Comparative Population Studies
Vol. 48 (2023): 665-684 (Date of release: 07.11.2023)

Excess Mortality During the COVID-19 Pandemic in South Korea

Bongoh Kye

Abstract: This study examines excess mortality in South Korea during the COVID-19 pandemic. I analyze age-specific mortality rates and present an international comparison. First, Korean excess mortality remained low until the end of 2021 but significantly increased in early 2022. Second, this excess mortality was concentrated among older people. For example, cumulative excess mortality among the population aged 85+ years until the 30th week of 2022 was approximately 1-2 percent, that is, an additional 1-2 percent of this age group died compared with what we would have expected in the absence of COVID-19. Third, the international comparison demonstrates that excess mortality in South Korea was relatively low. The country experienced one of the lowest excess mortality rates among countries under study until the end of 2021, but excess mortality rapidly increased in early 2022. However, it returned to being comparatively low by mid-2022. This comparison shows cross-national variation in excess mortality, which may be associated with policy responses and public health infrastructure. Finally, I discuss implications and opportunities for future research.

Keywords: Excess mortality · South Korea · COVID-19

1 Introduction

This study examines excess mortality after the outbreak of COVID-19 in South Korea (hereafter, Korea). It focuses on age and sex differences in excess mortality in Korea and presents an international comparison. Scholars have widely recognized that fatality rates due to COVID-19 are highly age-dependent. In other words, the risk of dying when stricken with COVID-19 is much higher for and concentrated among older persons than younger ones. For example, among the 29,209 cumulative deaths due to COVID-19 in Korea as of November 1, 2022, 59 percent (17,269 deaths) were individuals aged 80 years and over (*Kye* 2022). Furthermore, COVID-19 costs lives indirectly as well as directly. For example, the impact of the pandemic on the public health system certainly hindered its normal operation, resulting in unnecessary

Federal Institute for Population Research 2023

URL: www.comparativepopulationstudies.de
DOI: https://doi.org/10.12765/CPoS-2023-26
URN: urn:nbn:de:bib-cpos-2023-26en8

deaths that otherwise would not have occurred. In addition, some individuals may recover from the disease, but the consequent damage may be sufficiently significant to result in their deaths at a later point in time. However, such deaths are not attributed to COVID-19, despite certainly being related to the virus. Hence, researchers should estimate the numbers of deaths directly and indirectly caused by COVID-19. One way of doing so is assessing the magnitude of excess deaths.

This study analyzes Short-Term Mortality Fluctuations (STMF) data to examine the patterns of excess mortality during the pandemic in Korea. The STMF visualization toolkit available at https://mpidr.shinyapps.io/stmortality/ can produce the same results reported in this study because it allows for inspecting excess mortality under baseline mortality scenarios including the ones used in this study. The main contribution of this study is a reorganization of country-specific excess mortality patterns and their comparison with pre-pandemic mortality. This will show how severe the mortality crises due to the pandemic were in different countries in a comparative perspective. The remainder of the paper is structured as follows. Section 2 briefly reviews previous studies that examined excess death during the pandemic. Sections 3 and 4 explain the data and methods used to estimate excess mortality, respectively. Section 5 presents the results, and Section 6 summarizes the findings and discusses their implications.

2 Literature review

COVID-19 has been a major topic in demographic and public health research due to its global impact on public health, the economy, and social relationships. The increase in mortality during and after the pandemic is among the most prevalent research topics in these fields. Scholars have analyzed various death outcomes and applied different methods to assess excess mortality.

A 2022 report by the World Health Organization (WHO) analyzed excess death counts using monthly death counts in 2020-2021 by specifying baseline deaths under the assumption of linear changes in monthly deaths (*Knutson et al.* 2023; *WHO* 2022). Global excess deaths between 2020 and 2021 were estimated at 14.9 million, which was more than five times the number of deaths directly related to COVID-19 (2.7 million). This finding suggests that the number of deaths indirectly caused by COVID-19 far exceeded those directly caused by COVID-19.

A few studies have also analyzed changes in life expectancy after the outbreak of the pandemic. For example, *Aburto et al.* (2022) used STMF data to analyze changes in life expectancy in 29 countries in 2020 and demonstrated that life expectancy in many countries declined in 2020 compared to 2019, and even was lower than in 2015 in certain countries (e.g., Russia). Although the annual increase in life expectancy at birth between 2015 and 2019 was approximately 0.2-0.3 years, it declined in many countries after the COVID-19 outbreak. In the United States, life expectancy at birth decreased by more than 1 year, and the decrease in life expectancy was concentrated among the older population. However, there is cross-national variations, and the reduction in life expectancy among individuals aged 60 years and under was largest in Eastern Europe.

Other studies have examined excess mortality by comparing observed and projected life expectancies (*Islam et al*. 2021; *Schöley et al.* 2022). While *Aburto et al.* (2022) examined the trend in mortality after the pandemic, these studies compared observed and predicted mortalities under the assumption that previous trends on mortality continued. These analyses thereby accounted for declining mortality trends in assessing the size of excess mortality. The results demonstrated that the loss of life expectancy in Russia and the United States in 2020 was greater than 2 years, but no such reduction was observed in New Zealand, Taiwan, Korea, or Norway (*Islam et al.* 2021). In Germany, *Luy et al.* (2021) analyzed changes in life expectancy by age and sex and illustrated that life expectancy at birth and at age 60 in Germany decreased by 0.2 years, with a greater reduction among men than women. The reduction in eastern Germany was greater than in western Germany.

Changes in life expectancy can be easily interpreted, but require fine-grained mortality data to be used. The STMF data provide fairly wide age intervals (0-14, 15-64, 75-84, and 85+ years) compared with the data usually used to construct life tables. Thus, we need to convert the data into shorter age intervals to estimate life expectancy, likely entailing errors. Hence, several studies analyzed age-specific mortality rates instead of constructing life tables. Examining COVID-19 deaths in Italy in 2020, *Basellini* and *Camarda* (2022) found that the degree of intergenerational co-residence, number of intensive care unit beds per capita, and delay in the outbreak of the epidemic influenced the magnitude of related deaths. Furthermore, *Nepomuceno et al.* (2022) used the STMF to analyze excess mortality by applying various mortality baselines. The authors constructed a total of 12 mortality baselines, four time-trend models (specific-average, specific-trend, specific-average with trend, and harmonic with trend), and three reference periods (2010-2019, 2015-19, and 2017-2019). Their results indicate that excess mortality in the United States, Eastern Europe, and Southern Europe was high; in contrast, it was low in New Zealand and Taiwan.

