	15.3	26.8	20.9	17.4	20.9
junior	33.8	25.8	20.4	32.8	23.6	35.3
assistant	12.1	16.4	9.7	25.6	26.7	12.4
others	13.7	40.4	34.2	16.1	31.3	27.5

Annex 6 Universities which enroll college students of preventive medicine in China

Province	University
Beijing	Peking University Health Science Center, Minzu University of China, Capital university of medical science
Tianjin	Tianjin Medical University
Hebei	Hebei Medical University, North China Coal Medical University
Shanxi	Shanxi Medical University
Neimenggu	Neimenggu University of Science and Technology, Neimenggu Medical College
Liaoning	Shenyang Medical College, Dalian Medical University, China Medical University
Jilin	Jilin University, Beihua University, Jilin Medical College, Northeast Normal University
Heilongjiang	Mudanjiang Medical College, Qiqihar Medical University
Shanghai	Shanghai Jiaotong University, Fudan University,
Jiangsu	Suzhou University, Yancheng Normal College, Xuzhou Medical University, Nanjing Medical University, Nantong University
Zhejiang	Zhejiang University, Wenzhou Medical College,
Anhui	Anhui University of Science and Technology, Anhui Medical University, Bengbu Medical College
Fujian	Xiamen University, SouthEast University, Fujian Medical University
Jiangxi	Nanchang University, Yichun College, Gannan Medical College
Shandong	Shandong University, Qingdao University, Shandong Agricultural University, Weifang Medical College, Jining Medical College
Henan	Zhengzhou University, Xinxiang Medical University, Henan University of TCM
Hubei	WuHan University, Huazhong University of Science and Technology, Hubei University, Wuhan University of Science and Technology
Hunan	Hunan Normal University, Central South University, University of South China, XiangNan University, Changsha Medical College
Guangdong	Guangdong Medical College, Guangzhou Medical College, Guangdong Pharmaceutical University,

Guangxi	Southern Medical University, Zhongshan University Guangxi Medical University
Hainan	Hainan Medical College
Chongqing	Chongqing Medical University, Third Military Medical University
Sichuan	Sichuan University, Luzhou Medical College
Guizhou	Guiyang Medical College
Yunnan	Kunming Medical College, Dali University
Tibet	Xizang University
Shanxi	Xi'an Jiaotong University, Shaanxi University Of Chinese Medicine, Xi'an Medical College
Gansu	Lanzhou University
Qinghai	Qinghai University
Ningxia	Ningxia Medical College
Xinjiang	Xinjiang Medical University, Shihezi University

Annex 7 Universities which enroll undergraduates of Environmental Science in China

Province	University
Beijing	Peking University, Beijing University of Technology, Beijing Forestry University, Minzu University of China, People ' s University of China, Beijing Normal University, China University of Mining and Technology, Beijing Union University, China University of Petroleum(Beijing), China University of Mining & Technology(Beijing)
Tianjin	Nankai University, Tianjin University, Tianjin University of Technology, Tianjin University of Science and Technology, Tianjin Agricultural University
Hebei	North China Electric Power University(Baoding), Hebei Polytechnic University, Hebei University of Science and Technology, Northeastern University at Qinhuangdao
Shanxi	Taiyuan University of Technology, Shanxi University, Shanxi Agricultural University, Shanxi University of Finance & Economics, Taiyuan University of Science and Technology
Neimenggu	Inner Mongolia University, Inner Mongolia University of Technology, Neimenggu Normal University
Liaoning	Liaoning University, Northeastern University, Dalian University of Technology, Dalian Nationalities University, Liaoning University of Technology, Bohai University, Dalian University, Shenyang Normal University, Liaoning Shihua University, Liaoning Normal University, Shenyang Pharmaceutical University, Shenyang Agricultural University, Liaoning Technical University
Jilin	Jilin University, Yanbian University, Northeast Normal University, Beihua University, Changchun University of Science and Technology, Jilin Agricultural University, Changchun Normal University, Jinlin Normal University, Jilin Architecture and Civil Engineering Institute, Jilin Institute of Chemical Technology
Heilongjiang	Harbin Institute of Technology, Northeast Agricultural University, Northeast Forestry University, Heilongjiang University, Hei Longjiang August First Land Reclamation University
Shanghai	Tongji University, Shanghai Jiaotong University, East China Normal University, Fudan University, Donghua University, Shanghai Ocean University
Jiangsu	Jiangsu Polytechnic University, Hangzhou Dianzi University, Yangzhou University, Huaiyin Noraml College, Suzhou University of Science and Technology, Nanjing University of information Science & Technology, Nanjing Forestry University, Nanjing University of Technology, Hangzhou Normal University, Nanjing University, Nanjing Agricultural University, Nanjing Normal University
Zhejiang	Zhejing University, Zhejiang Normal University, Zhejiang Ocean

