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## Announcements

## The 26<sup>th</sup> National Cancer Week — April 15, 2020

China's 26<sup>th</sup> National Cancer Week is held from April 15 to 21 and was initiated by the China Anti-Cancer Association in 1995.

Cancer is an important cause of death worldwide. Globally, it had caused 9.6 million deaths and 233.5 million disability-adjusted life years (DALY), and the total number of deaths has been increasing according to the Global Burden of Disease Study (GBD) 2017 (1). With economic growth and population aging, China is suffering a larger burden of disease. The 4 cancers with the most diagnoses were lung, stomach, liver, and esophageal cancer, which account for 57% of cancers in China (2). Among these four causes, two of them were gastrointestinal (GI) tract cancers; in addition, colorectal cancer is also increasing. Proactive prevention, intervention, screening, early diagnosis, and treatment may improve the effectiveness of disease management and prolong the survival time of patients and reduce mortality.

Cancer prevention and control is not only a health issue, but also a livelihood issue, an economic issue, and a social issue. Themed "Joint Action for Anti-Cancer", this year's publicity week aims to advocate the government, society, and individuals to take active action, create a healthy and supportive environment, widely promote cancer prevention awareness, and enhance public awareness and capacity of cancer prevention to reduce social harm and the burden of disease.

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## Preplanned Studies

## Mortality of Common Gastrointestinal Tract Cancers — Huai River Basin, 2008–2018

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### Summary

#### What is already known on this topic?

Gastrointestinal (GI) tract cancer is a leading cause of death and produces a heavy disease burden. GI tract cancer in the Huai River Basin was reportedly higher than the national level during 2004–2006, while current mortality rates and variations have not been reported recently.

#### What is added by this report?

During 2008 to 2018, significant decreases were observed in the rates of esophageal cancer (from 28.5 to 13.2 per 100,000) and stomach cancer (from 32.1 to 16.5 per 100,000). There was no statistical difference for the mortality rates of colorectal cancer, which actually showed a significant increase among men aged 45 to 54 years and women aged below 55 years. Substantial disparities exist among different sexes, age groups, and geographical regions.

#### What are the implications for public health practice?

These results highlight that the mortality of GI tract cancers in the Huai River Basin in 2018 are similar to national levels and still produce a heavy disease burden. More attention is needed to provide important evidence for evaluating the improvement and remaining gaps in cancer prevention and control strategies in the Huai River Basin.

Gastrointestinal (GI) tract cancers, commonly including esophageal, stomach, and colorectal cancer, have been a leading causes of death causing 2.2 million deaths and 46.5 million years of life lost (YLLs) as estimated in the Global Burden of Diseases Study (GBD) 2017 (1). Stomach, esophageal, and colorectal cancers were ranked as the seventh, eleventh, and fifteenth leading causes of YLLs in both men and women in China (2). Previous reports have noted that

the cancer mortality in the Huai River Basin was higher than the national level during 2004–2006 (3). In this study, mortality data was used for the first time to demonstrate temporal trends, population distributions, and geographical distributions of GI tract cancer in the Huai River Basin from 2008 to 2018 (3). Trends of GI tract cancer mortality were examined by sex, age group, and region of the Huai River Basin. Study results indicated that, from 2008 to 2018, age-standardized mortality rate (ASMR) of esophageal and stomach cancer decreased annually by 6.7% and 5.9%, respectively, for both sexes, and the decrease in ASMR also occurred in some specific demographic and geographic subgroups. However, the ASMR of colorectal cancer did not decrease significantly and actually significantly increased among men aged 45 to 54 years (average annual percent change [AAPC]: 3.3%, 95% CI\*: 0.5%–7.2%) and among women aged below 55 years (AAPC aged 0–44 years group: 2.7%, 95% CI: 1.1%–5.3%; AAPC aged 45–54 years group: 7.5%, 95% CI: 3.4%–11.8%). This study also displayed geographic disparities for GI tract cancers, and the mortality of GI tract cancers in the Huai River Basin in 2018 was similar with national levels through related targeted prevention and control measures over the past 11 years (4). Continuous early diagnosis and treatment of GI tract cancers in the Huai River Basin, improved water quality, and improved healthcare conditions may play roles in decreasing mortality. As the lifestyles and dietary habits of Chinese residents have changed, prevention strategies should be further strengthened to target GI tract cancers, and colorectal cancer should be prioritized.

Mortality data of GI tract cancers were obtained from China CDC's Cause of Death Reporting System (CDRS) from 2008 and 2018. According to the International Classification of Diseases, 10<sup>th</sup> revision (ICD-10), esophageal cancer, stomach cancer, and colorectal cancer were coded as C15, C16, and C18–C21, respectively, for this study.

Based on the geographical distribution of the Huai River, its tributaries, and the "Encyclopedia of Rivers and Lakes in China", 14 districts and counties from 4 provinces (Anhui, Henan, Shandong, and Jiangsu) in the Huai River Basin were divided into 5 categories: the upstream basin (upper stream) including 2 counties; the midstream north basin (midstream-north) including 6 counties or districts; the midstream

south basin (midstream-south) including 1 county; the downstream basin (downstream) including 3 counties; and the Yishui River Basin including 2 counties. This report used the Sixth Chinese National Census (2010) as the standard population to calculate the age-standardized mortality rate (ASMR). Joinpoint regression was used to examine the significance of trends and to calculate the AAPC by different sub-regions of the basin, diseases, sex, and age groups during 2008–2018. When AAPC>0, the ASMR showed an upward trend, otherwise it showed a downward trend (5).

A total of 70,691 deaths were reported due to GI tract cancer from 2008 to 2018, with 47,131 males and 23,560 females. The ASMRs per year were higher among men than women by diseases. From 2008 to 2018, the ASMR of esophageal cancer decreased steadily from 28.5 per 100,000 population to 13.2 and for stomach cancer from 32.1 per 100,000 population to 16.5. For esophageal cancer and stomach cancer, the AAPC decreased –6.7% (95% CI: –7.7% to –5.8%,  $p<0.001$ ) and –5.9% (95% CI: –7.0% to –4.9%,  $p<0.001$ ) per year, respectively. Downward trends were significant across both sexes, and the AAPC of ASMR for esophageal and stomach cancers were higher among men compared to women (esophageal cancer: AAPC=–6.7% in men, AAPC=–7.7% in women; stomach cancer: AAPC=–6.0% in men, AAPC=–6.5% in women). However, the ASMR of colorectal cancer showed stability from 2008 to 2018 for both men and women, and there was no statistical difference (Table 1).

The mortality rate of GI tract cancers increased with age in both men and women, and the rate was much higher among those aged 65 years and above. There was an obviously statistical difference for mortality of esophageal and stomach cancer in all age-groups for men and women. For both sexes, the mortality rate of stomach cancer decreased significantly among those aged 55 years and above and decreased to a lesser degree among those aged below 55 years old. The mortality rates of colorectal cancer in different age groups presented different characteristics. The mortality rate increased significantly among men aged 45 to 54 years (AAPC: 3.3%, 95% CI: 0.5%–7.2%) and women aged below 55 years old (AAPC aged 0–44 years group: 2.7%, 95% CI: 1.1%–5.3%; AAPC aged 45–54 years group: 7.5%, 95% CI: 3.4%–11.8%). There were no significant differences in mortality rate

\* CI=confidence interval.

TABLE 1. Age-standardized mortality rate (per 100,000) and average annual percent change (%) of gastrointestinal tract cancers in the Huai River Basin by sex, 2008–2018.