The international comparison of excess mortality illustrates that excess mortality was lower in Korea than in the majority of countries. Moreover, the loss of life expectancy in 2020 was statistically nonsignificant in Korea, in contrast to most other countries (*Islam et al.* 2021). The excess mortality in Korea in 2020 was one of the lowest among countries examined, regardless of estimation method (*Nepomuceno et al.* 2022). As elsewhere, excess mortality patterns in Korea showed within-country variation. While excess mortality in Korea was negative in the majority of weeks in 2020, that is, fewer deaths occurred than expected based on the previous trend, excess mortality among men eligible for Medicaid was positive. This finding suggests that the impact of the pandemic on mortality was concentrated among the economically disadvantaged (*Kim et al.* 2022). *Shin et al.* (2021) demonstrate seasonal and regional variations in excess mortality. Daegu-Gyeongbuk province, in which a cluster outbreak during the first wave of pandemic occurred, exhibited higher excess mortality during the spring of 2020.

Based on previous studies, the current study examines excess mortality in Korea from a comparative perspective. It contributes to the literature in two ways. First, it extends the time span of analysis on excess mortality during the pandemic. Previous studies in Korea analyzed data through 2020, when excess mortality was negligible (*Kim et al.* 2022; *Shin et al.* 2021). The larger comparative studies published thus far also focus on excess mortality in 2020 (*Islam et al.* 2021; *Nepomuceno et al.* 2022). By using data until the 30th week of 2022, this study extends previous work. Second, the current study explores age and sex differences in excess mortality in Korea during the pandemic and compares them with those of other countries. As harm due to COVID-19 on health is age-dependent, it examines differences in the patterns of excess mortality by age and sex.

3 Data

The study uses the STMF data provided by the Human Mortality Data Base (https://www.mortality.org/), which provides annualized weekly mortality rates by age (i.e., 0-14, 15-64, 65-74, 75-84, and 85+ years) and sex for 38 countries (*Jdanow et al.* 2021). Time coverage varies by country, but data between 2015 and 2022 are available for the majority of countries. I use data last updated on September 26, 2022, which covers information until the 37th week of 2022 for several countries (e.g., Chile, Denmark, Scotland, and the Netherlands). However, data is more limited for other countries (e.g., Taiwan and Russia). Thus, the study analyzes data until the 30th week of 2022, when the data for Korea and the majority of countries are available.

Using short-term mortality data (e.g., weekly or monthly) introduces two concerns. If the late registration of deaths is common, then the death rates for the most recent periods could be underestimated. In addition, short-term fluctuation in death may reflect other shocks beyond the interest of the study. For example, the spikes in death rates in Europe from late July to early August in 2020 were largely consequences of a heat wave, rather than COVID-19 (*Wang et al.* 2022). Despite these concerns, I opt to use weekly mortality data, because doing so can enable the precise monitoring of trends (*Nepomuneno et al.* 2022). Furthermore, to minimize the undue influence of a particular period on the trend, the study uses cumulative excess mortality, which is defined in the next section.

4 Method

Specifying baseline mortality rates is necessary for analyzing excess mortality. Many methods can be used to define excess mortality (*Nepomuceno et al.* 2022). The present study applies two approaches. First, I use a specific-average method. Weekly mortality rates tend to fluctuate cyclically due to the seasonality of mortality, and the specific-average method uses the average mortality rates of the reference periods as baselines. Second, I use a specific-trend method, which specifies baselines under the assumption that mortality rates per week change in a linear manner. Equations (1) and (2) present the formulas for the two abovementioned methods (*Nepomuceno et al.* 2022: 282-283):

Specific-average model: $$Base_{y,w,a} = \frac{1}{r}\sum_{h=y-r}^{t-1} \alpha_{h,w,a} + \varepsilon_{y,w,a} \quad (1)$$

Specific-trend model: $Base_{y,w,a} = \beta_w h + \varepsilon_{y,w,a}$, (2)
($w = 1, 2,\ldots, n$; $h = y-r, y-r+1,\ldots, y-1$)
where y indicates the year, w is the week, a indicates age, r is the number of reference periods in years, n is the total number of weeks in year y, and $\varepsilon_{y,w,a}$ are the residuals.

The specific-average model estimates baseline age-specific mortality rates ($Base_{y,w,a}$) using the weekly average during the reference period (2015-2019), while the specific-trend model assumes a linear time trend of weekly mortality. If mortality declines over time, then age-specific baseline mortality rates under the specific-trend model also tend to decline and are lower than those under the specific-average model, which assumes no declining trend. In contrast, baseline mortality rates for the entire population will exhibit the opposite pattern, because crude death rates increase due to population aging. As excess mortality is defined as the difference between observed and baseline mortalities, low baseline mortality yields high excess mortality. Thus, the specific-trend method is likely to be more accurate than the specific-average model, because the former reflects mortality trends, whereas the latter does not. Nonetheless, the study presents the results of the specific-average method to assess the degree to which excess mortality depends on the assumption of baseline mortality. This study uses 2015-2019 as the reference period for specifying baseline mortality. The analysis of excess mortality in Korea uses both baseline mortality rates, while the international comparison uses only the specific-average method.

Excess mortality rates are defined as the differences in weekly mortality rates between baseline and observation, which is expressed in Equation (3). Excess mortality rates can produce negative values if the observed weekly mortality rates were lower than the baseline.

$Excess_{y,w,a} = Obs_{y,w,a} - Base_{y,w,a}$, (3)
where y is the year, w indicates the week, and a is the age.

Cumulative excess mortality rates are estimated as the sum of excess mortality until a given week w, which is expressed in Equation (4):

$Cum\_Excess_{y,w,a} = \sum Excess_{y,w,a} /52$, (4)
where y is the year, w indicates the week, and a is the age.

Cumulative excess mortality rates at week w of year y display the excess mortality rates accumulated up to this time point since the outbreak of COVID-19. This measure is useful for showing how excess mortality accumulated during the period under consideration. Cumulative excess mortality increases with the increase in excess mortality. Although short-term events may influence excess mortality, which could significantly fluctuate and render the interpretation of trends difficult, cumulative excess mortality tends to remain stable and easy to interpret. The study will compare cumulative excess mortality rates with 2019 mortality rates, which will elucidate the severity of the mortality crisis during the pandemic.

