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Epidemiological Situation and Social Vulnerability in the Era of the COVID-19 Pandemic

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The December 2019 outbreak in China of a novel coronavirus infection (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus quickly spread globally. In the era of economic globalization, as of February 24, 2021, the cumulative number of people with COVID-19 has reached 110 million worldwide, with more than 24.7 million deaths, with containment of the pandemic not likely to happen soon. Conventional outbreaks have spread in low- and middle-income countries where poverty and immature health systems prevail, resulting in significant human and social inequity. However, middle- and upper-income people account for more than 85% of the total cumulative deaths. The spread of infection in Africa and Asia is relatively limited despite their fragile health systems. These unexpected phenomena are noteworthy when reconsidering the definition of social vulnerability. To prevent direct or indirect mortality associated with the COVID-19 pandemic, society has made efforts to minimize disruptions to health systems and mitigate social, racial, and gender inequity globally. While facing conventional and newly emerged social vulnerabilities, we are standing at a historical turning point to promote our new normal lifestyle of “coexisting with viruses” through a promising paradigm shift that focuses on improving the sustainability of our entire planet.

Keywords: COVID-19, pandemic, epidemiology, case fatality rate, vulnerability

Introduction

The December 2019 outbreak of a new coronavirus infection (COVID-19) in Wuhan, China, spread quickly on a global scale. In the era of mass transportation, reflecting economic globalization, the pandemic, which had previously been considered a challenge for low- and middle-income countries, spread considerably in high-income countries in Europe and the United States (US). These are countries with well-established healthcare sys-

tems with state-of-the-art medical technologies. In the past, most emerging and reemerging viral infections were caused by pathogens that already existed on Earth and spread in the region. However, the new coronavirus, namely severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is an unknown virus that mankind has never encountered before, and therefore, its pathogenicity, pathogenesis, and treatment are completely unknown. Because of these uncertainties, the pandemic has caused delays in the initial response, such as economic lock-

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Daily confirmed COVID-19 cases

The number of confirmed cases is lower than the number of total cases. The main reason for this is limited testing.

Our World
in Data

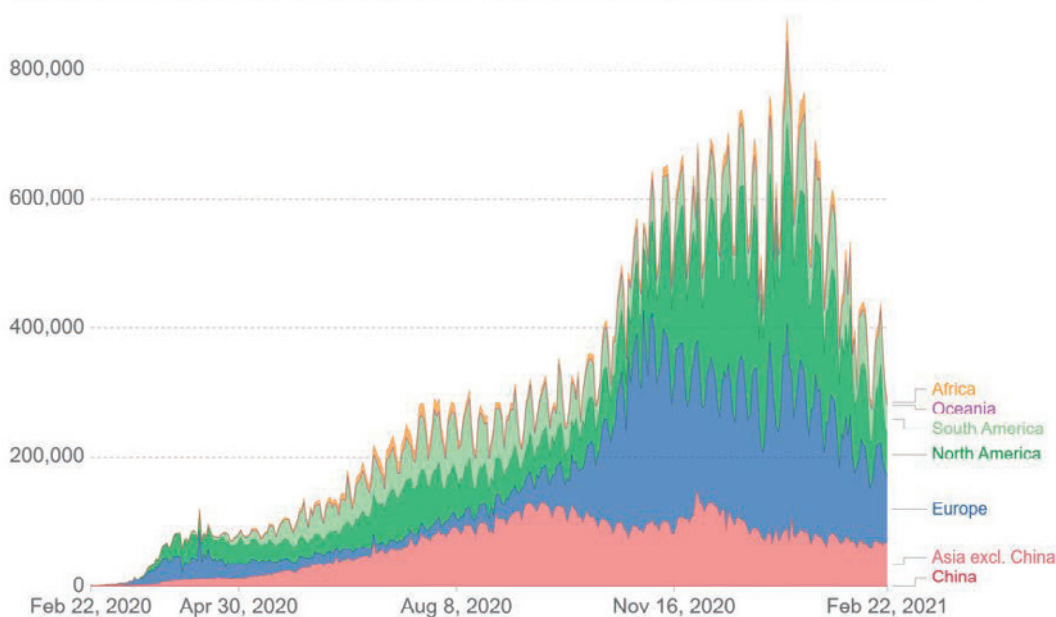


Figure 1. Daily confirmed COVID-19 cases in the world (22nd February, 2021).

