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Cover Image: "World Cancer Day 2020" poster (adapted from www.caca.org.cn/doc/003/000/450/00300045046_8d84288c.pdf).

Announcements

The 20th World Cancer Day — February 4, 2020

World Cancer Day is organized by the Union for International Cancer Control (UICC) and celebrated annually on February 4 since 2000. This year's global observance marks the 20th World Cancer Day and raises awareness for cancer and for its prevention, detection, and treatment.

In 2018, an estimated 18.1 million new cancer cases and 9.6 million cancer deaths occurred globally (*1*), and according to the National Central Cancer Registry of China, about 4.28 million new cancer cases and 2.86 million cancer deaths occurred in China, which accounted for about 23.7% and 30.0% of the global cancer incidence and deaths, respectively. Cancer has become a leading cause of death in China over the past 40 years and contributes an increasing burden of cancer due to population aging. Furthermore, factors such as increasing prevalence of physical inactivity and obesity, decreasing prevalence of infection-related disease, high prevalence of smoking in males, and air pollution may contribute to the changing profile of the cancer burden in China (*2*). Though serious challenges remain, significant progress has been made in cancer prevention and control in China as the highest cancer-specific mortality rates (stomach, esophageal, and liver) decreased over a recent 15-year period (*3*).

World Cancer Day's 2019–2021 campaign theme is "I Am and I Will" and calls for personal commitment and prompt action to reduce the growing burden of cancer. This theme emphasizes personal responsibility, making healthier lifestyle choices, supporting cancer patients and survivors, and fighting for a cancer-free world.

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Vital Surveillances

Cancer Mortality — China, 2018

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Abstract

Introduction Cancer is an important public health concern with heavy disease burden in China. In 2017, cancer is the leading cause of death, with around 2.60 million deaths, which accounts for 26.07% of all deaths. This study aims to present cancer mortality in China in 2018 to provide evidence for cancer control and prevention.

Methods Mortality data from China Cause of Death Reporting System (CDRS) and population data from National Bureau of Statistics are used for cancer mortality estimation. A descriptive analysis was conducted to demonstrate the results.

Results A total of 2,557,297 cancer deaths were estimated in China in 2018 with a mortality rate and age-standardized mortality rate of 183.89 and 145.60 per 100,000, respectively. Lung, liver, and stomach cancer were the three leading causes of cancer death and accounted for around 56.75% of all cancer deaths. The age-standardized mortality rate was higher in men (194.37 per 100,000) than in women (99.47 per 100,000), in urban areas (148.25 per 100,000) than in rural areas (144.62 per 100,000), and in eastern regions (150.57 per 100,000) than in central (142.09 per 100,000)/western regions (141.54 per 100,000). The age-specific mortality rate remains low for the population younger than 44 years old and reaches its peak after 80 years old. Leukemia is the leading cause of cancer death among those aged 0–14 years in both sexes, while breast cancer is the leading cause of cancer death in women aged 15–44 years.

Conclusions and Implications for Public Health Practice The cancer mortality patterns show substantial disparities among sexes, age groups, areas, and regions. Healthy lifestyle promotion, active vaccination uptake, and environmental governance are essential to eliminate cancer-related risk factors in the overall population. Tailored strategies for the early screening

and diagnosis, therapeutic management, and palliative care should be a top priority for enforcement among target populations and regions.

Introduction

In China, the increased cancer mortality making it the leading cause of death since 2010 and a dominant public health problem (*1*). In 2017, around 2.60 million individuals died from cancer, which accounts for 26.07% of all deaths in China (*2*). The number is projected to grow substantially in the coming years due to population aging, socio-economic transitions, and unhealthy lifestyle adoption (*3*). Specific strategies should be initiated to reduce the burden of cancer mortality in China.

Cancer control and prevention rely on population-based mortality data to identify the scope of priorities and to map out enforcement of solutions (*1*). This report provides a detailed picture about the level and distribution of cancer mortality nationwide in 2018, targets that have the greatest need to be prioritized, and a baseline for assessing effectiveness of cancer control efforts in the future (*1*).

Methods

An integrated China Cause of Death Reporting System (CDRS) was established in combination with the Disease Surveillance Points System (DSPs) and National Vital Registration System in 2013. The system covers over 300 million individuals from 605 disease surveillance points in 31 provincial-level administrative divisions that account for 24% of China's population and routinely collects individual details of death information in real time through an internet-based approach. Detailed descriptions of stratified methods, selection of surveillance points, and determination of national representativeness have been reported elsewhere (*4*).

Primary quality control of mortality data was conducted mainly based on comprehensive evaluation criteria for validity, reliability, and completeness (*5*). 512 out of 605 disease surveillance points met the quality control criteria and were included in pooled data. The eligible points covered a population of 272 million, among which a total of 1,822,530 all-cause deaths were reported (*5*). International Classification of Diseases, 10th revision (ICD-10) was used to identify cancer deaths. Cancer-specific mortality data was obtained and stratified by sex, age group, area (urban/rural), and region (eastern/central/western). National population data was obtained from National Bureau of Statistics in 2018 with identical stratification as the mortality data (*6*).

Crude mortality rate of cancer in each stratum by sex, age group, area, and region was calculated using mortality data from eligible points and respective population. In consideration of potential CDRS under-reporting, the mortality rate presented in this report was adjusted through a formula: mortality rate = crude morality rate/(1-under-reporting rate) (*7*). By multiplying the mortality rate with the population in each stratum and calculating the sum, estimated cancer deaths with scaled-up aggregation data in each stratum was acquired. The Sixth National Population Census in 2010 was used for age-standardized mortality rate (ASMR) estimation (*6*). SAS software (version 9.4, SAS Institute Inc., Cary, USA) was applied for statistical analysis.

Results

Table 1 displays the mortality rate, ASMR, and estimated cancer deaths by sex in 2018 nationwide. A total number of 2,557,297 cancer deaths were estimated, with 1,658,302 men and 898,995 women. The mortality rate and ASMR for all cancer sites were 183.89 and 145.60 per 100,000, with 233.74 and 194.37 per 100,000 in men, 132.27 and 99.47 per 100,000 in women, respectively. Lung, liver, and stomach cancer were the three leading causes of cancer death for both sexes and having 1,451,345 estimated deaths in total, which accounts for 56.75% of all cancer deaths with 1,028,777 (62.04%) in men and 422,568 (47.00%) in women. Men showed a higher ASMR than women for nearly all cancer types. For overall cancer and the three leading causes of cancer death, men exceeded women with rates of 194.37 *vs.* 99.47 per 100,000, 60.13 *vs.* 23.72 per 100,000, 35.18 *vs.* 11.52 per 100,000, and 25.08 *vs.* 10.31 per 100,000, respectively.

Table 2 displays the morality rate and ASMR of cancer in different areas and regions. ASMR in urban areas showed a slightly higher value than rural areas at 148.25 and 144.62 per 100,000 respectively. Eastern regions showed the highest ASMR (150.57 per 100,000), followed by central (142.09 per 100,000) and western regions (141.54 per 100,000). Lung, liver, and stomach cancers still rank as the three leading causes of cancer death in both urban and rural areas as well as eastern/central/western regions.