Year	Esophageal cancer						Stomach cancer						Colorectal cancer					
	Both		Male		Female		Both		Male		Female		Both		Male		Female	
	CMR	ASMR	CMR	ASMR	CMR	ASMR	CMR	ASMR	CMR	ASMR	CMR	ASMR	CMR	ASMR	CMR	ASMR	CMR	ASMR
2008	24.3	28.5	31.0	40.5	17.3	18.4	27.4	32.1	36.0	46.6	18.3	19.6	5.9	6.8	6.5	8.4	5.2	5.6
2009	21.0	24.3	27.1	35.2	14.5	15.2	25.6	29.6	33.3	42.6	17.5	18.5	5.8	6.8	6.5	8.6	5.0	5.3
2010	21.5	24.8	29.1	37.1	13.6	14.4	26.1	29.9	34.9	43.9	16.8	17.8	6.2	7.2	7.2	9.3	5.2	5.6
2011	23.8	23.4	31.7	34.3	15.8	14.1	28.6	28.3	39.1	42.3	18.1	16.5	7.5	7.5	8.5	9.4	6.4	5.9
2012	21.8	19.4	29.6	27.8	14.0	11.5	25.6	23.0	35.5	33.5	15.5	13.2	7.1	6.5	7.8	7.5	6.5	5.5
2013	20.9	18.9	27.3	25.9	14.5	12.3	25.2	22.8	34.2	32.4	16.2	13.6	7.4	6.7	8.1	7.8	6.7	5.7
2014	20.8	18.1	29.1	26.6	12.5	10.1	25.4	22.4	34.7	32.1	16.1	13.3	7.9	7.1	9.0	8.5	6.8	5.8
2015	20.8	17.8	27.9	25.2	13.9	11.2	25.2	21.8	34.9	31.7	15.6	12.7	9.0	7.9	10.4	9.6	7.6	6.3
2016	20.7	16.2	28.0	23.4	13.4	9.6	24.7	20.0	33.8	28.5	15.6	12.0	8.3	6.8	9.9	8.4	6.8	5.3
2017	19.4	15.1	27.4	22.7	11.4	8.0	24.2	19.5	33.8	28.6	14.5	11.1	9.4	7.7	10.8	9.3	7.9	6.1
2018	18.1	13.2	24.5	19.2	11.5	7.6	21.8	16.5	29.8	23.9	13.6	9.4	8.9	6.8	10.4	8.5	7.4	5.3
AAPC	-6.7 <sup>*</sup>		-6.7 <sup>*</sup>		-7.7 <sup>*</sup>		-5.9 <sup>*</sup>		-6.0 <sup>*</sup>		-6.5 <sup>*</sup>		0.5		0.2		0.4	
(95% CI)	- (-7.7 to -5.8)		- (-7.8 to -5.5)		- (-9.1 to -6.3)		- (-7.0 to -4.9)		- (-7.2 to -4.8)		- (-7.6 to -5.5)		- (-0.9 to 1.9)		- (-1.5 to 1.9)		- (-0.8 to 1.7)	

Abbreviations: CI=confidence interval, CMR=Crude Mortality Rate, ASMR=age-standardized mortality rate, AAPC=average annual percent change.

<sup>\*</sup>  $p < 0.05$ .

between men and women aged 55 years old and above (Table 2).

Overall, the ASMRs by spatial distribution of the Huai River Basin were presented in Table 3. The downstream basin had the highest ASMR of GI tract cancers for men and women from 2008 to 2018, among which, the mortalities of 2 cancers decreased significantly (esophageal cancer: from 47.2 to 21.3 per 100,000; AAPC=-6.3%, 95% CI: -7.7% to -5.0%; stomach cancer: from 40.7 to 21.7 AAPC=-5.9%, 95% CI: -6.6% to -5.2%), and mortality of colorectal cancer did not decrease significantly (from 8.6 to 9.3 AAPC=1.2%, 95% CI: -0.5% to 3.1%), followed by the Yishui River Basin and midstream-south basin. The AMSR of colorectal cancer increased significantly among women in the Yishui River Basin (AAPC=4.2%, 95% CI: 0.1% to 8.3%).

## DISCUSSION

Long-term real-time surveillance for cancer incidence and mortality can not only indicate clues to influence factors but also provide important evidence for evaluating the effectiveness of cancer prevention and treatment. GI tract cancers are important causes of death worldwide, and the total number of deaths has been increasing globally (1). According to the Global

Cancer Statistics Report 2018, there were approximately 400,000 esophageal cancer deaths worldwide in 2014, among which 37.0% of them occurred in China (6). Stomach cancer was the first leading cause of cancer death in 1970–1990 (3) and was still one of the main public health problems over the following several decades (4). This is the first study to demonstrate temporal trends of GI tract cancer mortality during a recent 11 year period in the Huai River Basin, which is a key area. In the findings, the ASMR of esophageal and stomach cancer declined rapidly from 2008 to 2018. By contrast, the ASMR of colorectal cancer showed stability during the study period, and even a substantial upward trend could be found among people aged 55 and below of colorectal cancer, especially for women living in the Yishui River Basin. A higher mortality rate and ASMR among men than women were observed in all given years by cancer site, and cancer mortality increased with age.

Some evidence showed that the mortality of GI tract cancers in the Huai River Basin was higher than the national level during 2004–2006. The mortality in certain counties for esophageal cancer was 2.8 times higher than national levels and for stomach cancer 1.6 times higher (3). By contrast, the reduction of mortality declined to national levels in 2018 (4), which could presumably be due to a series of prevention

TABLE 2. Mortality rate (per 100,000) and average annual percent change (%) of gastrointestinal tract cancers in the Huai River Basin, by sex and age group, 2008 and 2018.

Sites/Age group (years)	2008			2018			AAPC (95% CI)		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
<b>Esophageal cancer</b>									
<45	0.3	0.4	0.2	0.1	0.1	0.1	-9.7*(-16.4 to -2.5)	-8.2(-17.5 to 2.3)	-11.8*(-18.7 to -4.4)
45-54	12.1	18.4	5.5	4.3	7.2	1.6	-8.5*(-11.1 to -5.8)	-7.1*(-9.8 to -4.2)	-12.1*(-16.8 to -7.1)
55-64	50.6	71.0	29.6	24.1	37.7	10.1	-7.6*(-9.7 to -5.4)	-6.5*(-8.8 to -4.2)	-10.5*(-13.0 to -8.0)
65-74	157.4	214.8	100.0	79.2	113.3	43.7	-5.4*(-6.8 to -4.0)	-5.1*(-6.5 to -3.7)	-6.4*(-9.0 to -3.7)
≥75	352.7	495.2	250.0	164.7	229.2	113.6	-6.6*(-8.5 to -4.7)	-7.0*(-8.5 to -5.5)	-6.7*(-8.2 to -5.2)
<b>Stomach cancer</b>									
<45	1.1	1.2	1.0	0.6	0.7	0.5	-3.7(-9.0 to 2.0)	-3.3(-7.3 to 0.8)	-6.2(-12.3 to 0.3)
45-54	16.9	25.3	8.3	11.5	16.3	7.0	-3.8*(-6.5 to -1.0)	-3.5*(-5.9 to -1.1)	-3.7(-8.2 to 0.9)
55-64	56.5	82.5	29.8	31.1	46.5	15.4	-6.5*(-8.9 to -4.1)	-6.0*(-7.8 to -4.1)	-6.7*(-9.2 to -4.2)
65-74	171.2	246.1	96.3	94.2	137.0	49.8	-4.8*(-6.0 to -3.6)	-4.7*(-6.0 to -3.3)	-5.7*(-7.2 to -4.1)
≥75	375.7	537.4	259.2	173.2	248.8	113.3	-7.0*(-8.5 to -5.6)	-7.0*(-8.7 to -5.4)	-7.6*(-9.1 to -6.1)
<b>Colorectal cancer</b>									
<45	0.9	0.7	1.0	0.5	0.8	0.3	0.0(-3.9 to 4.0)	2.6(-4.1 to 6.5)	2.7*(1.1 to 5.3)
45-54	4.3	6.0	2.5	6.6	7.2	6.1	4.9*(1.7 to 8.3)	3.3*(0.5 to 7.2)	7.5*(3.4 to 11.8)
55-64	13.3	15.7	10.8	13.6	17.2	10.0	0.2(-2.3 to 2.7)	0.5(-2.1 to 3.3)	-0.4(-3.3 to 2.7)
65-74	30.7	36.2	25.2	31.1	35.7	26.4	1.5(-0.9 to 3.9)	2.1(-1.0 to 5.4)	0.5(-2.3 to 3.3)
≥75	70.4	89.8	56.5	70.6	92.4	53.2	-0.6(-2.3 to 1.1)	-1.2(-3.3 to 0.9)	-0.1(-2.3 to 2.1)

Abbreviations: CI=confidence interval, AAPC=average annual percent change.

