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Special Issue I: Demographic Perspectives of the Impact of COVID-19 Pandemic

COVID-19 and Mortality Decline in Asia in 2020

HAYASHI Reiko

COVID-19 affected people all around the world, but its mortality differs from country to country. America and Europe were significantly affected, while Asia and Africa's mortality remained low. Although the pandemic continues, vital statistics based on death registration started to be available for the earlier period from 2020, enabling an analysis of COVID-19 impact using the information written on the death certificate, including causes of death. In contrast to Europe and America, where the surge in mortality occurred due to COVID-19, all countries in Eastern and South-Eastern Asia equipped with register-based vital statistics recorded the mortality decline with or without age adjustment. In these countries, the reduction in deaths was caused by respiratory system diseases, notably pneumonia and influenza. Also, accidents decreased and suicide increased. Various factors could influence the mortality difference among global regions, but it is difficult to find a conclusive singular factor that caused the difference, for now.

Along with the course of the COVID-19 pandemic, its impact has evolved through the years. Significant excess mortality occurred in Japan and South Korea during the Omicron wave in March 2022. Most of the increase is caused by diseases and symptoms other than COVID-19. We have to wait until the final statistics are released for a more detailed analysis. If it was caused by limited access to healthcare services by excessive resource allocation to COVID-19, it is imperative to restructure the health system as soon as possible.

Keywords: COVID-19, mortality, Asia

I. Introduction

On 30th January 2020, World Health Organization (WHO) declared that the COVID-19 outbreak constitutes a Public Health Emergency of International Concern (PHEIC). This infectious disease, which is said to have originated in China, spread rapidly around the world, causing an increase in infections and deaths, especially in North and South America and Europe. Not only the direct damages from the disease but the implementation of restrictions on daily life to mitigate the infection also caused a tremendous impact on society and the economy.

In the earlier period of the pandemic, during the year 2020, the early publication of vital statistics was available in only a few countries, but now that the pandemic continues to a certain length, the routine vital statistics, although slow, have started to be available. At the time of writing this paper (August 2022), most countries equipped with universal death registration had already published the final data for 2020. This article uses those vital statistics and compare death structure

by age and cause in Eastern and South-Eastern Asia.

II. Data

The statistics on cases and deaths of COVID-19 around the globe are widely available. These data are based on epidemiological surveillance, defined and stipulated by laws or regulations on infectious disease control, with which most countries are equipped. The surveillance data release is quick, daily or weekly, and with the COVID-19 pandemic, many countries improved its release using the graphical publication interface on the internet. The primary purpose of epidemiological surveillance is to stop the spread of the disease, so it is crucial to capture the case as soon as possible. Once the patient recovers or dies, it is considered that the causal agent exists no more, and the case is deleted from the surveillance target. Hence, the event of death is not the direct purpose of surveillance, and sometimes the death information is not detailed. In addition, the data is only concentrated on the designated infectious diseases, so it does not give the whole picture of how people are dying in society.

On the other hand, death information is available from vital statistics based on death registration with the death certificate made by medical doctors. The vital statistics are stipulated by laws and regulations concerning civil registration and vital statistics, different from epidemiological surveillance. The death registration and compilation of vital statistics take time. In the case of Japan, for example, the rapid release of preliminary results is made two months after the occurrence. Then the approximate report is released five months after with more detailed data, and the final data is released around September of next year. Although slow, the final data contains detailed information such as the cause of death or place of death. In addition to the slowness, the weak point of vital statistics is that not all countries can provide vital statistics covering all deaths that occurred in the territory. According to the United Nations Statistics Division, only 127 out of 233 countries or areas have a death registration coverage of 90% or more (UN 2021).

The cause of death statistics is included in the vital statistics in many countries. However, as it requires a death certificate made by a medical expert, usually a medical doctor, the process of statistics making is slightly different. Due to this process, in countries where the number of doctors is limited, it is difficult to issue certificates for all deaths occurring in the territory. Hence, the countries which can correctly publish the cause of death statistics are limited. According to the World Health Organization (WHO), which is mandated to collect and compile the cause of death information, the cause of death data from only 66 out of 129 countries are of good quality and usable (WHO 2020). In Eastern and South-Eastern Asian countries, seven countries and areas (Japan, South Korea, Taiwan, Singapore, Brunei, Philippines and Malaysia.) publish cause of death data. Other countries publish limited tables in annual statistics yearbooks (Thailand, Myanmar, Vietnam), conduct sample surveys (China, Indonesia), or now create a system to collect vital statistics, including the cause of death (Cambodia, Lao PDR) (Hayashi and Komazawa 2022).

This article will use the vital statistics of Japan, South Korea, Mongolia, Taiwan, Singapore, Brunei, Philippines and Malaysia. The comparative analysis of 2020 data was conducted compared to the previous years. The final data of vital statistics are up to 2020 in Japan, South Korea, Brunei, Philippines and Malaysia at the time of writing this article (August 2020), so the comparison was made up to that year. Mongolia does not publish the cause of death statistics online. Malaysian cause of death statistics contains both medically and non-medically certified deaths, both of which are used.

