Review

Unraveling Rising Mortality: Statistical Insights from Japan and International Comparisons

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Unraveling Rising Mortality: Statistical Insights from Japan and International Comparisons

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Abstract: Since the onset of the COVID-19 pandemic, Japan has experienced a significant rise in mortality, with excess deaths surpassing historical projections. Statistical data indicate a sharp increase in mortality rates from 2021 onward, attributed to COVID-19, aging demographics, cardiovascular diseases, and malignancies. Preliminary 2024 data suggest continued excess mortality, fueling public debate. This review analyzes national and municipal mortality trends using official Japanese statistics and comparative data from South Korea, the U.S., and the EU. Findings reveal a sharp mortality rise post-2021 in Japan and South Korea, while Western nations experienced peak deaths in 2020, followed by declines. The review explores contributing factors, including potential vaccine-related adverse effects, declining healthcare access, pandemic-induced stress, and demographic shifts. Notably, older adults' reluctance to seek medical care led to delayed diagnoses, treatment interruptions, and preventable deaths. Although some argue that declining COVID-19 vaccination rates in 2023 may have contributed to rising mortality in 2024, available data suggest a multifactorial causation. Japan's rapidly aging population, coupled with increasing mortality and declining birth rates, presents profound social and economic challenges. A nuanced approach, avoiding simplistic causal claims, is crucial for understanding these trends. This review highlights the need for a sustainable societal framework to address demographic shifts and improve healthcare resilience. Future pandemic strategies must balance infection control measures with mitigating unintended health consequences to ensure a more adaptive and effective public health response.

Keywords: healthcare system strain; declining population; demographic shifts; covid-19 pandemic; mortality

Introduction

Since the onset of the coronavirus disease (COVID-19) pandemic, rising mortality rates in Japan have become a topic of concern. In particular, reports indicate an increase in excess mortality, defined as the difference between observed deaths and the number expected based on historical data and statistical models [1]. Mortality rates have risen significantly since 2021, posing a major public health challenge. Statistical data up to 2022 suggest that, in addition to COVID-19, factors such as senility, cardiovascular diseases, and malignant neoplasms have contributed to this increase [2]. Moreover, continued long-term monitoring of excess mortality and other quantitative data beyond 2022 remains essential [3]. In February 2025, nationwide and municipal-level statistical reports on mortality for 2024 was released. Meanwhile, discussions on social media platforms such as X have highlighted growing concerns over the renewed increase in deaths throughout 2024 (Table 1). The increase in mortality during the COVID-19 pandemic has been reported in countries other than Japan [4–7]. Even after the acute phase of the COVID-19 pandemic subsided, mortality rates in Japan have not decreased. In 2022, they rose again, in 2023 there was a slight decrease or plateau, and in 2024, a trend of rising mortality rates has been observed again.

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Table 1. URLs of the social media reporting the increase in the number of deaths in Japan.

Increase in the number of deaths nationwide in Japan
https://x.com/cr_cidp/status/1895037084777488589
https://x.com/sunsun_38/status/1895017200710496449
https://x.com/donkey1399/status/1895646280887808434
Increase in the number of deaths nationwide and in each municipality in Japan in January 2025
https://x.com/VPIbflbSdnuQKaw/status/1894371517703893129
https://x.com/donkey1399/status/1905063278776344895
https://x.com/MNHR_Labo/status/1905465631832740159
https://x.com/JINKOUZOUKA_jp/status/1904779750935323086
https://x.com/JINKOUZOUKA_jp/status/1896793205867491626
https://x.com/JINKOUZOUKA_jp/status/1896485581271838850
https://x.com/JINKOUZOUKA_jp/status/1892790468359966987

A recently published short opinion article discusses the relationship between COVID-19 vaccination and excess mortality in Japan [8]. This article describes the sharp increase in excess mortality in Japan following the emergence of the Omicron variant. Hypotheses regarding the potential association between mRNA vaccination and excess mortality include adverse effects such as myocarditis, autoimmune diseases, and cancer, as well as immune suppression due to repeated vaccinations. However, the article does not provide direct evidence demonstrating a causal relationship between mRNA vaccines and excess mortality. Instead, it outlines possible contributing factors and concludes that, due to insufficient research and data, the true cause remains unclear.

To clarify the relationship between vaccination and excess mortality, studies directly investigating the correlation between mRNA COVID-19 vaccination and excess mortality in Japan are necessary. However, as of now, no studies have comprehensively examined this association.

This review first presents trends in mortality counts and crude death rates over the past decade across Japan and its four major cities (Tokyo's 23 wards, Yokohama, Osaka, and Nagoya), comparing these trends with those observed in other countries. Subsequently, we examine potential factors contributing to the rise in mortality in Japan since 2021. Finally, we provide our perspective on Japan's future as it enters an era of unprecedented population decline.

While this review article references numerous online sources, the author wishes to emphasize that these citations are intended solely to confirm objective facts and are not meant to defame or criticize any specific individual or group

Development and Efficacy of mRNA Vaccines: A Scientific Assessment of COVID-19 Protection

mRNA COVID-19 vaccines work by delivering mRNA encoding the viral spike protein into the body, prompting cells to produce the antigen and induce an immune response. Their rapid development was enabled by pre-existing mRNA technology research, prioritization of funding and regulatory processes during the pandemic, and the concurrent execution of large-scale clinical trials. Extensive clinical trials and real-world data have confirmed their high efficacy, particularly in preventing severe disease, as well as their safety, with rare but minimal risks of adverse effects [9].

Japan's Ministry of Health, Labour and Welfare, along with related academic societies, strongly recommends additional vaccinations in the fall and winter of 2024 for the elderly and those at high risk of severe disease [10]. They maintain the stance that the benefits of COVID-19 vaccination far outweigh the risks. Numerous studies worldwide support the efficacy of COVID-19 mRNA vaccines, and infectious disease experts continue to recommend vaccination based on these findings.