<sup>a</sup>*p*<0.05.

strategies implemented by the government. Rapidly reduced ASMRs from esophageal and stomach cancers can be observed, which is consistent with previous findings from the Chinese Burden of Disease 2017 study (2). With economic growth and population aging, the increased number of cancer deaths was closely related to changing patterns of dietary habits and lifestyles. Previous studies showed healthy lifestyle changes among the general public have associations with reduced deaths, such as smoking cessation, low-sodium diet, restricted drinking and processed meat intake, sufficient consumption of vegetables and fruits, and so forth (7-8). Among high-risk individuals, earlier detection, diagnosis, and treatment were introduced for specific cancer sites, such as *Helicobacter pylori* infection screening, which may improve the effectiveness of disease management and prolong the survival time of patients and reduce mortality.

Previous studies showed increasing trends of colorectal cancer death (9). In this study, the ASMR of colorectal cancer did not differ significantly, while mortality increased and the ASMR trended upward among young people during the study period. The

diet-structure and other personal risk behaviors, such as lack of physical activity, high-fat, and low-fiber diet intake have becoming increasingly common and could increase colorectal cancer mortality (7). Colorectal cancer statistics (2020) reported that colorectal cancer death rates increased by 1.3% annually in those aged younger than 50 years from 2008 to 2017 in the United States, which is similar to results found in this study (9). The rapid growth of obesity among young people could contribute to increasing colorectal cancer death, and lifestyle differences may be the main reason contributing to the mortality differences between men and women. For example, many studies showed that unhealthy lifestyle habits such as drinking, smoking, and insufficient vegetable and fruit intake for men (7). Exploring reasons contributing to stable periods is difficult, and the observation period needs to be extended to determine trends in the long-term mortality in the future.

Unsafe sanitation was the main environmental risk factor of GI tract cancers, including drinking untreated water, using non-sanitary toilets, discharging wastewater freely, and increasing usage of pesticides

TABLE 3. Mortality rate (per 100,000), age-standardized mortality rate (per 100,000), and average annual percent change (%) of gastrointestinal tract cancers in the Huai River Basin, by sex and basins, 2008 and 2018.

Basin/Sites	2008						2018						AAPC (95% CI) for ASMR											
	Both			Male			Female			Both					Male			Female						
	CDR	ASMR		CDR	ASMR		CDR	ASMR		CDR	ASMR		CDR	ASMR		CDR	ASMR		CDR	ASMR		Both	Male	Female
Upper stream																								
Esophageal cancer	20.1	21.3	26.9	32.1	12.3	12.9	12.9	12.3	11.3	15.9	11.3	21.4	17.1	10.1	6.1	-6.4* (-7.8 to -5.0)	-6.1* (-7.6 to -4.6)	-7.1* (-8.9 to -5.3)						
	32.7	34.0	46.2	52.6	18.0	18.4	18.4	18.0	19.3	26.0	19.3	37.7	30.2	14.0	9.3	-5.3* (-6.7 to -4.0)	-5.3* (-7.4 to -3.1)	-6.0* (-8.1 to -3.9)						
	8.2	8.5	9.4	10.4	6.6	6.9	6.9	6.6	8.1	10.8	8.1	12.2	9.7	9.4	6.5	1.0 (-1.6 to 3.8)	1.0 (-2.3 to 4.3)	0.8 (-2.6 to 4.3)						
Midstream-north																								
Esophageal cancer	15.9	19.7	19.2	26.9	13.7	12.4	12.4	13.7	9.4	11.9	9.4	16.0	13.5	7.7	5.5	-7.3* (-8.4 to -6.1)	-7.1* (-9.0 to -5.3)	-8.4* (-10.2 to -6.6)						
	20.4	25.4	25.2	35.4	17.0	15.2	15.2	17.0	13.8	16.6	13.8	21.6	19.2	11.6	8.6	-5.7* (-7.2 to -4.1)	-5.8* (-7.5 to -4.1)	-6.1* (-7.6 to -4.5)						
	4.8	5.9	5.4	7.5	4.6	4.1	4.1	4.6	5.6	6.8	5.6	8.3	7.4	5.2	4.0	-0.1 (-2.1 to 1.8)	-0.6 (-2.7 to 1.6)	0.1 (-2.5 to 2.7)						
Midstream-south																								
Esophageal cancer	26.5	29.3	39.5	44.2	13.9	12.6	12.6	13.9	11.0	15.5	11.0	24.1	16.7	6.1	4.5	-9.5* (-10.9 to -8.1)	-9.7* (-11.3 to -8.1)	-10.5* (-13.5 to -7.3)						
	31.7	35.8	46.4	54.6	17.5	15.8	15.8	17.5	19.2	27.0	19.2	38.0	26.7	14.9	10.8	-6.4* (-8.0 to -4.7)	-7.0* (-8.9 to -5)	-6.0* (-7.6 to -4.4)						
	5.3	5.7	5.9	6.4	4.9	4.7	4.7	4.9	7.0	9.1	7.0	11.2	8.7	6.7	5.2	-0.8 (-4.3 to 2.8)	0.8 (-3.1 to 4.8)	-2.9 (-6.1 to 0.3)						
Downstream																								
Esophageal cancer	42.9	47.2	54.5	67.6	30.9	30.9	30.9	30.9	21.3	33.9	21.3	43.3	29.9	24.5	13.8	-6.3* (-7.7 to -5.0)	-6.4* (-7.9 to -4.8)	-7.0* (-8.9 to -5.0)						
	38.5	40.7	52.6	62.1	23.4	24.0	24.0	23.4	21.7	33.3	21.7	47.2	32.7	19.6	11.9	-5.9* (-6.6 to -5.2)	-6.1* (-6.9 to -5.3)	-6.2* (-8.1 to -4.3)						
	8.1	8.6	8.2	10.5	7.6	7.9	7.9	7.6	9.3	13.9	9.3	16.3	11.7	11.5	7.4	1.2 (-0.5 to 3.1)	1.4 (-0.5 to 3.4)	0.2 (-2.4 - 2.8)						
Yishui River Basin																								
Esophageal cancer	35.3	42.4	44.9	60.3	27.4	25.5	25.5	27.4	18.9	26.3	18.9	37.4	29.1	14.9	9.5	-5.7* (-7.4 to -3.9)	-5.4* (-7.2 to -3.6)	-7.1* (-9.9 to -4.3)						
	33.0	40.1	41.2	55.2	27.0	24.6	24.6	27.0	15.8	20.9	15.8	29.0	23.6	12.6	8.4	-7.4* (-11.9 to -2.6)	-5.9* (-10.3 to -1.4)	-8.6* (-11.5 to -5.6)						
	6.1	7.3	6.9	8.8	5.8	5.3	5.3	5.8	7.1	9.6	7.1	9.6	7.7	9.6	6.6	1.7 (-0.3 to 3.8)	-0.4 (-2.5 to 1.8)	4.2* (0.1 to 8.3)						

Abbreviations: CI=confidence interval, CDR=crude death rate, ASMR=age-standardized mortality rate.

\*p&lt;0.05.



(10). Environmental governance of water supplies and transitions to a greener economy might play a crucial role in effectively reducing cancer mortality. Nevertheless, a higher ASMR in the downstream basin and Yishui River Basin could be speculated as partially related to inferior sanitation conditions compared to upstream areas, which reminded stakeholders of promoting geo-specific measures to ameliorate the situation.

This study was subject to some limitations. First, the geographical distribution of the Huai River made the midstream-south basin classification include just one county, and the results could be affected by the quality of the reporting area. Second, cause-of-death diagnosis ascertainment bias was inevitable, which required redistribution algorithms for undetermined codes.

In summary, GI tract cancer deaths over the 11 years in the Huai River Basin showed significant improvements. The ASMR of GI tract cancer decreased or remained stable primarily due to enhancements in health awareness, environmental governance, and improvements in access to prevention, diagnosis, and treatment. Therefore, tailored strategies should be developed for target population.

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## Commentary

## Leveraging CDC's Advantages in Enhancing Cancer Prevention and Control

Jing Wu<sup>1, #</sup>

The 26<sup>th</sup> National Cancer Week takes place from April 15–21, 2020, and we would like to take this opportunity to raise the awareness for all parts of our society. This year's theme is "Joint Action for Anti-Cancer" (1). The government will continue to assume a leading role, while private organizations and individuals are encouraged to participate proactively. The goal is to involve all citizens in the building and development of a supportive environment for cancer prevention and control with the benefits jointly shared by all.