TABLE 1. Mortality rate, age-standardized mortality rate, and estimated deaths of cancer by sex in China, 2018.

ICD-10	Sites	Mortality rate (per 100,000)			ASMR (per 100,000)			Estimated deaths		
		Both sexes	Males	Females	Both sexes	Males	Females	Both sexes	Males	Females
C00-C97	All sites	183.89	233.74	132.27	145.60	194.37	99.47	2,557,297	1,658,302	898,995
C00-C14	Mouth and oropharynx	3.46	5.05	1.81	2.85	4.33	1.40	48,125	35,816	12,309
C15	Esophageal	14.19	20.77	7.38	10.84	16.92	5.02	197,519	147,373	50,146
C16	Stomach	22.61	30.70	14.21	17.48	25.08	10.31	314,459	217,843	96,616
C18-C21	Colon and rectal	13.30	15.59	10.92	10.28	12.87	7.89	184,819	110,627	74,192
C22	Liver	28.31	40.85	15.33	23.30	35.18	11.52	394,028	289,846	104,182
C25	Pancreas	6.39	7.36	5.41	5.00	6.08	3.96	88,930	52,172	36,758
C33-C34	Trachea, bronchus, and lung	53.40	73.44	32.63	41.43	60.13	23.72	742,858	521,088	221,770
C43-C44	Melanoma and other skin	0.85	0.91	0.80	0.66	0.76	0.56	11,848	6,405	5,443
C50	Breast	4.45	0.16	8.91	3.82	0.13	7.48	61,646	1,100	60,546
C53	Cervix uteri	3.15	NA	6.41	2.67	NA	5.32	43,525	NA	43,525
C54-C55	Corpus uteri	1.21	NA	2.46	1.00	NA	1.98	16,719	NA	16,719
C56	Ovarian	1.46	NA	2.96	1.22	NA	2.43	20,121	NA	20,121
C61	Prostate	2.00	3.92	NA	1.42	3.14	0.00	27,783	27,783	NA
C67	Bladder	2.26	3.47	1.02	1.66	2.81	0.68	31,567	24,590	6,977
C81-C90, C96	Lymphomas and multiple myeloma	3.90	4.76	3.01	3.18	4.04	2.35	54,264	33,782	20,482
C91-C95	Leukemia	4.16	4.76	3.52	3.64	4.29	3.00	57,752	33,788	23,964
C17, C23, C24, C26–C32, C37–C41, C45–C49, C51, C52, C57–C60, C62–C66, C68–C80, C97	Other sites	18.79	22.00	15.49	15.16	18.61	11.86	261,334	156,089	105,245

Abbreviation: ASMR=Age-standardized mortality rate; NA=Not applicable.

Table 3 displays the ASMR of cancer in different age groups by sex. The ASMR was relatively low for those 45 years and younger, but then increased drastically by reaching its peak for those 80 years old with rate of 1486.30 per 100,000. Major causes of cancer death differ between age groups. Among the population aged 0–14 years old for both sexes, leukemia, lymphomas and multiple myeloma, and liver cancer are the major causes. While in those aged 60 years or older, lung cancer is the leading cause of cancer. For males aged 15–59 years and female aged 15–44 years, liver cancer and breast cancer are the leading cause of cancer death, respectively.

Discussion

This study presents an up-to-date overview of cancer mortality in China in 2018 with particularly attention paid to population distribution and spatial patterns. This report illustrates a national profile of cancer mortality and creates rational evidence for forming specific strategies in cancer prevention and control (*8*).

Cancer is a major public health problem and the leading cause of death in China. Our results were consistent with GBD2017 estimates (with 2,606,907 deaths, a mortality rate of 184.56 per 100,000, and an ASMR 138.13 per 100,000) (*2*). Lung, liver, and stomach cancers are the leading three causes of cancer death in overall population. Previous studies concluded that nearly 60% of cancer deaths can be avoided by common and modifiable risk factors such as unhealthy lifestyle choices like tobacco consumption, alcohol drinking, physical inactivity, and unbalanced dietary habits (*9*). As one of the leading contributors to premature death, tobacco smoking accounts for 22.6% of all cancer deaths in China and is expected to increase in near future (*9*). Chronic infection contributes to 29% of cancer deaths, predominantly from liver cancer potentially caused by hepatitis B virus and hepatitis C virus, stomach cancer caused by *Helicobacter pylori*, and cervical cancer caused by

TABLE 2. Mortality rate (per 100,000) and age-standardized mortality rate (per 100,000) by area and region in China, 2018.

Sites	Urban		Rural		East		Central		West	
	Mortality rate	ASMR	Mortality rate	ASMR	Mortality rate	ASMR	Mortality rate	ASMR	Mortality rate	ASMR
All sites	187.35	148.25	182.10	144.62	207.73	150.57	173.78	142.09	161.25	141.54
Mouth and oropharynx	3.40	2.79	3.49	2.89	3.90	3.00	2.89	2.46	3.54	3.17
Esophageal	12.64	9.76	14.99	11.40	16.60	11.56	12.00	9.47	13.47	11.48
Stomach	21.03	16.41	23.42	18.05	26.07	18.38	21.78	17.45	18.44	15.89
Colon and rectal	15.96	12.31	11.91	9.28	16.08	11.25	11.30	9.10	11.73	10.13
Liver	25.07	20.52	30.00	24.80	28.06	21.46	29.27	24.57	27.43	24.75
Pancreas	7.69	6.03	5.73	4.49	8.32	5.92	5.53	4.50	4.64	4.02
Trachea, bronchus, and lung	56.43	44.00	51.83	40.21	60.42	42.85	52.47	42.11	43.96	37.96
Melanoma and other skin	0.78	0.61	0.90	0.69	0.92	0.62	0.80	0.64	0.83	0.72
Breast	5.30	4.45	4.02	3.50	5.35	4.28	4.18	3.66	3.47	3.23
Cervix uteri	2.72	2.32	3.36	2.85	2.73	2.20	3.49	2.99	3.31	3.05
Corpus uteri	1.08	0.88	1.27	1.06	1.30	1.00	1.11	0.94	1.19	1.09
Ovarian	1.88	1.57	1.23	1.04	1.85	1.45	1.25	1.08	1.13	1.03
Prostate	2.63	1.91	1.65	1.18	2.54	1.58	1.57	1.18	1.72	1.44
Bladder	2.68	1.99	2.06	1.50	2.77	1.79	2.00	1.54	1.87	1.57
Lymphomas and multiple myeloma	4.48	3.61	3.61	2.97	4.43	3.32	3.74	3.15	3.31	2.97
Leukemia	4.09	3.51	4.19	3.71	4.76	3.92	3.82	3.43	3.69	3.43
Other sites	19.46	15.60	18.46	14.98	21.61	15.96	16.57	13.80	17.53	15.61

Abbreviation: ASMR=Age-standardized mortality rate.

human papillomavirus. In addition, environmental carcinogens like indoor and outdoor air pollution, contaminated soil and drinking water also pose major risks for population cancer mortality (*1*).