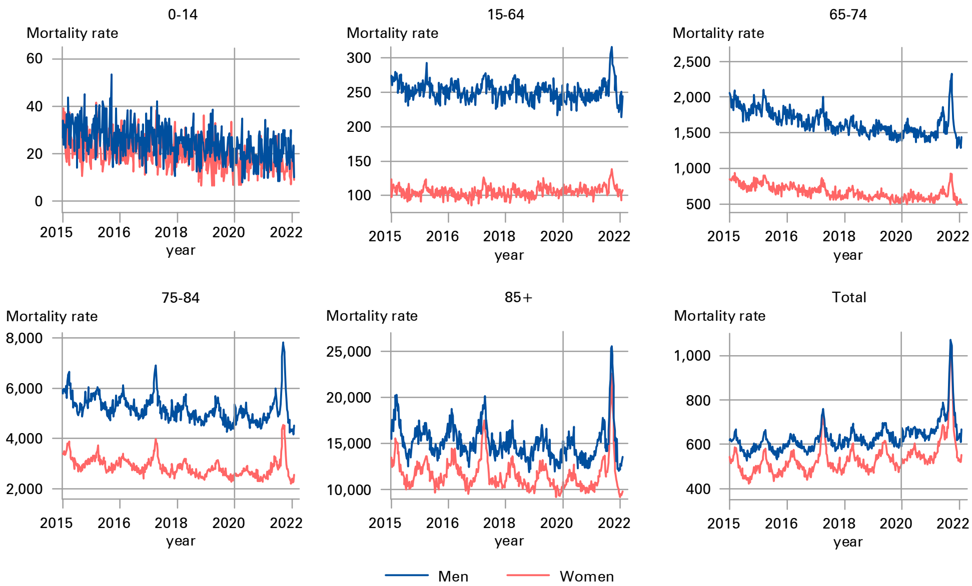
5 Results

5.1 Korea

Figure 1 presents the age-specific annualized weekly mortality rates per 100,000 individuals in Korea for 2015-2022. The study presents the results using different y-axes by age groups to clearly show the trend for each age group. The figure shows downward trends in the weekly mortality for those aged 0-14 and 65 years and over among men and women from 2015 to 2019. This result reflects the decline in age-specific mortality rates over time. The study found no notable trend for those aged 15-64 years. In contrast, the mortality rates for the 75-84 and 85+ age groups significantly fluctuated, with a declining trend. In general, mortality rates were higher at the end and at the beginning of the year, which may be related to the increases in mortality during the winter. Mortality rates for the entire population tended to increase, which reflects population aging.

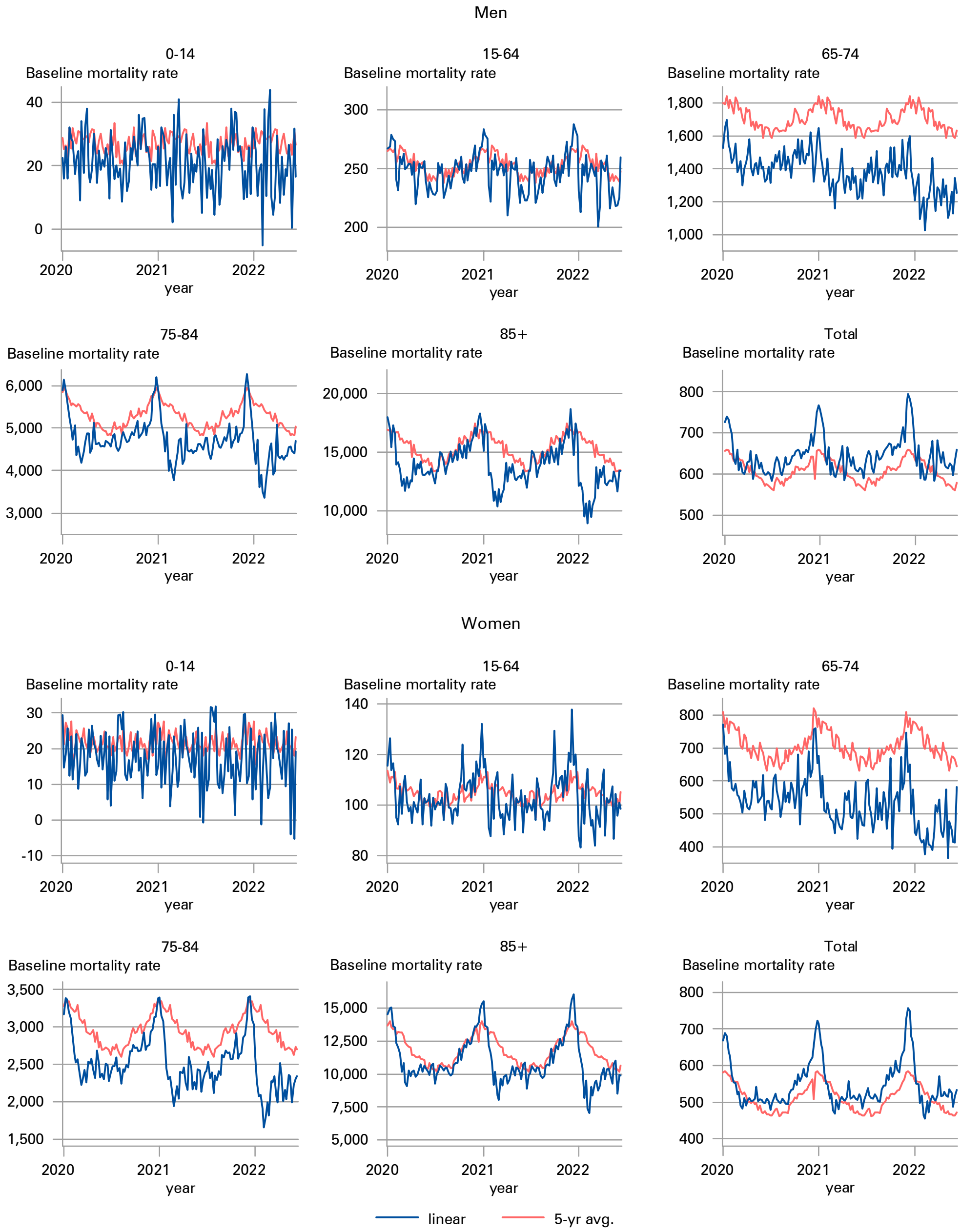
Mortality trends after the outbreak of COVID-19 (since 2020) did not exhibit any notable difference from the previous period until 2022; a surge in mortality was observed for early 2022 except for the 0-14 age group, in which the declining trend

Fig. 1: Age-specific annualized weekly mortality rates per 100,000 in Korea (2015-2022)



Source: author's calculation using STMF data

Fig. 2: Baseline mortality rates per 100,000 in Korea (2020-2022)



Notes: The reference period is 2015-2019, and the time unit is weeks.

Linear refers to the specific-trend method, and 5-yr avg. refers to the specific-average method.