### The Importance of Enhancing Cancer Prevention and Control

Cancer is a common enemy of mankind that leads to labor force loss and family poverty, which has huge impacts on the national economy and the sustainable development of society. According to an estimate by the World Health Organization's (WHO) International Agency for Research on Cancer (IARC), there were more than 18 million cancer incident cases and 9.5 million deaths worldwide in 2018 (2). China CDC's statistics show that there are more than 3.5 million incident cancer cases each year in China, the mortality in 2018 was 183.89 per 100,000 persons, and the death case was around 2.55 million (3). The most common cancers in China include lung cancer, breast cancer, gastric cancer, liver cancer, colorectal cancer, esophageal cancer, cervical cancer, and thyroid cancer. The top 3 cancers were lung, liver, and gastric cancers which accounted for 56.75% of all cancer deaths in 2018 (3). Recently, there was an increasing trend of lung, breast, and colorectal cancer incidence, and the incidence of liver cancer, gastric, and esophageal cancers remained high. Cancer containment still remains challenging.

Cancer is preventable and controllable. WHO suggests that cancer is a lifestyle-related disease and that one third of cases can be prevented, another third can be cured by early detection, and the last third can receive treatment that will prolong survival, relieve

suffering, and increase quality of life with existing medical treatments. Early cancer prevention measures should be taken to reduce the physical and mental suffering and financial burden on individuals and families and therefore improve the quality of life. Cancer risk can be minimized if healthy living habits are developed from childhood and exposure to carcinogenic risks is avoided (4–5).

Many international studies and practice experiences have shown that taking proactive prevention strategies and measures would have significant effects on reducing cancer incidence and deaths (6–8). Continuous analysis of the US's past thirty-year cancer statistics indicates that the number of deaths is decreasing and is opposite to the increasing incidence. Experts estimate cancer deaths fell by around 2.9 million since 1991 due to reductions in the population of smokers and decreases in lung cancer deaths, which are growing more significant in reducing cancer fatalities (9–12).

### The Features of China's Policies on Cancer Prevention

The prevention and control of cancer has always been China's priority. A series of plans and outlines have been made and implemented during the past 8 years. The Working Plan of Non-Communicable Disease (NCD) Prevention and Control (2012–2015) was issued in 2012, the Three-Year Action Plan (2015–2017) for Cancer Control and Prevention was enacted in 2015, and the "Healthy China 2030" Planning Outline issued in 2016 clearly states the goals and tasks of cancer containment. In the same year, the Medium-Long Term Plan for NCD Prevention and Control (2017–2025) set the improvement of the 5-year overall survival (OS) as one of the main goals. In June 2019, the State Council kicked off Healthy China Action and issued a portfolio of specific plans under this big initiative. One of the action plans that was specifically aimed at cancer containment was "The Cancer Prevention and Control Implementation Plan



2019–2022 (13)". The released policies showed that cancer prevention and control has been raised to a position of national health strategy.

These policies had also shown increasing focus on cancer prevention and treatment from all aspects, having prevention as the main concern and combining prevention with therapy. In particular, the first of the eight actions in the implementation plan is the Risk Factor Control Action, which not only emphasizes health knowledge education and healthy behavior cultivation but also the construction of health supporting environments. Those are also the core tasks of chronic disease prevention and control for CDCs at all levels.

### **The Advantages of CDCs in Cancer Prevention**

Cancer prevention has always been a major task of chronic disease control for Chinese national and regional CDCs. The organization has many advantages in realizing national requirements:

First, China's CDCs have an advantage in the surveillance system, especially after an integrated China Cause of Death Reporting System (CDRS) has been established in combination with the Disease Surveillance Points System (DSPs) and National Vital Registration System in 2013. The data is not only representative of the nation, but also represents individual provincial-level administrative divisions (PLADs), which serves as important references for decision-making.

Second, the CDCs have an advantage in multidisciplinary research. For decades, the CDCs have carried out a series of laboratory and population studies in cancer etiology and the relationship and association between cancer and occupations, the environment, nutrition, tobacco, and other lifestyle risk factors. The CDCs have constantly been applying research findings into practice.

Third, the CDCs have an advantage in regional projects implementation. In the Huai River Basin, the comprehensive cancer prevention and control practice, an integrated environment and health surveillance system that covers more than 18 million people, has been running for more than 10 years. A portfolio of prevention measures, including health promotion, lifestyle interventions, professional capacity building, HBV vaccination, improvement of drinking water, environmental factors, etc., have been implemented. These efforts have controlled and reduced the high

cancer incidence in the regions.

Fourth, the CDCs have an advantage in primary prevention. Population-based tobacco controls and expanded vaccination campaigns have been strengthened in recent years. In addition, CDCs put in place the "Healthy Lifestyle for All Initiative", demonstration zones of NCD control and prevention, and Anti-Cancer Workplace Program among other initiatives. A series of materials and tools for cancer prevention and control have been developed along the way.

### **Suggestions for Leveraging the CDCs' Advantages in Enhancing Cancer Prevention and Control**

The overall goal, "Curb the uprising cancer incidence and mortality by 2022, improve the 5-year overall survival of cancer by 3% over 2015", has been clear. The timeline is tight and enforcing earlier prevention is critical. To address current weaknesses, we put forward four concrete suggestions:

First, we should strengthen scientific research on cancer prevention at the national level. An increasing number of research findings emphasize that prevention is the most economical and effective method for cancer control (14–16). Non-therapeutic approaches that were neglected before are drawing attention, such as reduce salt intake to prevent gastric cancer and appropriate exercise for cancer prevention. However, current cancer prevention research is not sufficient, so we suggest that the Ministry of Science and Technology (MOST), the National Science Foundation of China (NSFC), and other resources give more support for precise individual risk-assessment-based prevention studies, randomized controlled trials, and large-scale cohort studies.

Second, proactive measures should be taken at the national level to strengthen the roles of CDCs and make full use of the CDCs' four-tier system (national, provincial, municipal, and county). We should strengthen the training of big data analysis and the knowledge and comprehensive skills for cancer prevention and control for public health personnel at all levels. We suggest that CDCs team up with clinicians and set up multidisciplinary teams to work as local cancer prevention technology centers, conduct specific research, and carry out prevention plans, technical paths, and guidelines that consider local conditions. We suggest the establishment of a number of model institutes for health management with a

cancer prevention focus and a number of transformation and commercialization platforms for research results to provide more prevention services for local residents.

Third, practical experience gained regionally should be promoted to a nationwide scope. Mobilizing the masses has always been an effective tool in our work, and proven regional models can be expanded to more places, such as the comprehensive cancer prevention and control in the Huai River Basin, in Linxian County of Henan Province, and others. Proven effective measures should be supported by medical insurance policies or essential public health services. Commercial health insurance should also be explored and private capital should be involved. Information technology should be continuously applied to improve monitoring systems so that the assessment of these measures and projects will be more closely monitored.

Fourth, awareness of cancer prevention should be raised for social economic and sustainable development perspectives. Widespread support should be gained domestically and from outside of China. We should explore and develop mobile-technology-based interventions and precise prevention management among high-risk populations, which will lead to the industry evolution. We should reduce cancer-caused poverty by preventing cancer and meeting the health-driven poverty reduction goal. Furthermore, we should work more closely with international parties, share Chinese wisdom of cancer prevention in the international community, participate in the formulation of more international standards and norms, demonstrate our commitment to the community of a shared future for mankind, and take responsibility as a great nation.

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## Perspectives

## Wearing Face Masks — the Simple and Effective Way to Block the Infection Source of COVID-19

Tianxing Jiang<sup>1</sup>; Hao Wang<sup>2</sup>; George F. Gao<sup>3</sup>; Xiaoming Jiang<sup>4,5,#</sup>

The key difference between the coronavirus disease 2019 (COVID-19) and previous coronaviruses such as SARS and MERS is that some infected people do not display obvious symptoms but are contagious during the incubation period for 14 days (1) or longer.