III. Total number of deaths from 2018 to 2020

Based on the vital statistics published by each country's authorities, the total number of deaths decreased from 2019 to 2020 in Japan, Mongolia, Taiwan, Brunei, Philippines and Malaysia. In South Korea and Singapore, it increased. In the reference countries in America and Europe (US, England and Wales, and Germany), the increase in 2020 was significant (Figure 1). In order to verify the increase, the age-adjusted number of deaths was calculated using the age-specific mortality of 2018 to 2020, setting the standard population as that of 2019 in each country. The increase in deaths in South Korea and Singapore turned into a decrease, whereas the increases in deaths in US, England and Wales and Germany were persistent even after the age adjustment. The increase in deaths in South Korea and Singapore from 2019 to 2020 was due to the increasing number of older persons, not the COVID-19 pandemic. As population ageing is proceeding, especially in middle-income emerging countries, its effect on mortality statistics must be adequately considered.

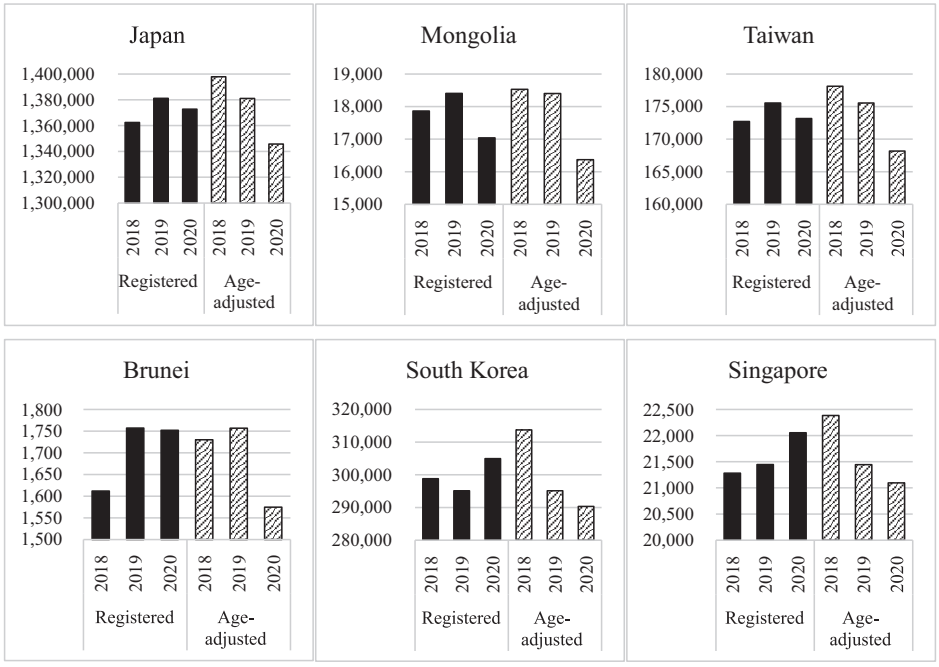


Figure 1 Total number of deaths from 2018 to 2020

Note: Age-adjusted by the population structure of 2019 in each country. Detailed descriptions are listed in the online data file.

Source: Vital statistics, final statistics (Ministry of Health, Labour and Welfare, Japan), Deaths and Death rates by cause (KOSIS, Statistics Korea), Population Statistics Resources (Department of Household Registration, Ministry of the Interior, Taiwan), Population (Mongolian Statistical Information Service), Report on Registration of Births and Deaths (Immigration & Checkpoints Authority, Singapore), Population and Population Structure Latest Data (Department of Statistics Singapore), Vital Statistics (Department of Economic Planning and Statistics, Brunei), Population (eData Library, Brunei), Vital Statistics Report and Projected Mid-Year Population Based on 2015 POPCEN (Philippine Statistics Authority), Vital Statistics (eStatistik, Department of Statistics, Malaysia), Population by Age Group, Sex and Ethnic Group, Malaysia (data.gov.my, Malaysia), Underlying Cause of Death, 1999-2020, National Vital Statistics (National Center for Health Statistics, Centers for Disease Control and Prevention, US), Deaths registered in England and Wales and population projection (Office for National Statistics, UK), Deaths by age (12613-0003), population by age (12411-0005), Genesis-online (Statistisches Bundesamt, Germany).