Source: author's calculation using STMF data

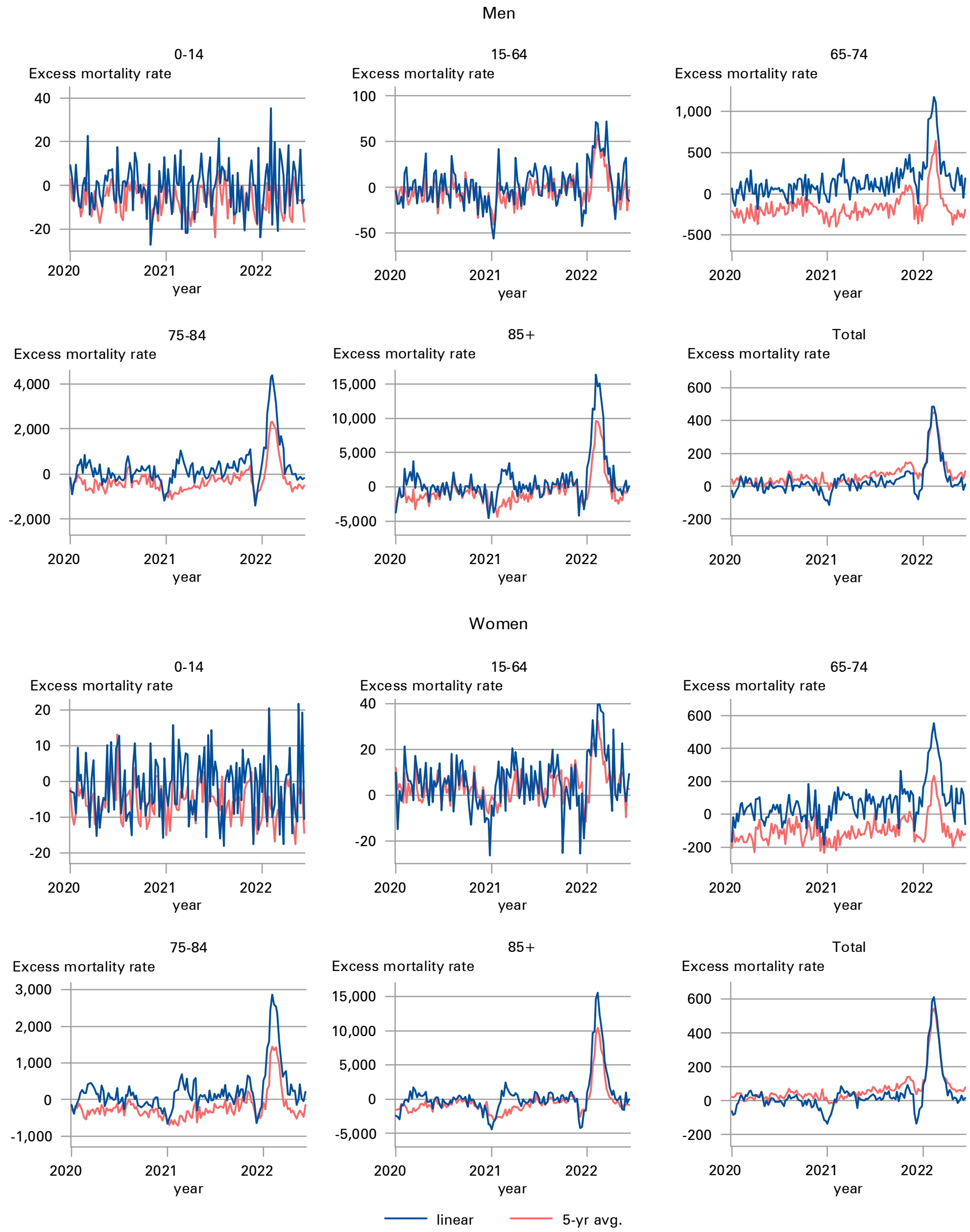
continued. Mortality rates returned to previous levels from May onwards. Although the study observes increases in mortality for all age groups except for the 0-14 age group, the increase in mortality was more significant for the older population. For example, the mortality rate for men aged 85+ years when mortality reached its high point in the Spring of 2022, was greater than 25,000 per 100,000. If this level of mortality remained constant for one year, then 25 percent of individuals in this age group would have died within a year. The study also shows gender differences: although mortality for men increased more than that for women in the 15-64 and 65-74 age groups during the peak period, the increase for women was greater for those in the 85+ age group.

Figure 2 presents baseline mortality rates for men and women. The blue lines depict baseline mortality rates using the specific-trend method (linear), and the red lines represent those using the specific-average method (5-yr average). Fluctuations produced by the specific-trend method are greater than those by the specific-average method, and baseline mortality rates using the specific-trend model exhibit a declining trend that reflects the reduction in age-specific mortality rates between 2015 and 2019. An exception is the 15-64 age group. In addition, the specific-trend model shows increasing baseline mortality for the entire population due to population aging. The level of baseline mortality was higher for men than women, but the patterns of changes and differences between the two baseline mortality rates were similar.

Figure 3 depicts the excess mortality rates from the first week of 2020 to the 30th week of 2022. Although the study does not observe any remarkable trend for those aged 0-14 years, the changes exhibited by the other age groups display notable patterns. First, the study finds no clear trends until early 2022. Second, excess mortality increased in Spring 2022 and then returned to the previous level. Third, excess mortality using the specific-average model is lower than that produced using the specific-trend model for all age groups, because the baseline mortality rates were lower for the specific-average model than those for the specific-trend model. For the entire population, the opposite is true; excess mortality rates for the specific-average model tend to be higher than those for the specific-trend model, because crude death rates increased due to population aging. Moreover, gender differences in excess mortality differed by age group. Except for those aged 85+, excess mortality among men was greater than that among women. For the entire population, excess mortality was higher for women than men, because the older population is composed of more women.

Figure 4 presents cumulative excess mortality rates. As is evident, the trends during the pandemic greatly differed from the baseline mortality rates. When comparing the age patterns of excess mortality under the specific-average model (5-year average), we find that cumulative excess mortality rates remained negative except for women aged 15-64 years. In other words, weekly mortality rates after the COVID-19 outbreak, on average, remained lower than the average weekly mortality rates between 2015 and 2019. Thus, we can conclude that no excessive death tolls occurred during the first two years of the pandemic if the declining mortality trend is not considered. The study observes that cumulative excess mortality increased

Fig. 3: Excess mortality rates per 100,000 in Korea (2020-2022)



Notes: The reference period is 2015-2019 and the time unit is weeks.

Linear refers to the specific-trend method, and 5-yr avg. refers to the specific-average method.

Source: author’s calculation using STMF data

Fig. 4: Cumulative excess mortality rates per 100,000 in Korea (2020-2022)

Notes: The reference period is 2015-2019, and the time unit is weeks.

Linear refers to the specific-trend method, and 5-yr avg. refers to the specific-average method.

