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Cover Photo: A China CDC medical team enters an abandoned mine to begin field investigation (Photographer: Feng Li from Guyana Mangannese Inc.).

Foreword

Message from Deputy Editor-in-Chief Liming Li —On the Launch of the *China CDC Weekly*

As the Founding Director-General of China CDC and the Deputy Editor-in-Chief, I would like to express my heartfelt congratulations for the *China CDC Weekly*.

Public health in China has been keeping pace with the development and construction of New China through its world-renowned accomplishments. In its 70 years of experience, China has established a public health system for epidemic and disease prevention with the following aspects: the Department of Preventive Medicine and Health and epidemic prevention stations as a foundation; epidemiology and five major systems (food hygiene, occupational health, environmental health, school health, and radiological health) as the main body; the National Immunization Program, All-People's Patriotic Health Campaign, primary healthcare networks, and health surveillance systems as initiatives; and biomedical principles as a scientific basis. Such a system had high cost-effectiveness, wide coverage, low investment, and high efficiency, and while being government led, it involved collaboration and participation of the whole society.

In 2002, the national-level Chinese Center for Disease Control and Prevention (China CDC) was established to direct the work of the original three-level disease prevention system (i.e. county, city/prefecture, and provincial) and to achieve a complete disease control and prevention system from local to central. This was a major milestone for the development of China's modern public health system.

The establishment of China CDC not only refined the system for disease control and prevention to cover communicable and non-communicable diseases, but it also expanded programs for child and adolescent health, mental health, sexually transmitted diseases (STDs) and acquired immune deficiency syndrome (AIDS) prevention, tuberculosis prevention, endemic disease prevention, and others on the basis of original research on environmental health, nutrition and food hygiene, occupational health, and radiological health. For example, China CDC set up the National Immunization Program, Public Health Surveillance and Information Center, etc., to achieve full coverage of general hygiene and health institutionally and functionally. China CDC also put forward a mission: "Centered on disease control, based on scientific research, and rooted on training talent." For this target, the Chinese Field Epidemiology Training Program (CFETP) was initiated in 2001 and a total of 313 trainees completed their two-year course as of 2019.

In addition, to prepare a *Morbidity and Mortality Weekly Report* (*MMWR*)-like journal was an aspiration even in the early years of China CDC. Our original concept included a release platform for information on the practice on public health in China, a dissemination platform for related agencies and international partners, and a learning platform for China CDC personnel on new scientific and practical techniques. After more than ten years and through great effort, such a platform is now finally available.

Congratulations again to the founder George F. Gao and the founding team. I'm honored to join the editorial board and sincerely hope that the *China CDC Weekly* will be a trusted source of scientific information on public health events in China and a world-leading journal of public health in the near future.

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Vital Surveillances

Incidence, Prevalence, and Mortality of Four Major Chronic Non-communicable Diseases — China, 1990-2017

Peng Yin[1]; Jinlei Qi[1]; Yunning Liu[1]; Jiangmei Liu[1]; Jinling You[1]; Lijun Wang[1]; Maigeng Zhou[1,#]

Summary

What is already known about this topic?

The burden from chronic non-communicable diseases has become an important public health concern in China.

What is added by this report?

The most recent estimates on incidence, prevalence, and mortality for cancer, cardiovascular disease, chronic respiratory disease, and diabetes in China during 1990-2017 reveal that the accumulated prevalences of the four major NCDs are increasing, but the age-standardized mortality rates for CVD, cancer, and CRD have been on a decline during the period of 1990-2017.

What are the implications for public health practice?

More effective intervention strategies should be developed to deal with the continuously increasing burden caused by NCDs.

Abstract

Introduction Chronic and non-communicable diseases (NCDs) have become an important public health concern in China. We aimed to estimate the incidence, prevalence, and mortality of four major NCDs including cardiovascular disease (CVD), cancer, chronic respiratory diseases (CRD), and diabetes in China during 1990-2017.

Methods The general analytic framework of Global Burden of Diseases Study 2017 (GBD 2017) was applied. Data from Disease Surveillance Point System, censuses, and Chinese Center for Disease Control and Prevention Cause-of-Death Reporting System were used for mortality estimates. National surveys, cancer registries, and published studies were used for incidence and prevalence estimates.

Results In 2017, new cases for CVD, cancer, and diabetes were 13.5, 4.6, and 3.3 million, an increase of 120.4%, 159.7%, and 57.3% respectively compared with 1990. There were 9.6 million incident cases for CRD in 2017, a 4.9% decrease compared with 1990. A total of 8.1 million people died from cancer, CVD, CRD, and diabetes in China in 2017. There was a substantial decline in age-standardized mortality rate for CRD and a steady but slow decline for CVD and cancer. During 1990-2017, the age-standardized prevalence rate increased by 7.4%, 135.2%, and 17.0% for CVD, cancer, and diabetes respectively.

Conclusions and Implications for Public Health Practice The accumulated prevalence of the four major NCDs are increasing but the age-standardized mortality rate for CVD, cancer, and CRD has been on a decline during 1990-2017. More effective intervention strategies should be developed to deal with the continuously increasing burden caused by NCDs in China.

Introduction

Chronic and non-communicable diseases (NCDs) cause a heavy burden globally and have become a major global concern (*1*–*2*). In recent decades, China has gone through an epidemiological shift in disease patterns, mainly from infectious and nutritional diseases to NCDs (*3*). The Chinese government responded quickly to the emerging public health concerns and issued Healthy China 2030 aiming to promote population health with specific goals and targets (*4*). In order to achieve these goals, clear understanding of the levels and the trends of these NCDs is crucial. In this report, the National Center for Chronic and Noncommunicable Disease Control and Prevention of China CDC used the results of the Global Burden of Diseases Study 2017 (GBD 2017) to investigate the incidence, prevalence, and mortality of four major NCDs including cardiovascular disease (CVD), cancer, chronic respiratory diseases (CRD), and diabetes in China during 1990-2017.

