Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Letter to the Editor

COVID-19 protective measures prevent the spread of respiratory and intestinal infectious diseases but not sexually transmitted and bloodborne diseases

Dear editor,

Protective measures such as social distancing, mask wearing, and hand sanitizing were strictly implemented in China after the lockdown of Wuhan in response to the COVID-19 epidemic. These measures substantially altered everyday activities and also impacted the spread of other infectious diseases.[1–3]

A few studies have shown marked reductions in cases of influenza, dengue fever, and measles during the COVID-19 epidemic.[2,4] However, it remains unknown whether there were short- and long-term benefits to COVID-19 control measures for other infectious diseases with distinct epidemiological characteristics.

To investigate the effect of the widespread implementation of COVID-19 protective measures on the incidence of other common infectious diseases, we tracked 39 notifiable diseases reported in the Infectious Disease Surveillance System (IDSS) from January 2017 to December 2020 in Changsha. The capital city of China's Hunan province, Changsha has a resident population of 8.4 million and is located about 300 km from Wuhan city. Changsha's first COVID-19 case was confirmed on January 21, 2020. Three days later, Changsha launched the first-level response to a major public health emergency immediately after the lockdown of Wuhan. Quarantine measures such as shelter in place, limited public transportation, and business closures were strictly implemented until early February. The epidemic ended on February 19. Although normal life had been gradually restored after the epidemic, activities such as hospital visits and travel remained seriously affected.

In 2019, a significant increase in influenza cases was observed due to improved detection by the widespread use of colloidal gold immunochromatography assay. As a result of COVID-19, the total number of notifiable infectious diseases dropped dramatically in February 2020. However, from May to November, cases increased to 47,351. This represents a 35.15% increase compared to the same period of 2019. We also analyzed disease rate changes in those with over 20 monthly cases in 2017 to 2019. Compared with the average levels of February to April in the previous three years, the cases of most infectious diseases dropped significantly during February to April 2020, except for AIDS. Cases declined most markedly for HFMD (97.00%), influenza (86.67%), mumps (82.29%), acute hemorrhagic conjunctivitis (81.67%), and scarlet fever (80.48%). As time went on, the prevalence of syphilis increased to the same level as the previous three years, while rates of HFMD, tuberculosis, bacillary dysentery, gonorrhea, Hepatitis B, hepatitis C, and other infectious diarrheal diseases were even higher in 2020 (Table 1).

Taking the transmission route into account, the number of respiratory and intestinal diseases from February to June 2020 dropped dramatically compared to the average levels of the same period in 2017 to 2019. However, in July to December 2020, the number of intestinal diseases increased 100.57% compared to the same time period in 2017 to 2019. The cases of sexually transmitted and bloodborne diseases dropped slightly in February to April 2020, then increased 2.82% in May to December 2020, compared with the three-year average. Cases of parasitic and vector-borne diseases constitute only 0.2% of total notifiable diseases, so the impact of COVID-19 on these conditions remains difficult to evaluate (Fig. 1).

As airborne transmission is the dominant route in the spread of COVID-19,[5] protective measures for containing the COVID-19 epidemic were also effective in combating the spread of other respiratory diseases. This influence remained after the epidemic. The reduced incidence of diseases with other transmission routes during the COVID-19 epidemic may largely be explained by the mass reduction in population mobility due to travel restrictions. According to data from China's Ministry of Transport,[6] public transportation passenger volume in Changsha dramatically decreased (88.86%) in February 2020 compared to February 2019, and in July it recovered to 90% of the level seen in 2019. We found that passenger volume was significantly correlated with sexually transmitted and bloodborne diseases (correlation coefficient $r = 0.782$, $p < 0.001$), and intestinal diseases ($r = 0.418$, $p = 0.011$) during the period between January 2018 and December 2020. Protective measures showed a positive effect on containing the transmission of intestinal diseases, but the influence weakened during the second half of 2020 because of increased social interaction after the lifting of epidemic restrictions. Sexually transmitted and bloodborne diseases were more closely associated with population mobility. The reduction in population mobility during the COVID-19 epidemic presumably led to a reduction in these cases, but the epidemic's influence on sexually transmitted and bloodborne diseases was relatively weaker and shorter-lived compared to its influence on diseases with other transmission routes.