	University, Zhejiang Forestry University, Wenzhou Medical University, Shaoxing University, Wenzhou University, Zhejiang Wanli University,
Anhui	University of Science and Technology of China, Anhui University, Anhui Agricultural University, Anhui Normal University, Huaibei Coal Industry Teachers College, AnHui Science And Technology University, Huangshan University, Anqing Normal College
Fujian	Xiamen University, HuaQiao University, Quanzhou Normal College, Quanhou Normal College, Zhangzhou Normal University, Minjiang University
Jiangxi	Nanchang University, Jiangxi Agricultural University, Jiangxi University of TCM, Shangrao Normal University, Yichun College, Jinggangshan University
Shandong	Ocean University of China, University of Jinan, Shandong University, Qingdao Agricultural University, Liaocheng University, Qingdao University, Qingdao University of Science & Technology, Qingdao Technological University, Qufu Normal University, Shandong University of Science and Technology, Shandong Agricultural University, Shandong Institute of Light Industry, Taishan College, Yantai University, Shangdong Normal University
Henan	Zhengzhou University, Henan University, North China University of Water Conservancy and Electric Power, Henan University Of Urban Construction, Henan Institute of Science and Technology
Hubei	Wuhan University, Wuhan University of Technology, Huazhong Agricultural University, Xiaogan University, Hubei university for Nationalities
Hunan	Hunan University, Jishou University, Central South University of Forestry and Technology, South-Central University for Nationalities
Guangdong	Zhongshan University, South China Normal University, Guagndong University of Technology, South China Agricultural University, Guangdong Ocean University, Guagnzhou University, Hanshan Normal University, Jiaying University, South China University of Technology, Jinan University, Zhongkai University of Agriculture and Engineering
Guangxi	Guilin University of Technology, Guangxi Normal College
Hainan	Hainan University
Chongqing	Southwest University, Yangtze Normal University, Chongqing Three Gorges University, Southwest University, Chongqing University, Chongqing Jiaotong University, Chongqing Academy of Arts and Sciences
Sichuan	Sichuan University, Sichuan Agricultural University, Southwestern University of Finance and Economics, Southwest University for Nationalities, China West Normal University, Neijiang Normal College, Leshan Normal College
Guizhou	Guizhou University, Guizhou Universtiy for Nationalities, Guizhou University
Yunnan	Yunnan University, Kunming University of Science and Technology,

	Yunnan Agricultural University, Yunnan Nationalities University, Southwest Forestry University, Yuxi Normal University, Dali University
Tibet	Xizang University
Shanxi	Chang'an University, Northwest University, Northwestern Polytechnical University, Shanxi Normal University, Yan'an University, Xian University of Architecture and Technology, Xi'an Polytechnic University, Shanxi University of Technology
Gansu	Lanzhou University, Lanzhou Jiaotong University, Northwest Normal University
Qinghai	Qinghai University
Ningxia	Ningxia University
Xinjiang	Xinjiang University, Xinjiang Agricultural University, Xinjiang Normal University, Kashi Normal College, Yili Normal College