Methods

Detailed descriptions of the data, quality control measures, and statistical modeling for the GBD 2017 have been reported elsewhere (*1*,*3*). Data for all-cause mortality in China were derived primarily from the Disease Surveillance Point System; censuses; surveys including the Annual Survey on Population Change and the Intercensal Survey; the Maternal and Child Health Surveillance System; and the One-Per-Thousand Population Fertility Sample Survey. Cause-specific mortality was estimated primarily with the GBD cause of death ensemble modelling tool, CODEm (*1*). Prevalence and incidence of non-fatal outcomes were primarily estimated with the Bayesian meta-regression method DisMod-MR 2.1 (*5*). Data on non-fatal outcomes were derived primarily from published studies, national surveys, cancer registries, the Chinese Center for Disease Control and Prevention cause-of-death reporting system, and hospital inpatient data. World standard population generated by GBD was used to estimate the age-standardized rate for incidence, prevalence, and mortality (*6*).

Results

Table 1 shows the absolute numbers of incidence, prevalence, and mortality of four major NCDs by gender in China. In 2017, the new cases for CVD, cancer, and diabetes were 13.5, 4.6, and 3.3 million, an increase of 120.4%, 159.7%, and 57.3% respectively compared with 1990. There were 9.6 million incident cases for CRD in 2017, 4.9% decrease compared with 1990. There were 106.7, 22.4, 93.9, and 89.5 million prevalence cases for CVD, cancer, CRD and diabetes, respectively, in 2017, increasing by 119.8%, 278.6%, 14.0%, and 114.6% in comparison with 1990.

As shown in Table 2, the age-standardized rate for incidence, prevalence, and mortality decreased for CRD with higher declines in females than in males during 1990-2017. The age-standardized prevalence rate increased by 7.4%, 135.2%, and 17.0% for CVD, cancer, and diabetes, respectively. The age-standardized incidence rate per 100,000 was 732, 244, and 199 for CVD, cancer, and diabetes in 2017 in China, which is a 3.3%, 27.9%, and 12.3% increase compared with 1990.

Figure 1 shows the trend of the age-standardized incidence rate for four major NCDs during 1990-2017. There was a steady but slow rise in age-standardized incidence rate for cancer, especially in the past 10 years. As shown in Figure 2, the age-standardized prevalence rate decreased significantly for CRD while increasing significantly for cancer. Figure 3 showed a substantial decline in age-standardized mortality rate for CRD. The age-standardized mortality rate for diabetes, however, remained relatively stable during the study period.

Discussion

Our study found that a total of 8.1 million people died from cancer, CVD, CRD, and diabetes in China in 2017. These diseases place heavy burdens on the economic and social development in China and have become a huge challenge for the Chinese government.

China has made great achievements towards reducing the burden of communicable, maternal, neonatal, and nutritional conditions. The overall improvement in healthcare among the Chinese population can also be reflected by the observed decline of mortality rate for CVD, cancer, and CRD in this study. Better access to medical services, wider coverage of health insurance in both urban and rural areas, and improvement of diagnosis and treatment of many diseases have contributed to the decline in mortality rate. On the other hand, longer life expectancy, population aging, and more westernized lifestyles have resulted in the increasing number of cases and deaths due to NCDs, which poses challenges to society and the government.

These NCDs have common risk factors including tobacco smoking, alcohol drinking, physical inactivity, and unbalanced dietary habits. Previous studies showed that modifiable risk factors explained nearly 60% of cancer deaths in China, with tobacco smoking accounting for 22.6% of cancer deaths (*7*). The burden will continue to grow with high smoking prevalence in Chinese men and the high level of indoor air pollution from cooking and heating with coal and other biomass fuels in rural areas (*8*).

Our results showed that both the absolute numbers and the age-standardized rates for incidence, prevalence, and mortality for diabetes increased from 1990 to 2017. A large cross-sectional survey in 2010 showed the estimated diabetes prevalence of Chinese adults was 11.6% and the prevalence of pre-diabetes was 50.1%, representing 113.9 million Chinese adults with diabetes and 493.4 million with pre-

TABLE 1. Incidence, prevalence, and mortality numbers and percentage change of major NCDs in China, 1990 to 2017.

	Incident cases in thousands			Prevalent cases in thousands			Death numbers in thousands		
	1990	2017	Percentage change (%)	1990	2017	Percentage change (%)	1990	2017	Percentage change (%)
CVD	6,144 (5,918 - 6,396)	13,541(13,003 - 14,120)	120.4	48,538(46,761 - 50,347)	106,670(102,572 - 111,110)	119.8	2,245(2,188 - 2,363)	4,378(4,233 - 4,517)	95.0
Males	3,128(3,018 - 3,256)	6,922(6,650 - 7,214)	121.3	22,868(22,012 - 23,766)	50,357(48,368 - 52,525)	120.2	1,130(1,095 - 1,172)	2,406(2,308 - 2,504)	112.8
Females	3,016(2,899 - 3,145)	6,619(6,348 - 6,917)	119.5	25,670(24,720 - 26,663)	56,314(54,091 - 58,733)	119.4	1,115(1,072 - 1,212)	1,972(1,875 - 2,063)	76.9
Cancer	1,767(1,705 - 1,869)	4,589(4,392 - 4,770)	159.7	5,922(5,745 - 6,247)	22,421(20,842 - 23,751)	278.6	1,418(1,377 - 1,491)	2,607(2,507 - 2,702)	83.9
Males	1,000(958 - 1,039)	2,721(2,586 - 2,865)	172.2	2,291(2,180 - 2,374)	10,245(9,571 - 10,903)	347.1	856(823 - 887)	1,669(1,588 - 1,751)	94.9
Females	767(727 - 857)	1,867(1,736 - 1,979)	143.5	3,630(3,489 - 3,974)	12,176(10,988 - 13,320)	235.4	561(533 - 626)	938(877 - 990)	67.1
CRD	10,162(8,923 - 11,456)	9,665(8,719 - 10,745)	-4.9	82,341(76,495 - 89,019)	93,899(86,774 - 100,857)	14.0	1,237(1,070 - 1,285)	1,010(968 - 1,114)	-18.4
Males	5,314(4,652 - 6,014)	5,196(4,665 - 5,803)	-2.2	40,458(37,506 - 43,777)	45,667(42,116 - 49,359)	12.9	627(604 - 651)	583(555 - 609)	-7.1
Females	4,848(4,271 - 5,464)	4,469(4,044 - 4,956)	-7.8	41,883(38,915 - 45,159)	48,232(44,430 - 51,865)	15.2	610(431 - 659)	427(394 - 528)	-30.0
Diabetes	2,122(1,934 - 2,331)	3,338(3,025 - 3,736)	57.3	41,708(37,392 - 46,543)	89,496(80,957 - 99,786)	114.6	64(61 - 68)	153(148 - 159)	139.9
Males	1,120(1,012 - 1,238)	1,642(1,495 - 1,843)	46.5	22,529(19,981 - 25,381)	48,205(43,307 - 54,000)	114	27(25 - 28)	74(70 - 77)	177.7
Females	1,002(915 - 1,101)	1,696(1,524 - 1,900)	69.3	19,179(17,262 - 21,274)	41,291(37,456 - 45,972)	115.3	37(34 - 41)	80(75 - 84)	113.1