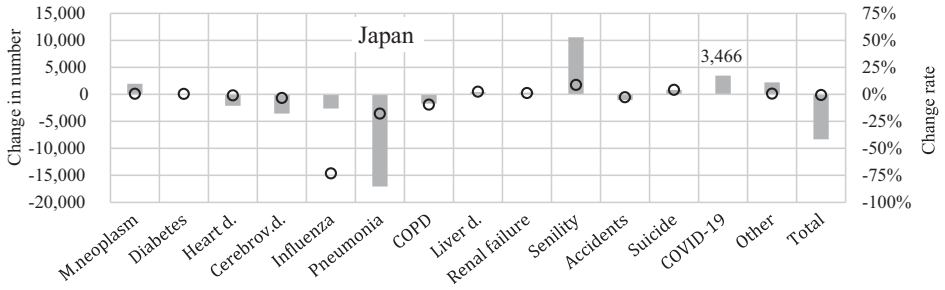
IV. Cause of death from 2019 to 2020

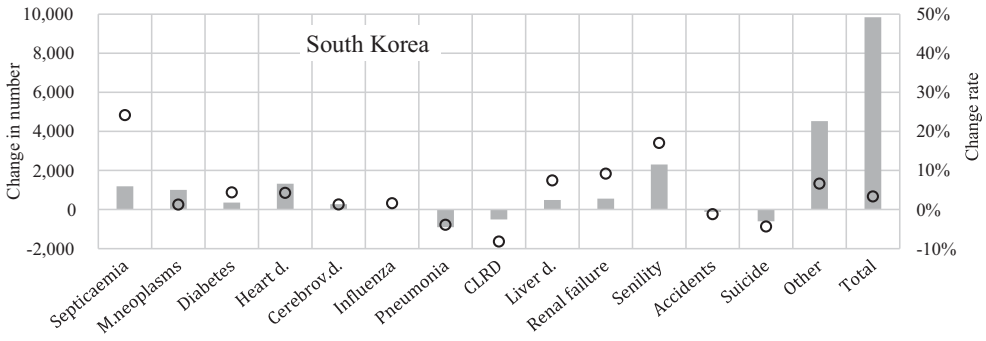
The decline in the number of deaths can be decomposed by cause. Figure 2 shows the change in the number of deaths by cause in 2020 compared to 2019, in number and change rate for seven countries in Eastern and South-Eastern Asia which have data. In all countries, the number of deaths caused by pneumonia declined in 2020. Influenza also fell in Japan, Taiwan, Malaysia and Singapore. As the number of influenza deaths is not large, the decrease in number is not outstanding, but the change rate is significant. For example, in Japan and Taiwan, influenza deaths declined by 75% in 2020 compared to 2019. The number of influenza deaths in Singapore became zero in 2020, while it counted seven in 2019. Other respiratory diseases, such as chronic obstructive

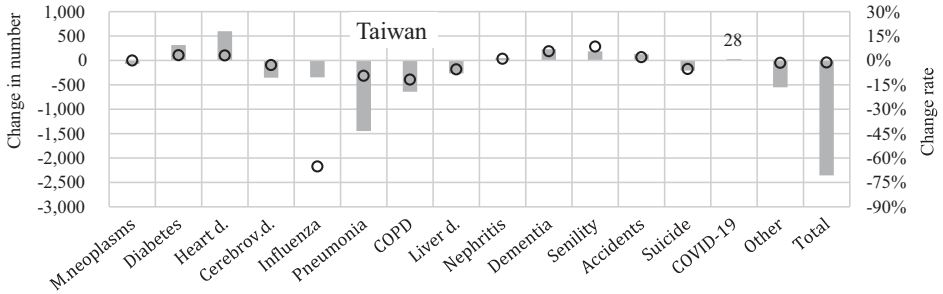
pulmonary diseases (COPD) or chronic lower respiratory diseases (CLRD), also declined.

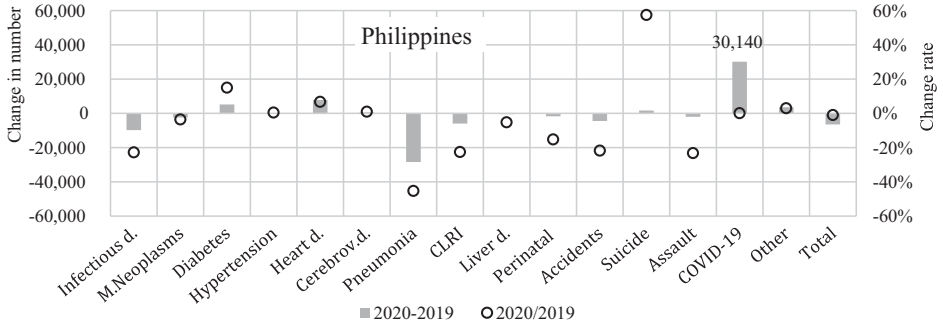
The decline in influenza deaths might be due to the vaccination promotion in 2020 to avoid the double burden of influenza and COVID-19. Also, the decrease in pneumonia deaths in the Philippines was offset by the increase in COVID-19 deaths. However, the general reduction of deaths caused by respiratory system diseases is observed in all studied countries. It might be due to the enhanced personal protection against respiratory infection in 2020.

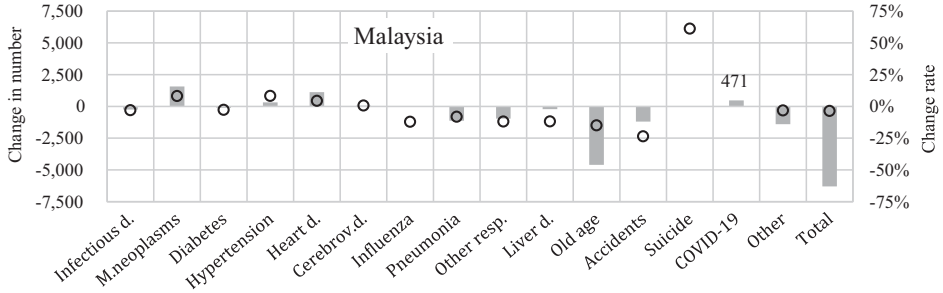
Accidents are the cause which declined in five of seven countries observed. The activity restrictions enforced by lockdown or related public orders might be the reason for the reduction. On the contrary, suicide increased in Japan, the Philippines, Malaysia, and Singapore. In Japan, the declining trend of suicide for ten years was reversed in 2020. For the remaining three countries, the number of suicides in usual years is small, but the change rate from 2019 to 2020 was considerable. The lack of communication might cause suicide to increase due to human contact restrictions. However, suicides declined in Korea and Taiwan. The impact of COVID-19 on mental health needs to be further clarified.