<https://ourworldindata.org/coronavirus>

Daily confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

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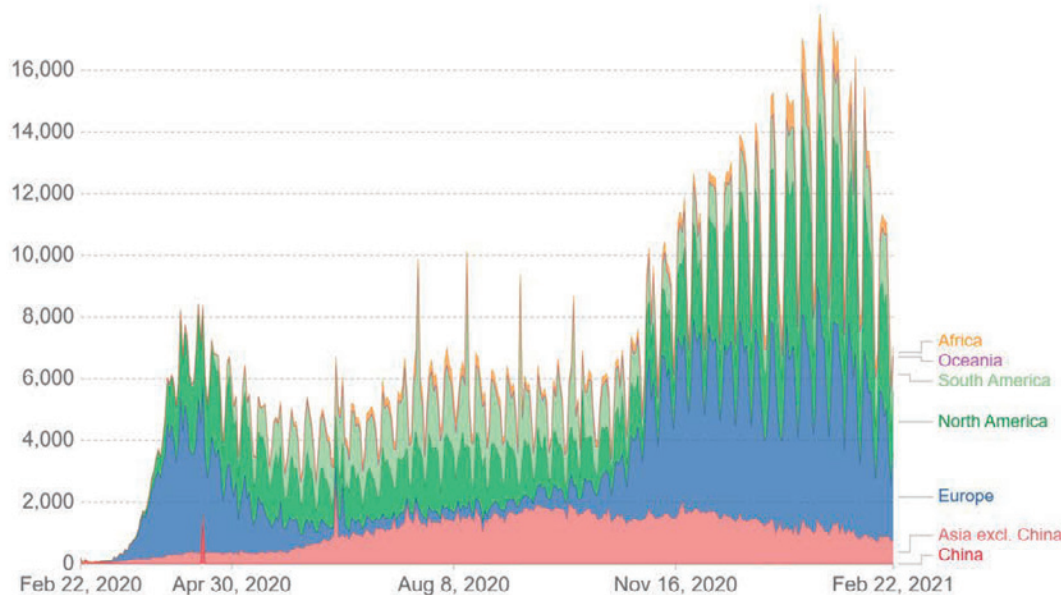


Figure 2. Daily confirmed COVID-19 deaths in the world (22nd February, 2021).

<https://ourworldindata.org/coronavirus>

downs, which has led to a health system crisis.¹ In this paper, we discuss the epidemiological situation of COVID-19, which articulates social vulnerabilities, as the world faces the era of a novel pandemic.

Epidemiological Situation of COVID-19 as Dated in February 2021

As of February 22, 2021, the cumulative number of peo-

Daily new confirmed COVID-19 cases per million people

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.