Abbreviation: CVD, Cardiovascular diseases; CRD, Chronic respiratory diseases.

TABLE 2. The age-standardized incidence, prevalence, and mortality rates and percentage change of major NCDs in China, 1990 to 2017.

	Incidence rate per 100,000			Prevalence rate per 100,000			Death rate per 100,000		
	1990	2017	Percentage change (%)	1990	2017	Percentage change (%)	1990	2017	Percentage change (%)
CVD	708(683 - 737)	732(704 - 760)	3.3	5,241(5,048 - 5,452)	5,632(5,429 - 5,853)	7.4	332(324 - 352)	262(253 - 270)	-21.2
Males	742(716 - 771)	771(742 - 800)	3.9	5,000(4,815 - 5,195)	5,414(5,214 - 5,633)	8.3	360(349 - 371)	308(296 - 320)	-14.4
Females	681(657 - 709)	697(670 - 726)	2.3	5,484(5,280 - 5,704)	5,847(5,624 - 6,087)	6.6	310(297 - 338)	221(210 - 231)	-28.7
Cancer	191(185 - 202)	244(233 - 254)	27.9	582(565 - 613)	1,369(1,244 - 1,502)	135.2	163(159 - 172)	138(133 - 143)	-15.5
Males	224(216 - 233)	296(282 - 311)	31.9	478(458 - 493)	1,183(1,095 - 1,274)	147.6	205(198 - 212)	183(175 - 192)	-10.9
Females	162(154 - 181)	197(183 - 209)	21.6	704(677 - 771)	1,596(1,390 - 1,870)	126.5	127(120 - 141)	97(91 - 102)	-23.3
CRD	930(831 - 1034)	753(641 - 879)	-19.0	8,051(7,507 - 8,675)	5,883(5,367 - 6,455)	-26.9	200(172 - 207)	63(60 - 69)	-68.5
Males	963(862 - 1068)	794(675 - 928)	-17.5	7,935(7,409 - 8,528)	5,794(5,270 - 6,394)	-27.0	226(218 - 234)	80(76 - 83)	-64.6
Females	898(801 - 1001)	709(604 - 826)	-21.1	8,198(7,645 - 8,826)	5,970(5,450 - 6,541)	-27.2	180(129 - 194)	49(45 - 60)	-72.8
Diabetes	177(163 - 195)	199(182 - 219)	12.3	4,052(3,663 - 4,496)	4,740(4,278 - 5,284)	17.0	8(8 - 9)	8(8 - 9)	6.1
Males	177(162 - 194)	203(186 - 226)	15.0	4,222(3,783 - 4,715)	5,145(4,602 - 5,762)	21.9	7(7 - 8)	9(8 - 9)	20.5
Females	178(163 - 196)	193(176 - 214)	8.7	3,851(3,494 - 4,272)	4,311(3,914 - 4,802)	11.9	9(8 - 10)	8(8 - 9)	-5.1

Abbreviation: CVD, Cardiovascular diseases; CRD, Chronic respiratory diseases.