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Compared to unvaccinated individuals, vaccinated individuals have been shown to have a reduced risk of hospitalization and long-term symptoms [11]. In South Korea, vaccinated individuals had lower non-COVID-19 mortality rates compared to unvaccinated individuals [12]. In the Netherlands, the 2023 COVID-19 XBB.1.5 vaccine was associated with reduced hospitalizations and ICU admissions due to COVID-19 [13]. Even in breakthrough infections, vaccination has been shown to suppress household transmission [14]. In Japan, a report indicated that Omicron breakthrough infections in individuals with three or more vaccine doses or prior infections had a lower frequency of systemic symptoms [15]. Vaccination has also been associated with a lower risk of post-acute sequelae of COVID-19, with a third dose further reducing risks of heart failure, arrhythmia, cardiac arrest, pulmonary embolism, and new dialysis compared to two doses [16].

Many studies have reported the beneficial effects of vaccination on long-term symptoms. Booster doses have been shown to mitigate severe disease and post-acute sequelae [17,18]. Pre-infection vaccination has been strongly associated with a reduced risk of being diagnosed with long-term COVID-19 complications [19]. A systematic review and meta-analysis have also confirmed that vaccines reduce post-COVID conditions [20]. Additional reports suggest that post-COVID syndrome risk is lower among previously vaccinated individuals compared to unvaccinated individuals infected with the Omicron variant [21].

The updated 2023-2024 COVID-19 vaccines have demonstrated protective effects against hospitalizations caused by XBB and JN lineages, providing a rationale for promoting new vaccine formulations [22]. The BNT162b2 XBB vaccine offers statistically significant additional protection against various COVID-19 outcomes. However, older vaccine formulations provided little to no long-term protection against hospitalization, irrespective of dose number or vaccine type, reinforcing the need for updated vaccinations [23]. The relative effectiveness of ancestral-strain mRNA vaccines against Omicron infections has been shown to be higher than that of viral vector and protein subunit vaccines [24].

Accordingly, the U.S. Advisory Committee on Immunization Practices (ACIP) has recommended COVID-19 vaccination for all individuals aged six months and older using FDA-approved or authorized vaccines for the 2024-2025 season [25].

However, mRNA vaccines have been reported to cause more adverse reactions compared to Novavax's protein-based COVID-19 vaccine (NVX-CoV2373) [26]. A Japanese study suggested that while COVID-19 mRNA vaccines are generally safe, there was a potential trend of increased pulmonary embolism following the first dose [27].

Despite ongoing discussions regarding COVID-19 vaccination, a substantial proportion of the elderly population in Japan had received booster doses up until 2023. However, the uptake of booster vaccinations in 2024 has declined considerably.

Analysis of National and Municipal Mortality Trends

Interested in the data circulating on social media, the author first verified the accuracy of annual nationwide mortality trends in Japan over the past decade (since 2015) using confirmed statistics published in the Vital Statistics of Japan by the Ministry of Health, Labour, and Welfare. For 2024, preliminary figures from relevant government websites were used (Table 2).

A line graph plotting these figures is presented in Figure 1 and closely mirrors trends observed on social media. Nationwide mortality in Japan showed a slight decline in 2020, the first year of the COVID-19 pandemic, followed by significant increases in 2021 and 2022. The mortality rate remained elevated in 2023 and is projected to persist in 2024.

Table 2. Area, population, population density, aging rate, and URL of population dynamics statistics site for each municipality.

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City/Area	Area (km^2)	Estimated Population (as of February 1, 2025)	Population Density (people/km^2)	Aging rate (%)	URLs of population dynamics statistics site for each municipality
Entire Japan	377974	123779000	334	29.3	https://www.mhlw.go.jp/toukei/list/81-1a.html
					https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/geppo/s2024/dl/202412.pdf
					https://www.stat.go.jp/data/jinsui/new.html
					https://www.stat.go.jp/data/jinsui/2023np/index.html
Tokyo 23 Wards	628	9876493	15739	21.0	https://www.hokeniryo.metro.tokyo.lg.jp/kiban/chosa_tokei/jinkodotaitokei/kushityosonbetsu
					https://www.toukei.metro.tokyo.lg.jp/juukiy/2025/jy25000001.htm
Yokohama	438	3766732	8595	25.0	https://www.city.yokohama.lg.jp/city-info/yokohamashi/toke i-chosa/portal/jinko/dotai/nen/
					https://www.city.yokohama.lg.jp/city-info/yokohamashi/toke i-chosa/portal/jinko/dotai/tsuki.html
					https://www.city.yokohama.lg.jp/city-info/yokohamashi/toke i-chosa/portal/jinko/choki.html
Osaka	225	2794005	12399	25.8	https://www.city.osaka.lg.jp/kenko/cmsfiles/contents/0000277/277916/

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					11R03-03-01nennjibetusibousuu.pdf
					https://www.pref.osaka.lg.jp/documents/4370/r04c05.pdf
					https://www.city.osaka.lg.jp/toshikeikaku/page/0000541634.html
					https://www.city.osaka.lg.jp/toshikeikaku/cmsfiles/contents/0000203/203035/01_R06-10-suikei-gaiyou.pdf
Nagoya	326	2331413	7141	25.0	https://www.city.nagoya.jp/somu/page/0000051424.html
					https://www.city.nagoya.jp/kenkofukushi/page/0000176348.html
					https://www.city.nagoya.jp/somu/page/0000181516.html

To assess how these trends compare at the municipal level, line graphs were generated for Japan's four largest cities by population—Tokyo's 23 wards, Yokohama, Osaka, and Nagoya—using publicly available statistical data from each municipal government (Table 2 provides the URLs for these data sources). The mortality trends for Tokyo's 23 wards (Figure 2A), Yokohama City (Figure 2B), Osaka City (Figure 2C), and Nagoya City (Figure 2D) are shown.