Recently, there are many discussions about whether all persons should wear masks when they go out during the COVID-19 pandemic. The main reasons for the opposition are that the effectiveness of masks in preventing infection is not clear, ordinary people rarely wear masks correctly, everyone wearing masks may cause social panic, there are not enough masks, etc. (2–3). However, the main reason for supporting wearing a mask is that it can prevent persons with asymptomatic infections (so called covert infections) from releasing virus-containing droplets to infect other people (4–5). George F. Gao of China CDC also pointed out that European and American countries not wearing masks was a mistake and discussed the importance of wearing masks for epidemic control for the first time (4).

This paper is based on the three major measures of prevention and control of infectious diseases and systematic comparisons of the evolutions in practices implemented by epidemic countries with and without mask wearing. We suggest that covert infections actually cause a big leak in controlling the source of infection and inevitably lead to epidemics growing beyond control. “Everyone wear face masks” is a simple, feasible, and low-cost method of blocking the infection source and can result in the epidemic being effectively controlled as evidenced in China and the Republic of Korea.

### Leaks in the Control of Infection Source

Controlling the infection source, stopping the route of transmission, and protecting susceptible people are the three major measures for the prevention and control of infectious diseases. Among them, controlling the infection source successfully is the most important

and essential measure since any leaks from the infection source will cause the other two measures to fail.

Specific to the COVID-19 virus epidemic, patients with covert infections are indistinguishable from healthy people without nucleic acid testing. Therefore, patients with covert infections are possibly ignored by the prevention and control departments, the public, and even the infected people themselves, and these patients can become freely moving infection sources, resulting in transmission beyond control. A reported 30%–60% of COVID-19 infections are asymptomatic or have mild symptoms while having the ability to spread the virus (6).

Finding an effective way to distinguish and then control these covert infections is crucial for control of the COVID-19 epidemic. Otherwise, stopping the spread of the virus will be impossible.

### Everyone Wear Face Masks: Two Birds, One Stone

At present, the COVID-19 epidemic are present in many countries in spite of strict quarantine measures, including lockdowns at the city or country level, that have been implemented. Confirmed cases increase rapidly, at times nearly exponentially in some countries, which indicates that the implementation of certain control measures often did not work. China and the Republic of Korea are major exceptions as effective control of the epidemic was achieved within almost a month of the inception, and China had even achieved almost zero growth of local infections (7).

What is the reason for such a big difference in epidemic control? In China and the Republic of Korea, everyone wears face masks.

COVID-19 is mainly transmitted by droplets and close contacts. The virus-bearing droplets spread to the environment while the infected person breathes, talks, and sneezes, and the droplets deposit on the ground, on the table, on the door knob of the bus, and on all objects within a region of about one meter around the

infected person. All of the deposited droplets become infection sources for several hours, and in many countries' quarantine measures, only infected persons are required to wear masks to prevent them from releasing virus droplets and contain most of the virus in the mask (4–5). However, since persons with asymptomatic covert infections are unknown without nucleic acid testing, these patients then become dangerous sources to spread the COVID-19 virus unintentionally.

In China's and the Republic of Korea's quarantine measures, all people (therefore including the persons with asymptomatic covert infections) are strictly required to wear masks to protect themselves from virus infection. This requirement effectively limits all persons with covert infections from releasing virus droplets so that they cannot become hidden sources of contagion. Two birds, one stone. With everyone wearing face masks, China and the Republic of Korea have used this simple and low cost method to successfully cut off the path of transmission and to block off the invisible infection sources of COVID-19. This latter function is more important and unique for COVID-19 epidemic control.

We can use the epidemics in Guangdong (as a representative of China), the Republic of Korea, and Singapore to illustrate the importance of face masks in epidemic control as these are regions with imported COVID-19 virus only and different measures are being used for epidemic control (7). In Guangdong and the Republic of Korea, the epidemic was effectively controlled with total confirmed cases of less than 1,500 (Guangdong) and about 10,000 (Republic of Korea) within about 10 days of implementing “everyone wear face masks” and other extremely strict measures. Singapore had also adopted strict prevention and control measures and had achieved good results with no serious outbreaks so far. But without the “everyone wear face masks” measure, the country's epidemic control conditions are relatively fragile and seem to be affected more readily by persons with covert infections as local infections take place. The recent continuous increase of infection persons in Singapore may show

some instability in their epidemic control strategy and may demonstrate the need for a wider measure involving face masks.

Based on the above discussion and the experiences of the worldwide pandemic, “everyone wear face masks” is playing important roles in cutting off the transmission paths and as the major method of blocking the COVID-19 infection source. Therefore, “everyone wear face masks” is of key importance in epidemic control and is absolutely necessary to fully promote.

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## Notes from the Field

## Weekly Assessment of the COVID-19 Pandemic and Risk of Importation — China, April 8, 2020

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### INTRODUCTION

In the past 7 days, COVID-19 continued rapidly spreading worldwide. According to the World Health Organization (WHO) website, by 10:00 CET on April 7, 2020, 209 foreign countries and territories on 6 continents plus the Diamond Princess international cruise ship reported 1,196,651 confirmed cases and 69,274 deaths; among them, 178 countries and territories were confirmed to have local transmission. Cumulatively, the WHO website reported 30,570 confirmed COVID-19 cases from 18 countries and territories in the Western Pacific (excluding China), 686,338 cases from 60 countries and territories in Europe, 9,132 cases from 10 countries and territories in South-East Asia, 78,565 cases from 21 countries and territories in the Eastern Mediterranean, 384,242 cases from 53 countries and territories in the Americas, and 7,092 cases from 47 countries and territories in Africa (1).

In this report, using the public data of COVID-19 on internet, particularly the data from April 2 to 9, 2020, the pandemic was analyzed globally and by country. The current COVID-19 epidemic in the USA was reviewed. The risk of case importation into China was also evaluated.

### RESULTS

#### Equivalent-Mortality Lines of Several Severely Affected Countries

Similar to the report last week, dozens of countries with fatal confirmed cases over 100 by April 8 were selected. As shown in Figure 1, the crude case fatality ratio (CFR, total deaths/total cases) and the cumulative incidence (CI, total cases/total population) of each country were calculated and illustrated on the X-axis and the Y-axis, respectively. Compared with the data in the last report (March 26 to April 1) (2), more

countries were included. Spain and Italy moved from the mortality zone of 20–25 deaths/100,000 to that of 25–30 deaths/100,000 in the past 7 days with very high CFRs and CIs. Belgium and France moved relatively faster from the zone of 5–10 deaths/100,000 to that of 15–20 deaths/100,000. The Netherlands were located in the zone of 10–15 deaths/100,000. Switzerland, the UK, and Sweden were located in the zone of 5–10 deaths/100,000, in which Switzerland had a markedly higher CI and the UK had a higher CFR. Austria, Germany, Portugal, USA, Ireland, Denmark, and Iran were still located at the zone of 1–5 deaths/100,000, showing rapidly increasing CI but slowly increasing CFR. Romanian and Ecuador entered this zone from that of 0–1 deaths/100,000 in the past 7 days. The other 12 countries were located at the zone of 0–1 deaths/100,000, including China and the Republic of Korea. Algeria showed rapidly increasing CFR, while Canada and Turkey revealed rapidly increasing CI.