Source: author's calculation using STMF data

in early 2022 using the specific-average model, which confirms a significant excess mortality during this period. Nonetheless, this increase did not turn the cumulative excess mortality positive. Here, women in the 15-64 age group were an exception, as their cumulative excess mortality was positive and increased over time. Interestingly, the cumulative excess mortality rates of the total population tended to increase for men and women despite the negative excess mortality for each age group, except for women aged 15-64 years. Simply put, crude death rates during the pandemic were higher than those during the reference period (2015-2019) and tended to increase. This result likely reflects the trend of population aging in Korea in general, rather than an increasing mortality risk per se.

The study finds contrasting patterns in the specific-trend model (linear). For the youngest age group (0-14 years), cumulative excess mortality remained negative and close to zero. The patterns for those aged 15-64 years differed by gender. Although cumulative excess mortality for men remained negative until the end of 2021 and increased in early 2022, that for women continuously increased since the COVID-19 outbreak. The levels of excess mortality among those aged 65+ years were higher for men than women under the specific-trend model. For the 65-74 age group, cumulative excess mortality increased over time for men and women. For those aged 75 and over, it remained low or negative until the end of 2021, which then sharply increased in early 2022. The magnitude of cumulative excess mortality was greatest for those aged 85+ years: more than 2,000 additional men per 100,000 died since the outbreak of COVID-19. For the entire population, cumulative excess mortality was higher under the specific-average model than the specific-trend model due to population aging. The specific-trend model reflects the increase in crude death rates due to population aging, whereas the specific-average model does not.

Table 1 compares cumulative excess mortality until the 30th week of 2022 with mortality rates in 2019. Doing so enables the assessment of the relative magnitude of excess mortality since the COVID-19 outbreak. For the specific-trend model, there were 94 excess deaths per 100,000 men, accounting for 15.1 percent of the crude death rate for men in 2019. This figure amounted to 18.6 percent for women, because their crude death rate was lower than that for men. If we apply the specific-average model, then these figures became higher (men: 30.6 percent; women: 35.8 percent). A total of 15-35 percent of excess death occurred during the pandemic. As we observed in the analysis of excess mortality, the majority of excess mortality occurred in early 2022, which indicates the severity of the mortality crisis during this period.

The magnitude of cumulative excess mortality differs by age and sex. For those aged 0-14 years, cumulative excess mortality rates were negative under both models, which suggests that mortality rates were lower than the baselines. Under the specific-trend model, cumulative excess mortality rates reached approximately 2-29 percent of the mortality rates for 2019 by age. These figures were negative under the specific-average model, except for women aged 15-64 years. Compared with mortality rates in 2019, the largest cumulative excess mortality was observed for people aged 65-74 years (men: 26.5 percent; women: 28.8 percent). Although

Tab. 1: Cumulative excess mortality rates as of the 30th week of 2022, compared to mortality rates in 2019

	A. Specific-trend (linear)	B. Specific-average (5-yr. avg.)	C. 2019 Mortality	A/C (%)	B/C (%)
		Men			
Age					
0-14	-1	-17	24	-4.2	-70.8
15-64	6	-11	250	2.4	-4.4
65-74	410	-425	1549	26.5	-27.4
75-84	752	-763	4923	15.3	-15.5
85+	2126	-1645	14379	14.8	-11.4
Total	94	191	624	15.1	30.6
		Women			
Age					
0-14	-4	-15	19	-21.1	-78.9
15-64	15	11	105	14.3	10.5
65-74	179	-263	621	28.8	-42.4
75-84	582	-566	2672	21.8	-21.2
85+	1136	-1019	11070	10.3	-9.2
Total	97	187	522	18.6	35.8

Notes: The reference period is 2015-2019, and the time unit is weeks.
The unit for cumulative mortality rates and mortality rates in 2019 is 100,000.
Source: Short-Term Mortality Fluctuation (www.mortality.org) (09/26/2022)

cumulative excess mortality rates were highest among those aged 85+ years, the relative magnitude was the greatest among those aged 65-74 years. The cumulative excess mortality rates under the specific-average model were negative except for women aged 15-64 years, which indicates that weekly mortality rates during the pandemic were, on average, lower than the mean mortality rates between 2015 and 2019.

5.2 International comparison

COVID-19 is a global phenomenon, and international comparisons are necessary to understand excess mortality during the pandemic. Many factors, including as baseline mortality levels and public policies, influenced the rate of excess mortality in each country. This study has compared the level of excess mortality by applying baseline mortality rates under the specific-trend model. It now presents excess mortality and cumulative excess mortality for the entire population of selected countries. Figure 5 displays excess mortality rates at the population level. Excess mortality rates in several countries, such as New Zealand, Norway, and Australia, were very low, but Eastern European countries, such as Bulgaria, the Czech Republic, and Lithuania, displayed high excess mortality rates. Excess mortality in

Fig. 5: Excess mortality rates per 100,000 in selected countries, entire population