Similar to the nationwide trend (Figure 1), mortality in all four major cities rose sharply from 2021 and remained elevated through 2022 and 2023. Among the cities with preliminary data available for 2024, Yokohama and Osaka recorded further increases. Overall, all four cities exhibited nearly identical mortality trends.

Figure 3 shows the trends in crude mortality rates per 100,000 persons over the past decade across Japan and its four major cities. It is evident that the crude mortality rate rose sharply in 2021 across Japan and all these cities and has remained high since 2022. Compared to the national average, major metropolitan areas tend to have a slightly lower aging population. Therefore, excluding Osaka, the crude mortality rates in the three major cities are somewhat lower than those of Japan as a whole. In particular, the 23 wards of Tokyo exhibit a lower crude mortality rate, likely due to the influx of younger individuals moving to the city for education and employment, resulting in a lower aging population. Yokohama, which is part of the Tokyo metropolitan area, follows a similar trend, although its crude mortality rate is slightly higher than Tokyo's. Nagoya has a higher crude mortality rate still. Osaka's crude mortality rate is comparable to the national average, likely due to several factors, including a higher aging population than in the Tokyo metropolitan area, significant income disparities, leading to greater health risks and unequal access to medical care among lower-income groups, a higher prevalence of lifestyle-related diseases, such as diabetes, obesity, and smoking, and

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the impact of living conditions and stress-related factors on health. These factors likely interact in a complex way to contribute to Osaka's mortality trends.

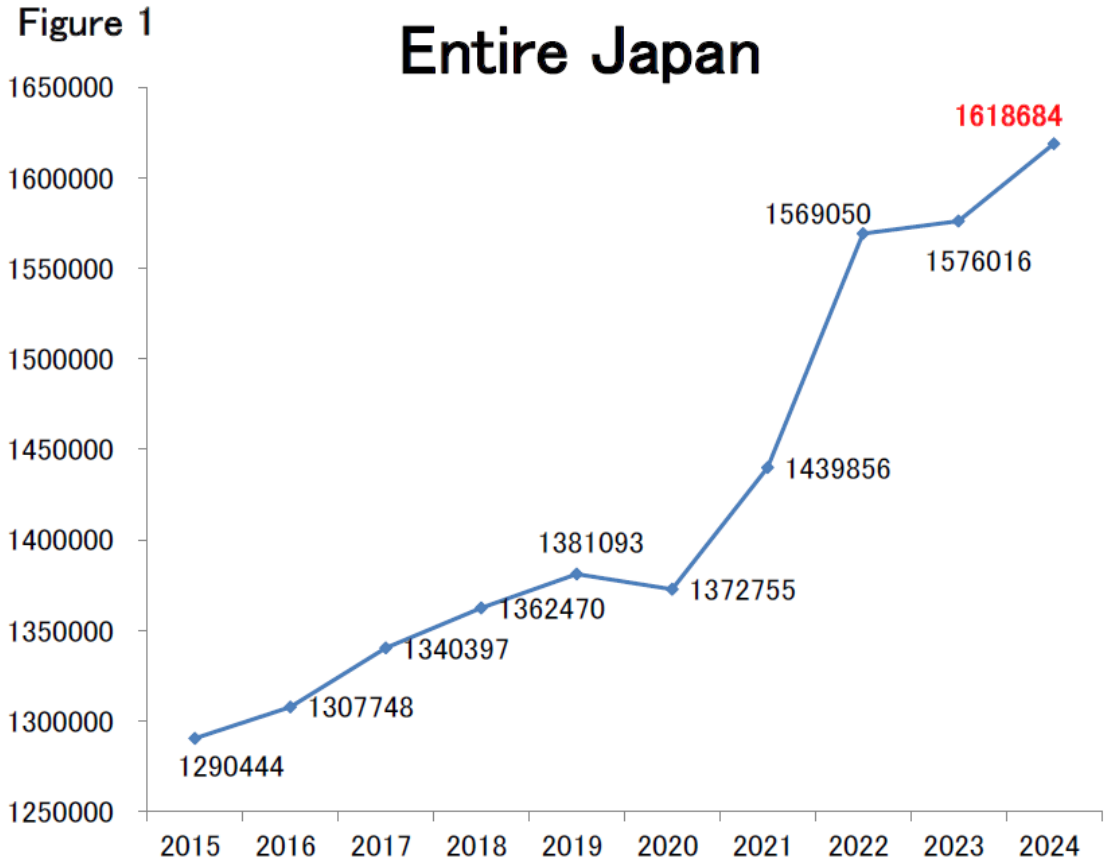
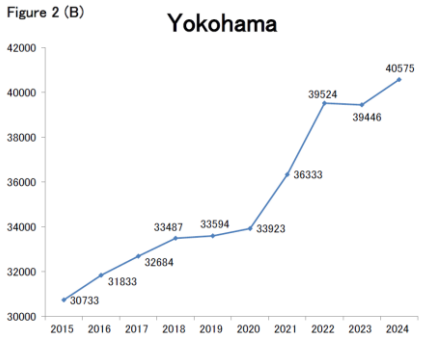
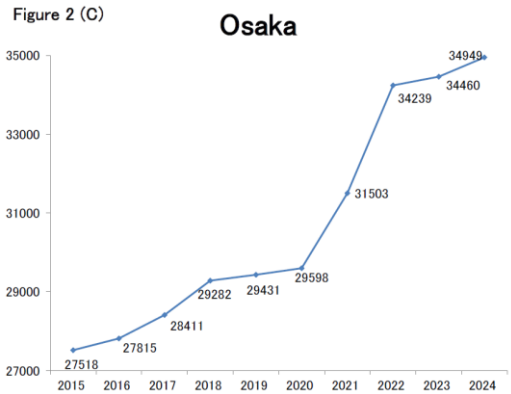


Figure 1. Trends in the annual number of deaths in Japan since 2015.