#### Rates of Increase of Confirmed Cases in Various Affected Countries in the Past Two Weeks

Countries with more than 1,000 confirmed cases by April 7 were selected and the individual average daily growth rates (cumulative cases in one day/cumulative cases in the previous day) were calculated, which were showed in Figure 2 with different colors based on geographic region. Belarus showed the highest average daily growth rate but a small number of cumulative cases, while Turkey kept a high growth rate with a large number of cumulative cases in the past two weeks. Western European countries generally contained more cumulative cases, but some Eastern European countries such as Russia, Belarus, Ukraine, and Serbia had higher growth rates. Regarding Western European countries with large populations and more cumulative cases, the UK and France had relatively higher growth rates (in the region of 10%–20% rate) than Spain, Germany, and Italy (in the region below

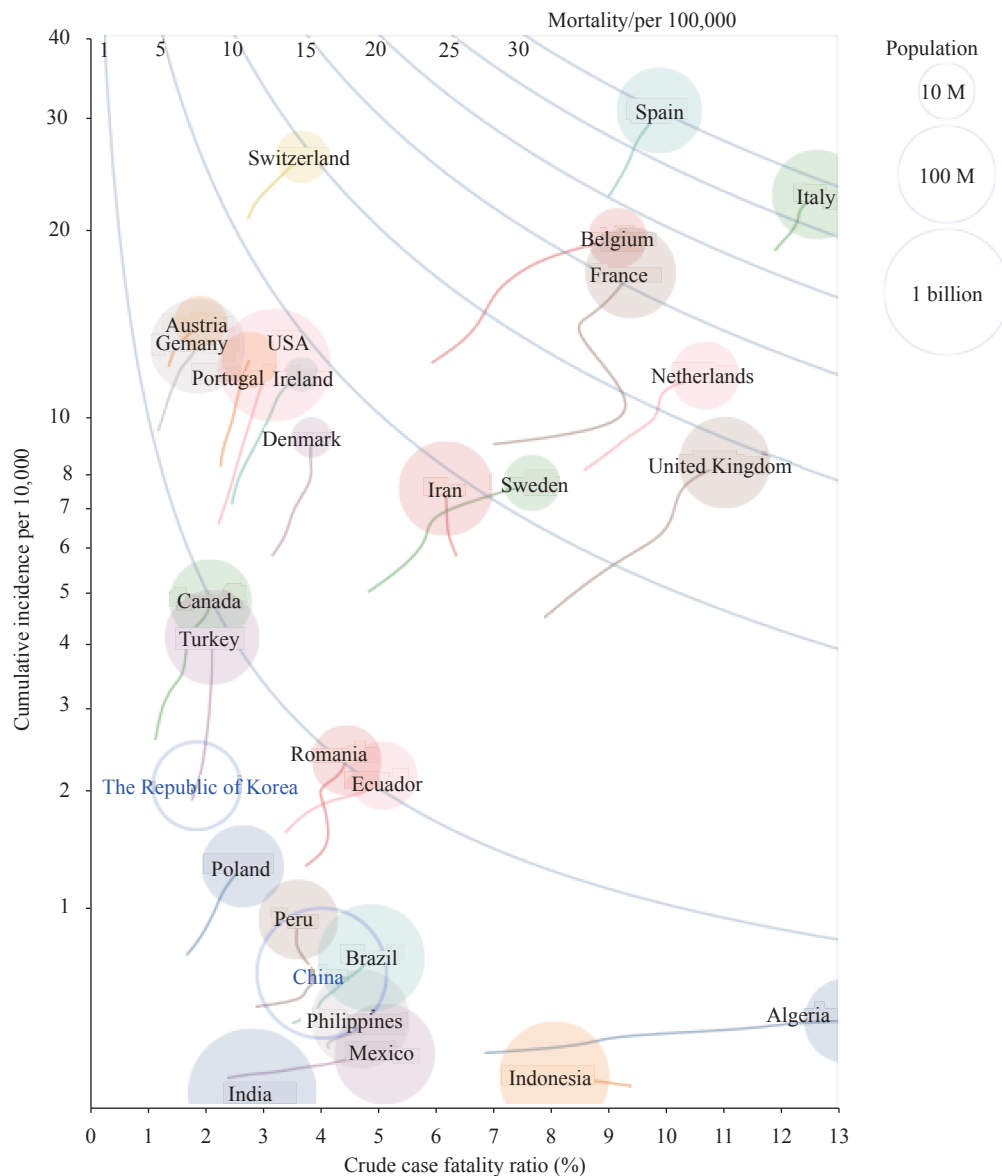


FIGURE 1. Comparisons of the COVID-19 crude case fatality ratio (X axis = total deaths/total cases), cumulative incidence (Y axis = total cases/total population), and mortality (the isolate = total deaths/total population) of 29 countries with more than 100 fatal cases by April 8, 2020. The size of the balloon was proportional to the country's population size. The small rope of the balloon traced the history of changes related to CI and CFR in the past 7 days. M=million.

10%). USA, containing the largest number of cumulative cases, still had a high growth rate, while other countries in North and South America, such as Canada, Mexico, Brazil, Peru, and Chile, also had high growth rates. Besides China and the Republic of Korea where the COVID-19 pandemic was largely controlled, the numbers of the cumulative cases in the majority of Asian countries were relatively fewer. However, the daily growth rates in India and the Philippines were high. More attention should be paid to countries with large population in Asia and South America in the next few weeks.

### The COVID-19 Epidemic in the USA

The COVID-19 epidemic in the USA has been getting worse, but the situation varied widely among different states. The data of states with more than 50 fatalities were collected and the CI, CFR, mortality (case/100,000), and changes in the past week were calculated separately (3). Meanwhile, the same indicators of Hubei Province, the worst-hit province of China, were shown in the same figure as reference. As shown in Figure 3, Hubei was located at the bottom of the zone of 5–10 deaths/100,000 with a CFR of 4.73% and CI of 11.6/10,000. The state of New York

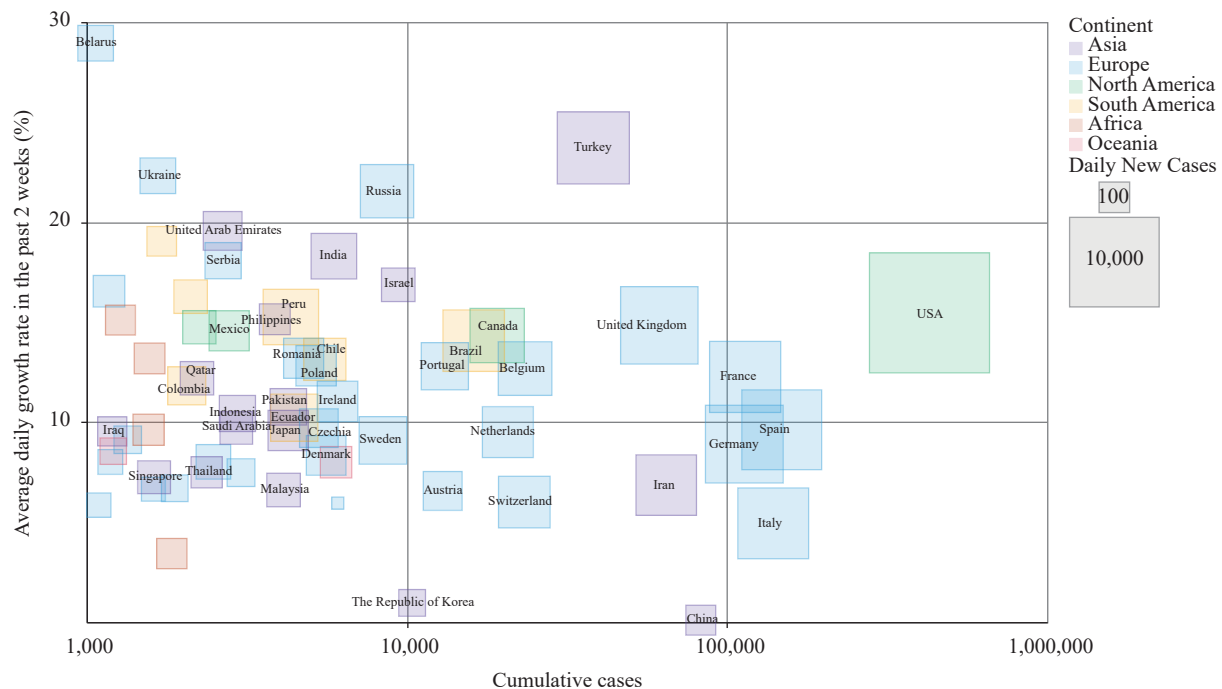


FIGURE 2. The average daily growth rate of the reported cumulative cases in the past two weeks for each affected country with more than 1,000 total confirmed cases by April 7. The color represented the continent. The size of the square was proportional to the number of new cases on April 7.

(NY) was located at the zone of the highest mortality (25–30 deaths/100,000) with the highest CI and higher CFR. New Jersey (NJ) and Louisiana (LA) were located in the zone of 10–15 deaths/100,000 with rapid increases in CI and CFR in NJ and a rapid increase in CI in LA. Massachusetts (MA), Connecticut (CT), and Michigan (MI) were in the zone of 5–10 deaths/100,000 with a higher CFR in MI. The other states were distributed in the zones of 1–5 or 0–5 deaths/100,000. States adjacent to NY seemingly show higher mortalities.