Major differences based on sex could be seen in nearly all cancer types. The ASMR in men is approximately two to three times as high as that of their female counterparts, particularly in three leading causes of cancer death. The disparity could be primarily driven by variations in exposure prevalence to cancer-specific risk factors (*3*). For example, the prevalence of daily smoking in men was 45% and 2% for women in 2012, suggesting that underlying potential to reduce cancer levels through reducing tobacco consumption among men (*10*). Men are also more likely to be exposed to occupational hazards in poor working environments compared with women, and this may also increase the risk of cancer-specific mortality (*11*). In contrast, colon cancer ranks fourth for women, which could be explained by higher prevalence of low fruit intake and physical inactivity compared with men (*3*).

Cancer is a chronic disease that is closely related to age. Our results showed the highest cancer mortality among the population aged over 60 years old, and lung, liver, stomach, esophageal, and colon cancers are the primary contributors. Although cancer mortality in children is not as high as in the aging population, certain cancers largely influenced by metabolic and congenital factors pose a heavy burden for children, such as leukemia. Special attention should also be paid to lung cancer in adult males, and breast and cervical cancer in adult females. Early screening, detection, diagnosis, and health promotion is of great necessity. In addition, different strategies should be conducted in accordance with specific populations for cancer control and prevention (*12*).

The spectrum of cancer mortality differs based on area and region for nearly all cancer types in China, which reflects the spatial discrepancies in living habits and healthcare level. In 2018, urban areas and eastern regions were cancer epicenters. Most of the results could be partially explained by rising socioeconomic status, population aging, westernized lifestyle, and endocrine and reproductive factors such as female breast and colon cancer. Despite a slightly lower cancer mortality rate compared with urban areas, digestive-system-related cancers were still the most frequent cancers in rural areas and might be due to factors including limited medical resources, unsatisfactory

TABLE 3. Age-specific mortality rate (per 100,000) of all cancer and five leading types of cancer by sex and age in China, 2018.

Age groups (years old)	Both		Males		Females	
	Sites	Age-specific mortality rate	Sites	Age-specific mortality rate	Sites	Age-specific mortality rate
All	All sites	183.89	All sites	233.74	All sites	132.27
	Trachea, bronchus, and lung	53.40	Trachea, bronchus, and lung	73.44	Trachea, bronchus, and lung	32.63
	Liver	28.31	Liver	40.85	Liver	15.33
	Stomach	22.61	Stomach	30.70	Stomach	14.21
	Esophageal	14.19	Esophageal	20.77	Colon and rectal	10.92
	Colon and rectal	13.30	Colon and rectal	15.59	Breast	8.91
0–14	All sites	3.90	All sites	4.37	All sites	3.35
	Leukemia	1.71	Leukemia	1.94	Leukemia	1.45
	Lymphomas and multiple myeloma	0.31	Lymphomas and multiple myeloma	0.38	Lymphomas and multiple myeloma	0.23
	Liver	0.15	Liver	0.18	Liver	0.12
	Trachea, bronchus, and lung	0.04	Trachea, bronchus, and lung	0.06	Mouth and oropharynx	0.02
	Mouth and oropharynx	0.02	Mouth and oropharynx	0.02	Trachea, bronchus, and lung	0.01
15–44	All sites	18.29	All sites	21.80	All sites	14.67
	Liver	4.56	Liver	7.68	Breast	2.32
	Trachea, bronchus, and lung	2.36	Trachea, bronchus, and lung	2.98	Trachea, bronchus, and lung	1.72
	Leukemia	1.74	Leukemia	2.12	Cervix uteri	1.40
	Stomach	1.33	Stomach	1.46	Leukemia	1.36
	Breast	1.16	Colon and rectal	1.23	Liver	1.34
45–59	All sites	159.37	All sites	206.61	All sites	111.16
	Trachea, bronchus, and lung	38.58	Liver	57.86	Trachea, bronchus, and lung	21.80
	Liver	35.55	Trachea, bronchus, and lung	55.03	Breast	15.07
	Stomach	15.16	Stomach	21.27	Liver	12.79
	Colon and rectal	9.42	Esophageal	14.69	Cervix uteri	10.57
	Esophageal	8.43	Colon and rectal	11.56	Stomach	8.92
60–79	All sites	688.91	All sites	932.01	All sites	448.68
	Trachea, bronchus, and lung	217.96	Trachea, bronchus, and lung	318.85	Trachea, bronchus, and lung	118.27
	Liver	96.87	Liver	138.87	Liver	55.37
	Stomach	90.53	Stomach	132.42	Stomach	49.13
	Esophageal	59.46	Esophageal	91.83	Colon and rectal	35.84
	Colon and rectal	47.83	Colon and rectal	59.96	Esophageal	27.46
80+	All sites	1486.30	All sites	2004.11	All sites	1103.11
	Trachea, bronchus, and lung	452.43	Trachea, bronchus, and lung	645.06	Trachea, bronchus, and lung	309.89
	Stomach	207.59	Stomach	290.90	Stomach	145.94
	Liver	154.51	Liver	205.05	Colon and rectal	119.13
	Colon and rectal	145.83	Esophageal	190.57	Liver	117.12
	Esophageal	135.23	Colon and rectal	181.90	Esophageal	94.28

Note: "Both" represents the total population.

medical treatment, and late cancer diagnosis in under-developed regions, all of which should also be tackled with target strategies (*8*,*13*).

During past decades, several programs related to cancer control and prevention have been launched in China and yielded profound benefits, such as cancer screening for esophageal, stomach, liver, female breast and cervical cancer. Nevertheless, although China has implemented basic medical insurance coverage, solutions to address the geographic variations and unequal distribution of resources, limitations in the availability, accessibility, affordability of medical resources, compliance to treatment, understaffing, lack of professional staff capacity, and insufficient funding reduces the efficacy of existing cancer intervention strategies. In 2016, the government released the "Healthy China 2030" policy, which set an ultimate goal to reduce premature mortality from major noncommunicable diseases by 30% from 2015 to 2030. Since cancer is one of the most fundamental noncommunicable diseases and the leading cause of death, improvement of effective cancer prevention and control interventions will play a key role in achieving the goal (*8*). Interventions such as early screening and diagnosis and therapeutic management among high risk populations and regions are urgently needed (*1*). To eliminate cancer-related risk factors, strategies such as healthy lifestyle promotion, active vaccination uptake, and environmental governance should also be prioritized (*12*).

The findings in this report are subject to some limitations, one of which is reporting accuracy of underlying cause-of-death. Ascertainment bias in cancer diagnosis remains the greatest concern in attenuating the quantity and quality of cancer mortality estimations, which requires correction for redistribution algorithms for implausible diagnostic codes (*14*).

Cancer mortality is expected to increase with existing risk factors explosion and potential ones emerging in the coming years. This report helps to identify heterogeneity in cancer mortality patterns and is of great value for tailoring priorities in cancer control and prevention in China.

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Preplanned Studies

Disproportionate Increase of New Diagnosis of HIV/AIDS Infection by Sex and Age — China, 2007–2018

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Summary

What is already known about this topic?

The annual rates of newly diagnosed HIV/AIDS among total population is increasing in China, yet HIV/AIDS in older adults has received little attention.