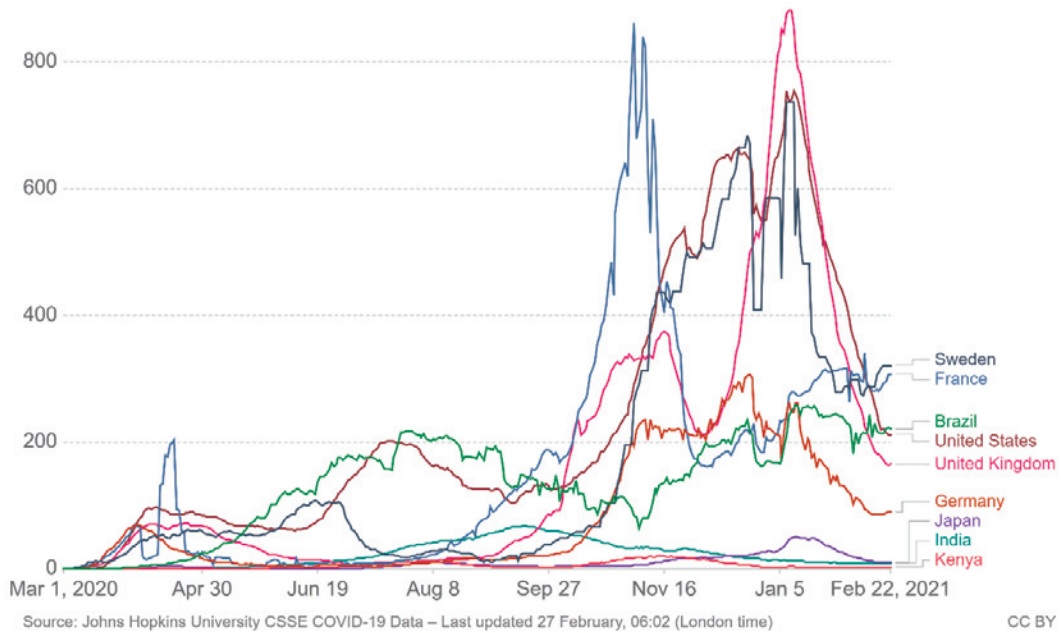


Figure 3. Daily new confirmed COVID-19 cases per million people among major countries (22nd February, 2021). <https://ourworldindata.org/coronavirus>

Daily new confirmed COVID-19 deaths per million people

Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

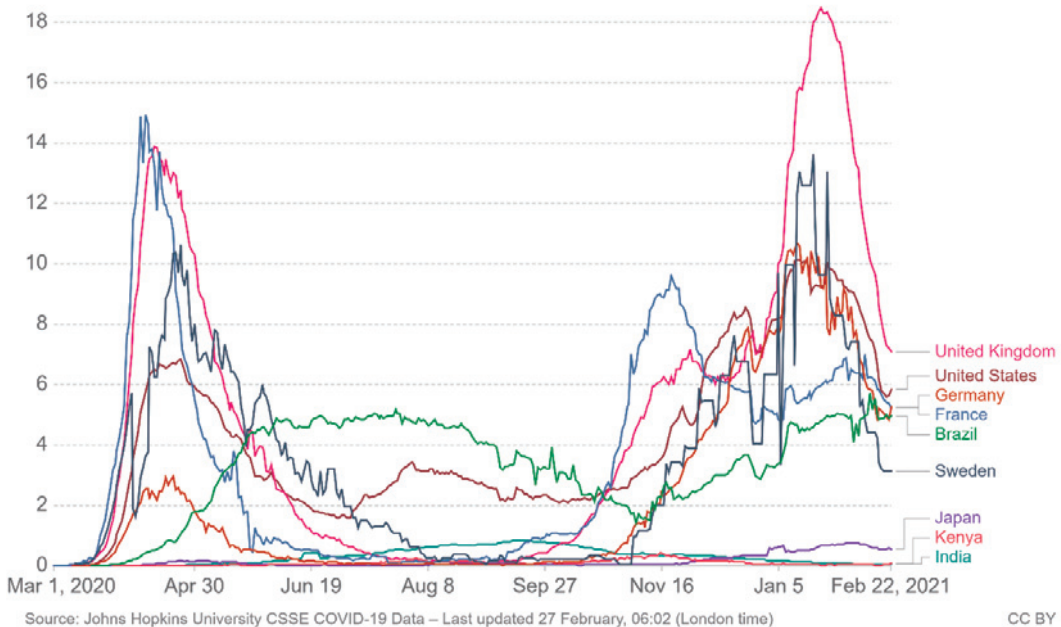


Figure 4. Daily new confirmed COVID-19 deaths per million people among major countries (22nd February, 2021). <https://ourworldindata.org/coronavirus>

ple with COVID-19 has reached 110 million worldwide, with more than 24.7 million deaths and containment of

the pandemic not likely to happen soon. However, the increasing trend has slowly subsided (**Figure 1 and 2**). The

Case fatality rate of the ongoing COVID-19 pandemic

The Case Fatality Rate (CFR) is the ratio between confirmed deaths and confirmed cases. During an outbreak of a pandemic the CFR is a poor measure of the mortality risk of the disease. We explain this in detail at OurWorldInData.org/Coronavirus