By April 8, the cumulative number of virus tests in the USA was 2,212,685 revealing 423,391 positive results (19.1%) (4). The new daily average number of tests in the past week was 148,967, which was a 141.4% increase compared with the previous week from March 25 to April 1 (average daily testing number: 105,319). The daily average number of positive results in the past week was 29,850 per day, which was a 147.7% increase compared with that of the week of March 25 to April 1 (daily average positive number 20,207) (Figure 4). The weekly average positive rates of the previous week and the week before then were 20.0% and 19.2%, respectively. This reflects that the COVID-19 pandemic in the USA overall is still at the stage of rapid increase.

The numbers of tests and of positive results varied

widely between different state. Overall, 13 states with the cumulative cases over 8,000 by April 8 were selected, and the cumulative rates of positive results in the past 20 days were evaluated (5). As shown in Figure 5, NY, NJ, and MI were the 3 states with the highest rates of positive results and numbers of cumulative case. The curves of the rates of positive results in those three states continued increasing in the past weeks, reaching to 40.8%, 46.8%, and 37.7%. The positive rates of LA and CT were below 30% but showed relatively rapid increases in the past week from 13.4% and 19.4% on April 1 to 21.8% and 26.8% on April 8, respectively. MA, Illinois (IL), and Pennsylvania (PA) also displayed an increasing curve in the rates of positive results last week. The positive rates of the other states remained fairly stable, but among them, Georgia (GA) was at a higher zone.

### COVID-19 Imported Cases into China

By April 8, a total of 1,101 imported confirmed COVID-19 cases were diagnosed in the mainland of China. In the past 7 days, 262 confirmed cases were identified, among them 137 were imported via airplanes and 125 imported via land ports from Russia. Since March 29, China issued more air restrictions and the daily number of flights from abroad declined to 74 on average, among these 77% were from Asian



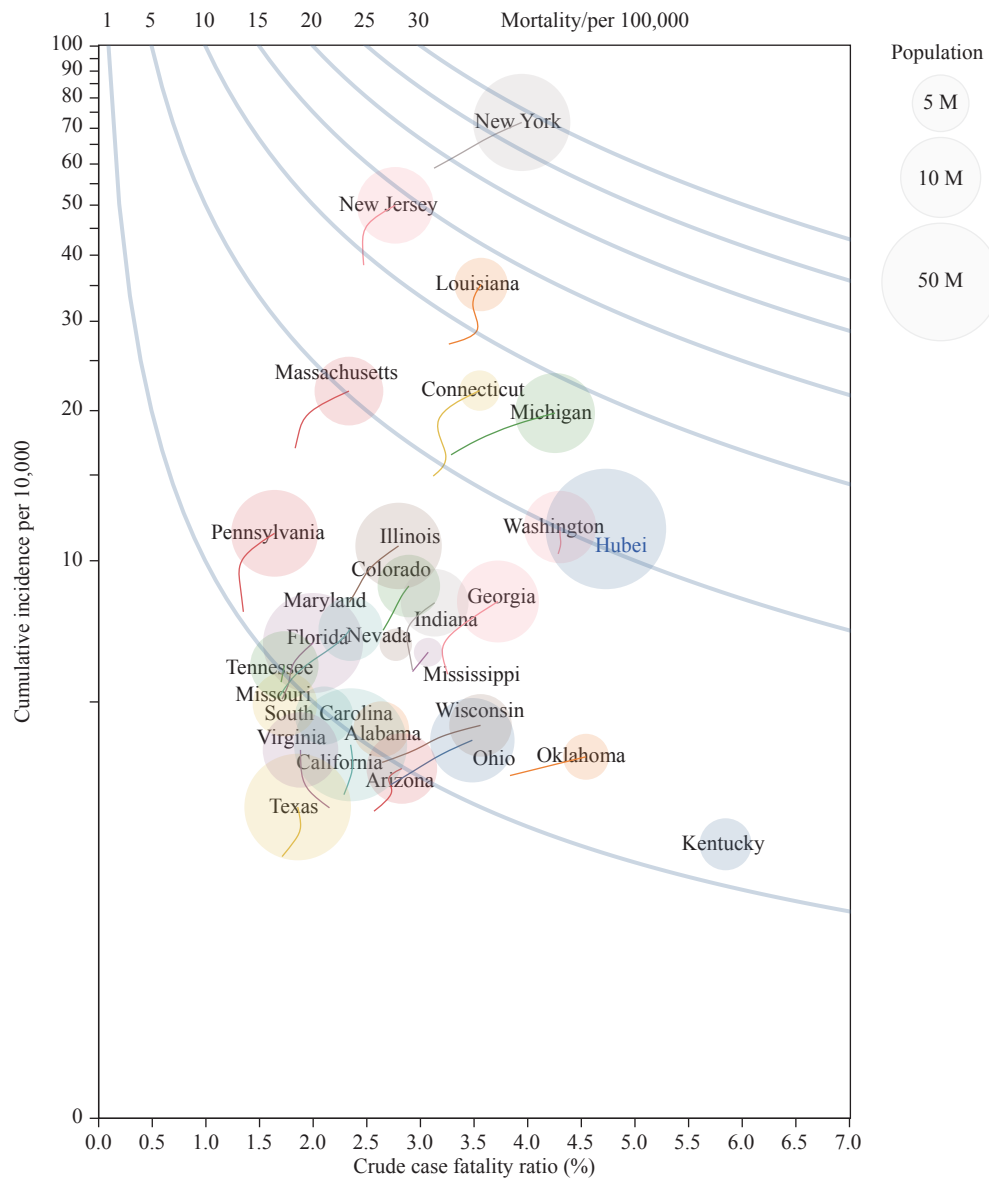


FIGURE 3. Comparison of the COVID-19 crude case fatality ratio (X axis = total deaths/total cases), cumulative incidence (Y axis = total cases/total population), and mortality (the isoline = total deaths/total population) of 30 states of the USA with more than 50 fatal cases by April 8, 2020. The size of balloon was proportional to the state's population size. The small rope of the balloon traced the history of changes related to CI and CFR in the past 7 days. M=million.

countries and regions, 8% from Europe, 6% from North America, 5% from Oceania, and 2% from Africa. As shown in Figure 6, imported cases from the UK were reduced and those from the USA did not change drastically, but those from Russia increased dramatically and became the predominant source of imported cases over the past few days.

## DISCUSSION

In the past 7 days (April 2 to 8), the COVID-19 pandemic continued its rapid spread and 1.71-fold

more cases were reported on April 8 when compared with to April 2. The USA is the most severely affected country where 9 states have reported more than 10,000 confirmed cases. The rapid increase of COVID-19 in some European countries appear to be slightly slowing. The daily number of new reported cases in Italy, Germany, Spain, Belgium, Norway, Switzerland, and Austria declined, but the numbers in France and the Netherlands fluctuated but remained high. On the contrary, daily new cases in the UK, Ireland, Portugal, and Sweden still increased. Moreover, the daily number of new reported cases in many Eastern

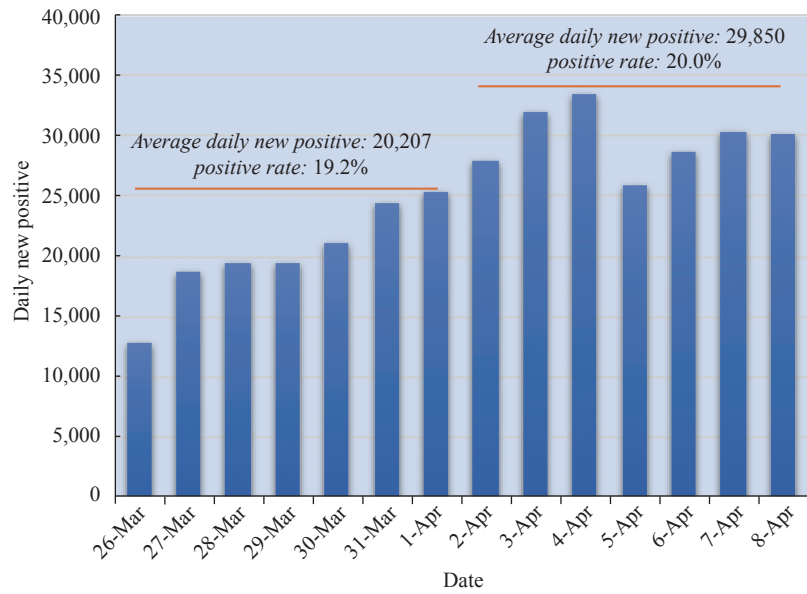


FIGURE 4. The daily number of new positive test results in the USA.