What is added by this report?

The overall rates of new diagnosis of HIV/AIDS per 100,000 populations increased 3.26 and 2.18 times among male and female in all ages from 2007 to 2018, respectively. Among adults aged ≥60 years, the rate increased 10.41 times (1.35 to 14.06 per 100,000) from 2007 to 2018. Male adults aged 60–69 and 70–79 years and female aged 50–59 and 60–69 years had the highest increasing rates among all groups.

What are the implications for public health practice?

This study highlights the need to strengthen HIV/AIDS prevention among older adults. Health education and other effective measurements might be used to prevent HIV/AIDS among this group.

The rates of new diagnosis of HIV/AIDS have rapidly increased and HIV/AIDS has become a major public health concern in China (*1*). In most countries, the morbidity and mortality of HIV/AIDS were higher in males than in females and were higher in the younger population than in the older population. While prevention of HIV/AIDS in younger populations have been prioritized in the past (*2*–*3*). The prevalence of HIV/AIDS among older adults (≥60 years) has grown faster than that of younger groups and received less attention. Using data from the Chinese Notifiable Infectious Disease Reporting System (CNIDRS), China CDC analyzed rates of annually diagnosed infections during 2007–2018. Across the 12-year period, the rate of new diagnosis of HIV/AIDS increased 3.26 times (from 4.95 to 16.15 per 100,000) among males and increased 2.18 times (from 2.30 to 5.01) among females. Among older adults aged ≥60 years, the new diagnosis rate increased 10.31 times (from 2.17 to 22.37) among males and 10.81 times (from 0.57 to 6.16) among females. Because surveillance data can help develop prevention efforts, understanding the magnitude and trends in HIV among different sex and age groups is important for improving HIV prevention strategies.

Data from CNIDRS were analyzed to assess HIV/AIDS trends. CNIDRS is a passive notifiable infectious disease case reporting system with nearly 170,000 system users distributed across the country. Medical doctors at all levels of hospitals were obligated to report all newly diagnosed HIV/AIDS cases to this system. We issued a Standard Guide of Case Reporting and carried out regular supervision and annual training at the county level for data quality control. The CNIDRS has set certain logic restrictions for data entry and conducts checks for case duplication across the whole country every month. Therefore, even though some underreporting or duplication of reported HIV/AIDS cases is inevitable, such cases should not significantly alter the data.

Data were stratified by sex and 10-year age groups (0–9, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79, and ≥80 years). Crude annual rates of newly diagnosed HIV/AIDS per 100,000 population and the observed annual rates of newly diagnosed HIV/AIDS, including rates categorized by sex and age group, were calculated. The Joinpoint Regression Program (version 4.6.0; National Cancer Institute) was used to model rates and test time trends. Annual percentage change was calculated to estimate the magnitude and direction of trends across the study period. Data processing and other analyses were conducted using R version 3.5.1 (The R Foundation for Statistical Computing).

From 2007–2018, a total of 1,103,668 HIV/AIDS cases were reported in CNIDRS (Table 1). Compared with females, males experienced higher rates of newly diagnosed HIV/AIDS (10.01 *vs*. 3.45 per 100,000). On average, the highest rates of newly diagnosed HIV/AIDS (16.63, 95% CI*: 16.39–16.88) were

* CI=Confidence Interval

TABLE 1. Number and rate of newly diagnosed HIV/AIDS infections among the overall population and by sex and age group — China, 2007–2018.

Sex/Age group (years)	No. of HIV/AIDS case (%)	Average annual rate* (95% CI)	No. of joinpoints	Joinpoint year range	APC	Modeled rate range	Overall % change in modeled rate range
Total, ALL	1,103,668(100.0)	6.81(6.77−6.86)	0	2007−2018	10.1†	3.8−10.9	189.4
Male, ALL	831,057(75.3)	10.01(9.93−10.08)	0	2007−2010	10.1†	5.1−6.8	33.5
			1	2010−2015	13.9†	6.8−13.0	91.7
			2	2015−2018	7.4†	13.0−16.1	24
Female, ALL	272,611(24.7)	3.45(3.41−3.50)	0	2007−2009	10.6†	2.4−2.9	22.6
			1	2009−2016	4.4†	2.9−3.9	35.4
			2	2016−2018	13.2†	3.9−5.0	27.9
Total, 0−9	9,367(0.8)	0.49(0.46−0.53)	0	2007−2016	-2.8	0.5−0.4	-23.1
			1	2016−2018	42.1	0.4−0.8	102.5
Total, 10−19	32,204(2.9)	1.55(1.49−1.61)	0	2007−2010	11.0	0.6−0.9	35.9
			1	2010−2015	25.0†	0.9−2.7	206.9
			2	2015−2018	-0.1	2.7−2.6	-0.7
Total, 20−29	280,789(25.4)	10.35(10.22−10.49)	0	2007−2012	1.2	8.4−8.9	6.1
			1	2012−2015	12.1†	8.9−12.6	41
			2	2015−2018	-0.7	12.6−12.3	-2.2
Total, 30−39	275,260(24.9)	11.13(10.99−11.28)	0	2007−2018	4.9†	8.5−14.4	70
Total, 40−49	211,865(19.2)	7.62(7.51−7.73)	0	2007−2011	15.7†	3.6−6.4	79.1
			1	2011−2018	9.0†	6.4−11.8	83.5
Total, 50−59	136,826(12.4)	6.71(6.59−6.84)	0	2007−2012	28.3†	1.6−5.5	246.9
			1	2012−2018	18.0†	5.5−15.0	169.7
Total, 60−69	102,416(9.3)	8.21(8.03−8.38)	0	2007−2011	35.4†	1.6−5.5	236.6
			1	2011−2018	17.1†	5.5−16.6	201.6
Total, 70−79	46,068(4.2)	6.47(6.27−6.68)	0	2007−2011	41.1†	1.2−4.9	296.8
			1	2011−2018	13.7†	4.9−12.1	145.1
Total, 80+	8,873(0.8)	3.56(3.30−3.82)	0	2007−2018	17.6†	1.1−6.6	497.3
Male, 0−9	4,950(0.6)	0.49(0.44−0.54)	0	2007−2016	-3.2	0.5−0.4	-26.4
			1	2016−2018	39.8	0.4−0.8	97.4
Male, 10−19	23,713(2.9)	2.13(2.04−2.23)	0	2007−2010	12.8	0.7−1.0	44.1
			1	2010−2015	33.5†	1.0−4.2	323.5
			2	2015−2018	-2.1	4.2−3.9	-6.3
Male, 20−29	214,681(25.8)	15.50(15.27−15.72)	0	2007−2011	2.8	10.1−11.3	11.9
			1	2011−2015	16.5†	11.3−20.9	84.4
			2	2015−2018	-0.2	20.9−20.7	-0.7
Male, 30−39	209,984(25.3)	16.63(16.39−16.88)	0	2007−2018	6.0†	12.0−22.7	89.1
Male, 40−49	159,878(19.2)	11.31(11.12−11.51)	0	2007−2011	16.2†	5.2−9.4	82.5
			1	2011−2018	9.5†	9.4−17.8	89.4
Male, 50−59	94,568(11.4)	9.10(8.90−9.31)	0	2007−2013	27.5†	2.2−9.3	330.1
			1	2013−2018	16.5†	9.3−20.0	114.9
Male, 60−69	75,076(9.0)	11.89(11.59−12.19)	0	2007−2011	35.3†	2.4−8.1	234.3
			1	2011−2018	16.8†	8.1−24.0	196.3
Male, 70−79	39,877(4.8)	11.57(11.18−11.98)	0	2007−2011	40.3†	2.3−8.8	287.7