The reduction in the number of notifiable infectious diseases cannot be attributed entirely to the implementation of control measures, as patients were less likely to go to the hospital during the epidemic. This may have been due to not being able to make an appointment (during the epidemic, hospitals cancelled or reduced nonurgent outpatient visits) or due to fear of becoming infected with the SARS-CoV-2 virus. To investigate this potential bias, we selected two municipal general hospitals in Changsha and compared their number of outpatients during the COVID-19 epidemic. Our investigation revealed that the number of outpatient visits decreased significantly after the epidemic's onset in late January. Outpatient visits began increasing at the end of February, and by mid-May the number was back to the level of previous years.

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Table 1
The changes of the number of notifiable diseases reported in 2017–2020.

	Period	Number in 2020	Changes in 2020 vs. 3-year average (2017–2019)	Changes in 2020 vs. 2019
Respiratory diseases				
Rubella	Feb.–Apr.	5	-92.06%	-97.25%
	May.–Jun.	2	-94.69%	-98.08%
	Jul.–Dec.	15	-56.73%	-65.91%
Scarlet fever	Feb.–Apr.	35	-80.48%	-83.87%
	May.–Jun.	48	-81.08%	-79.83%
	Jul.–Dec.	222	-64.80%	-77.80%
Influenza	Feb.–Apr.	1678	-86.87%	-94.00%
	May.–Jun.	1108	-76.42%	-90.94%
	Jul.–Dec.	3517	-88.01%	-95.03%
Pertussis	Feb.–Apr.	36	-53.85%	-78.57%
	May.–Jun.	16	-78.28%	-89.81%
	Jul.–Dec.	31	-85.63%	-91.80%
Mumps	Feb.–Apr.	304	-82.29%	-88.82%
	May.–Jun.	583	-75.50%	-83.16%
	Jul.–Dec.	1699	-58.29%	-64.42%
Tuberculosis	Feb.–Apr.	1100	-5.55%	-16.35%
	May.–Jun.	1032	23.00%	15.05%
	Jul.–Dec.	2720	6.11%	0.48%
Intestinal diseases				
Hand-foot-and-mouth disease	Feb.–Apr.	80	-97.00%	-97.59%
	May.–Jun.	616	-94.48%	-91.57%
	Jul.–Dec.	33378	124.72%	274.19%
Hepatitis E	Feb.–Apr.	28	-34.38%	-34.88%
	May.–Jun.	8	-70.37%	-72.41%
	Jul.–Dec.	44	-34.33%	-38.03%
Other infectious diarrheal diseases	Feb.–Apr.	760	-71.65%	-75.77%
	May.–Jun.	1152	22.99%	0.79%
	Jul.–Dec.	3188	1.29%	-6.18%
Typhoid/paratyphoid	Feb.–Apr.	6	-53.85%	-60.00%
	May.–Jun.	23	97.14%	109.09%
	Jul.–Dec.	25	-19.35%	13.64%
Bacillary dysentery	Feb.–Apr.	57	-15.76%	-25.00%
	May.–Jun.	77	0.87%	-4.94%
	Jul.–Dec.	101	-41.62%	-40.24%
Hepatitis A	Feb.–Apr.	14	-36.36%	-33.33%
	May.–Jun.	10	-40.00%	-44.44%
	Jul.–Dec.	42	5.88%	-22.22%
Sexually transmitted and bloodborne diseases				
Gonorrhea	Feb.–Apr.	149	-42.02%	-36.60%
	May.–Jun.	220	5.10%	19.57%
	Jul.–Dec.	845	26.18%	36.73%
Hepatitis C	Feb.–Apr.	241	-31.34%	-35.04%
	May.–Jun.	218	2.99%	2.35%
	Jul.–Dec.	660	-6.52%	-7.56%
Hepatitis B	Feb.–Apr.	1474	-15.56%	-26.12%
	May.–Jun.	1341	11.84%	10.73%
	Jul.–Dec.	3795	3.69%	3.35%
Syphilis	Feb.–Apr.	879	-32.30%	-32.59%
	May.–Jun.	971	-0.61%	2.21%
	Jul.–Dec.	2706	-6.89%	-9.83%
AIDS	Feb.–Apr.	73	0.92%	-23.16%
	May.–Jun.	130	104.19%	94.03%
	Jul.–Dec.	228	10.50%	5.56%
Parasitic and vector-borne diseases				
Malaria	Feb.–Apr.	7	23.53%	0.00%
	May.–Jun.	0	-100.00%	-100.00%
	Jul.–Dec.	4	-76.92%	-69.23%
Epidemic hemorrhagic fever	Feb.–Apr.	54	63.64%	28.57%
	May.–Jun.	63	43.18%	43.18%
	Jul.–Dec.	46	-19.77%	-17.86%
Dengue fever	Feb.–Apr.	0	-100.00%	-100.00%
	May.–Jun.	0	-100.00%	-100.00%
	Jul.–Dec.	0	-100.00%	-100.00%
Other infectious disease				
Acute hemorrhagic conjunctivitis	Feb.–Apr.	27	-81.67%	-85.48%
	May.–Jun.	24	-87.46%	-91.18%
	Jul.–Dec.	94	-73.40%	-59.66%