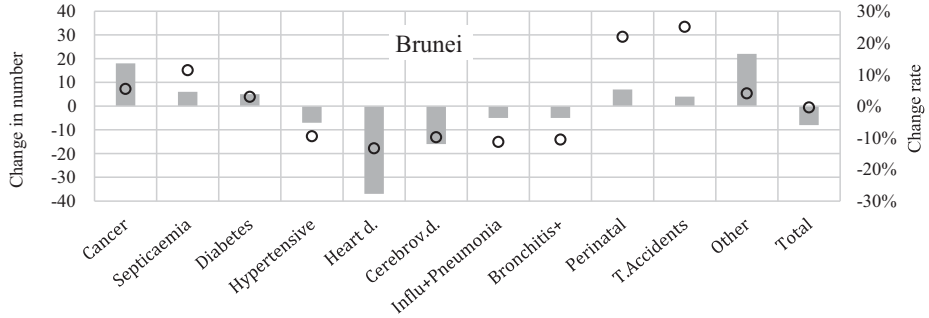





Taiwan
Change in number
Change rate
28
M.neoplasms
Diabetes
Heart d.
Cerebrov.d.
Influenza
Pneumonia
COPD
Liver d.
Nephritis
Dementia
Senility
Accidents
Suicide
COVID-19
Other
Total


Philippines
Change in number
Change rate
30,140
Infectious d.
M.Neoplasms
Diabetes
Hypertension
Heart d.
Cerebrov.d.
Pneumonia
CLRI
Liver d.
Perinatal
Accidents
Suicide
Assault
COVID-19
Other
Total
2020-2019
2020/2019


Malaysia
Change in number
Change rate
471
Infectious d.
M.neoplasms
Diabetes
Hypertension
Heart d.
Cerebrov.d.
Influenza
Pneumonia
Other resp.
Liver d.
Old age
Accidents
Suicide
COVID-19
Other
Total


Brunei
Change in number
Change rate
Cancer
Septicaemia
Diabetes
Hypertensive
Heart d.
Cerebrov.d.
Influ+Pneumonia
Bronchitis+
Perinatal
T.Accidents
Other
Total

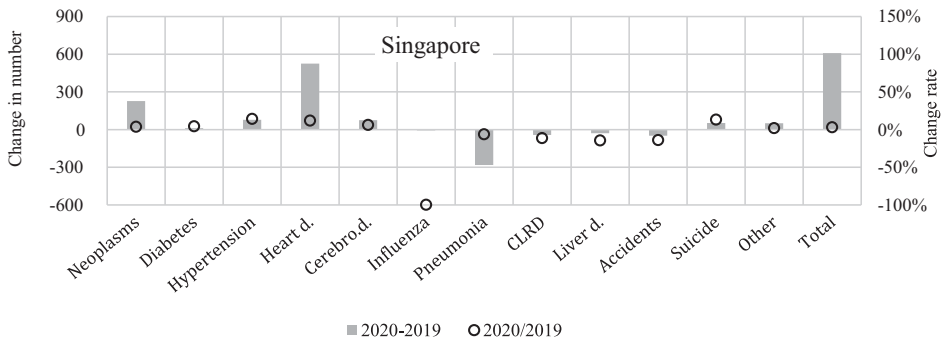


Figure 2 Change of number of deaths by cause from 2019 to 2020

Notes: d. =diseases. The number of COVID-19 deaths is shown above the bar. The original cause name, corresponding ICD codes and other details are included in the online data file.
Source: Vital Statistics (Ministry of Health, Labour and Welfare, Japan), Causes of Death Statistics (Statistics Korea), Causes of Death Statistics Annual Report (Ministry of Health and Welfare, Taiwan), Registered Deaths in the Philippines (Philippine Statistics Authority), Statistics on Causes of Death Malaysia (Department of Statistics Malaysia), Vital Statistics (DEPS Brunei), Report on Registration of Births and Deaths (Immigration & Checkpoints Authority, Singapore).

V. Factors affecting mortality difference

1. Regional difference in COVID-19 mortality

Globally, not only in Asia but the African region is also known for lower mortality of COVID-19. In most countries in America and Europe, the mortality rate is more than 100 per 100,000 population, whereas many are less than 50 in Asia and Africa (Figure 3).