TABLE 1. (continued)

Sex/Age group (years)	No. of HIV/AIDS case (%)	Average annual rate* (95% CI)	No. of joinpoints	Joinpoint year range	APC	Modeled rate range	Overall % change in modeled rate range
Male, 80+	8,330(1.0)	7.96(7.38−8.58)	1	2011−2018	13.4†	8.8−21.3	141
			0	2007−2018	17.1†	2.5−14.4	466.9
Female, 0−9	4,417(1.6)	0.50(0.45−0.55)	0	2007−2012	6.1	0.4−0.6	33.3
			1	2012−2016	-12.3	0.6−0.3	-41.1
			2	2016−2018	61.7†	0.3−0.9	163.6
Female, 10−19	8,491(3.1)	0.88(0.81−0.94)	0	2007−2018	6.5†	0.6−1.2	98.4
Female, 20−29	66,108(24.2)	4.98(4.85−5.12)	0	2007−2009	3.5	6.4−6.8	7.2
			1	2009−2013	-9.9†	6.8−4.5	-34.2
			2	2013−2018	-4.0†	4.5−3.7	-18.5
Female, 30−39	65,276(23.9)	5.39(5.25−5.54)	0	2007−2009	10.8	4.5−5.5	22.8
			1	2009−2015	-0.8	5.5−5.3	-4.7
			2	2015−2018	5.1	5.3−6.1	15.9
Female, 40−49	51,987(19.1)	3.80(3.69−3.92)	0	2007−2009	23.8†	1.8−2.8	53.3
			1	2009−2018	8.2†	2.8−5.6	104
Female, 50−59	42,258(15.5)	4.23(4.09−4.37)	0	2007−2012	25.4†	1.1−3.4	211.1
			1	2012−2018	19.1†	3.4−9.6	185.7
Female, 60−69	27,340(10.0)	4.44(4.26−4.62)	0	2007−2011	36.2†	0.8−2.9	242.9
			1	2011−2018	18.1†	2.9−9.2	220.1
Female, 70−79	6191(2.3)	1.68(1.54−1.84)	0	2007−2011	42.2†	0.3−1.3	306.5
			1	2011−2018	14.4†	1.3−3.2	155.6
Female, 80+	543(0.2)	0.37(0.27−0.50)	0	2007−2018	17.1†	0.1−0.7	483.3

Abbreviations: APC=annual percentage change; CI=confidence interval.

* Rate per 100,000 population.

† Statistically significant regression results ($p<0.05$).

found in males aged 30–39 years. The lowest rates were found among females aged 80 years and above (0.37, 95% CI: 0.27–0.50).

For the entire 12-year period, the rate of newly diagnosed HIV/AIDS increased 2.92 times (from 3.66 to 10.70) in the overall population, 3.26 times (from 4.95 to 16.15) among males, and 2.18 times (from 2.30 to 5.01) among females. Among adults aged 20–39 years, the rate of newly diagnosed HIV/AIDS increased 1.61 times (8.28 to 13.35), 1.94 times (11.12 to 21.58), and 0.92 times (5.28 to 4.84) from 2007 to 2018 among the overall population, males, and females, respectively. Among adults aged ≥60 years, the rate of newly diagnosed HIV/AIDS increased 10.41 times (1.35 to 14.06), 10.31 times (from 2.17 to 22.37), and 10.81 times (from 0.57 to 6.16) from 2007 to 2018 among the overall population, males, and females, respectively.

The overall crude rate of HIV/AIDS was highest in 2018 and the five age groups with the highest crude rate of HIV/AIDS per 100,000 population were aged 60–69 years (16.98), 50–59 years (14.88), 30–39 years (14.57), 20–29 years (12.36), and 70–79 years (12.28) in 2018 (Figure 1).

The modeled rate among male aged 20–29 years increased 11.9% from 2007 to 2011 and 84.4% from 2011 to 2015 but decreased 0.7% from 2015 to 2018. The modeled rate among female aged 20–29 years increased 7.2% from 2007 to 2009 but decreased 34.2% from 2009 to 2013 and 18% from 2013 to 2018, respectively (Table 1, Figures 2, 3).

The modeled rate among male aged 30–39 years increased 89.1% from 2007–2018. The modeled rate among female aged 30–39 years increased 22.8% from 2007 to 2018, then decreased 4.7% from 2009 to 2015, and then increased 15.9% from 2015 to 2018 (Table 1, Figures 2, 3).

Sharp increases in modeled rate of HIV were observed among female aged 50–59 years and 60–69 years, as well as male aged 60–69 years and 70–79 years (Table 1, Figures 2, 3).

The modeled rate among female aged 50–59 years

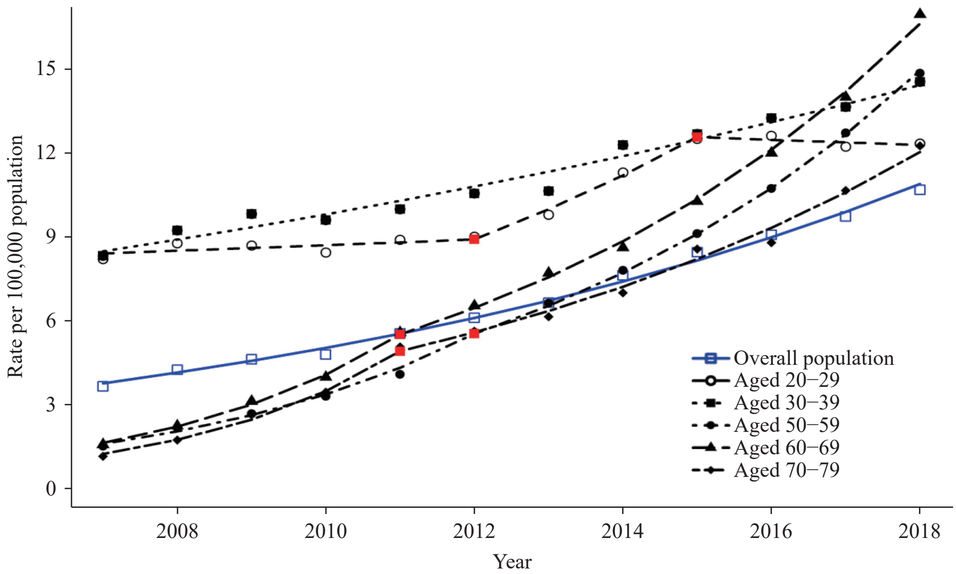

FIGURE 1. Observed and modeled rates of newly diagnosed HIV/AIDS among all population by specific age groups — China, 2007–2018.