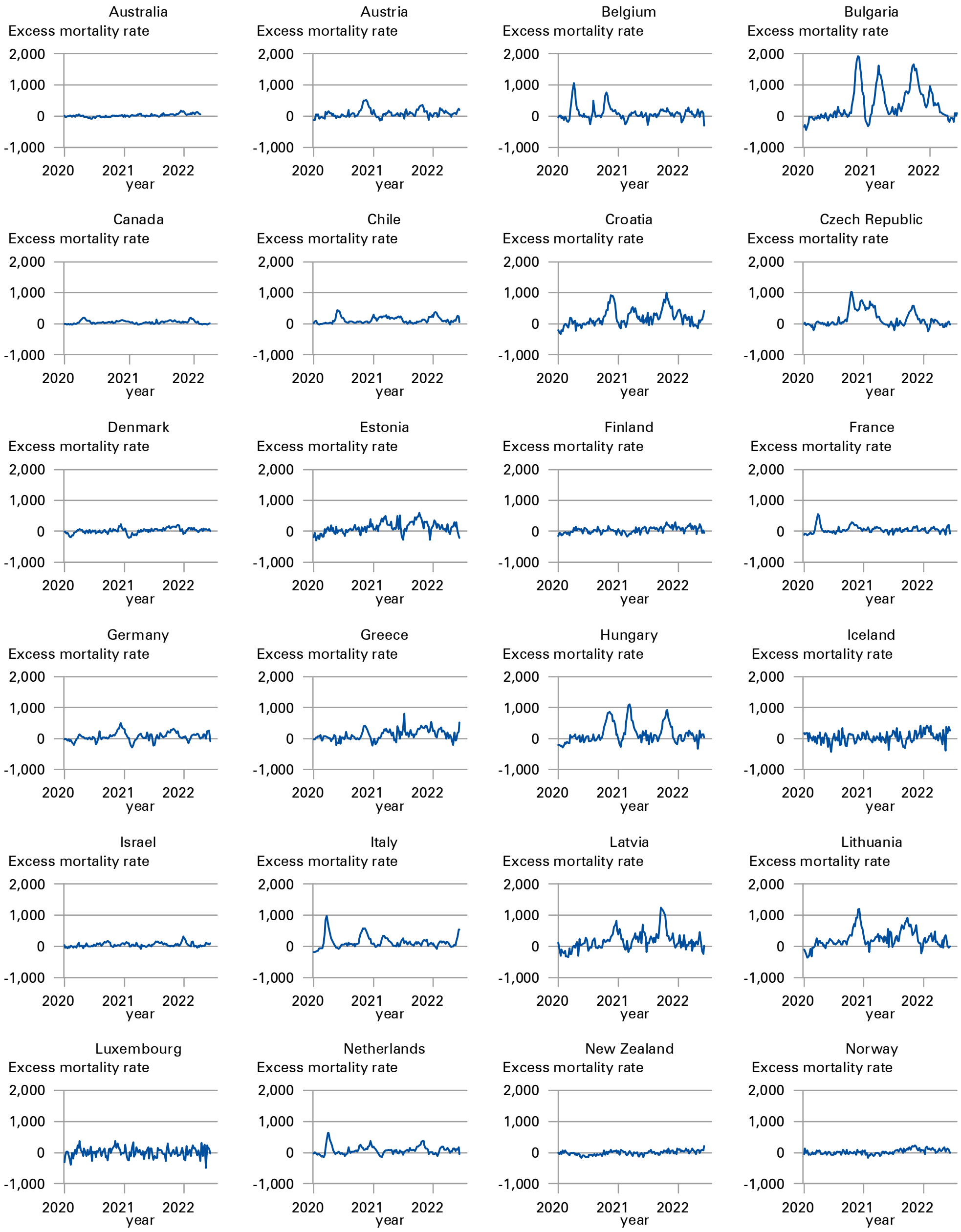
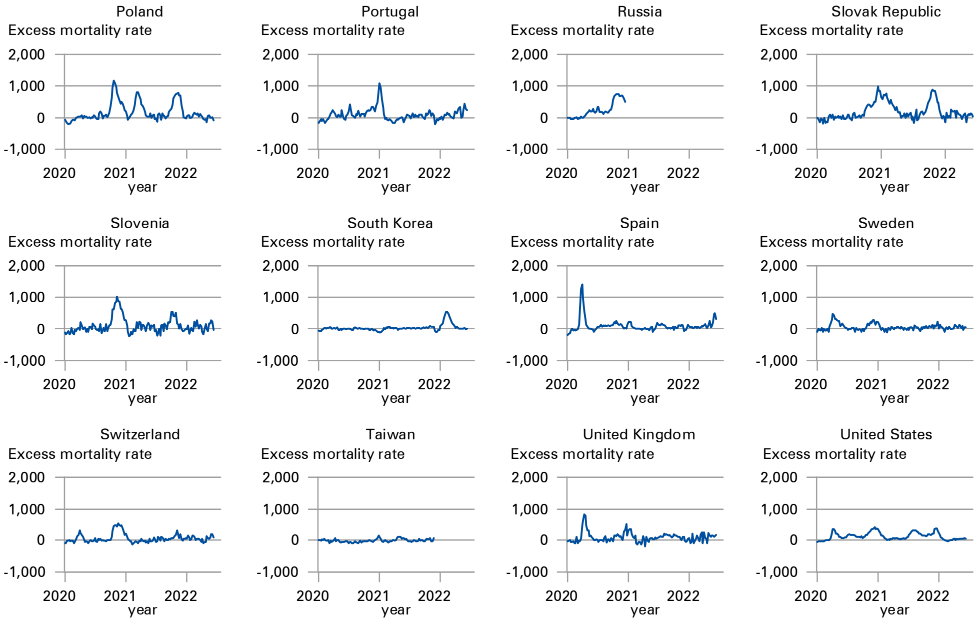


Fig. 5: Continuation



Notes: The reference period is 2015-2019, and the time unit is weeks.
Source: author's calculation using STMF data

Korea remained at the lowest level globally until the end of 2021 but became the highest in early 2022.

Figure 6 compares the cumulative excess mortality rates. We can observe several patterns. First, cumulative excess mortality rates in East European countries increased nearly linearly. For example, the cumulative excess mortality in Bulgaria began increasing in the early stage of the pandemic and continued to increase, reaching 968 per 100,000 by the 30th week of 2022, for the highest rate among the countries examined. In other words, nearly one person per 1,000 Bulgarians additionally died across the two and a half years of the pandemic. Second, cumulative excess mortality rates rapidly increased during the early stage of the pandemic, but eventually slowed down in the United Kingdom and the United States. Excess mortality rates in these countries increased earlier than those of Eastern European countries. Although the former slowed down, the latter continued to increase. This contrasting pattern may be related to policy responses and overall public health capacity. Policy responses in the United States and the United Kingdom at the early stage were known to be ineffective in restraining the spread of the virus and excess death. However, these countries possessed advanced medical technology and health infrastructure to cope with the pandemic, leading to a slowdown in excess mortality. In contrast, Eastern European countries lacked sufficient resources and were therefore very susceptible to the virus and continued to experience high mortality rates. Third, countries in Northern Europe and Oceania

Fig. 6: Cumulative excess mortality rates per 100,000 in selected countries, entire population