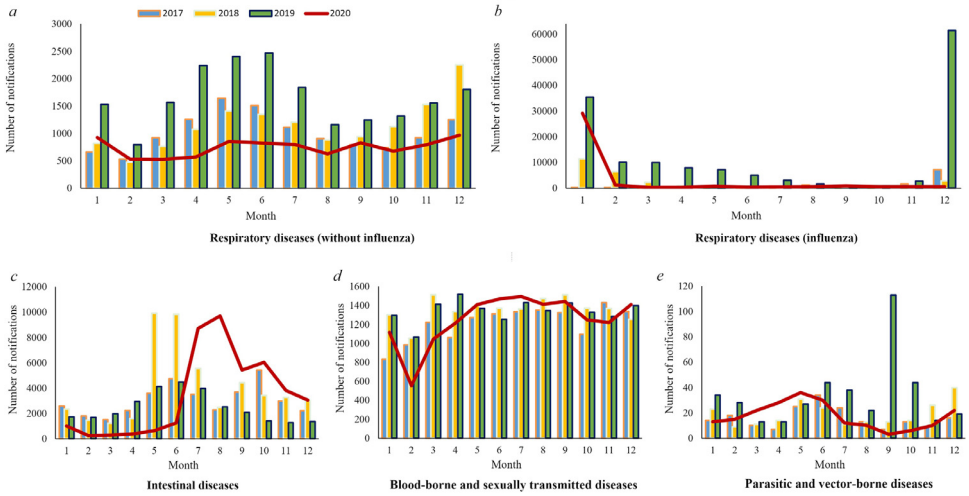

Fig. 1. Comparison on the number of notifiable infectious diseases in Changsha, 2017–2020.

Outpatient visits were about 26.17% less frequent in February to June compared to the same period of the previous three years. There was, however, the possibility of underreporting of infectious diseases.

Our study evaluated the long-term impact of COVID-19 protective measures on the incidence of 39 notifiable diseases for the whole year of 2020. Our analysis revealed that the epidemic had an especially great impact on respiratory and intestinal infectious diseases. Sexually transmitted and bloodborne diseases were more sensitive to the effects of population mobility.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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