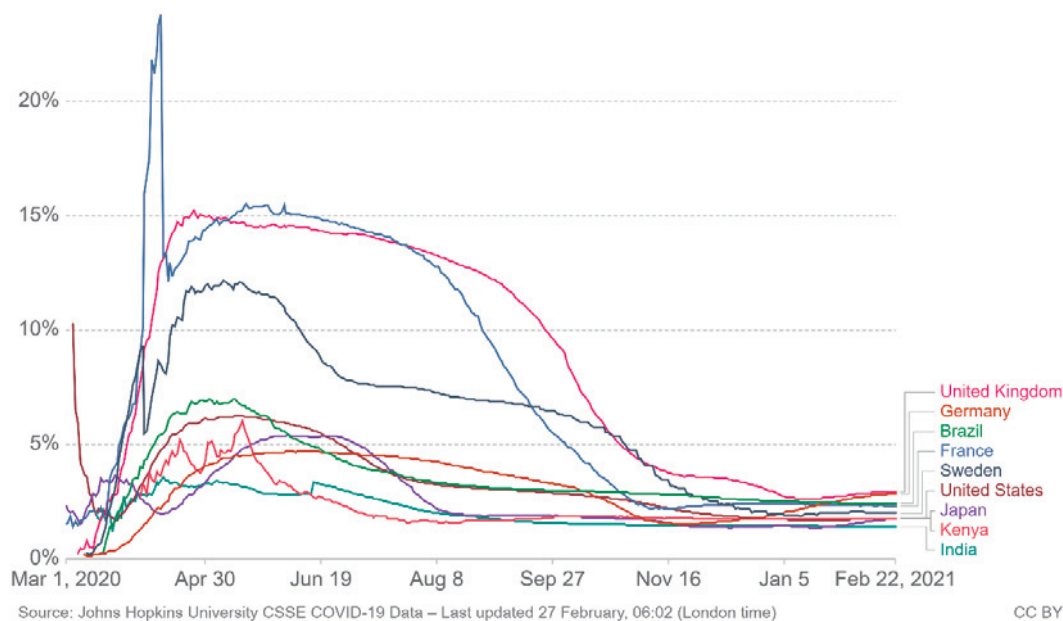


Figure 5. Case fatality rate of the ongoing COVID-19 pandemic among major countries (22nd February, 2021). <https://ourworldindata.org/coronavirus>

cumulative number of cases is 28.41 million in the US, 11 million in India, and 10.4 million in Brazil, with these three countries accounting for 45% of the cumulative cases worldwide.²

The trend of new cases and deaths among major countries such as the US, United Kingdom of Great Britain and Northern Ireland (UK), France, Sweden, Germany, Brazil, India, Japan, and Kenya revealed different epidemiological magnitudes (**Figure 3 and 4**). Europe and North/South America are highly affected, while Asia and Africa are relatively spared by the pandemic despite their population densities and economic prosperities. In particular, the case fatality rate among those countries converges to 2-3%, while the degree of health system development is distinctive from each other (**Figure 5**).

In Japan, the number of infected people is 428,553 and the number of deaths is 7,645 as of February 22, 2021, with the third pandemic wave slowly subsiding² (**Figure 6 and 7**). However, the number of infected people is higher than 100,303 in China where the disease first broke out and was relatively higher than in Asian countries such as 88,921 in South Korea and 2,419 in Vietnam.² Looking at the trends over time, after the first wave with a large number of fatalities, the second wave oc-

curred due to the resumption of economic activities. Fortunately, the situation started to come under control with subsequent efforts. However, the third pandemic wave boosted by the travel promotion program and festive period is the largest, leading to a second state of emergency for metropolitan areas in Japan.

It is known that the fatality rate of any viral pandemic declines over time. While the case fatality rate of seasonal influenza in Japan is about 0.01-0.1%, COVID-19 is still lethal and can cause severe pneumonia, cytokine storms, and blood coagulation system abnormalities. Moreover, genetic analysis shows evolutionary relationships between viral mutations and ongoing pandemics. Since November 2020, new variants of SARS-CoV-2, which are assumed to be up to 70% more transmissible, have been identified in the UK, South Africa, and Brazil, leading to increased vigilance across the world.³ Therefore, we need to continue to pay close attention to the spread and convergence of COVID-19, especially in the urban and elderly population and in people with underlying diseases.⁴

Daily new confirmed COVID-19 cases

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.