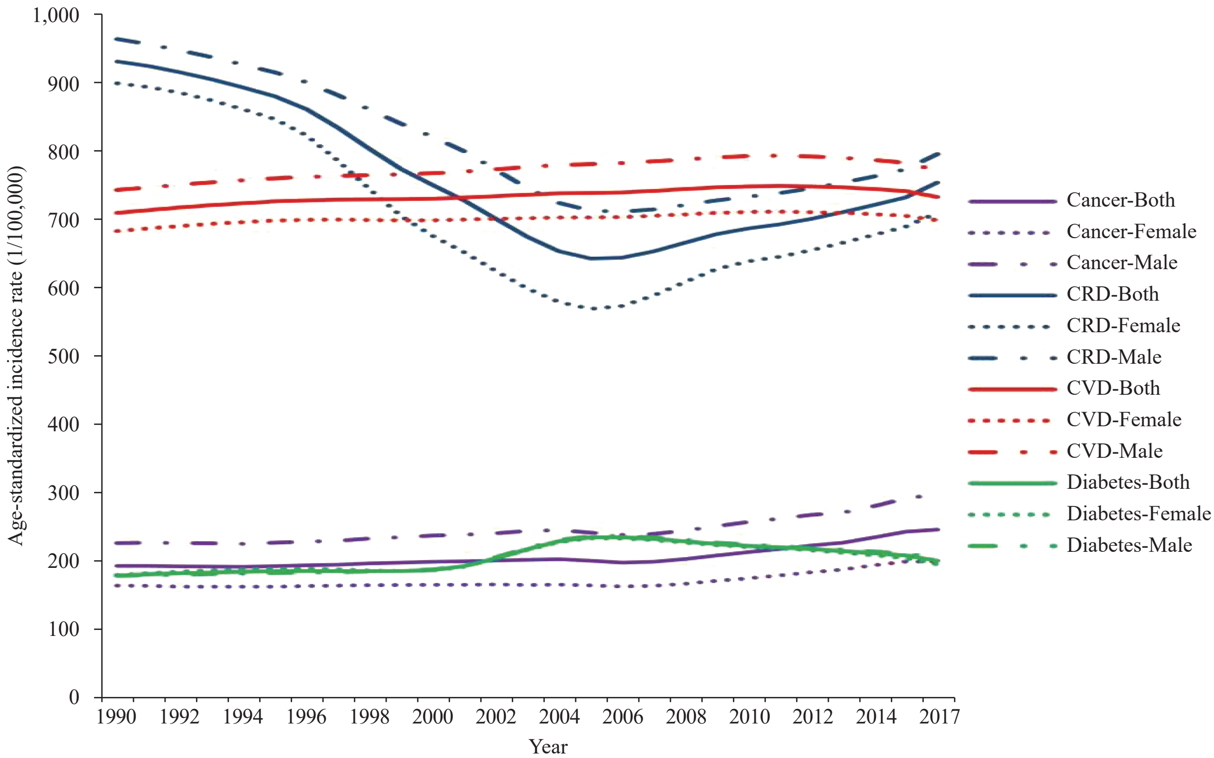

FIGURE 1. Age-standardized incidence rates (1/100,000) for CVD, cancer, CRD, and diabetes in China, 1990-2017.

Note: “Both” represents the total population; Abbreviation: CVD, cardiovascular diseases; CRD, chronic respiratory diseases.

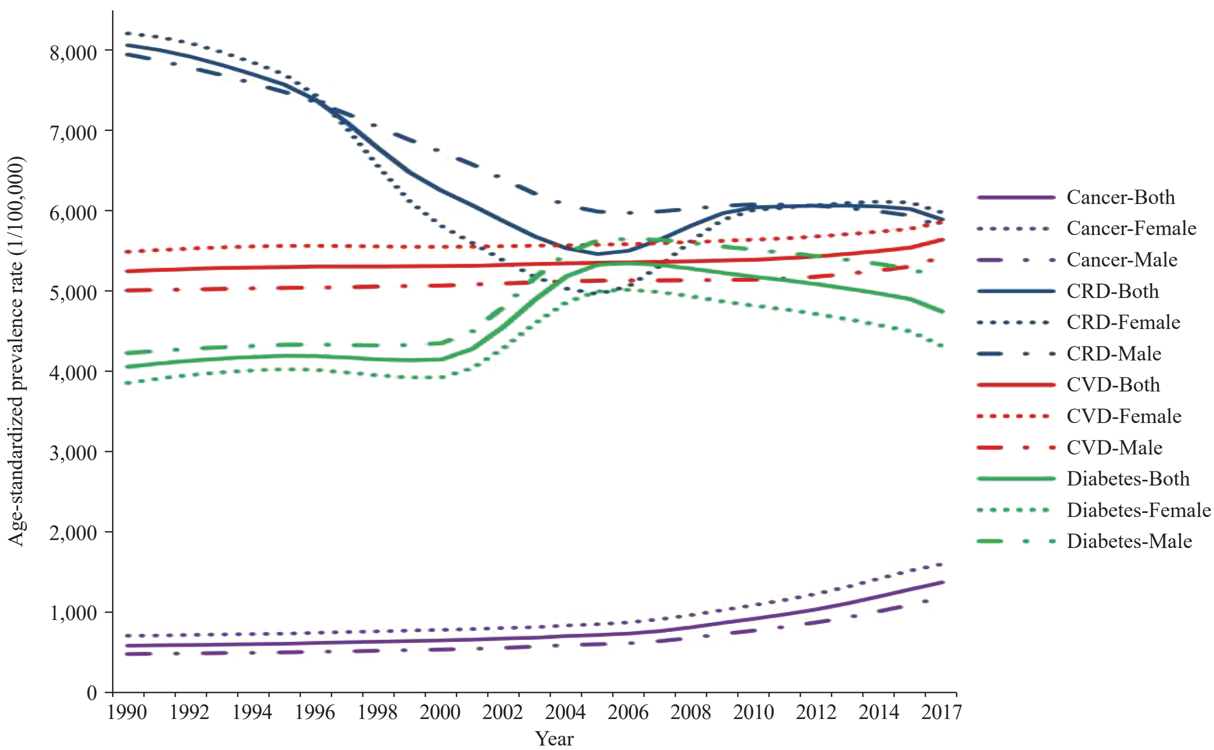

FIGURE 2. Age-standardized prevalence rates (1/100,000) for CVD, cancer, CRD, and diabetes in China, 1990-2017.

Note: “Both” represents the total population; Abbreviation: CVD, cardiovascular diseases; CRD, chronic respiratory diseases.