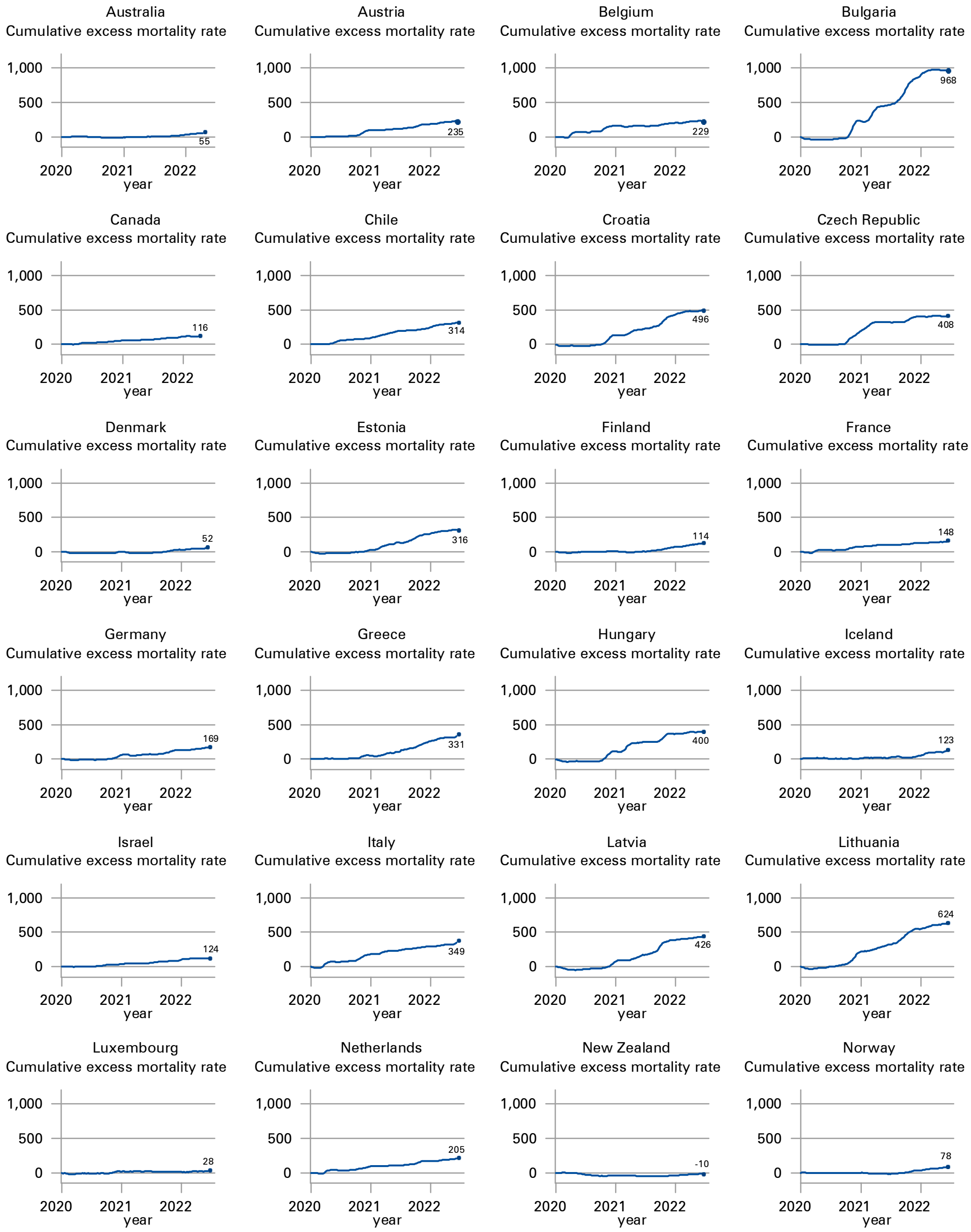
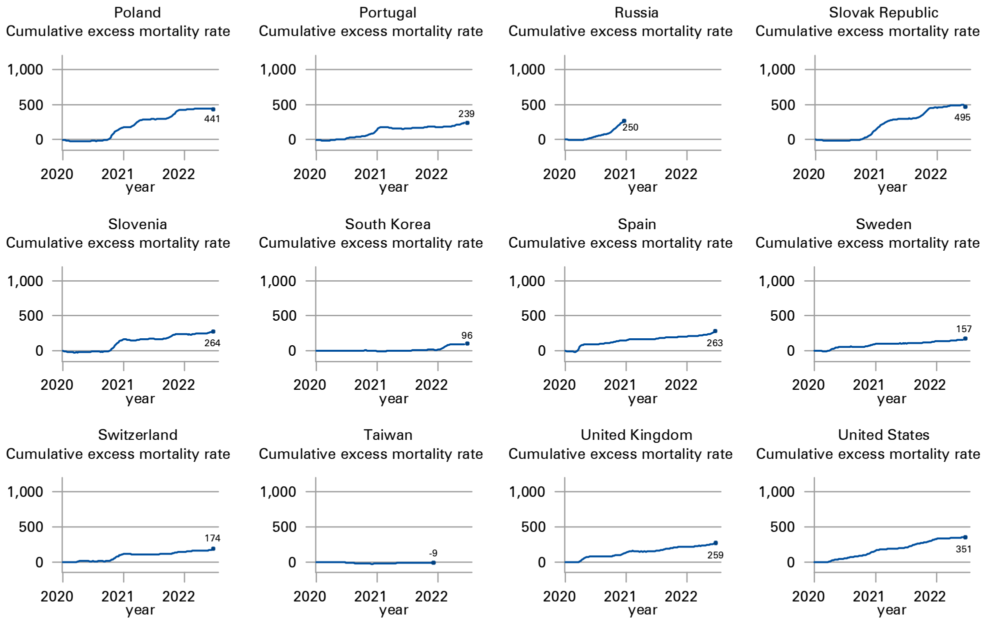


Fig. 6: Continuation

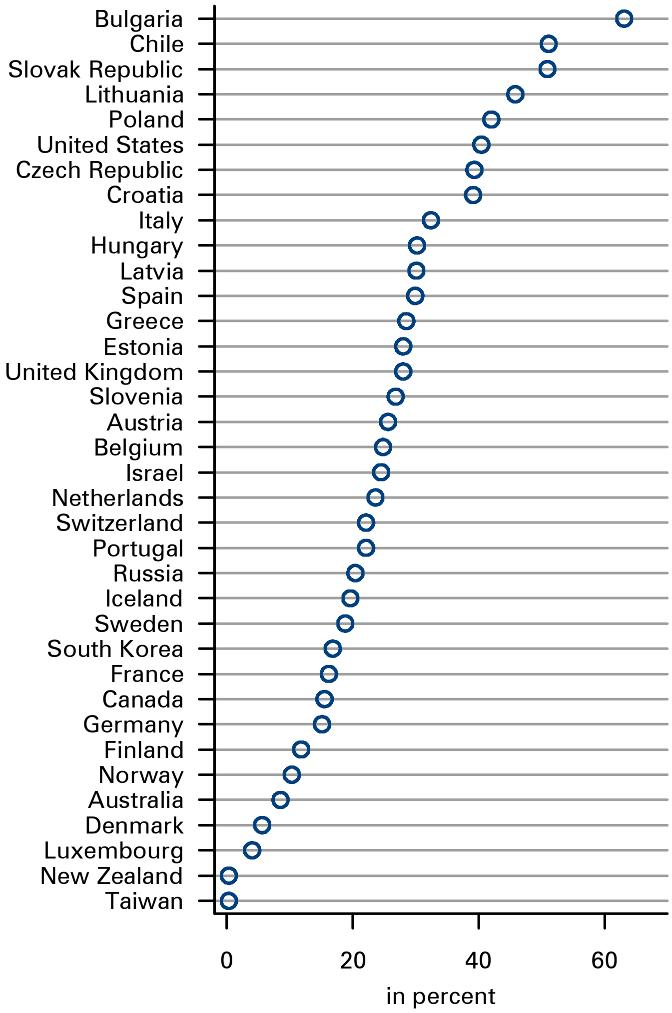


Notes: The reference period is 2015-2019, and the time unit is weeks.
Source: author's calculation using STMF data

successfully restricted excess death. In New Zealand, cumulative excess mortality by the 30th week of 2022 was even negative, which indicated that mortality rates during the pandemic were lower on average than those assumed under the specific-trend model. Finally, cumulative excess mortality in Korea was also comparatively low. Among the countries whose data were available until the 30th week of 2022, cumulative excess mortality for Korea was the fifth lowest after New Zealand, Luxemburg, Denmark, and Norway. Until 2021, cumulative mortality in Korea was the lowest globally along with New Zealand, but increased significantly in early 2022 and reached 96 per 100,000 by the 30th week of 2022.