Annex 8 Curriculum Examples

Peking University

Title	Credits	Teaching Hours	Semester
Computer	2	32	1
Computer (practice)	1	32	1
English	8	136	1-4
Modern History of China	2	32	2
Ideology Cultivation and Legal Basis	2	32	1
Physical Education	4	104	1-4
Advanced Mathematics (I)	4	64	1
Advanced Mathematics (II)	4	64	2
General Chemistry	4	64	1
General Chemistry Experiment	2	64	1
Organic Chemistry	4	64	2
Organic Chemistry Experiment	2	64	2
General Physics	4	64	2
Physics Experiment	1	36	3
General Biology	3	48	1
Strategics	2	45	2
Introduction to Preventive Medicine	1	18	3
Principle of Marxism	4	64	3
Systematic Anatomy	3	90	3
Histology and Embryology	3.5	90	3
Mao Zedong Thought, Deng Xiaoping Theory and Three Represents Thought	4	64	4
Biochemistry	3	54	3
Biochemistry Experiment	1.5	54	3
Medical History	1	18	3

Physiology	3	54	4
Function Experiment (I)	1	36	4
Medical Psychology	3	54	4
Medical Genetics	2	43	4
Medical Immunology	2.5	63	4
Medical Microbiology	2.5	63	4
Medical Parasitology	1.5	45	4
Pathophysiology	2	36	5
FunctionExperiment (II)	2	64	5
Pharmacology	2	54	5
Pathology	4.5	108	5
Medical Ethics	1	18	5
Dialectics of Nature	2	36	5
Sanitary Chemistry	3	72	5
Community Medicine	1.5	27	5
Medical diagnostics	3	72	6
Experiment Diagnostics	1.5	36	6
Medical Imaging	1.5	45	6
General Surgery	1.5	36	6
The basis of Chinese medicine	1.5	36	6
Internal Medicine	6.5	154	6
Surgery	4	90	6
Obstetrics and Gynecology	2.5	54	6
Pediatrics	2.5	54	6
Neurology	1.5	36	6
Psychiatry	1.5	30	7
Infectious Diseases	3.5	90	7
Ophthalmology	1.5	36	7
Otolaryngology	1.5	36	7

Dermatology	1.5	36	7
Stomatology	1	27	7
Clinical Practic	10		8
Hygiene Toxicology	3	68	8
Child & Adolescent Health	2	48	8
Women and Children Health Care	1	20	9
Hygiene Statistics	3	84	8
Epidemiology	3	85	9
Occupational Health	3	72	9
Environmental Health	3	76	9
Nutrition & Food Hygiene	3	74	9
Health Education	2	36	9
Health Management	3	60	9
Health Law	2	36	9

Fudan University

(only professional courses)

Title	Course No.	Credits	Semester
Cell Biology	356.101.1	2.5	3
Systematic Anatomy	356.198.1	3	3
Biochemistry	356.199.1	5	3
Physiology	356.107.1	4	4
Histology and Embryology	356.104.1	3.5	3
Immunology	356.114.1	2	4
Microbiology	357.030.1	3.5	4
Parasitology	356.118.1	2	4
Pathophysiology	356.124.1	3	5
Pharmacology	356.127.1	4	5
Function Experiment	356.205.1	2.5	5
Diagnostics	356.202.1	3.5	5
Diagnostic Imaging	356.003.1	2.5	5
Internal Medicine	356.004.1	6	6
Surgery	356.006.1	3	6
Obstetrics and Gynecology	356.008.1	2.5	6
Pediatrics	356.010.1	2.5	6
Infectious Diseases	356.013.1	2.5	6
Toxicology	357.031.1	2	7、8
Community Medicine	357.032.1	2	7、8
Health Education	357.010.1	2	7、8
Hygiene Statistics	357.014.1	3	7、8
Sanitary Chemistry	357.033.1	2.5	7、8
Health Management	357.034.1	2	7、8
Hygiene Microbiology	357.035.1	2	7、8

Health Law	357.107.1	1	7、 8
Epidemiology	357.040.1	4.5	9
Occupational Health	357.039.1	4	9
Environmental Health	357.037.1	4	9
Nutrition	357.038.1	4	9
Child & Adolescent Health	357.036.1	2.5	9
Clinical Practic	357.041.1	8	7、 8
Practice	357.105.1	1	10
Thesis	357.101.1	6	10