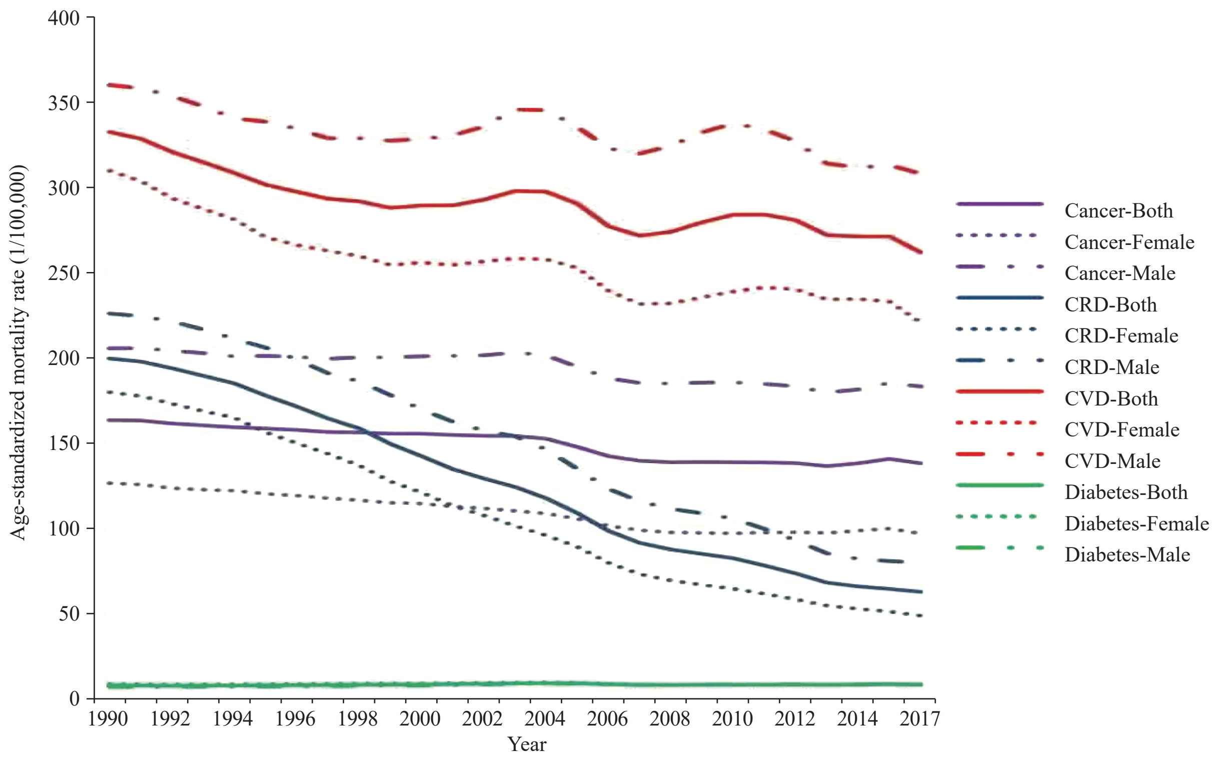

FIGURE 3. Age-standardized mortality rates (1/100,000) for CVD, cancer, CRD, and diabetes in China, 1990-2017.

Note: "Both" represents the total population; Abbreviation: CVD, cardiovascular diseases; CRD, chronic respiratory diseases.

diabetes (*9*). Along with the striking number of people with diabetes, the significant increasing trend of diabetes prevalence and mortality indicated the importance of diabetes as one of the emerging public health challenges in China during the last two decades.

Accordingly, the Chinese government has recognized and paid more attention to the importance of prevention and control of NCDs. Many efforts have been made to tackle the problem with focuses on surveillance, monitoring, and intervention. In addition, intervention efforts tailored to individuals and high-risk populations were also made at the national, provincial, and city levels. The National Healthy Lifestyle for All Campaign was launched in 2009 and included a broad range of focuses such as promoting physical activity, improving community exercise facilities, establishing demonstration areas including restaurants, schools, and factories, and increasing health related awareness such as providing community members with salt reduction spoons, oil control jars, etc. These health-promotion interventions have been shown to play an important role in addressing NCDs in China (*10*). Building upon the Healthy China 2030, the Chinese central government recently issued the Healthy China Action 2019-2030 and specified 15 major areas for action (*11*). The effective implementations of this plan is anticipated to halt the increasing burden from NCDs among Chinese population.

The findings in this report are subject to some limitations. GBD 2017's limitations are also applied to this study. First, for the estimation of all-cause mortality in China, death distribution methods were used to evaluate the completeness of the Disease Surveillance Point System, but these methods have a wide range of uncertainty. Second, the current DisMod-MR 2.1 tool does not capture the cohort nature of some diseases such as lung cancer. Third, the lack of more robust cause-specific mortality data from some western provinces affects the precision of our estimates.

NCDs have become a serious public health problem and pose significant challenges to society. In the battle of dealing with NCDs, Chinese government needs to place more effort in the continued surveillance of the levels and trends of chronic diseases and relevant risk factors. Prevention strategies including controlling common risk factors are urgently needed.

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Outbreak Reports

An Outbreak of Febrile Histoplasmosis Among Chinese Manganese-Mine Workers in Cooperative Republic of Guyana in 2019

Lei Zhou[1,2]; Xin Wang[3]; Jiandong Li[4]; Rui Song[5]; Xiaoping Dong[6,7,#]; George F. Gao[8]; Zijian Feng[8,#]

Summary

What is already known on this topic?

Cases of histoplasmosis have been reported in every continent except Antarctica but are fairly rare in China. High prevalence of histoplasmosis has been observed in Central America, Caribbean, and South America. Infections of *Histoplasma* are acquired through a respiratory route, particularly inhalation of aerosols from disturbed soils enriched with excreta from birds and bats. These infections are most common in persons involved with removing soil, visiting caves, cleaning old houses, or felling trees, etc.

What is added by this report?

This is the first report of cluster infections of *Histoplasma* among overseas Chinese workers. A strong dose-dependent association of illness onset and disease severity with the exposure intensity to the soils and wastes possibly contaminated by the *Histoplasma* has been proposed. Long labor times, repeated entering of contaminated tunnels, working in high-dust environments are likely to result in earlier illness onsets, more severe clinical courses, and even fatal outcomes. More importantly, none of the patients used reliable personal protection equipment (PPE), such as common masks while working, that would prevent the inhalation of more *Histoplasma* spores.

What are the implications for public health practice?

The epidemiological findings of this outbreak investigation highlight a probable risk of infection with *Histoplasma* when entering without PPE into the environment with bats living around, such as caves or mines. Effective education and communication might be needed among residents and travelers. This outbreak expands our knowledge of the control and prevention of fungal disease in China.

At the beginning of April 2019, China National Health Commission (NHC) and China Center for Disease Control and Prevention (China CDC) received reports of a cluster of febrile illness involving about ten Chinese workers in a manganese ore in Cooperative Republic of Guyana. The enterprise applied to NHC for permission for evacuating the patients back to China for further treatment. A special Chinese medical team composed of the experts of epidemiology, medical bacteriology, clinical and emergency medicines was deployed to Georgetown, Guyana on April 6, 2019 to provide the support in clinical and public health, to identify the potential etiology and to assess the potential threat, especially the risk of international transmission.