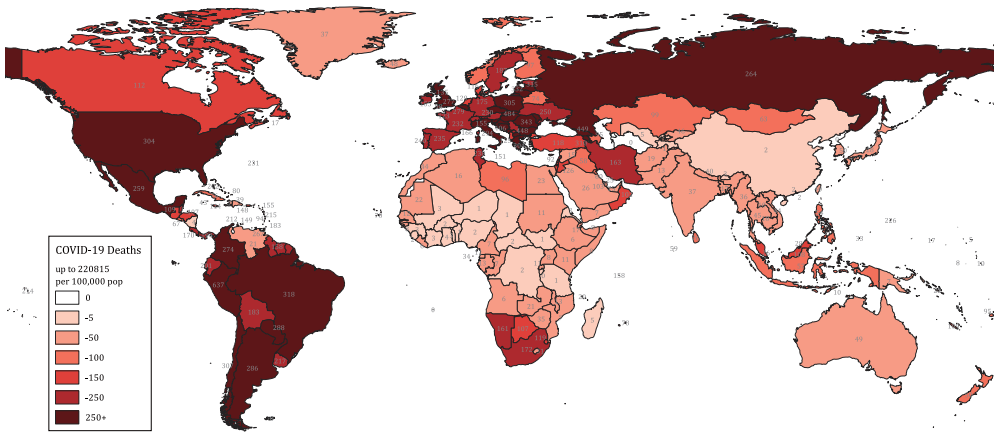


Figure 3 COVID-19 mortality by country

Note: mortality is calculated with COVID-19 deaths from 3rd January 2020 to 15th August 2022 divided by the 2021 mid-year population.
Source: COVID-19 deaths by WHO COVID-19 Dashboard, population by World Population Prospects 2022, Online Edition (United Nations, Department of Economic and Social Affairs, Population Division). Map created by QGIS, using world country boundary data of NaturalEarth.

Several authors made the explanation on differences between countries and global regions. Yamanaka (n.d.) used the term "Factor X", which made the difference between Japan and other countries and listed factors such as wearing a mask, self-imposed activity restriction, genetic difference, cross-immunity or contact tracing. The marked mortality difference between US and Canada was explained by political commitment, the national health care system, trust in government, acceptance of wearing masks and vaccines, and basic health status differences, including the burden of obesity and diabetes (Karabel 2022). However, it is challenging to elucidate the factors that caused the difference quantitatively. An analysis of modelled data from 177 countries and territories did not explain the most cross-country variation of COVID-19 mortality (COVID-19 National Preparedness Collaborators 2022).

Here, five factors are reviewed in the following sections.

2. Population Ageing

The first factor which would explain the difference is population ageing. As COVID-19 deaths are concentrated in old age, countries with a higher proportion of older persons inevitably have higher COVID-19 mortality. As shown in Figure 4, the proportion of older persons is well correlated with COVID-19 mortality with a coefficient of correlation (r) of 0.593.

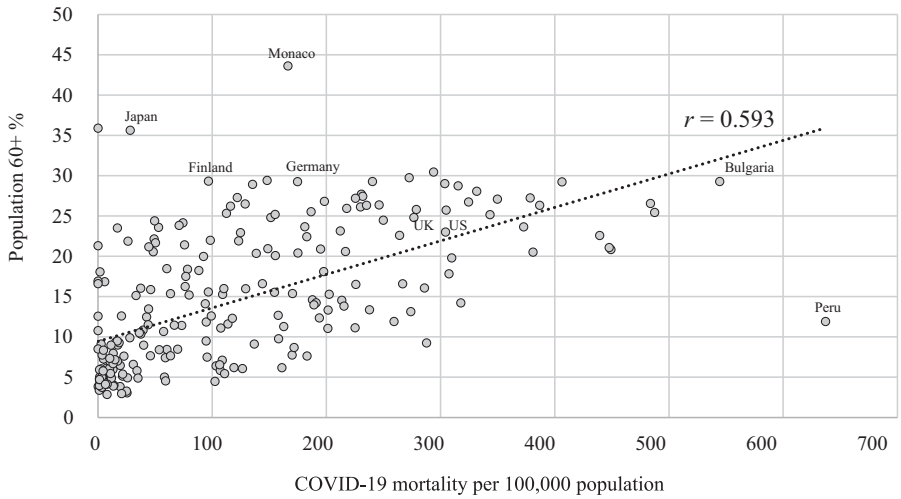


Figure 4 COVID-19 mortality and proportion of the population aged 60 and over

Note: mortality is calculated with the total COVID-19 deaths from 3rd January 2020 to 15th August 2022 divided by the 2021 mid-year population.
Source: COVID-19 deaths by WHO COVID-19 Dashboard, total population and proportion of population 60+ by World Population Prospects 2022, Online Edition (United Nations, Department of Economic and Social Affairs, Population Division).

However, not to mention the outlier countries such as Japan or Monaco, where the COVID-19 mortality is disproportionately low compared to their level of population ageing, or Peru, on the contrary, there is a significant difference in COVID-19 mortality among the countries with the same level of population ageing. For example, Bulgaria, Germany and Finland are at the same level of ageing, with 29.3% of the population aged 60 and over, while the COVID-19 mortality is 544.4, 174.7 and 96.6 respectively; Bulgarian COVID-19 mortality is five times higher than in Finland. Also, the geographical mortality pattern shown in Figure 3 remains the same even if the denominator population is set to older persons aged 60 years and over (Figure 5). There must be some other factors which should explain the COVID-19 mortality difference.