China Medical University

Course	Semester	Teaching Hours
Mao Zedong Thought	1	32
Moral Education	1	44
Principles of Marxism	3	48
Deng Xiaoping Theory	4	62
Principles of Marxism Political Economy	5	36
Medical Ethics	4	20
Law	3	28
Strategics	3	36
Physical Education	1-4	120
English	1-4	288
Professional English	8-9	54
Computer	1-3	108
Advanced Mathematics	1	74
General Chemistry	1	80
Organic Chemistry	2	76
Medical Physiology	2	74
Human Anatomy	2	108
Histology and Embryology	2	88
Diagnostics Imaging	6	28
Biochemistry	3	116
Cell Biology	3	60
Medical Genetics	4	40
Pathogen Biology	5	100
Medical Immunology	4	46
Infectious Diseases	6	28
Physiology	4	64

Pathology	5	104
Pathophysiology	5	50
Pharmacology	5	68
Clinical Pharmacology	6	32
Function Experiment	4-5	104
Document Retrieval	6	18
Introduction to Preventive Medicine	3	24
Diagnostics	6	60
Internal Medicine	6	102
Surgery	6	80
Obstetrics and Gynecology	6	24
Pediatrics	6	24
Forensic science	6	20
Otolaryngology	6	20
Ophthalmology	6	20
Dermatology	6	20
Hygiene Statistics	8	80
Sanitary Chemistry	8	74
Radiation Hygiene	8	30
Community Medicine	8	30
Hygiene Toxicology	8	54
Health Microbiology	8	40
Child & Adolescent Health	8	50
Statistical software application	8	48
Multivariate analysis	8	18
Occupational Health	9	100
Environmental Health	9	92
Epidemiology	9	120
Nutrition & Food Hygiene	9	92

Public health monitoring	9	18
Environmental Health	9	18
Trace Elements and Nutrition	9	18
Scientific Research Methods	10	16
Health Service Management	10	28

Tianjin Medical University

No	Course No	Title	Semester	Credits	Teaching Hours	Theory	Practice
1	01040101	English I	1	2	36	36	
2	01040201	English Listening and Speaking I	1	2	36	36	
3	01060101	Advanced Mathematics	1	2.5	45	45	
4	15010101	Physical Education 1	1	2	36	2	34
5	22010101	Strategics	1	2	156	36	120
6	10010601	Modern History of China	1	2	36	36	
7	01080101	Medical Basic Chemistry	1	4	72	45	27
8	01130202	Histology and Embryology	1	3	54	27	27
9	01090104	Cell Biology	1	2	36	28	8
10	01120202	Human Anatomy	1	4	72	48	24
11	01070101	Medical Physics	2	4	72	58	14
12	01040102	English II	2	2	36	36	
13	01040202	English Listening and Speaking II	2	2	36	36	
14	01080102	Organic Chemistry	2	5	90	54	36
15	15010102	Physical Education II	2	2	36	2	34
16	100110701	Moral Education and Law	2	3	54	54	
17	01100103	Physiology	2	4.5	81	72	9
18	01110102	Medical Biochemistry	2	4.5	81	54	27
19	15010103	Physical Education III	3	2	36	2	34
20	01040103	English III	3	2	36	36	
21	01040203	English Listening and Speaking III	3	2	36	36	
22	01140104	Medical Immunology	3	2.5	45	35	10
23	01180105	Pathological Anatomy	3	3	54	36	18
24	01160301	Human Parasitology	3	2.5	45	35	10