Outbreak Recognition and Initial Response

On March 28, 2019, six Chinese males with fever visited the local Pakera District Hospital (PDH) in Matthews Ridge. They complained of non-productive coughing, headaches, weakness and joint pain, and two of them had severe symptoms. All of them came from a manganese ore mine nearby. After hospitalization, the District Medical Officer (DMO) notified this event to the Chief Medical Officer (CMO) of the Ministry of Public Health (MOPH) of Guyana immediately and MOPH operationalized its emergency responses operations quickly. One day later, a patient's condition suddenly deteriorated and died with a manifestation of hemorrhagic and multi-organ failure. The rest of the five patients were further transferred to Georgetown Public Hospital (GPH) on March 30, 2019. In the following days, eight more cases including seven Chinese workers and one Guyanese worker were successfully identified and transferred to GPH. Two other mild cases with only mild fever stayed in PDH. Another severe patient displayed multi-organ failure and died in GPH on April 3, 2019.

Based on the signs and symptoms of the six patients, the MOPH of Guyana issued a working case searching definition: a person who had fever, with or without any one of the below symptoms with unexplained reasons such as cough, headaches, weakness, muscle, and/or joint pains since March 1, 2019 in Matthews Ridge. Healthy miners in the manganese ore mine who had entered the same abandoned tunnels and the close contacts of the patients were placed under medical observation. Up to April 15, 2019, a total of 16 patients were identified. Two Chinese patients died, and two cases (one Chinese patient and one Guyanese patient) were discharged. Because the Guyanese patient showed negative laboratory test results and had no exposure to the abandoned mines, he was excluded from the final case-list. A total of 24 miners including 10 healthy co-exposed miners and 14 close contacts were under medical observations in Matthews Ridge.

Pathogen Detection

Various tissue specimens from the two fatal cases and blood samples from surviving patients were transferred to the laboratories of China CDC. Next-generation sequencing (NGS) technology based on Illumina MiSeq platform identified different lengths of specific gene sequences of *Histoplasma capsulatum* in seven different samples of two fatal cases and one severe case, including lung and blood samples. Up to April 15, 7 cases were laboratory confirmed as being infected with *Histoplasma capsulatum*. Therefore, 7 of 15 patients were laboratory confirmed cases and the remaining 8 patients were clinically diagnosed cases (Table 1).

Epidemiological Investigation on the Field

The investigation was conducted by carefully interviewing the patients and their healthy co-workers. The median age of 15 Chinese male patients was 43.5 years old (range: 23-56). The first case displayed clinical manifestation on March 22, 2019 and the peak of disease was on March 30, 2019 (Table 1 and Figure 1). Fever was the most frequent symptom (n=15, 100%), while other symptoms were also noticed including headache (n=10, 67%), muscle pains (n=8, 53%), joint pains (n=8, 53%), weakness (n=7, 47%), cough (n=3, 20%), skin rash (n=3, 20%), and dizziness (n=1, 7%). A clinical evaluation score (range: 0.5 to 100) was assigned to each of the 15 Chinese cases by clinical experts according to illness severity. The more severe the illness was, the higher score was assessed. Among the 15 cases, 2 were fatal cases, 4 were severe cases, and 9 were milder cases (Table 1). The median incubation period of all 15 cases was estimated as 10 days (range 2-11.5 days). The median incubation period of 6 severe and fatal cases [4 days (range 1.5-10 days)] was estimated significantly higher than that of 9 milder cases [12.5 days (range 8.5-13.5 days)].

It was found that all 15 Chinese patients worked in 4 short tunnels (less than 20 meters long) during March 16 and 29, 2019, with varying labor hours. The tunnels were abandoned for more than 50 years. Bats were observed to live inside, and the feces of bats were observed on the ground during the field investigation. The workers entered the tunnels for waste clearance, including shoveling soil and crushing the concrete of the ground without any PPE. Neither the 10 co-workers who had also entered in those tunnels nor the 14 close contacts got sick, resulting an attack rate of 38.5%, and the exposure's odds ratio (OR) of 2.4 (1.495-3.853) ($p<0.0001$). This strongly highlights that all patients in this event were exposed to the same pathological agent, and the possibility of human-to-human transmission is extremely limited.

The Relationship Between Exposure Intensity and Disease Severity

As shown in Table 1, the frequency of entry and duration of stay inside of the tunnels among the 15 Chinese patients varied largely. To evaluate the exposure intensity of cases, an equation was used as below:

$$\sum_{F=1}^{n}(twTLE)$$

Of note, n was the number of abandoned tunnels (range: 1-4), F was the times of entry, t was hours of stay per entry, w was the type of work including shovel (score=1.5), crush (score=1), and inspection (score=0.5), T was the date of entry including Period 1 (score=1.5) from March 13 to 22 and Period 2 (score=1) from March 23 to 29, L was the place of work including the bottom (score=1.5), middle (score=1) and entrance (score=0.5) of the tunnels, and E indicated whether other work was performed during the stay (Yes scoring 1, No scoring 0.5).

Two distinct profiles of exposure intensity among the patients were clearly noticed. One was above 170 and the other was below 15. A logistic regression

TABLE 1. The epidemiological and clinical characteristics of the 15 Chinese manganese-miner male case-patients in the outbreak of febrile illness in Matthews Ridge, Cooperative Republic of Guyana in 2019*.