Our World
in Data



Source: Johns Hopkins University CSSE COVID-19 Data – Last updated 27 February, 06:02 (London time)

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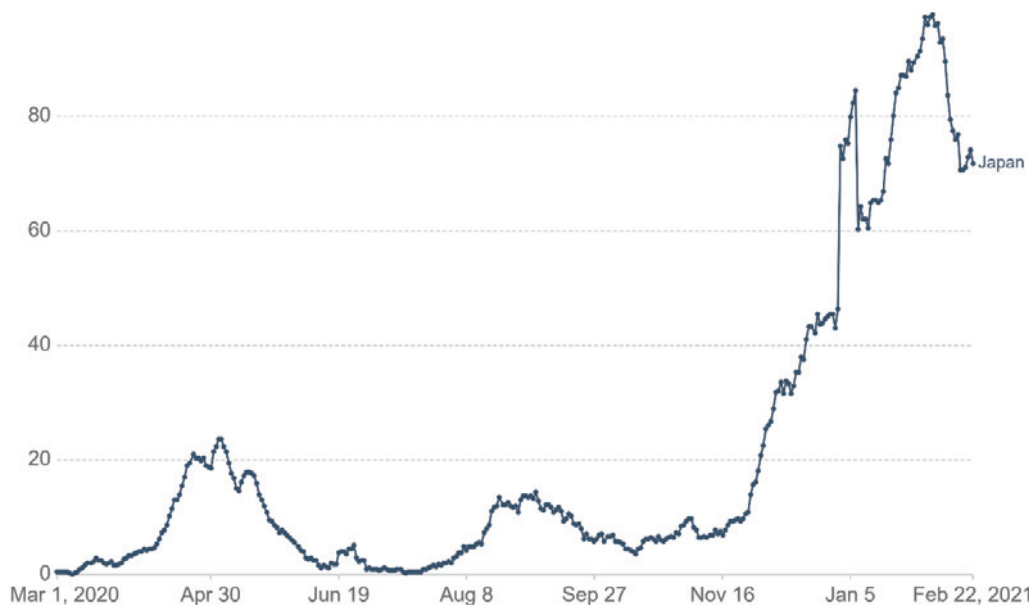
Figure 6. COVID-19 daily new cases in Japan (22nd February, 2021).

<https://ourworldindata.org/coronavirus/country/japan?country=-JPN>

Daily new confirmed COVID-19 deaths

Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

Our World
in Data



Source: Johns Hopkins University CSSE COVID-19 Data – Last updated 27 February, 06:02 (London time)

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Figure 7. COVID-19 daily death cases in Japan (22nd February, 2021).

<https://ourworldindata.org/coronavirus/country/japan?country=-JPN>

Total confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

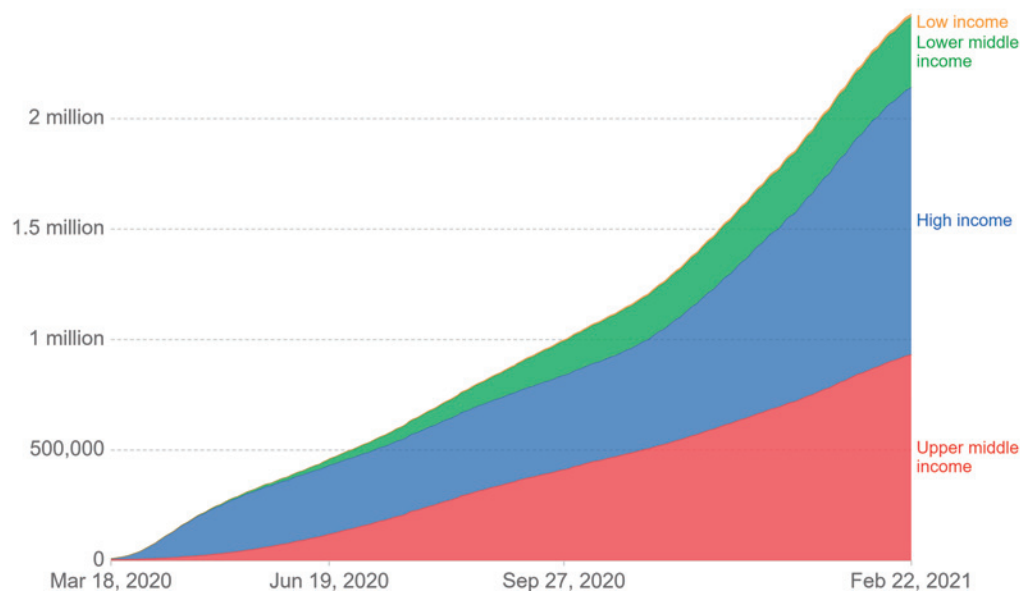


Figure 8. Total confirmed COVID-19 deaths by income (22nd February 2021).
<https://ourworldindata.org/coronavirus>

