Journal of
Preventive Medicine
& Public Health

Author Response

Social and Policy Determinants of COVID-19 Infection Across 23 Countries: An Ecological Study

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Dear Editor,

We appreciate Dr. Mungmunpuntipantip and Wiwanitkit' letter and their interest in our paper entitled "Social and Policy Determinants of COVID-19 Infection Across 23 Countries: An Ecological Study" [1]. We used coronavirus disease 2019 (COVID-19) indicators, such as incidence, mortality, and fatality rates, as well as data on various social and policy determinants as of September 2020. Based on the results of our ecological study, we hypothesized that the transmission rates of COVID-19 may change depending on the state of society and policy-making factors.

In a letter to the editor, the authors suggested that an update of our study was necessary because many circumstances had changed since the initial pandemic. We fully agree with this suggestion. However, our hypothesis would be more challenging to evaluate after the initial pandemic, since unlike the early days of the pandemic, social distancing and quarantine policies have been recently changing very rapidly in country-specific ways. Even when the same policy continues, it is now more difficult to compare the effect in each country. Unlike the beginning of the pandemic, social and national quarantine measures are changing due to increases or decreases in COVID-19 transmission rates or severity. Moreover, national quarantine policies (e.g., district lockdowns and others) after vaccination have been implemented only in some countries, such as China, but most countries have not implemented national quarantine policies for all citizens. Therefore, social and national policies cannot be determinants of COVID-19 rates in this situation.

As of April 22, 2022, there were 507 912 123 COVID-19 infection cases worldwide, and 6 236 644 deaths. In the last 7 days, the most active COVID-19 outbreaks were found in Germany, Korea, and France, and the most deaths occurred in the United States, the United Kingdom, and Russia. In Korea, social distancing and restrictions on gatherings are no longer mandatory as of April 18.

In further analyses, it would be more reasonable to consider specific social or policy determinants in each country than in multiple countries. As references, some studies have investigated infection-related factors in relation to national policies and regional, interpersonal, and independent factors [2,3], and a community-based big data modeling study on COVID-19 policy was conducted [4].

Considering the temporal relationship of causality, further research could consider the correlation between mortality and vaccination. Thus, we performed linear regression for the mortality rates of 228 countries using detailed information on vaccination from the World Health Organization as of April 18, 2022 [5]. As a result, we found that the number of total COVID-19 vaccinations, the number of vaccination types, and the

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Table 1. Linear regression analysis for the number of COVID-19 deaths by the status of COVID-19 vaccinations in 228 countries

Models[1]	Beta (standardized)	T-value	*p*-value
Model 1			
Outcome: cumulative no. of deaths			
Intercept	0	8.863	<0.001
Cumulative no. of cases	0.149	2.357	0.019
First vaccination date	-0.568	-8.858	<0.001
No. of vaccination types used	-0.145	-2.353	0.020
No. of total vaccinations[2]	-0.284	-4.331	<0.001
Model 2			
Outcome: newly reported deaths in the last 7 day			
Intercept	0	1.421	0.157
Cumulative no. of cases	0.613	11.557	<0.001
First vaccination date	-0.081	-1.420	0.157
No. of vaccination types used	-0.025	-0.456	0.649
No. of total vaccinations[2]	0.170	3.048	0.003

COVID-19, coronavirus disease 2019.
[1]The explanatory power (R^2) of model 1 and model 2 was 0.827 and 0.458, respectively.
[2]Cumulative total vaccine doses administered per 100 population.
Data from World Health Organization. WHO coronavirus (COVID-19) dashboard; 2022 Apr 18 [5].

first vaccination date were negatively correlated with the number of total deaths in 228 countries (Table 1). However, the number of deaths in the last week was rather positively correlated with the number of vaccinations, and it was not correlated with the date of the first vaccination type used. A simple analysis of this type could measure the effect of vaccination policies on deaths over time.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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