Case No.	Age (years)	Date of Onset	Type of diagnosis	Clinical Outcome	Clinical evaluation score†	Details of exposure in the four old mines								
						Date of first entry	Date of last entry	Times of entry	No. of mines	Type of work	Place of work	Hours of stay per time	Other miner's working§	Exposure intensity¶
1	47	Mar 22	Laboratory confirmed	Dead	100	Mar 16	Mar 22	7	4	Shovel	Bottom	2	Yes	189
2	44	Mar 26	Laboratory confirmed	Dead	100	Mar 16	Mar 25	7	4	Shovel	Bottom	2	Yes	270
3	42	Mar 27	Laboratory confirmed	Coma, ICU	90	Mar 16	Mar 27	5	4	Shovel, crush	Bottom, middle	2	Yes	175
4	51	Mar 25	Laboratory confirmed	ICU	90	Mar 17	Mar 23	5	4	Shovel	Bottom	2	Yes	171
5	49	Mar 29	Laboratory confirmed	Hospitalization	70	Mar 16	Mar 27	7	4	Shovel, crush	Bottom, middle	2	Yes	249
6	33	Mar 29	Clinical diagnosis	Hospitalization	1	Mar 18	Mar 18	1	1	Check around	Bottom	0.1	Yes	0.113
7	44	Mar 28	Laboratory confirmed	Hospitalization	1	Mar 24	Mar 27	4	4	Crush, check around	Bottom	1.5	No	9.6
8	56	Mar 30	Clinical diagnosis	Hospitalization	20	Mar 16	Mar 24	2	4	Check around	Bottom	0.1	No	0.525
9	34	Mar 30	Clinical diagnosis	Hospitalization	30	Mar 18	Mar 28	1	2	Crush	Bottom	1.5	Yes	5.625
10	48	Mar 30	Clinical diagnosis	Hospitalization	1	Mar 16	Mar 16	2	1	Check around	Bottom	0.1	Yes	0.225
11	43	Mar 30	Clinical diagnosis	Hospitalization	5	Mar 17	Mar 27	1	2	Check around	Bottom	0.1	Yes	0.3
12	38	Mar 31	Clinical diagnosis	Discharge	0.5	Mar 16	Mar 16	1	1	Check around	Entrance	0.5	No	0.094
13	50	Mar 26	Laboratory confirmed	ICU	80	Mar 16	Mar 24	7	4	Shovel	Bottom, middle	2	Yes	198
14	41	Apr 11	Clinical diagnosis	Hospitalization	30	Mar 28	Mar 28	1	1	Crush	Middle	1.5	Yes	2.25
15	23	Apr 11	Clinical diagnosis	Hospitalization	30	Mar 28	Mar 29	2	2	Crush	Entrance	6	Yes	12

Abbreviation: ICU = intensive care unit. All 15 cases were male. Next-generation sequencing (NGS) technology based on Illumina MiSeq platform identified different lengths of specific gene sequences of *Histoplasma capsulatum* in 7 different samples of 2 fatal cases and one severe case, including lung and blood samples. Up to April 15, 2019, 7 cases were laboratory confirmed being infected with *Histoplasma capsulatum.** All data were updated as of April 15, 2019 when the special Chinese medical team departed from Guyana back to China.
† A clinical evaluation score (range: 0.5 to 100) was assigned to each of the 15 Chinese cases by clinical experts according to their illness severity. The more severe the illness was, the higher score was. § Were other miners working close by? ¶ The exposure intensity was a score representing the exposure degree and risk of infection according to the detailed exposure information of the case-patients. It was calculated by using the equation of $\sum_{F=1}^{n}(twTLE)$; *n* was the number of the abandoned tunnels (range: 1-4), *F* was the times of entry, *t* was hours of stay per entry, *w* was the type of work including shovel (score=1.5), crush (score=1) and inspection (score=0.5), *T* was the date of entry including Period 1 (score=1.5) from March 13 to 22, 2019 and Period 2 (score=1) from March 23 to 29, 2019, *L* was the place of work including the bottom (score=1.5), middle (score=1) and entrance (score=0.5) of the tunnels, and *E* indicated whether other work was performed during the stay (Yes scoring 1, No scoring 0.5).

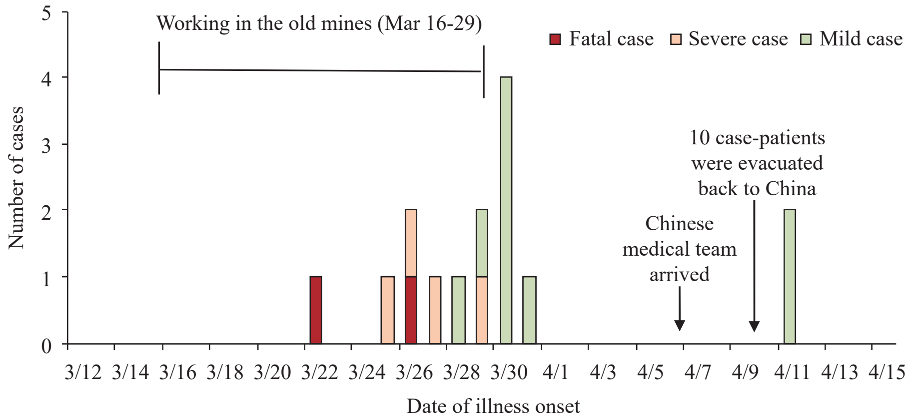

FIGURE 1. The date of illness onset of the Chinese-manganese-miner male case-patients in the outbreak of febrile illness in Matthews Ridge, Cooperative Republic of Guyana in 2019.

model [y=11.882ln(x)+18.405] was established by combining the exposure intensity scores of the cases with the individual clinical scores. The distribution of the 15 patients were distinctly divided in two separate areas (Figure 2). Patients with severe clinical manifestations and poor prognosis harbored significantly higher exposure intensity scores, in which 2 fatal cases showed exposure intensity scores of 189 and 270. Patients with low exposure intensity scores underwent mild clinical processes (Table 1). These data indicate a close relationship between the exposure intensity and disease severity.

Comments

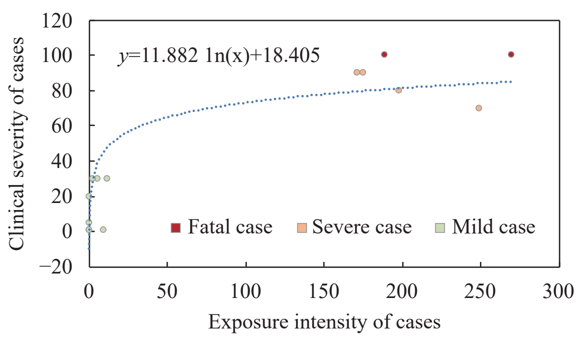

FIGURE 2. The dose-response exposures associated with severity of illness among 15 Chinese-manganese-miner male case-patients in the outbreak of febrile illness in Matthews Ridge, Cooperative Republic of Guyana in 2019.