Social Vulnerability Revealed by the COVID-19 Pandemic

The epidemiology of COVID-19 has revealed social vulnerabilities that are quite different from those revealed by previous infectious diseases. Conventional epidemics have spread in low- and middle-income countries and other places where poverty, inequality, immature health systems, and a lack of medical services as well as health human resources prevail, resulting in greater social disparities. However, in the case of COVID-19, the number of infectious cases and deaths is higher in high-income countries, and in terms of cumulative deaths, middle- and high-income people accounted for more than 85% of the total deaths (**Figure 8**). In terms of continental epidemiology, the mortality impact of COVID-19 in Africa and Asia is limited (**Figure 9**). However, there are arguments on the low capacity of diagnostic services, which leads to underreporting. However, when using Japan as a reference, many African countries, even those with lower incomes than Japan, are conducting more tests (**Figure 10**).

Excess mortality, which impacts life expectancy of the population, is a reflection of the burden of COVID-19 mortality. Between January and October 2020, the actual

number of deaths in the US exceeded the number of deaths expected based on statistics. Although two-thirds of the deaths were caused by the new coronavirus, the number of the deaths of the people between the ages of 25 and 44 increased by 26.5% compared with the average of the past 5 years, and the rate of increase was particularly high among Hispanics and Blacks, confirming once again that minorities are more susceptible to COVID-19.⁵ Regarding COVID-19 in Louisiana, 76.9% of the hospitalized patients and 70.6% of the deaths were from the Black populations, which comprise only 31% of the population.⁶

In terms of gender disparity in the US, during pregnancy, the risk of needing ICU care is three to five times higher than usual, and the risk of needing Extracorporeal membrane oxygenation (ECMO) is three times higher. The mortality rate was 1.7 higher than that of non-pregnant women. The rate of premature birth is also 1.2 times higher.⁷ In comparison to white women, Indian women are 2.7 times more likely to die of COVID-19 compared with white women, while women from the Afro-American community were 4.3 times more likely to die⁸ (**Figure 11**).

During medical crises, women are especially at risk. Female health workers are 2-3 times more susceptible to

Cumulative confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the actual number of deaths from COVID-19.

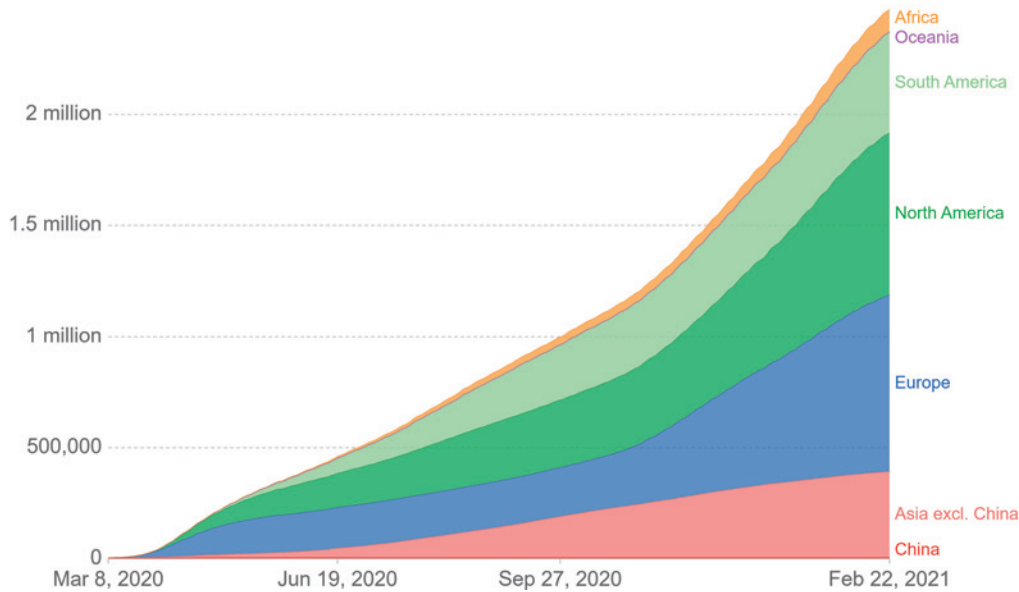


Figure 9. Cumulative confirmed COVID-19 deaths by continent (22nd February 2021).