Note: Joinpoint regression analysis was used to determine annual percentage change (APC) with statistically significant trends and significant joinpoints. The red points in the figure show the positions of jointpoints for each age group. Rates are single-year rates per 100,000 population.

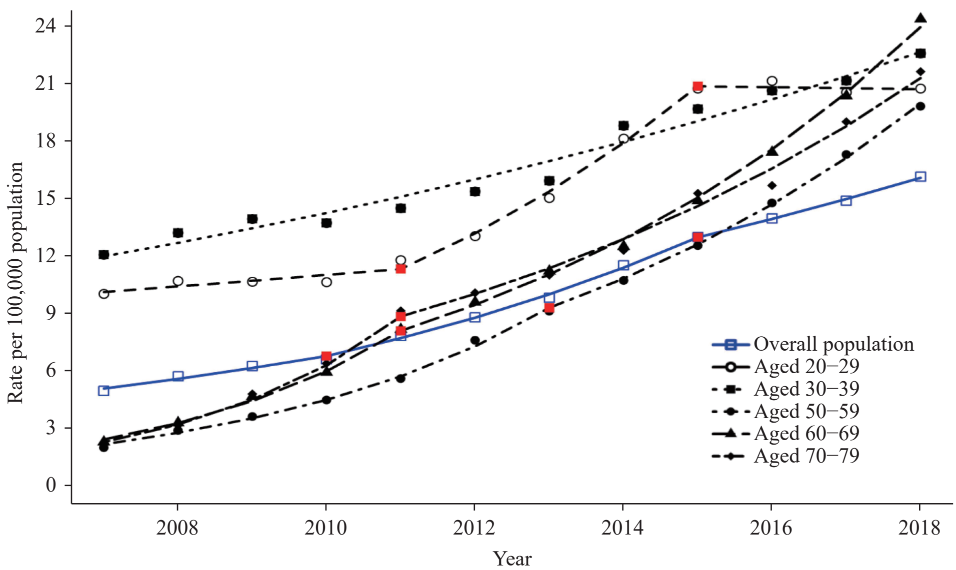

FIGURE 2. Observed and modeled rates of newly diagnosed HIV/AIDS among male by specific age groups — China, 2007–2018.

Note: Joinpoint regression analysis was used to determine annual percentage change (APC) with statistically significant trend and significant joinpoints. The red points in the figure show the positions of jointpoints for each age group. Rates are single-year rates per 100,000 population.

increased 211.1% from 2007 to 2012 and increased 185.7% from 2012 to 2018. The modeled rate among female aged 60–69 years increased 242.9% from 2007 to 2011 and 220.1% from 2011 to 2018, respectively (Table 1, Figures 2, 3).

The modeled rate among male aged 60–69 years increased 234.3% from 2007 to 2011 and 196.3% from 2011 to 2018. The modeled rate among male aged 70–79 years increased 287.7% from 2007 to 2018 (Table 1, Figures 2, 3).

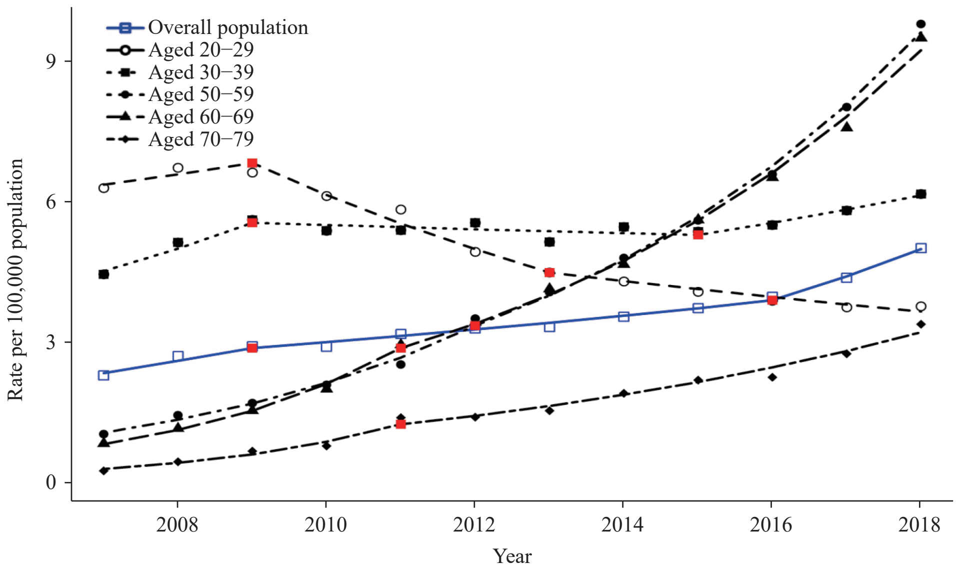

FIGURE 3. Observed and modeled rates of newly diagnosed HIV/AIDS among female by specific age groups — China, 2007–2018.

Note: Joinpoint regression analysis was used to determine annual percentage change (APC) with statistically significant trend and significant joinpoints. The red points in the figure show the positions of jointpoints for each age group. Rates are single-year rates per 100,000 population.

Discussion

From 2007–2018, a total of 1,103,668 HIV/AIDS cases were reported in China. In all study years, the total number and rate of HIV/AIDS in males were higher than those among females, and the rate found in males was approximately three times that of females, which is consistent with other studies suggesting that males are at higher risk (*2*). From 2007 to 2018, the rate of newly diagnosed HIV/AIDS in males increased faster than females. The ratio of modeled rate of newly diagnosed HIV/AIDS in males to females is 2.15∶1 in 2007, which increased to 3.23∶1 in 2018.

Significant differences in changing trends and patterns of rates of newly diagnosed HIV/AIDS were found among different age groups, especially between young adults and old adults. Although the annual average rates of newly diagnosed HIV/AIDS in young adults aged 20–29 years and 30–39 years remained the highest among all age groups, the annual percentage changes (APC) of HIV/AIDS among young adults aged 20–29 years and 30–39 years were less than that of the overall population. The rate of newly diagnosed HIV/AIDS in female aged 20–29 years declined significantly for ten years with APC equal to -9.9 from 2009 to 2013 and -4.0 from 2013 to 2018, and similar trends were also found among female aged 30–39 years.

A sharp increase in rates of newly diagnosed HIV/AIDS was observed among older adults aged 60–69 and 70–79 years. In males, the fastest increasing trends of HIV/AIDS were found in groups aged 60–69 and 70–79 years. In females, the fastest increasing trends of HIV/AIDS were found in groups aged 50–59 and 60–69 years from 2017 to 2018, the crude rates of newly diagnosed HIV/AIDS among these two groups reached the highest among all female groups. Our results were consistent with other studies about the higher risk of HIV/AIDS among older adults at the national, provincial, and local levels in China (*4*–*7*).

Older adults are often less educated and have not been the target populations for long-term HIV/AIDS control and prevention efforts in China. Females aged 50–69 years and males aged 60–79 years in the period before and after retirement often remain sexually active but lack adequate knowledge on protection and safety measures.