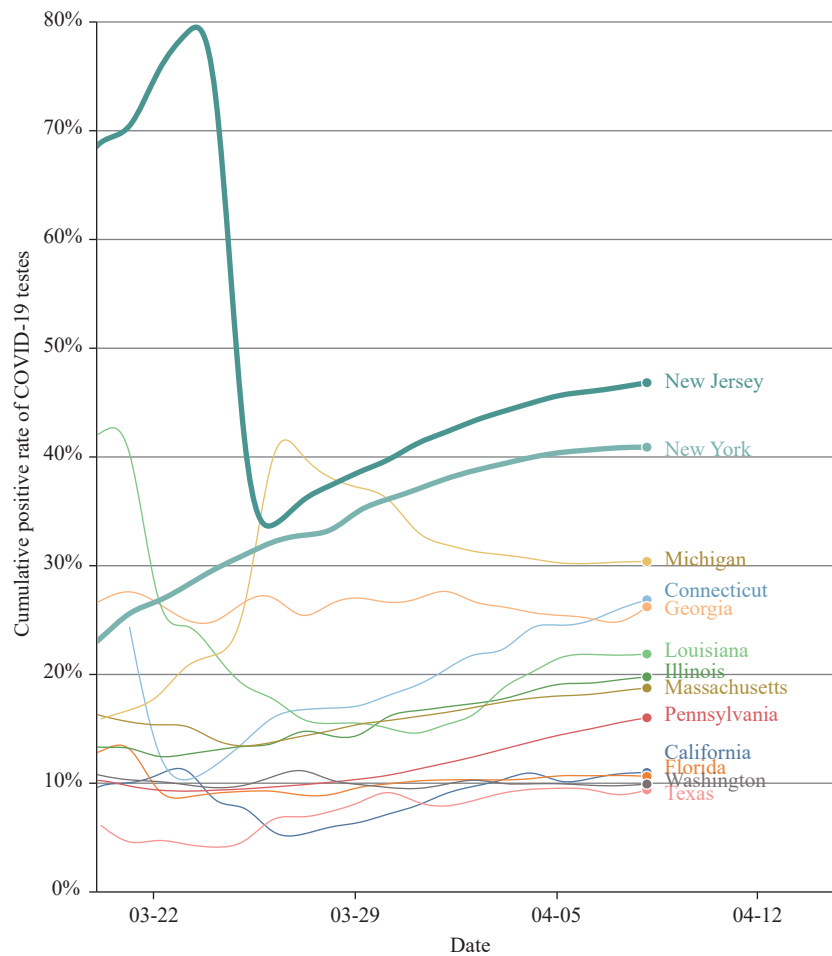


FIGURE 5. Comparison of the daily COVID-19 virus laboratory test positive rate of the top 13 states with the highest number of cumulative cases by April 8, 2020. Y axis = cumulative positive rate of total COVID-19 virus tests, X axis = date. The color represented the different states, while the width of the line represented the cumulative number of total tests.

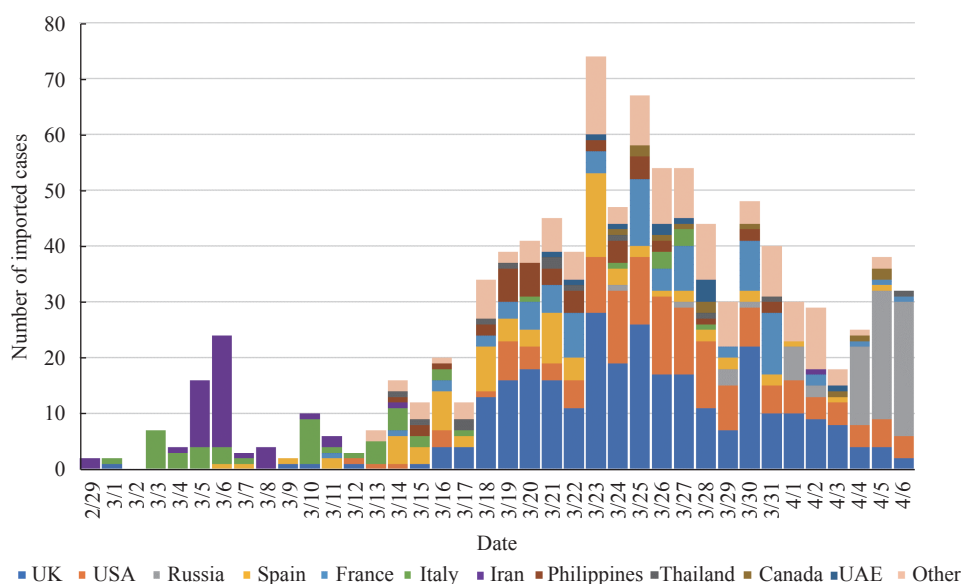


FIGURE 6. Daily number of COVID-19 of cases imported into China and countries of origin, February 29 to April 6.

European in the past week show clear increases such as Russia, Ukraine, Romania, and Poland. Large numbers of ongoing COVID-19 cases in the USA and Europe make them continuing epicenters of the pandemic worldwide.

By April 8, 9 states in the USA reported more than 10,000 cases. More importantly, 6 states showed higher numbers of cumulative cases and mortalities than Hubei Province, which was the worst affected province of China. Although more than 2.2 million COVID-19 tests have been conducted in the USA by April 8, high positive rates nationwide suggest that the epidemic is still in the stage of rapid increase, particularly in the states of NY, NJ, MA, LA, CT, and MI. The testing percentage in NY has already reached to 1.2%, while the positive rate has continuously increased in the past week reaching 40%. This situation is even more severe than that of Lombardy, the epicenter of Italy's epidemic, at the most critical stage.

From the COVID Tracking Project website (5), we have also collected data on the numbers of the hospitalized COVID-19 cases on April 8 in the 6 most affected states. In general, the ratios of hospitalized cases to total confirmed cases are low, i.e., 23.1% in NY, 9.4% in MA, 14.8% in NJ, 11.6% in LA, 16.8% in CT, and 17.8% in MI. The relatively low hospitalization ratio of COVID-19 cases will make patient isolation and management more difficult. On the other hand, rapid increases in COVID-19 cases over a short period of time will cause a shortage of medical resources in a specific regions. Such

phenomena have likely already appeared in some states in the USA, where the Institute of Health Metrics and Evaluation (IHME) has estimated shortages of 5,000 and 2,000 critical care beds in NY and NJ (6).

We have also noticed that the COVID-19 pandemic in Russia, India, Brazil, and Turkey with large populations became more severe in the past week with rapid increases in numbers of daily new cases and fatalities. The growth of the pandemic beyond control in many countries with large populations will definitely increase the difficulty of COVID-19 containment globally. More cases have been reported in African countries last week, especially Sub-Saharan countries. Compared with improvements in clinical treatment capacity, quick and efficient implementation of non-pharmaceutical measures in African countries is more pivotal.

The implementations of air travel restrictions and other relevant measures seemed to be effective and led to a reduction in imported cases via airports in China over the last week. However, more imported cases emerged via land ports last week, mostly from Russia. As a large country, there are dozens of land ports connecting China with 14 other countries as well as with Hong Kong SAR and Macau SAR, most of which are already temporarily closed. When compared to cities with international airports, most cities with land ports have relatively limited medical resources and medical service capacities. Careful assessment and rapid improvement in the capacities of surveillance, quarantine, isolation, clinical treatment, and transportation are still largely required.

Similar to our previous reports, relevant data presented here was collected from the websites of governments, mainstream media, relevant professional websites, and published literature, which may affect the accuracy and real-time performance. Deviations of the predictions and assessments from reality are probably inevitable.

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