Figure 7 displays the relative magnitude of cumulative excess mortality by the 30th week of 2022 compared with the mortality rates in 2019. The cumulative excess mortality rates in Bulgaria accounted for 60 percent of crude death rates in 2019, which suggests that more than 20 percent more deaths occurred annually during the two and a half years of the pandemic than otherwise would have. This finding illustrates that Bulgaria experienced a massive mortality crisis during the pandemic. As previously discussed, cumulative excess mortality was high among Eastern European countries and low in Northern Europe and Oceania. Cumulative excess mortality in Korea was close to 20 percent of the mortality rate for 2019, which was relatively low among the countries under study.

Fig. 7: Relative magnitude of cumulative excess mortality compared with mortality rates in 2019, entire population



Source: author's calculation using STMF data

6 Summary and discussion

This study has examined excess mortality in Korea using STMF data, analyzed age-specific mortality rates in Korea and other countries, and assessed the magnitude of excess mortality during the COVID-19 pandemic. The key findings are as follows. First, in Korea, excess mortality remained low until the end of 2021 but increased significantly in 2022. Second, this excess mortality was concentrated among older people. For example, cumulative excess mortality among those aged 85+ years until the 30th week of 2022 was more than 1-2 percent, which indicates that approximately 1-2 percent more deaths occurred for the oldest age group during the pandemic. Third, an international comparison showed that excess mortality in Korea was relatively low. Korea exhibited one of the lowest excess mortality rates globally until the end of 2021, but excess mortality increased rapidly in early 2022. However, the country's cumulative excess mortality was still comparatively low internationally as of the 30th week of 2022.

The present study is largely descriptive and demonstrates substantial variations in excess mortality during the COVID-19 pandemic. This variation is likely related to differences in population structure, public health systems, and policy responses during the pandemic. Future studies should examine the more exact determinants of excess mortality during the pandemic. However, this is methodologically challenging. In particular, assessing the causal impact of policy responses on excess mortality could be fairly difficult, because the level of excess mortality due to COVID-19 likely drove policy responses. Nevertheless, data on policy responses has been collected (*Hale et al.* 2020, 2021), which opens up the possibility of examining these relationships. This aspect could be an interesting next step for the research on mortality caused by COVID-19.

Acknowledgements

This work is a revision of a research report of the Korea Institute for Health and Social Affairs, International Research on Health and Welfare Policy (Policy Report 2022-03). I thank Dr. Yoon-Jeong Shin for providing me with the opportunity of participating in this study.

References

Aburto, Jose Manuel et al. 2022: Quantifying impacts of the COVID-19 pandemic through life-expectancy losses: A population-level study of 29 countries. In: International Journal of Epidemiology 51,1: 63-74. https://doi.org/10.1093/ije/dyab207

Basellini, Ugofilippo; Camarda, Carlo Giovanni 2022: Explaining regional differences in mortality during the first wave of Covid-19 in Italy. In: Population Studies 76,1: 99-118. https://doi.org/10.1080/00324728.2021.1984551

Hale, Thomas et al. 2020: Variation in government responses to COVID-19. In: BSG Working Paper Series 2020/032. University of Oxford.

Hale, Thomas et al. 2021: A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). In: Nature Human Behaviour 5,4: 529-538. https://doi.org/10.1038/s41562-021-01079-8

Islam, Nazrul et al. 2021: Effects of Covid-19 pandemic on life expectancy and premature mortality in 2020: Time series analysis in 37 countries. In: BMJ 375: e066768. https://doi.org/10.1136/bmj-2021-066768

Jdanov, Dimitri et al. 2021: The short-term mortality fluctuation data series, monitoring mortality shocks across time and space. In: Scientific Data 8,235. https://doi.org/10.1038/s41597-021-01019-1

Kim, Jin-Hwan et al. 2022: Inequitable distribution of excess mortality during the COVID-19 pandemic in Korea, 2020. In: Epidemiology and Health 44: e2022081. https://doi.org/10.4178/epih.e2022081

Knutson, Victoria et al. 2023. Estimating global and country-specific excess mortality during the COVID-19 pandemic. In: Annals of Applied Statistics 17,2: 1353-1374. https://doi.org/10.1214/22-AOAS1673

Kye, Bongoh 2022: Excess mortality due to COVID-19 in Korea. In: Statistical Research Institute (Ed.): Korean Social Trends 2022. (in Korean).

Luy, Marc et al. 2021: Decrease in life expectancy in Germany in 2020: Men from Eastern Germany most affected. In: Comparative Population Studies 46: 555-574. https://doi.org/10.12765/CPoS-2021-20

Nepomuceno, Marilia et al. 2022: Sensitivity analysis of excess mortality due to the COVID-19 Pandemic. In: Population and Development Review 48,2: 279-302. https://doi.org/10.1111/padr.12475

Schöley, Jonas et al. 2022: Life expectancy changes since COVID-19. In: Nature Human Behaviour 6,12: 1649-1659. https://doi.org/10.1038/s41562-022-01450-3

Shin, Min Sun et al. 2021: Estimation of excess all-cause mortality during COVID-19 pandemic in Korea. In: Journal of Korean Medical Science 36,39: e280. https://doi.org/10.3346/jkms.2021.36.e280

Wang, H. et al. 2022: Estimating excess mortality due to the COVID-19 pandemic: a systematic analysis of COVID-19-related mortality, 2020-21. In: Lancet 399,10334: 1513-1536. https://doi.org/10.1016/S0140-6736(21)02796-3

World Health Organization 2022: Methods for estimating the excess mortality associated with the COVID-19 pandemic. Working paper. World Health Organization.

Date of submission: 09.04.2023 *Date of acceptance: 22.09.2023*

Prof. Bongoh Kye (✉). Kookmin University. Seoul, Korea.
E-mail: bkye@kookmin.ac.kr

Comparative Population Studies

www.comparativepopulationstudies.de

ISSN: 1869-8980 (Print) – 1869-8999 (Internet)

Published by
Federal Institute for Population Research (BiB)
65180 Wiesbaden / Germany

Managing Publisher
Dr. Nikola Sander