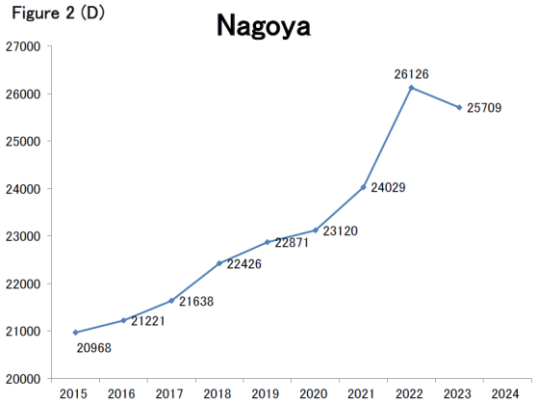


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Figure 2. Trends in the annual number of deaths in Japan's four most populous cities since 2015. (A): Tokyo 23 Wards, (B): Yokohama, (C): Osaka, (D): Nagoya.

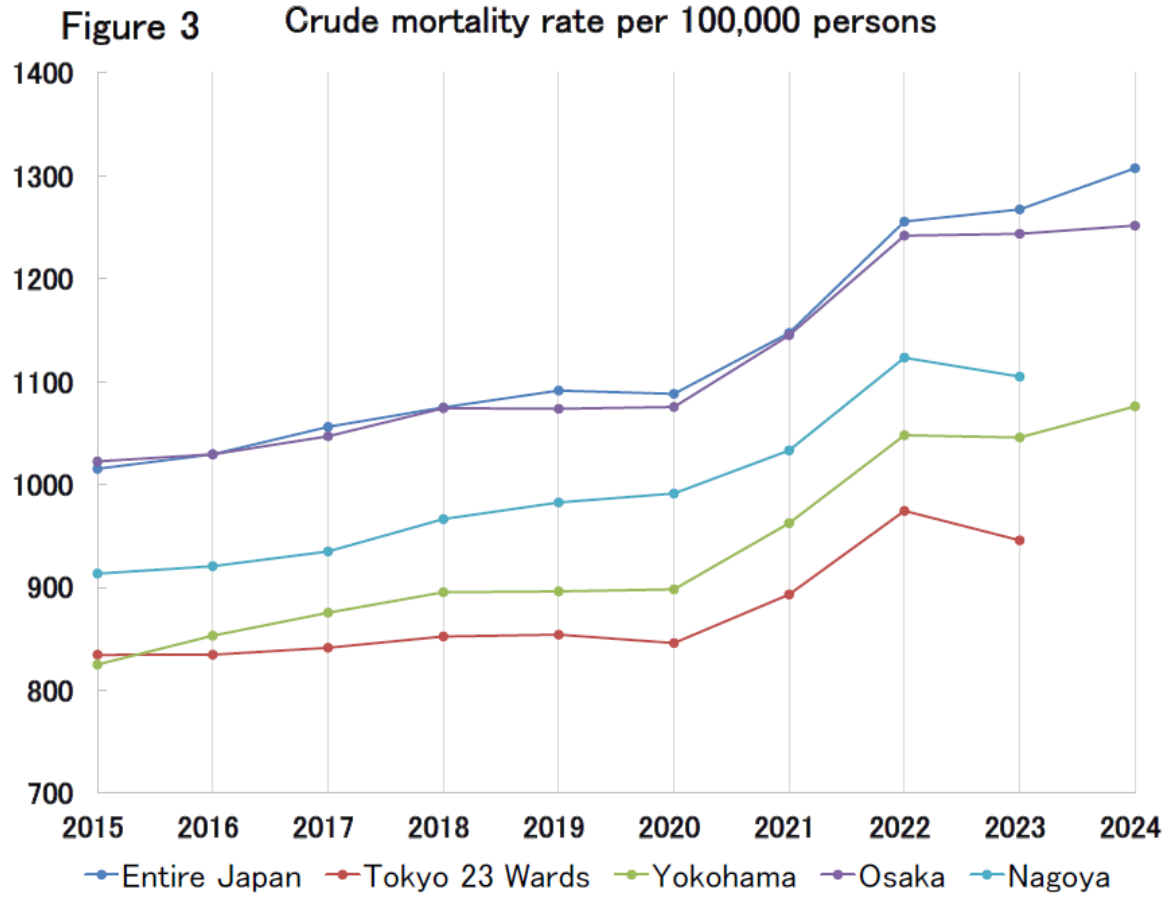

Figure 3. Crude mortality rate per 100,000 persons (2015-2024).

Mortality Trends Outside Japan

How have mortality trends evolved in countries outside Japan? To investigate this, population statistics from South Korea [28] were collected and analyzed using the same methodology. The results revealed a sharp increase in mortality beginning in 2022, followed by persistently high mortality in 2023, demonstrating a pattern similar to that observed in Japan (Figure 4).

Using data from Our World in Data [29], the author plotted mortality trends for Japan (Figure 5A) and South Korea (Figure 5B). While minor discrepancies exist due to differences in data aggregation methods, the overall trends align with those in Figure 1 and Figure 4. Specifically, no significant increase in mortality was observed in 2020; however, mortality began rising from 2021 to 2022. In contrast, mortality trends in the European Union (Figure 5C) and the United States (Figure 5D) followed a different trajectory, with both regions experiencing a sharp increase in deaths during the first year of the COVID-19 pandemic (2020), followed by a decline in mortality from 2022 to 2023.