<https://ourworldindata.org/coronavirus>

Total COVID-19 tests per 1,000 vs. GDP per capita

GDP per capita is adjusted for price differences between countries (it is expressed in international dollars).

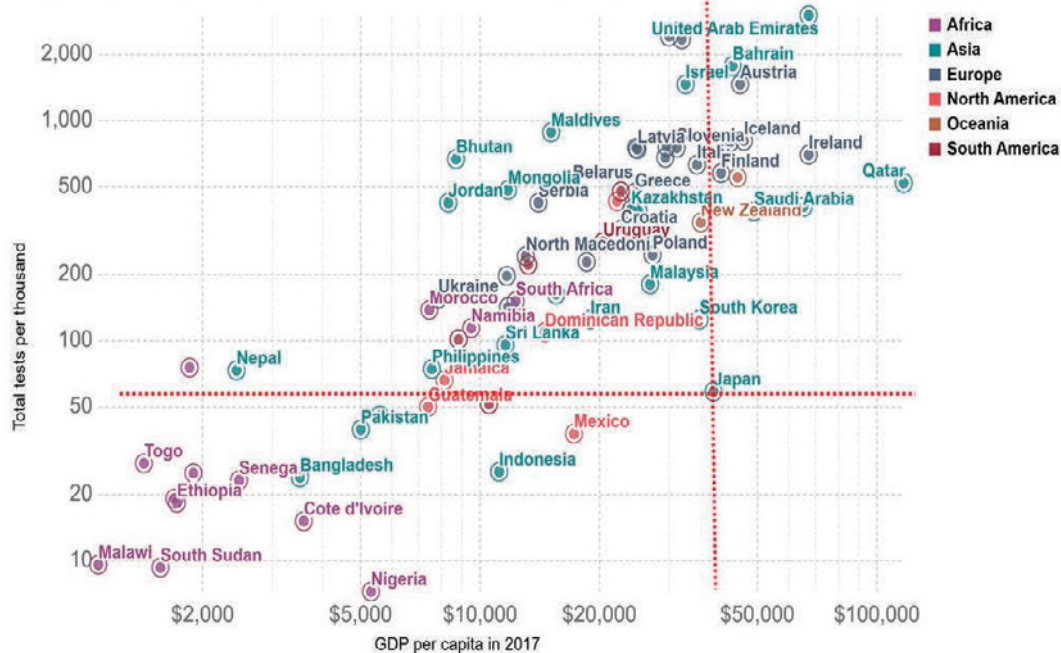


Figure 10. Total COVID-19 tests per 1,000 vs GDP per capita (22nd February 2021).

<https://ourworldindata.org/coronavirus>

infection than their male counterparts. Globally, women make up 70% of the health workforce and are more commonly frontline health workers. They experience greater burden due to their responsibilities of performing house-

hold tasks, childcare, and sometimes elderly care, which puts them at an even greater risk. There is also increasing domestic violence as a result of the lockdown policy worldwide.⁹ These results require increased efforts to pre-