In this overseas investigation among Chinese workers, a closely dose-dependent association of illness onset and disease severity with the exposure intensity to soil and waste possibly contaminated by the *Histoplasma* has been proposed. Long labor times, repeated entering of contaminated tunnels, working in dustier environments are likely to result in earlier illness onsets, more severe clinical courses and even fatal outcomes. More importantly, none of the patients used reliable PPE, such as common masks while working, that would prevent the inhalation of more *Histoplasma* spores. Finally, ten patients were successfully evacuated from Guyana to China with a Chinese medical aid aircraft without causing any further transmission. This outbreak practiced and exercised the Chinese medical emergency response overseas, but this investigation was limited because the environmental risk of the mines could not be evaluated. Environmental specimens collected in the mines were not been shipped to China on time due to restricted cooperation on specimen transportation between the countries.

The infection of *Histoplasma* has been reported in some countries in Southern America(*1–2*), including Guyana(*3*). During an interview with the staff in the local hospital, we learned that there was a local farmer who underwent similar but mild pathogenesis after entering the same tunnels and collecting feces of bats as fertilizer, highlighting the possibility of a long-term circulation of *Histoplasma* in this region. Although the clinical features of this cluster disease are similar to that of acute infections of *Histoplasma* described elsewhere(*4–7*), such a cluster outbreak is fairly rare in China. To our knowledge, no definitively confirmed cluster infection of *Histoplasma* in China has been reported. Despite that, there have been a few similar events that occurred in travelers in the caves in the southwestern region of China, inhabited various species of bats, though no reliable pathogen evidence has been obtained. The clinical findings of the cases provide valuable experience to Chinese clinicians to understand the clinical features of acute infection of *Histoplasma* and will help achieve early detection and efficient treatment for patients. Although information on the miners' reference level of health is not available for further comparative analysis, the epidemiological findings of this outbreak investigation highlight a probable risk of infection with *Histoplasma* when entering without PPE into environments inhabited by bats such as caves or mines. Education and communication initiatives might benefit residents and travelers in this region. This outbreak expands our knowledge of the control and prevention of fungal disease in China. Due to worldwide industrial collaborations and traveling, we to need watch closely for emerging pathogens(*8*).

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Commentary

China CDC Weekly: Bridging the Global and Chinese Public Health Communities

Xi Chen[1,2]

I would like to offer my hearty congratulations and gratitude for the inaugural publishing of *China CDC Weekly*, a timely platform for disseminating public health advances, enhancing public awareness, catalyzing scalable actions, and shaping the future of public health.

Pioneered by C-E.A. Winslow and others in 1915, the initial definition of public health is the science and art of preventing disease, prolonging life, and elevating human health (*1–2*). Some nations spend much more than others on healthcare but get less, and a primary reason is overspending on treating diseases but underspending on preventing them (*3*). Global public health practitioners have been working tirelessly on preventive medicine to promote public health. Likewise, *China CDC Weekly* has made great efforts to be established as a national public health bulletin for disease prevention through timely and reliable release of public health information, surveillance data, surveys, scientific research findings, and recommendations to health professionals and the public.

Informed public health actions require organized efforts of individuals, organizations, communities, and society, and *China CDC Weekly* publishes all materials in the public domain with the aim to simultaneously reach all levels of public health stakeholders, such as lay audiences, the scientific world, health professionals, the media, the government, etc., to better perform their duties. This is a major benefit over other indexed scientific journals.

As evidenced by the three reports in the first issue on HIV/AIDS, fine particulate matter, and plague, we are excited to see *China CDC Weekly* start by covering a wide range of determinants of health, including environmental, socioeconomic, behavioral, and health care. Cumulative evidence has shown that social determinants of health account for a much larger part of our health than health care does, even though most countries in the world have overspent in the latter (*4*). Greater efforts are needed to correct the mismatch between determinants of health and our investment portfolio into health (*5*). Published by China CDC, *China CDC Weekly* is in a unique position to voice authoritative advice to shift from the current paradigm of a curative medical system to one with increased focus on efforts that directly address the social determinants of health.

The launch of *China CDC Weekly* hits a key milestone of establishing a primary public health communications channel for the most populous developing country, the first of its type since the founding of the US CDC's *Morbidity and Mortality Weekly Report* (*MMWR*). The timely and transparent public health information *China CDC Weekly* disseminates will facilitate global dialogue for China to share its public health experiences and learn from others. It will also have great potential to accelerate integration and efficient coordination of China's public health missions with the rest of the world as globalization enables an epidemic in one part of the world to spread rapidly to another (*6*).

Moreover, the publication of *China CDC Weekly* is expected to enhance the sharing of common values for mankind. Amid rising tensions of global trade and economic disputes, the flattening globalized world might nevertheless become more harmonized if people can share more common values. In this regard, public health has been an appealing arena that could serve as the glue that binds people together. This has been manifested in the down-to-earth public health collaborations between China and USA, such as the greenlighted US-China Health Dialogue Track II (*7*), the acceleration of U.S. Food and Drug Administration (FDA) and China Food and Drug Administration (CFDA) drug approval (*8*), and recent joint-fighting against fentanyl trafficking and drug overdose (*9*). These partnerships have also been exhibited in China's decades-long provision of health aid to Africa and even shortly after the Great Chinese Famine in the 1960s when China suffered massively from poverty and malnutrition (*10*).

With the world's largest population, China has played a leading role in the world's health metric dynamics. During the 70 years following World War

II, life expectancy in China more than doubled from 35 years in 1949 to 77 years in 2018 (*11*). Going forward, China will play an increasingly important role in the world health community, which will present *China CDC Weekly* with tremendous opportunities to expand its influence on the global stage.

On behalf of the China Health Policy and Management Society, a global organization that strives to promote population health and health equity for Chinese people worldwide, we once again congratulate the founding of *China CDC Weekly*.

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