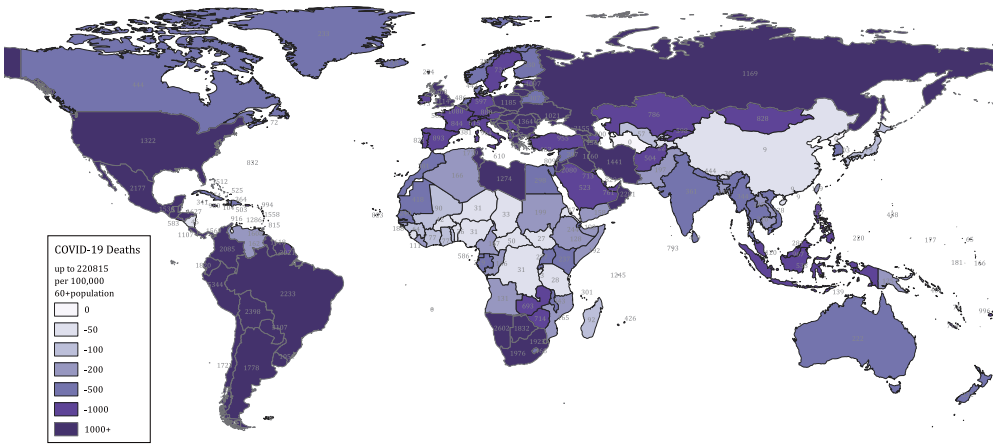


Figure 5 The ratio of COVID-19 deaths to population aged 60 and over

Note: mortality is calculated with COVID-19 deaths from 3rd January 2020 to 15th August 2022 divided by the 2021 mid-year population of 60 years and over.
Source: COVID-19 deaths by WHO COVID-19 Dashboard, population by World Population Prospects 2022, Online Edition (United Nations, Department of Economic and Social Affairs, Population Division). Map created by QGIS, using world country boundary data of NaturalEarth.

3. Genetic factor

The genetic factor was pointed out to explain the COVID-19 mortality difference from the early phase of the COVID-19 pandemic. Zeberg and Pääbo (2020) indicated that a genomic segment inherited from Neanderthals causes severe symptoms of COVID-19 infection. This theory might have been a good reason to explain the low COVID-19 mortality in Africa, as it is known that Africans are the only people not inheriting the Neanderthal gene (Green 2010). However later, it was found by the same authors that there are also genes which protect from severe COVID-19 on the Neanderthal gene (Zeberg and Pääbo 2021). At present, it is understood that the ancestries do not explain the genetic impact on the severity of COVID-19. Still, dozens of genes are identified associated with the severity of COVID-19 (COVID-19 Host Genetics Initiative 2022). Knowing

those genes will improve treatment and outcomes through gene screening and personalized clinical management (van der Made 2022).

However, the racial mortality difference within a county does not necessarily support the genetic influence. For example in US, the COVID-19 mortality is 2.1 times higher for American Indian or Alaska Native, 1.8 for Hispanic or Latino persons, 1.7 for black or African American, 0.8 for Asian, compared to white, non-Hispanic persons (from 1st March 2020 through 9th July 2022, CDC 2022). It is in line with lower COVID-19 mortality in Asian countries but opposite to lower COVID-19 mortality in African countries.

4. Immune system

The regional COVID-19 mortality difference could also be explained by the difference in biological factors other than genetic factors, such as the immune system. For example, BCG vaccination coverage was suggested to explain the mortality difference between countries. Five countries which never had a universal BCG vaccination policy, namely Italy, US, Lebanon, Netherlands and Belgium, had statistically higher COVID-19 mortality at the beginning of the pandemic (Miller 2020). Even before the COVID-19 pandemic, the trained immunity initiated by the BCG vaccine was known, and a large random control trial was planned (de Vrieze 2020). Along with the onset of COVID-19, the BRACE trial started in March 2020 (Pittet 2021). The results are not yet available (ClinicalTrials.gov 2022). So far, two other studies have tested the effectiveness of BCG vaccination against COVID-19, but the results conflict with each other (Locht 2022). Moreover, the initially observed mortality difference has changed as the pandemic prolonged. In addition, the BCG coverage does not clearly explain the high mortality in Latin America.

The immune system is diverse, which could affect the susceptibility to COVID-19. The cross-reactivities of antibodies against plasmodium falciparum (which causes malaria), or common cold coronaviruses, are also indicated to explain the low mortality in Africa (Lewis et al. 2022). If BCG, which is made out of mycobacterium bovis, the cow tuberculosis bacteria, or immunity induced by malaria are responsible for the protective effect against COVID-19, we have to re-think the strategies on disease elimination.

5. Underreporting

Underreporting could be an important factor when comparing mortality. In countries without vital statistics based on the death registration, for example in Sub-Saharan African countries, the low COVID-19 mortality could be attributed to underreporting. Based on the 153 studies conducted in Africa, a meta-analysis concluded that the SARS-CoV-2 seroprevalence increased from 3.0% in April-June 2020 to 65.1% in July-September 2021. While the number of registered cases was low, it was estimated that 100 times more infections occurred (Lewis et al. 2022). However, inadequate reporting of infections does not necessarily indicate the underreporting of severe cases or deaths.

In Latin America, even in countries without death registration statistics, the large excess deaths were visible by increasing demand and shortage of burial sites. A similar situation was not reported in African countries. It would be more probable that there are COVID-19 infections in Africa which tend not to develop into severe conditions.

In countries with vital statistics based on universal death registration, the underreporting of COVID-19 deaths in surveillance can be later verified by the vital statistics. As we have seen in the previous section, we can safely assume that the low COVID-19 mortality in Asia in 2020 was not due to underreporting, at least for eight countries with vital statistics, where even the total number of deaths declined.