Likelihood of dying from COVID-19 compare to white ethnicity

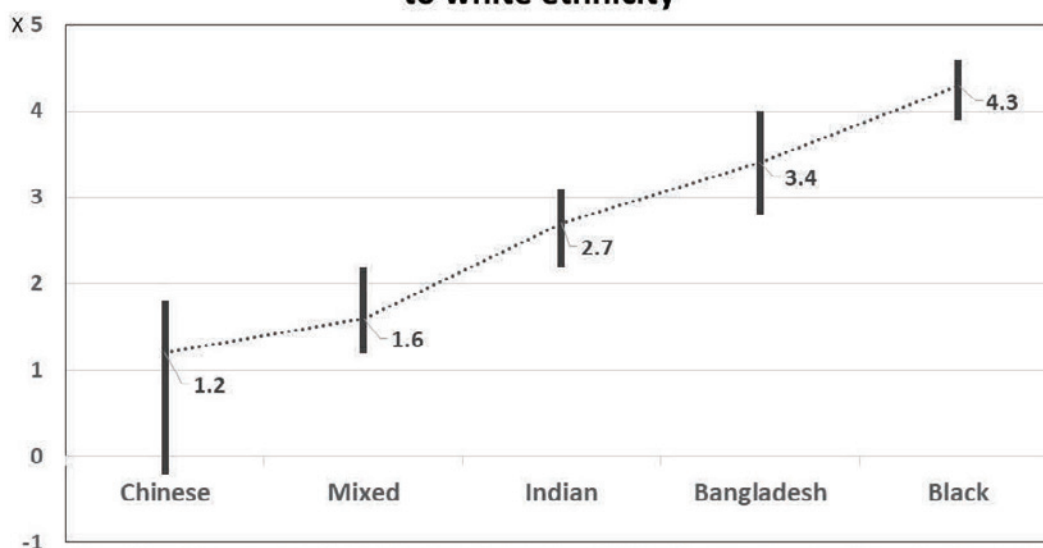


Figure 11. Marginalized groups are more likely to die from COVID-19.

<https://www.unwomen.org/en/digital-library/publications/2020/09/gender-equality-in-the-wake-of-covid-19> (Modified by the author)

vent mortality directly or indirectly associated with the COVID-19 pandemic, such as minimizing disruptions to health systems and mitigating social, racial, and gender inequity.

Redefining Social Vulnerability in the Era of the Novel Pandemic

The spread of infectious diseases reflects how susceptible all countries are to health-related crises. Even before the outbreak of the COVID-19 pandemic, social inequality has been a deep-rooted problem. Developing and third-world countries, as well as already vulnerable populations around the world, such as those dependent on the informal economy, women, people with disabilities, refugees, displaced people, and those suffering from prejudice, will be the most affected.

On the other hand, luxury cruise ships, live music venues, karaoke parlors, brothels, gyms, nursing homes, and dense, close, and enclosed spaces in urban areas have led to increased outbreaks. Existing travel conditions and public transportation systems have become hotbeds for the spread of the virus.

The social crisis caused by COVID-19 has revealed the vulnerability of modern society to pandemics. In capitalistic societies, human beings, who perform eco-

nomics activities, are the focus of this system. However, the ideal theories of coexistence with viruses, unregulated inroads into ecosystems, dense urban design, crowded commuter systems, jam-packed schooling, and urban work styles that pursue economic efficiency were found to be vulnerable to pandemics.¹⁰ Vaccine development has also been accelerated, and introduction plans are being made in many countries, but there is growing concern about political imbalances, which may prevent equitable distribution of the vaccine. This is the dilemma that countries face in the 21st century (**Table 1**).

At the same time, the virus is being studied at an unprecedented speed, vaccines and therapeutic agents are being developed, and interdisciplinary knowledge from fields other than medicine, such as sociology, economics, behavioral science, and political science, is leading to accumulation of knowledge on the social and economic consequences of pandemics.

The new normal after the pandemic may include drastic transformations: from resolution to coexistence, from autonomy to solidarity, and from wealth to compassion. The goals and directions of our future society are shifting from a human-centered development model to fostering of a shared consciousness that transcends disciplines to achieve a sustainable and universal co-existence. We are standing at a historical turning point to practice a new

Table 1. Conventional and new vulnerabilities in the society.

	Conventional vulnerability	New vulnerability
Attribution	<ul style="list-style-type: none"> ■ Disparity ■ Poverty ■ Rural area ■ Healthcare Systems ■ Gender ■ Nutrition ■ Education 	<ul style="list-style-type: none"> ■ Globalization ■ Economic prosperity ■ Urbanization ■ Aging ■ NCDs ■ Science and technology
Direction	Sustainability for human (prosperity)	Sustainability for planet (continuity)
SDGs	Human-centered approach Economic Prosperity	Whole Systems Approach Planet-consciousness

way of life involving a paradigm that considers the entire planet, which utilizes a bird's eye view of pandemics from the perspective of human history and the ecology of the entire planet, in response to the new normal cosmos in the 21st century.

Conflicts of Interest: The author declares that there are no conflicts of interest.

Author Contributions: TS developed the original idea, undertook the initial literature review, collected available open data (<https://ourworldindata.org/>), analyzed them and wrote up and submit the final manuscript.

Disclaimer: Tomohiko Sugishita is one of the Associate Editors of Tokyo Women's Medical University Journal and on the journal's Editorial Board. He was not involved in the editorial evaluation or decision to accept this article for publication at all.

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