During the early phase of the pandemic, East Asian countries such as Japan and South Korea recorded significantly fewer severe cases and deaths from COVID-19 compared with Western nations. The underlying reasons for this disparity remained unclear and were often referred to as "Factor X." However, leading infectious disease experts categorically dismissed the existence of "Factor X," considering it an illusion. The author has repeatedly questioned whether this dismissal was appropriate [10,30]. Given that the impact of infectious diseases can vary significantly depending on genetic, environmental, and regional factors, it is crucial to account for these differences when

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formulating future pandemic response strategies. It should be noted that much of the positive evidence regarding COVID-19 vaccines was generated in the early phase of their introduction (2021–2022) and primarily focused on populations in Western countries [9,31]. Therefore, applying such evidence directly to the current situation in East Asia may not be appropriate.

Figure 4

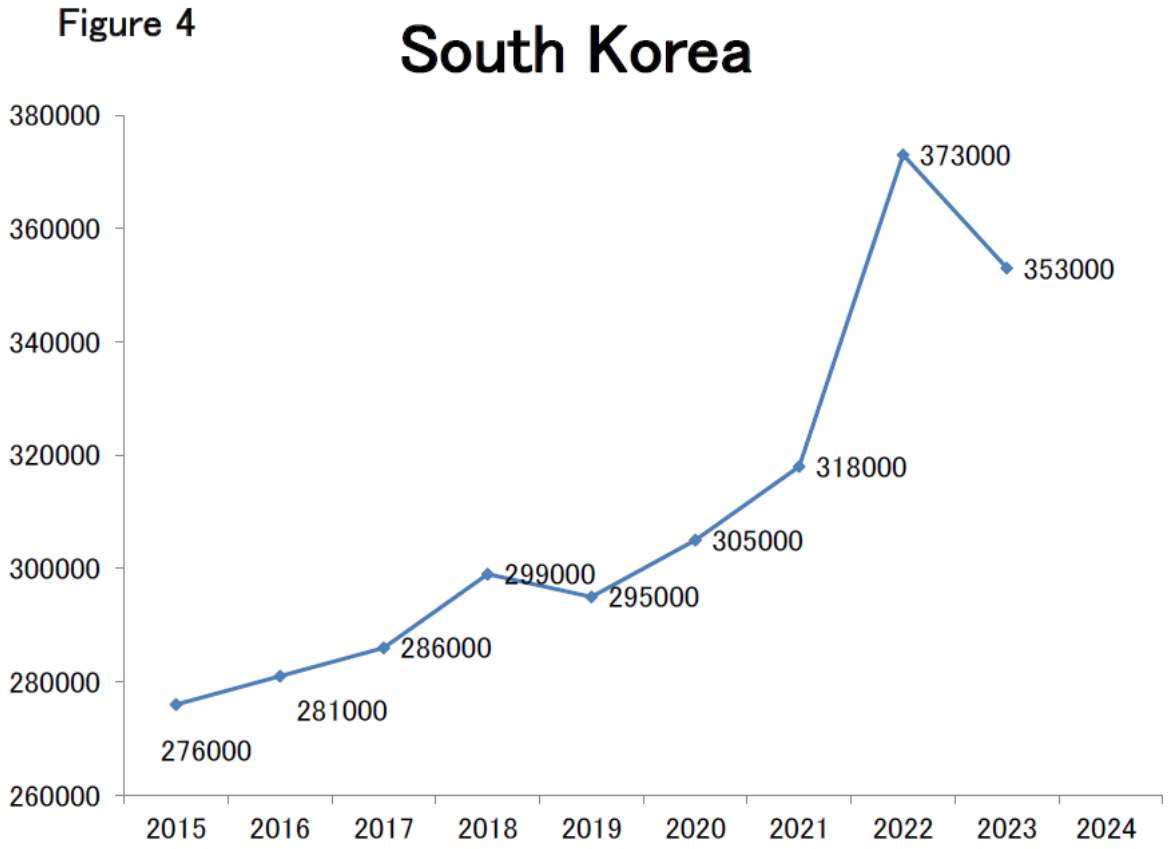
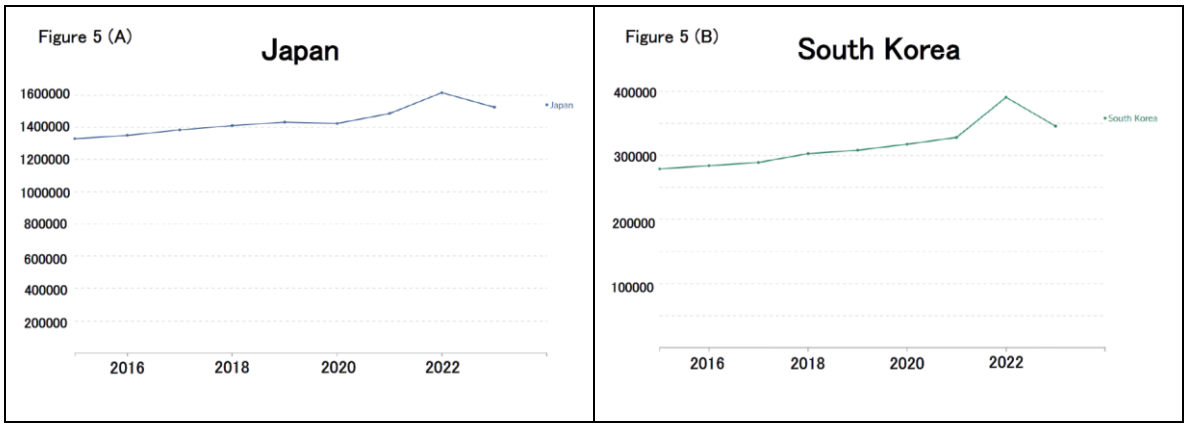


Figure 4. Trends in the annual number of deaths in South Korea since 2015.