However, when comparing the cause of death statistics, the surveillance and register-based number do not necessarily match each other. Table 1 shows the number of COVID-19 deaths from different sources in Japan. In 2020, the numbers of COVID-19 deaths in surveillance and vital statistics (underlying cause) were similar. However, the number of deaths which had mention of COVID-19 in the death certificate, shown in Table 1 as "multiple cause", is 5% more than municipal report surveillance data. During 2020, municipalities were notified to report any death with a COVID-19 diagnosis, even if COVID-19 did not cause the death. Thus, the surveillance data should be the same level as the number of deaths of multiple cause of COVID-19, but the former is smaller than the latter. The underreporting of surveillance is intensified for 2021 and 2022. In 2021, the number of COVID-19 deaths in vital statistics was 16,784, 14% more than the surveillance (municipal report). This proportion was 15% for the period from January to April 2022.

Table 1 Number of COVID-19 deaths in different sources (Japan)

Year	Surveillance			Vital statistics	
	National data		Municipal report	Underlying cause	Multiple cause
	MHLW	WHO			
2020	2,846*	3,414	3,664	3,466	3,848
2021	14,926	14,979	14,724	16,784	-
2022(until April)	11,268	11,155	11,793	13,511	-
Total	29,040	29,548	30,181	33,761	

*From 2020/5/10

Source: "Surveillance-National-MHLW"(Ministry of Health, Labour and Welfare) by "Visualizing the data: information on COVID-19 infections", Ministry of Health, Labour and Welfare, https://covid19.mhlw.go.jp/en/ . "Surveillance-National-WHO" by COVID-19 Dashboard https://covid19.who.int/ . "Surveillance-Municipal report" by "Data on COVID-19", National Institute of Population and Social Security Research, https://www.ipss.go.jp/projects/j/choju/covid19/ ; the data is based on daily number of death published online by prefecture and municipality. "Vital statistics-underlying cause" by Vital Statistics, Ministry of Health, Labour and Welfare, final data for 2020 and 2021, https://www.e-stat.go.jp/en/stat-search/files?page=1&toukei=00450011&tstat=000001028897 , monthly approximate number for 2022, https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00450011&tstat=000001028897 . "Vital statistics-multiple cause" by Hayashi et al. (2022) based on the death registration microdata provided through the Statistics Act. The number is the sum of the underlying cause of COVID-19 (3,466) plus deaths of other underlying cause with mention of COVID-19 in any part of the death certificate (382). Only 2020 data is available at the time of writing this article.

6. Behavioural difference and Public Health and Social Measures (PHSM)

The behavioural difference, the daily life behaviour and how people followed or ignored the governmental activity restrictions for infection control could make the difference. For example in Japan, the customary greeting is done by a bow, not by shaking hands, hugging or kissing. Also, it is common to remove shoes when entering a house. Moreover, people easily or willingly accepted wearing a mask when the government asked to do so. In countries with high COVID-19 mortality, in America and Europe, the daily greetings are in a manner with closer contact and covering the face with a mask is not preferred. However, it is not easy to compare these factors quantitatively.

Nevertheless, the speed and the level of implementation of governmental measures to stop the spread of the virus differs. These measures are categorized and compiled by WHO and collaborators as Public Health and Social Measures (PHSM). The 38 measures in 5 categories, including mask-wearing, closure of schools or businesses, restriction of gatherings, and domestic or international travel, are measured, and a composite index named "severity index" is calculated (WHO 2022). The regional severity index does not show a similar geographical difference in COVID-19 mortality. However, a closer and more detailed examination of PHSM is needed to determine if they impacted the COVID-19 outcome.

VI. Beyond 2020 - the changing trend

The COVID-19 pandemic lasted more than people had imagined at the beginning. In 2022, after the Omicron variant wave, many countries started to lift the ban on activity restriction, even though the number of cases and deaths are still at a significant level.

The mortality deficit observed in Asia in 2020 did not last for the following years. In Japan in 2021, the mortality increase was observed, but it was mostly in accordance with the increase in older persons. The 2021 life expectancy was shorter than 2020 but slightly longer than 2019 (MHLW 2022). However in 2022, clear excess mortality was observed during the sixth wave caused by the Omicron variant (Figure 6). In March 2022, 138,199 total deaths were registered, 16.9% more than the March 2019 deaths of 118,182. Among the difference of 20,017 deaths, only 23%, 4,630 deaths, were caused by COVID-19.

The excess mortality in South Korea during the same period was much more significant. The number of deaths in the week ending on 19th March 2022 was 10,475, 86% more than the same period in 2019, which counted 4,853 deaths (Statistics Korea 2022). This magnitude of excess was much more than what US, France or possibly other countries in Europe and America experienced in 2020.

So far, population ageing, genetic factors, immune system difference or underreporting do not explain the mortality decline in Asia in 2020 sufficiently. The last but essential factor, the level of

public health and social measures, could be the determinant of increased mortality in 2022 in Japan and South Korea. Those measures were somewhat relaxed during the period due to the lower case-fatality rate and for the sake of a normal economy. In fact, even though the case-fatality rate of the Omicron variant was low, the explosion in the number of cases caused the highest number of deaths since the beginning of the pandemic. A detailed evaluation of PHSM is deemed necessary.