25	01150103	Medical Microbiology	3	3	54	36	18
		Mao Zedong Thought, Deng Xiaoping Theory and Three	3	2	36	36	
26	10020701	Thought I Mao Zedong Thought, Deng Xiaoping Theory and Three	4	2	90	72	18
27	10020801	Thought II					
28	01040104	English IV	4	2	36	36	
		English Listening and Speaking IV	4	2	36	36	
29	01040204						
30	01050101	Computer	4	4.5	81	30	51
		Physical Education	4	2	36	2	34
31	15010104	Principles	4	3	54	54	
32	10020601	Marxism					
33	01190103	Pathophysiology	4	2	36	27	9
34	01240101	Diagnostics	4	5.5	99	54	45
35	01200104	Pharmacology	4	2	36	27	9
		Physical Education V	5	2	36	2	34
36	15010105						
37	10050101	Medical Ethics	5	2	36	36	
		Medical Psychology	5	2	36	36	
38	01230101						
39	01220101	Psychiatry	5	1.5	27	27	
40	05120001	Internal Medicine	5	4	72	72	
41	05120002	Surgery	5	3	54	54	
42	05120004	Dermatology	5	1	18	18	
43	05120008	Pediatrics	5	1	18	18	
44	05120007	Ophthalmology	5	1	18	18	
45	05120006	Otolaryngology	5	1	18	18	
		Infectious Diseases	5	3	54	54	
46	05120003						
47	05130001	Clinical Practic	6	10	20 week		
48	05030001	Hygiene Statistics	7	5	90	66	24
		Hygiene Toxicology	7	3	54	36	18
49	05040001						
50	05030002	Computer	7	2	36	18	18
		Health Microbiology	7	2	36	28	8
51	05090002						

		Sanitary						
52	05060001	Chemistry	7	5	90	60	30	
		Child &						
53	05050001	Adolescent Health	7	3	54	36	18	
54	05010001	Epidemiology	8	7	126	81	45	
55	05030013	EnglishI	7	2	36	28	8	
		Occupational						
56	05070001	Health	8	7	126	81	45	
		Nutrition & Food						
57	05090001	Hygiene	8	7	126	86	40	
		Environmental						
58	05080001	Health	8	7	126	81	45	
		Quarantine						
		inspection	8	2	36	28	8	
59	05090003	techniques						
60	05110005	EnglishII	8	2	36			
61	05140002	Practice	9	5	10w			
62	05140003	Practice	9	5	10w			
	01110501	Molecular biology						
63		techniques	10	2	36			
64	05020002	Community						
		Medicine	10	2	36			
65	05020004	Hospital						
		Management	10	2	36			
66	05020007	Health Education	10	2	36			
67	05020008	Introduction to						
		General Medicine	10	2	36			
68	05050002	Child health Care	10	2	36			
69	05050004	Woman Health						
		Care	10	2	36			
70	05070005	EnglishIII	10	3	60			
71	05090006	Chinese Medicine						
		and Food Therapy	10	2	36			
72	05140006	Emergency						
		Medicine	10	2	36			
73	05110002	Maternal and						
		Child Nutrition	10	2	36			
74	05090005	Nutrition and						
		Disease	10	2	36			
75	05060005	Food Chemical						
		Analysis	10	2	36			
76	05050003	Mental Health	10	2	36	28	8	

77	05030007	Application of Statistical Software	10	2	36
78	05020010	Health Service Management	10	2	36
79	05020011	Health Economics	10	2	36
80	05020012	Health Policy and Law	10	2	36
81	10030201	Situation and Policies	10	2	36

Xi'an Jiaotong University

Course No	Title	Teaching Hours	Credits	Semester
MLMD1001	Mao Zedong Thought	32	2	1
GNED1002	Moral Education	24	1.5	1
MILI0101	National Defense Education	32	4	1、 2
MLMD1002	Deng Xiaoping Theory	32	2	2
MLMD1003	Three Thought Theory	16	1	2
GNED1003	Law	24	1	2
PHLS0001	Marxism Philosophy	40	2.5	3
MLMD0001	Marxism Political Economy	32	2	4
CLIM2001	Introduction to Clinical Medicine	32	1.5	4
PHLS3003	Medical Ethics	32	2	6
PSYL4005	Medical Psychology	32	2	7
MAGT5001	Doctor-patient relations	16	1	7
COMP1010	Computer	56	3	1
PHED1001	Physical Education I	128	4	1
	Physical Education II			2
	Physical Education III			3
	Physical Education IV			4
ENGL1009	English I	128	8	1
	English II			2
MATH1025	Advanced Mathematics V	96	6	1
PHYS1010	Physics	64	4	2
PHYS1008	Physics Experiment	24	0.5	2
CHEM1051	Basic Chemistry	88	4.5	1
CHEM1054	Organic Chemistry	104	5	2
BASM1001	Cell Biology	48	2.5	1
BASM0004	Human Anatomy I	192	7.5	2