The findings in this report are subject to a couple of limitations. First, the scaling up of HIV/AIDS testing, such as implementation of mandatory testing for HIV/AIDS for certain medical treatments in most hospitals, might lead to a rapid increase of HIV/AIDS diagnoses among some groups of population from 2007 to 2018. However, the HIV/AIDS rates in younger females did not increase significantly, which indicates that the impact of expanded testing on the report was not as big as expected. Second, as health education is improved and more widely available, more people will receive HIV/AIDS testing which will increase diagnosis rates.

In summary, findings in this study highlight the need to strengthen HIV/AIDS prevention among older adults. Field surveys need to be conducted to understand the increase in the number of HIV/AIDS cases resulting from true changes in incidence, care-seeking behaviors, or other reasons. Health workers should also try to identify older adults at risk for HIV, to carry out targeted health education and preventative measures, and to treat and support those already affected.

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Perspectives

Identifying Options of Best Value: Use of Economic Evaluation in Public Health

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As economies develop, public health systems evolve, and technologies emerge, public health interventions become increasingly complex and options become limited by cost-effectiveness. As such, the use of economic evaluation has become increasingly important for decision-making in developing countries (*1*). In China, the desires to move towards a data-driven healthcare system and to promote use of health technology assessments (HTA) have highlighted the importance of economic evaluation (*2*).

Economic Evaluation: Terminologies

In public health, evaluation may broadly include both economic and program evaluation. Economic evaluation is defined as "the comparative analysis of alternative courses of action in terms of their costs and consequences" (*3*). Program evaluation is "a systematic way to improve and account for program actions involving methods that are useful, feasible, ethical, and accurate" (*4*). The two methodologies may be used for the same interventions but answer distinctly different questions. They are often intertwined as economic evaluations may rely heavily on the findings from program evaluations.

HTA was defined by the US Office of Technology Assessment in 1994 as "the structured analysis of a healthcare technology, a set of related technologies, or a technology related issue that is performed for the purpose of providing input to a policy decision" (*5*). Economic evaluation is a component of HTA, while other components focus on effect size, equity, and ethical concerns of the technology. Economic evaluations of medical technologies often require conducting new HTAs to generate estimated effect sizes and other parameters if sufficient information from existing studies is not available.

Prevention effectiveness studies are applications of economic evaluation in assessing the health and economic impact of public health policies, programs, and practices by determining their effectiveness, safety, and cost (*6*). Because prevention effectiveness studies are often attempting to project the impact of policy or programs in hypothetical scenarios, these studies face additional challenges. These studies usually involve estimation or simulation of counterfactual impacts, which may not be observed in real life, subjecting them to data and methodological criticism.

Common Methods of Economic Evaluation

Methods of economic evaluation include cost-effectiveness analysis (CEA), cost utility analysis (CUA), cost benefit analysis (CBA), and cost analysis. Each of the first three methods requires a careful cost analysis and an assessment of both beneficial and adverse health effects (*7*). All three methods measure costs in the same way but methods to value health and other benefits differ. CEA examines the cost per unit of health outcome for all options. CUA is a specific form of CEA in which the health outcomes are converted to measures of health-related quality of life such as the quality-adjusted life year (QALY). CBA differs from CEA and CUA in that it includes all the impacts of programs or policies—health and non-health impacts—and monetizes their value to assess whether the benefits exceed the costs. CBA is particularly useful for analyses that include important and substantial non-health benefits. Cost analysis is the process of estimating the cost of a program or policy or the financial cost of the health outcomes (*8*). Results from cost analyses are useful for decision making on their own or can be included in CEA, CUA, and CBA.

Key points to consider during an economic evaluation include: audience, problem or question to be analyzed, treatment or intervention, perspective, time frame and analytic horizon, analytic method, marginal or incremental analysis, costs, health outcomes, discount rate, sensitivity analyses, summary measure, and distributional concerns (*7*). Perspective is of particular importance for economic evaluation in public health, which usually takes a societal or government perspective. A recent guideline recommended economic evaluation studies to take two perspectives including societal perspective (*9*). Further materials outlining the components and details of economic evaluation are available elsewhere (*7*).

Use of Economic Evaluation in Public Health: US and China

Economic evaluation has played an important part in public health decision-making for almost 80 years. US CDC has used economic evaluation in making key program and policy decisions, most notably beginning in early immunization policy. In 1995, US CDC created the CDC Steven M. Teutsch Prevention Effectiveness Fellowship, a two-year postdoctoral training program in health economics to build agency expertise in economic evaluation. The fellowship has trained more than 150 individuals since its inception and has developed a cadre of economists at US CDC with expertise in economic evaluation and policy analysis (*10*). Applications of economic evaluation at US CDC include topics ranging from folic acid fortification to food-borne disease surveillance (*11–12*). However, economic evaluation research within US CDC does not represent the full spectrum of the field as there is a plethora of critical theoretical and applied research on economic evaluation outside of the agency. Systematic reviews elsewhere provide more comprehensive lists of economic evaluation studies within and outside of US CDC (*1–2*).

China is also utilizing economic evaluation for public health decision-making. Earlier economic evaluations of public health programs in China include those on the use of Japanese encephalitis vaccine (*13*), annual influenza vaccination among children aged 6 months to 14 years (*14*), and a nationwide hepatitis B catch-up vaccination among children and adolescents (*15*). Many economic evaluations in China have employed the modeling of complex diseases and interventions such as those for HIV/AIDS, universal newborn hepatitis B vaccination, and diabetes prevention (*16*). Some of the economic evaluations have resulted from collaboration between public health communities in the US and China (*13–14*).

Use of economic evaluation as part of HTA in China has steadily increased over the last decade. China's commitment to evidence-based decision-making in health and medicine has spurred interest and investment in HTA (*2*). To illustrate this point, a study of the Tufts Medical Center Cost-Effectiveness Analysis Registry (CEA Registry) found an increasing trend in the number of CEA studies with a geographic focus on Mainland China, concentrating on oncology, infectious and parasitic diseases, and endocrine, metabolic, and nutritional diseases (*2*). More broadly, a bibliometric analysis of full economic evaluations between January 1, 2012 and May 3, 2014 found China-based studies accounted 30% of all economic evaluation in upper-middle-income countries with similar major diseases areas of focus (*1*). CEA is more popular than CUA in upper-middle-income countries than it is in high-income countries (*1*), possibly due to the difficulty of developing population-specific QALY weights (*17*).

Misconceptions about Economic Evaluation

There are common misconceptions about the value of economic evaluation for public health decision-making. Some public health practitioners are not convinced of the need for economic evaluations because their value may be limited for straightforward situations. However, they can be critical for complex decision-making. For example, funding allocations between different disease areas or between public health and other functions often require systematic and comprehensive evaluation. Even for a specific health condition, there may be a multitude of options to be assessed. As high impact policy and program opportunities have become exhausted (eg., water fluoridation and urban sanitation), public health practitioners are now dealing with increasingly complex interventions involving emerging technologies and intricate social dynamics. Systematic, evidence-based evaluations of the impacts, cost, and benefits are critical for informed decision-making.