Japan or South Korea's increased deaths are partly caused by COVID-19 but also by other causes. When the data becomes available, further investigation should be made to examine the nature of the mortality increase. If the excess mortality is attributed to the limited access to health care by excessive resource allocation to COVID-19, there is a need to restructure the health system which could deliver sufficient care for both COVID-19 and other diseases.

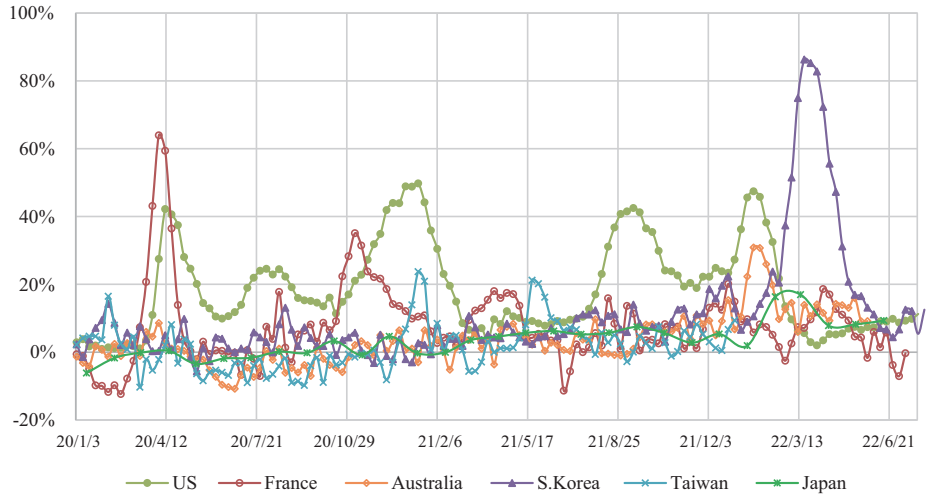


Figure 6 Ratio of the number of total deaths in 2020-2022 to 2019

Source: Weekly number of deaths of US, France, Australia and Taiwan by Short-Term Mortality Fluctuations, Human Mortality Database, https://mpidr.shinyapps.io/stmortality/ . Weekly number of deaths of South Korea by Statistics Korea https://kosis.kr/covid_eng/statistics_excessdeath.do . Monthly number of deaths of Japan by vital statistics rapid release https://www.mhlw.go.jp/toukei/list/81-1a.html .

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新型コロナ感染症流行と2020年のアジアにおける死亡減少

林玲子

新型コロナ感染症は世界中の人々に影響を与えたが，その死亡率は国によって異なる．地域別には南北アメリカおよびヨーロッパの死亡率は高く，アジアとアフリカの死亡率は低い傾向にある．パンデミックは当初想定されたよりも長く続いており，死亡登録に基づく人口動態統計を公表している国では，少なくとも2020年の統計が利用できるようになったことから，本稿では2020年の総死亡者数および死因別死亡数の変化を国際比較した．東アジア，東南アジアにおける死亡登録に基づく人口動態統計を公表している国・地域のうち，2019年から2020年にかけて日本，モンゴル，台湾，ブルネイ，フィリピン，マレーシアでは死亡数が減少し，韓国，シンガポールでは年齢調整死亡数が減少した（Figure 1）．これらすべての国で肺炎，インフルエンザ，その他の呼吸器系疾患による死亡数が減少し，多くの国で事故による死亡が減少，および自殺の増加があった（Figure 2）．

世界の地域間の死亡率の違い（Figure 3）は，人口高齢化，遺伝子，免疫システム，登録もれ，感染対策とその受容など，様々な要因による可能性があるが，その差を決定的に説明することは難しい．人口における高齢者の割合と新型コロナウイルス感染症による死亡率には強い相関があるものの（Figure 4），高齢者割合のみが決定しているとは考えにくく，高齢者数に対する新型コロナウイルス感染症死亡者数の割合は，全人口に対する割合と同様，アジア・アフリカで低く，アメリカ・ヨーロッパで高い（Figure 5）．遺伝子や免疫システムの違いは，特にアフリカの低い新型コロナウイルス感染症死亡率を説明する要素になりうる．牛の結核菌を元に作られたBCGやマラリアの交差免疫がコロナの重症化，死亡を押さえたのであれば，今後の疾病撲滅対策にも影響を及ぼすだろう．登録漏れについては，人口動態統計が整備されていない国においては確認は難しいが，ラテンアメリカで生じたような埋葬地の不足などはアフリカでは起こっておらず，アフリカの新型コロナウイルス感染症死亡率がラテンアメリカのように高かったとは考えにくい．日本においては感染症報告による新型コロナウイルス感染症死亡者数は人口動態統計と比べ，2020年の段階で５％程度，2021年以降は15％ほどの報告漏れが生じている（Table 1）．

2020年のアジアの死亡減少傾向は時間の経過とともに弱まっている．2022年３月のオミクロン波の流行時には，日本と韓国で大幅な超過死亡が発生した（Figure 6）．超過死亡の多くが新型コロナウイルス感染症によるものではなく，その増加の解明のために人口動態統計の確定値の公表が待たれるところである．もしも新型コロナ感染症への過剰なリソース割り当てにより通常の医療サービスへのアクセスが制限されていることが原因であるならば，医療システムを早急に再構成することが必要となる．

【キーワード】新型コロナ感染症，死亡，アジア