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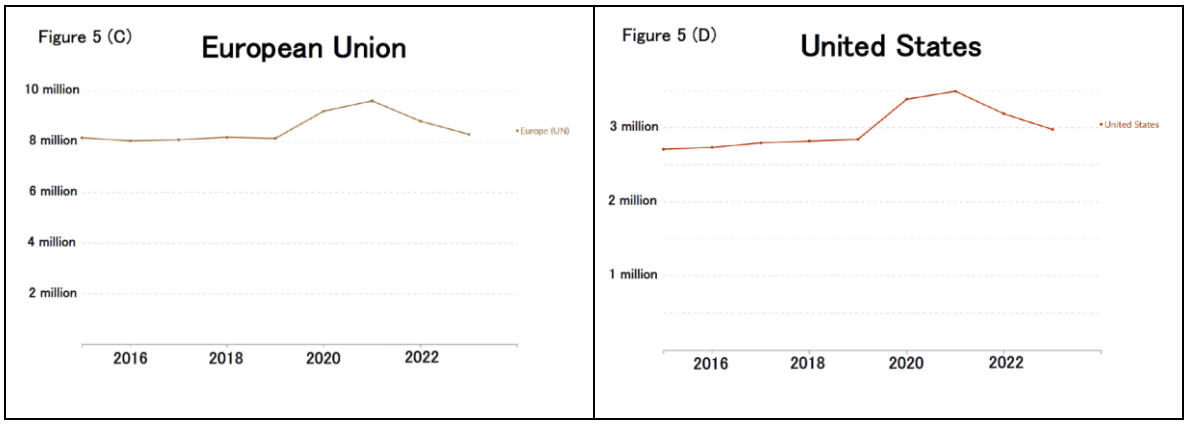

Figure 5. Trends in the number of deaths in each country since 2015. (A): Japan; (B): South Korea; (C): European Union; (D): United States.

Excess Mortality and COVID-19 Vaccination

Preliminary mortality data for each municipality in January 2025 were released in February 2025, revealing a significant increase in deaths compared to the previous year. This sharp rise has become a topic of widespread discussion (Table 1).

A study in the United Kingdom has reported that the Standardized Mortality Ratio (SMR) for all-cause mortality is higher in COVID-19 vaccinated individuals compared to unvaccinated individuals [32]. Opponents of COVID-19 vaccination argue that this surge in excess mortality is a direct consequence of the harmful effects of COVID-19 vaccines [33,34]. Infectious disease experts promoting COVID-19 vaccination appear in newspaper advertisements sponsored by vaccine manufacturers, continuing to advocate for booster doses [10]. However, information circulating on social media highlights that the number of cases approved for compensation under the COVID-19 vaccine injury relief system, including deaths, far exceeds the total for all other vaccines combined over the past more than 40 years [35]. It is anticipated that some may argue that the high number of compensation cases is due to the overwhelmingly large number of COVID-19 vaccine recipients. However, it has also been claimed that the incidence of adverse events is significantly higher for COVID-19 vaccines compared to influenza vaccines, despite both being widely administered [36].

Given such reports, it is understandable that the general public may grow increasingly distrustful of COVID-19 vaccines.

While the possibility that long-term effects of mRNA vaccines may have contributed to increased rates of cardiovascular diseases or immune dysfunction cannot be ruled out [8], multiple factors need to be considered. After vaccination, cases of herpesvirus [37] and varicella-zoster virus [38] infections, autoimmune diseases [39,40], thrombotic thrombocytopenia [41], nephrosis [42,43], nephritis [44,45], myocarditis, and pericarditis [46–51] have been reported. Notably, a significant rise in deaths was already evident in 2021, the year COVID-19 vaccinations began. Some researchers have speculated that the increase in mortality observed from 2024 to 2025 could be a delayed manifestation of vaccine-related adverse effects or long-term complications.

Other Contributing Factors to Increased Mortality

However, in addition to potential vaccine-related impacts, several other factors may have contributed to the rise in mortality. A key demographic factor is Japan's aging population—by 2024, the baby boomer generation will have reached 75 years and older, an age range associated with naturally rising mortality rates. Healthcare access issues may have also played a role, including increased strain on medical institutions and a decline in healthcare-seeking behaviors. Japanese older adults have traditionally sought medical care more frequently than those in other countries. However, following the COVID-19 pandemic, an increasing number of elderly individuals refrained from seeking medical attention. As a result, cases emerged in which the treatment of previously

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managed diseases was interrupted, regular screenings were not conducted, making early detection difficult, and, in some instances, patients were unable to access appropriate medical care after disease onset, leading to preventable deaths. These effects may still persist today. Furthermore, this reluctance to seek medical care likely contributed to insufficient prevention and early intervention for conditions such as cancer, cardiovascular diseases, and cerebrovascular diseases.

The adverse effects of delayed diagnosis and treatment have also been observed in patients with cardiovascular diseases requiring emergency care. Following the COVID-19 pandemic, primary PCI was performed significantly less frequently, and the incidence of mechanical complications resulting from ST-elevation myocardial infarction (STEMI) increased. Failing to seek immediate medical attention and waiting at home when experiencing heart attack symptoms may worsen outcomes for patients with STEMI [52].

Reperfusion therapy for acute ischemic stroke was also impacted by the COVID-19 pandemic. During the state of emergency, the number of stroke admissions decreased, and the time from hospital arrival to imaging and thrombolysis was longer compared to the period before the pandemic [53]. Thus, the fear of contracting COVID-19 has led to delays in the treatment of other life-threatening emergency conditions.

Moreover, frailty caused by the COVID-19 pandemic is also a problem due to older adults being afraid of contracting COVID-19, which has caused them to refrain themselves excessively and stay at home. The aftermath of the pandemic has led to heightened stress levels and reduced routine health check-ups, potentially exacerbating chronic illnesses.