	Human Anatomy II			3
BASM2010	Histology and Embryology	72	3.5	3
BICH2001	Biochemistry	88	4.5	3
BIOL2005	Molecular Biology	44	2	3
BASM2013	Physiology	72	4.5	4
BASM2014	Immunology	56	2.5	4
BASM2015	Pathology	112	5.5	5
BASM3019	Pathological Biology	64	4	4
BASM3004	Pathological Biology Experiment	40	1	4
BASM3021	Pathophysiology	48	3	5
BASM3022	Medical Genetics	48	2.5	5
BASM3023	Pharmacology	64	4	5
BASM2027	FunctionExperiment I	80	2.5	4
	FunctionExperiment II			5
CLIM3026	Diagnostics	84	4	6
CLIM3008	Medical Imaging	48	2	6
CLIM3005	Chinese Medicine	56	3	6
CLIM3018	Internal Medicine	112	6	6
	Internal Medicine			7
CLIM3019	Surgery	160	8	6
	Surgery			7
CLIM4021	Obstetrics and Gynecology	56	2.5	7
CLIM4022	Pediatrics	44	2.5	7
CLIM4029	Infectious Diseases	40	2	7
CLIM4019	Neurology	32	1.5	7
CLIM5010	Dermatology	32	1.5	7
CLIM5012	Ophthalmology	32	1.5	7
CLIM5013	Otorhinolaryngology	32	1.5	7
CLIM5007	Stomatology	32	1.5	7

PUBH4003	Microbiology	24	1	8
STAT4728	Biostatistics	64	3	8
PUBH5001	Hygiene Toxicology	40	2	8
PUBH5002	Sanitary Chemistry	40	2	8
PUBH5003	Epidemiology	64	3	9
PUBH5015	Environmental Health	64	3	9
PUBH5005	Nutrition & Food Hygiene	64	3	9
PUBH5006	Occupational Health	64	3	9
PUBH5007	Child & Adolescent Health	32	1.5	9
PEDA5003	Health Education	24	1.5	9
PUBH5009	Health behavior	16	1	9
MAGT2709	The basis of management	48	3	10
PUBH5010	Health Supervision	16	1	10
PUBH5011	Data management and processing	24	0.5	10
CLIM4009	Nuclear Medicine	32	1.5	6
PUBH4006	Nutrition	16	1	6
CLIM4011	Emergency Medicine	32	1.5	7
CLIM4012	Oncology	32	2	7
CLIM4014	Geriatrics	32	2	7
PUBH5014	Epidemiology	16	1	7

Lanzhou University

Title	Credits	Teaching Hours	Semester
Principles of Marxism	3	54	4
Mao Zedong Thought、,Deng Xiaoping Theory and Three Thought Theory	6	108	5、 6
Modern History	2	36	3
Moral Education and Law	3	54	1、 2
Situation and Policy Education	2		
English	16	288	1、 2、 3、 4、
Information technology	3	54	1
Physical Education	4	144	1、 2、 3、 4
Total	39	738	

Title	Credits	Teaching Hours	Semester
Medical Chemistry	8	180	1、 2
Medical Physics	4	90	1
Advanced Mathematics	3	54	1
Cell Biology	2.5	54	1
Systematic Anatomy	4.5	108	2
Histology and Embryology	4	90	2
Biochemistry	5	126	3
Physiology	5.5	126	3
Human Parasitology	3	72	4
Medical Immunology	3	72	4
Medical Microbiology	3	72	4
Pathological Anatomy	5.5	126	4
Pathophysiology	3.5	72	5
Pharmacology	4	108	5

Function Experiment	1	36	5
ExperimentDiagnostics	1.5	36	5
Diagnostics	5	108	5
Sanitary Chemistry	3.5	81	5
Surgery Introduction	2	36	6
Medical Imaging	2.5	54	6
Nuclear Medicine	2	36	6
Infectious Diseases	4	72	6
Dermatology	2	36	6
Internal Medicine	5.5	108	6、7
Obstetrics and Gynecology	3.5	72	7
Pediatrics	3.5	72	7
Neurology	1	18	7
Medical literature retrieval	1	18	9
Total	96.5	2133	