Another misconception is that economic evaluation serves as post hoc justification and has limited impact. However, economic evaluations have provided unexpected critical insights and guided public health policies. For instance in 2009, US CDC used economic evaluation to conduct a regulatory impact analysis to assess the health and other impacts of removing HIV infection from the definition of communicable disease of public health significance, which would allow foreign persons with HIV infection to be admitted into the US (*18*). US CDC researchers estimated that even at an upper bound estimated annual healthcare system cost of US $173 million, the benefits of the policy including family reunion, bringing in high-skill immigrants, and reducing stigma associated with HIV patients outweighed the cost (*18*). In 2010, regulations based on the US CDC analysis removed HIV status as automatic grounds for inadmissibility.

Another example, possibly illustrating the complexities of economic evaluations, is a recent CBA conducted by the Food and Drug Administration (FDA) of a proposed rule that would require graphic warning labels on cigarette packs (*19*). Disputes over the methodology used in the analysis has prevented the FDA from issuing a regulation that would have promoted tobacco cessation. After the economic community weighed in on the methodological controversy (*19*), the FDA issued a updated proposed rule and will change the recommended methodology for examining regulatory impact of the rule (*20*).

Recent Developments and Conclusions

While economic evaluation becomes more widespread and methods continue to develop, both users and practitioners are working to standardize the field. Three recent notable efforts include the updated CEA guidelines published by the Second Panel on Cost-Effectiveness in Health and Medicine (*9*), the Gates Reference Case for CEAs of Health Projects funded by the Bill & Melinda Gates Foundation (*21*), and methods for valuing mortality risks in low- and middle-income countries published by researchers from the Harvard T.H. Chan School of Public Health (*22*).

As the importance of economic evaluation as a decision-making tool grows, China's public health community should prioritize building its economic evaluation capacity. This will allow public health practitioners to identify the policies, interventions, and programs that offer the best value for the Chinese people and to contribute to its methodological development.

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Notes from the Field

An Outbreak of NCIP (2019-nCoV) Infection in China — Wuhan, Hubei Province, 2019−2020

The 2019-nCoV Outbreak Joint Field Epidemiology Investigation Team[1,2,3]; Qun Li[1,#]

Emerging and re-emerging pathogens are great challenges to the public health (*1*). A cluster of cases of viral pneumonia of unknown etiology (VPUE), now known as novel coronavirus-infected pneumonia (NCIP), occurred in Wuhan, Hubei Province and was reported to health authorities on December 29, 2019 (*2*). A national, provincial, and municipal joint investigation team has been assembled to conduct field investigations and implement disease control and prevention measures. This report shows interim results of the investigation and makes recommendations for response measures.

Identification of the Epidemic

On December 29, 2019, a hospital in Wuhan admitted four individuals with pneumonia and recognized that all four had worked in the Huanan Seafood Wholesale Market, which sells live poultry, aquatic products, and several kinds of wild animals to the public. The hospital reported this occurrence to the local center for disease control (CDC), which lead Wuhan CDC staff to initiate a field investigation with a retrospective search for pneumonia patients potentially linked to the market. The investigators found additional patients linked to the market, and on December 30, health authorities from Hubei Province reported this cluster to China CDC. The following day, China CDC sent experts to Wuhan to support the investigation and control effort. Samples from these patients were obtained for laboratory analyses.

To identify potential cases, a temporary surveillance case definition for the VPUE was established at that time that was consistent with previous "pneumonia of unknown etiology" definitions: an illness of unknown etiology with 1) fever with or without a recorded temperature; 2) radiographic evidence of pneumonia; 3) low or normal leukocyte count or low lymphocyte count during the early stage of disease; and 4) no improvement or worsening symptoms after 3 to 5 days of antimicrobial treatment per standard clinical guidelines (*3*).

A probable case of VPUE was defined as a surveillance VPUE case or an illness of unknown etiology fulfilling the first three surveillance VPUE case criteria with a history of exposure to the Huanan Seafood Wholesale Market in Wuhan or any other VPUE case.

The initial laboratory screening results from patients were negative for 26 common respiratory pathogens, including influenza A and B virus, parainfluenza virus, adenovirus, respiratory syncytial virus, metapneumovirus, rhinovirus, enterovirus, and other common respiratory viruses. On January 3, 2020, the sequence of novel β-genus coronaviruses (2019-nCoV) was determined from specimens collected from patients in Wuhan by scientists of the National Institute of Viral Disease Control and Prevention (IVDC), and three distinct strains have been established (*2*). On January 7, this novel coronavirus was confirmed to be the pathogenic cause of this VPUE cluster, and the disease has been designated NCIP.

Epidemiological Findings

Patients' clinical manifestations were consistent with viral pneumonia. Most patients had severe and nonproductive cough following illness onset, some had dyspnea, and almost all had normal or decreased leukocyte counts and radiographic evidence of pneumonia.

Huanan Seafood Wholesale Market has western and eastern sections, and 15 environmental specimens collected in the western section were positive for 2019-nCoV virus through RT-PCR testing and genetic sequencing analysis. Despite extensive searching, no animal from the market has thus far been identified as a possible source of infection.

As of January 19, 198 cases of NCIP have been reported in Wuhan with 110 (55.6%) cases reported in males. The median age was 57 years old with a range of 26 to 89 years. As of this day, 25 patients have recovered and have been discharged from medical care, and 3 patients have died. A total of 170 patients are receiving isolated medical treatment at designated Wuhan medical facilities. Among these patients, 126 are classified to have mild illnesses, 35 have severe illnesses, and 9 are in critical condition. A total of 817 close contacts of cases have been placed under quarantine for medical observation, of which 727 have been cleared and 90 remain in quarantine. No cases of NCIP have been found among the close contacts.

A total of 16 health care workers (HCWs) are believed to have been infected while caring for patients from the outbreak; 15 have confirmed NCIP, and 1 HCW is still under being verified.

Two clusters containing two cases and three cases, respectively, were identified among the confirmed cases. Human-to-human transmission appears to have occurred in the two-person cluster.

The epidemiological investigation of 198 confirmed cases revealed that 22% of patients had direct exposure to the Huanan Seafood Wholesale Market before illness onset; 32% of patients had contact with patients with fever or respiratory symptoms; and 51% of cases had neither visited the Huanan Seafood Wholesale Market nor had contact with similar patients before their illness onset.

Preliminary Conclusions

This outbreak was detected in Wuhan in late December 2019 and was caused by a novel coronavirus 2019-nCoV. Although investigation into the source or sources of NCIP is ongoing, exported cases have been reported by Thailand, Japan, Republic of Korea, and other provinces in China, indicating that the epidemic is ongoing in Wuhan and that further spread is almost certain.

During the investigation, the following was concluded: 1) recently-reported, confirmed cases have had no history of exposure to the Huanan Seafood Wholesale Market; 2) human-to-human transmission has occurred; and 3) HCWs have been shown to have been infected by the novel coronavirus. Based on this information, transmission within communities is believed to be taking place in Wuhan.

Measures to prevent or reduce transmission should be implemented, including use of personal protective equipment (surgical masks), school closures, postponement or cancellation of mass gatherings, and exit screenings.

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