The reasons why Japanese older adults refrained from visiting doctors are believed to be largely influenced by the fear of infection risk, especially due to the widespread public health campaign during the early days of the 2020 pandemic. Following the recommendation of Professor Nishiura of Hokkaido University, who was a member of the Cluster Response Team at the Ministry of Health, Labour and Welfare at the time, there was a major push to reduce contact with others by at least 70%, and as much as possible by 80%. Other factors, such as overcrowding in medical facilities, mental stress, and the desire to avoid placing additional burdens on the healthcare system, may have also contributed.

The author has previously highlighted concerns that prioritizing infection control may have delayed the diagnosis of other diseases [30], and that strict patient isolation protocols may have hindered flexible responses in clinical settings, potentially lowering the overall quality of medical care [54]. These can be considered indirect adverse effects of COVID-19 infection control measures.

While some may argue that the absence of infection control measures would have led to a higher number of direct COVID-19 deaths, it is deeply ironic that the extensive efforts, financial costs, and sacrifices made for infection control may have ultimately contributed to increased stress levels, a decline in routine health checkups, the progression of frailty in older adults, and an overall rise in mortality.

Reevaluating the Role of COVID-19 Vaccination and Hybrid Immunity in Excess Mortality

Conversely, proponents of COVID-19 vaccination may argue that the rise in mortality observed in 2024 is linked to a decline in vaccine uptake in 2023. A report suggested that COVID-19 vaccination contributes to reducing excess mortality among the elderly [55]. Furthermore, the VENUS study, led by Kyushu University, suggests that booster doses of mRNA vaccines do not increase the risk of mortality [56]. However, it remains unclear whether they contribute to a reduction in mortality risk. Proponents assert that individuals—particularly older adults and those with underlying health conditions—face an increased risk of severe disease and death due to decreased vaccine coverage.

However, given that the severity of COVID-19 had substantially declined by 2023, it remains difficult to conclude definitively that reduced vaccination rates were the primary driver of excess mortality. Furthermore, the total number of annual deaths attributed to COVID-19 in recent years

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has been approximately 30,000 [57], suggesting that COVID-19 alone is insufficient to fully account for the observed rise in excess mortality.

When considering the demographic impact of COVID-19 itself, it is essential to take into account the effects of herd immunity. In Japan, the majority of the population has received at least two doses of an mRNA vaccine, followed by natural infection, leading to a high prevalence of hybrid immunity. The author has previously reported that experiencing both natural infection with the virus and mRNA vaccination leads to a significant increase in antibody titers due to hybrid immunity, with antibody levels being maintained at a high level for an extended period (over one year) [58–60]. It is suggested that when antibody titers remain elevated, the effectiveness in preventing infection is sustained, and the risk of severe disease is reduced. In other words, even if only the initial two doses of vaccination are administered, followed by natural infection, it can be expected that the risk of severe illness from COVID-19 would be extremely low in healthy individuals.

To avoid any misunderstanding, it should be clarified that the author is not a complete skeptic of the COVID-19 vaccine and considers it an exceptionally effective technology for these reasons. However, the author cannot help but feel discomfort with the outright denial of the negative aspects of the COVID-19 vaccine or the dismissive attitude toward individuals who express skepticism about vaccination. It is entirely reasonable that some individuals initially had concerns regarding the efficacy and safety of mRNA vaccines, as they represented a novel technology and were developed within an exceptionally short timeframe.

The Complexity of Mortality Trends and the Need for Careful Analysis

It is difficult to definitively determine whether the arguments presented by either proponents or opponents of COVID-19 vaccination are simply "correct" or "incorrect." Changes in mortality rates are influenced by multiple factors, necessitating careful and rigorous data analysis. Rather than drawing simplistic causal conclusions, it is crucial to continue examining this issue from multiple perspectives. When COVID-19 vaccinations first started, some doctors appeared on social media and other platforms, tirelessly emphasizing the safety of the vaccine [51]. Some proponents of COVID-19 vaccination expressed extreme, aggressive, and emotionally charged opinions, appearing intolerant of any negative views on the vaccines [52,53]. However, they likely believed in the effectiveness of vaccination and were acting in the best interest of public health with no ill intent.

Regardless of one's stance, merely criticizing those with opposing views by claiming that their arguments lack evidence or scientific basis may backfire, as the same argument can be directed in return, ultimately undermining one's own position. It is desirable for both sides to remain objective and avoid extreme claims, such as "vaccines are absolutely effective and safe" or "vaccines are the sole cause." A cautious and rational approach is essential, emphasizing careful evaluation of data and distinguishing correlation from causation.

Debates over COVID-19 vaccines and infection control measures are deeply polarized, often culminating in irreconcilable disputes that highlight divisions rather than fostering meaningful dialogue. While opposing sides frequently dismiss each other’s claims, it is crucial to acknowledge the coexistence of differing perspectives and advocate for policies that respect individual choice. Both proponents and critics present valid arguments, yet their discourse is sometimes marked by emotional intensity, aggression, and overreach, raising concerns about the objectivity of their positions. Additionally, both sides tend to selectively disseminate information, emphasizing points that best support their respective viewpoints.

To be honest, the author was initially skeptical about the accuracy of social media posts that reported a significant increase in mortality by the end of February 2025. However, as demonstrated in this study, data extracted from publicly accessible sources, including the Ministry of Health, Labour and Welfare and various municipal governments, and plotted on a simple line graph, confirmed that the reported trend was indeed real. Readers interested in verifying this finding are encouraged to consult the URLs listed in Table 1, which are linked to the statistical data from each

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municipality. Those who identify any discrepancies or potential errors in the data are welcome to contact the author.

In the modern era, information disseminated via social networking services (SNS) on the internet holds significant influence alongside official statements issued by governmental authorities and academic societies. While such information varies in quality—some may be misleading and potentially detrimental to public decision-making—insightful and sharp analyses are also frequently observed. It is anticipated that the incorporation of such perspectives into policy-making will become increasingly important in the future.