Title	Credits	Teaching Hours	Semester
Hygiene Statistics	3.5	72	7
Hygiene Toxicology	2.5	54	7
Community Medicine	2	36	7
Environmental Health	4	90	9
Nutrition & Food Hygiene	4	90	9
Occupational Health	4	90	9
Epidemiology	4	90	9
Child & Adolescent Health	2.5	54	9
Total	26.5	576	

Elective Courses (at least 6 credits)

Title	Credits	Teaching Hours	Semester
Medical Ethics	2	36	5
Health Management	2	36	6
Medical Research Design and	1	18	9

Thesis Writing			
Health regulations and supervision	2	36	7
Detection techniques of modern medicine	1.5	36	6
Advances in preventive medicine	1	18	9
Maternal and Child Health	1	18	5
Pediatrics	2	36	7
Evidence-Based Medicine	1.5	27	6
Total	18	333	

Wuhan University

No	Title	Credits	Teaching Hours	Semester
300181	Moral Education and Law	3	54	1
300182	Principles of Marxism	3	54	2
600120	Modern History of China	2	30	4
100002	Mao Zedong Thought、Deng Xiaoping Theory and Three Thought Theory	6	108	3
1200001	Physical Education	4	144	1-4
1200005	Strategics	1	18	1
500001	English	12	216	1-4
700034	Computer	4	72	1-2
0500515	College Chinese	2	36	1
0700744	Advanced MathematicsG	4	72	3
0700045	Basic Chemistry	3	54	3
0700327	Basic Chemistry Experiment	1	36	3
0700750	Organic Chemistry	3	54	2
0700751	Organic Chemistry Experiment	1	36	2
0700668	Physics	4	72	2
0801422	Physics Experiment	1.5	54	2
1000051	Human Anatomy	3.5	81	1
0700159	Cell Biology	2	45	2
1000118	Histology and Embryology	2.5	63	2
0700165	Physiology	3.5	63	3
1000247	FunctionExperiment(I)	1	45	3
0700156	Biochemistry	3.5	63	3
1000058	Biochemistry Experiment	1	45	3
1000101	Medical Immunology	2.5	54	3
0700183	Medical Microbiology	2	54	4

1000	Sanitary Chemistry	3.5	72	4
1000102	Medical Genetics	1.5	27	5
1000002	Pathology	3.5	63	5
1000003	Pathology Experiment	1	48	5
1000001	Pathophysiology	2	36	5
1000091	Pharmacology	3.5	63	5
1000248	FunctionExperiment(II)	1.5	54	5
1000049	Human Parasitology	1.5	36	4
1000155	Hygiene Statistics	3.5	72	5
1000258	Diagnostics	2.5	54	6
1000074	Surgery	4.5	81	6
1000046	Internal Medicine	4.5	81	6
1000048	Dermatology	2	36	6
1000043	Epidemiology	3.5	72	6
1000018	Obstetrics and Gynecology	3	54	7
1000006	Infectious Diseases	2	36	7
1000270	Occupational Health	3.5	72	8
1000271	Environmental Health	3.5	72	8
1000160	Hygiene Toxicology	3	54	8
1000158	Child & Adolescent Health	2	36	8
1000272	Health supervision and health justice	3	54	9
10000	Nutrition & Food Hygiene	3.5	72	9
1000219	Prevention and Control of Public Health Emergency Incidents	2	36	9
1000251	Evidence-Based Medicine	1	18	8
1000009	Pediatrics	2.5	45	7
1000273	Statistical software	2	36	7
0500446	Professional English	2	36	7
1000274	Health Management	2	36	7
1000189	Health Economics	2	36	7

1000275	Social health insurance	2	36	7
1300037	Practice		2 w	
1300449	Practice in Internal Medicine and Surgery	8	16 w	7
1300450	Practice of Preventive Medicine	8	16 w	9-10
1300400	Thesis	4		10

Beihua University

Title	Credits	Teaching Hours	Semester
Ideology Cultivation and Legal Basis	3	64	1
Modern History of China	2	36	2
Situation and Policies	2	46	4
Principles of Marxism	3	64	5
Mao Zedong Thought、,Deng Xiaoping Theory and Three Thought Theory	6	134	6
Physical Education	4	136	1-4
English	14	240	1-4
Computer	4	90	1
Computer (VF)	3	72	2
Computer (VB)	2	36	4
Writing	2	36	4
Basic Chemistry	2.5	54	1
Organic Chemistry	3.5	72	2
Medical Physics	2.5	54	2

Title	Credits	Teaching Hours	Semester
Human Anatomy	5	108	1
Cell Biology	2.5	54	2
Histology and Embryology	3	72	2
Biochemistry	6	126	3
Medical Microbiology	2.5	54	3
Immunology	2	36	3
Physiology	6	126	3
Parasitology	1.5	36	4
Medical Psychology	2	36	4
Pathology	5.5	118	5
Pathophysiology	2.5	54	5
Pharmacology	2.5	54	5
Diagnostics	4.5	90	5
Internal Medicine	4.5	82	6
Surgery	4	72	6
Gynecology	2	36	6
Pediatrics	1.5	24	6
Infectious Diseases	2	36	6

Title	Credits	Teaching Hours	Semester
Sanitary Chemistry	2.5	54	4
Community Medicine	1.5	36	5
Health regulations and supervision	2	36	5
Hygiene Statistics	4	100	6
Epidemiology	4	100	7
Hygiene Toxicology	3	72	7
Nutrition & Food Hygiene	4	90	7
Environmental Health	4	90	8
Occupational Health	4	90	8
Radiological Protection	2	36	8
Child & Adolescent Health	2	46	8

Selected Courses

Title	Credits	Teaching Hours
Hygiene Microbiology	1	18
Health Education	1	18
Women and Children Health Care	1	18
Adolescent Medicine	1	18
Reproductive health	1	18
Geriatrics	1	18
Rehabilitation Medicine	1	18
Disaster and Injury Medicine	1	18
public health incidents	1	18
Introduction to General Medicine	1	18
Health Management	1	18
Health Information Management	1	18
Health Economics	1	18

Social health insurance	1	18
Health Policy	1	18
Medical Demography	1	18
Medical Sociology	1	18
Management of Hospital Infection	1	18
Management of health-related products	1	18
Management of dangerous chemicals	1	18

Annex 9 Contents of Environmental Health in some universities

Peking Universtiy

Didactic lecture

Contents	Teaching hours
Introduction of environmental health	2
Atmosphere Hygiene	6
Water Hygiene	8
Household and Public Place Hygiene	4
Soil Hygiene	4
Environmental Quality Assessment	4
Environmental Risk Assessment	2
Environmental Epidemiology	4

Practice

Contents	Teaching hours
Determination of Formaldehyde in Indoor Air	4
Determination of NO ₂ 、SO ₂ in the air	4
The measurement of CO、CO ₂ in indoor air and the determination of COHb in blood	4
Determination of lysozyme in saliva	4
Determination of hexavalent chromium in tap water	4
Discussion—survey of air pollution	4
The measurement of residual chlorine and the hardness in the tap water	4
Discussion—choice of water source	4
Water sampling: Measurement of dissolved oxygen and nitrogen in the water	8

Hebei Medical University

Didactic lecture

Contents	Teaching hours
Introduction	2
Relationship between Environment and Health	4
Water Hygiene	3
Drinking Water Hygiene	2
Atmosphere Hygiene	3
Biogeochemical Disease	3
Disease Caused by Environmental Pollution	3
Household and Public Place Hygiene	2
Soil Hygien	3
Rural and Urban Health Planning	3
Environmental Quality Assessment	2
Chemicals and Health	2

Practice

Contents	Teaching hours
Determination of Biochemical Oxygen Demand	3
Determination of Effective Chlorine in Tap Water	3
Determination of Residual Chlorine in Tap Water	3
Determination of Ammonia Nitrogen in Water	3
Determination of Nitrite Nitrogen in Water	3
Determination of Nitrate Nitrogen in Water	3
Determination of Environmental Pollutants in Water	3
Determination of SO ₂ in the air	3