Examining Japan's Rising Mortality Rate: An International Comparison and Contributing Factors

Based on our previous considerations, we aim to explore the reasons for the notable increase in Japan's mortality rate from an international perspective, particularly in comparison with Western countries.

One possible explanation is Japan's super-aged society. Japan has a higher proportion of elderly individuals than other countries, which naturally contributes to a greater prevalence of underlying health conditions, potentially leading to an increased mortality rate.

A key factor is the direct impact of COVID-19 itself. In Japan, there was a significant increase in COVID-19-related deaths among the elderly, particularly from the latter half of 2022 onward. In contrast, Western countries experienced their peak infections between 2020 and 2021, suggesting that Japan's peak was delayed.

Another consideration is the potential contribution of adverse events related to COVID-19 vaccination, particularly thrombotic events and cardiovascular diseases, to increased mortality. While vaccination rates declined in Western countries after 2022, Japan continued booster vaccinations, especially among the elderly, with many receiving six to seven doses. Additionally, mRNA vaccines were predominantly used in Japan, whereas other countries also incorporated protein-based vaccines. Notably, the Novavax protein-based COVID-19 vaccine (NVX-CoV2373) has been reported to have fewer side effects compared to mRNA vaccines. To assess the impact of vaccines, an urgent investigation is needed to analyze the correlation between Japan's excess mortality rate and vaccination rate since 2022.

The impact of COVID-19 policies should also be considered. Japan implemented strict infection control measures—including mask mandates, restrictions on outings, and behavioral limitations—for an extended period. This prolonged adherence to restrictive measures may have contributed to increased frailty and immune decline among the elderly. In contrast, Western countries lifted restrictions earlier, allowing for natural exposure to the virus and potentially facilitating immunity acquisition.

Healthcare and social system factors may also have played a role. In Japan, excessive emphasis on infection control may have overwhelmed medical institutions, leading to delays in the diagnosis and treatment of cancer and chronic diseases. Given that the peak of COVID-19 infections in Western countries occurred earlier, their healthcare systems may have recovered sooner. Furthermore, in Japan, the strain on medical resources resulted in increased cases of emergency transport difficulties, delaying treatment for myocardial infarction and stroke. In other countries, emergency medical services unrelated to COVID-19 may have resumed more promptly.

Lastly, the prolonged implementation of strict infection control measures in Japan had significant economic and social repercussions. The resulting economic downturn, rising inflation, and stagnation of income growth likely deteriorated the quality of life (QOL) for many individuals. Notably, the suicide rate increased, particularly among young adults and middle-aged men. In contrast, other countries experienced swifter economic recovery and resumption of social activities.

Japan's Declining Population and Its Implications

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Although deaths in Japan have risen significantly, the birth rate has sharply declined. Japan has entered an era of extremely low birth rates and increasing mortality. Since the onset of the COVID-19 pandemic, mortality rates have exceeded initial projections, highlighting a more severe population decline than previously anticipated. Measures such as providing support for child-rearing and considering the acceptance of immigrants are being explored to address the declining birthrate, but their effectiveness is likely to be limited. This demographic shift poses substantial challenges, including economic stagnation, diminished international influence, difficulties in maintaining social infrastructure and welfare systems, and security concerns. These issues have profound implications for Japanese society. Whether or not we choose to acknowledge this reality, we must confront it objectively. Moving forward, the key challenge is to develop a sustainable society based on a model of shrinking equilibrium—one that accommodates population decline without economic and social collapse, while integrating economic and social planning with demographic trends.

In Japan, where the majority of food and energy supplies rely on imports, some argue that maintaining a population of 120 million will become increasingly difficult as the country's economic contraction and decline are anticipated in the future, potentially leading to a loss of financial capacity to sustain such imports. Japan is the first major nation in modern history to experience such a rapid population decline. Low birth rates and an aging population make demographic decline a pressing issue not only in Japan but also in other developed countries. In contrast, many developing nations continue to struggle with rapid population growth. The global challenges of food and energy crises remain pressing, and population decline may help reduce environmental burdens. From an environmental conservation perspective, a shrinking population is not necessarily an entirely negative phenomenon. By pioneering a model for a society adapting to population decline, Japan can offer valuable insights for building a sustainable future.

Conclusions

The rising mortality in Japan, particularly since the onset of the COVID-19 pandemic, represent a significant public health concern. Analysis of nationwide and municipal mortality trends highlights a clear pattern of increased deaths beginning in 2021, which persisted through 2023 and shows projections for continued elevation in 2024. While COVID-19, alongside factors like cardiovascular diseases and cancer, has undoubtedly played a role, other complex factors, including the aging population, healthcare access issues, and possible long-term effects of COVID-19 vaccinations, must also be considered.

It is necessary to conduct further research, including cohort studies comparing mortality rates between vaccinated and unvaccinated groups to demonstrate a true causal relationship between COVID-19 vaccination and mortality, studies comparing international excess mortality data and examining correlations with vaccination rates, and research analyzing differences in mortality rates based on the presence or absence of booster vaccinations.

Moreover, the challenges posed by Japan's declining birthrate and aging population further complicate the situation, necessitating careful examination of the interconnected demographic and public health issues.

Despite the ongoing debate surrounding the causes of increased mortality, it is essential to adopt a balanced, data-driven approach to understanding the factors at play. A cautious and objective analysis of the available data, without resorting to extreme positions on either side of the vaccination debate, is crucial for developing appropriate public health responses. Japan's demographic decline, while presenting significant challenges, also offers an opportunity for the country to pioneer sustainable solutions for managing population change, potentially providing valuable insights for other nations facing similar issues. Moving forward, Japan must confront these demographic and public health challenges with strategic, evidence-based planning to ensure a stable and sustainable future.

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