Global Health & Medicine. 2024; 6(1):40-48. REVIEW
DOI: 10.35772/ghm.2023.01127

Senility deaths in aged societies: The case of Japan

Reiko Hayashi[1,*], Teruhiko Imanaga[2], Eiji Marui[3], Hiroshi Kinoshita[4], Futoshi Ishii[5], Emiko Shinohara[6], Motomi Beppu[1]

[1] National Institute of Population and Social Security Research, Tokyo, Japan;
[2] Kanade Medical Clinic, Saitama, Japan;
[3] University of Human Arts and Sciences, Saitama, Japan;
[4] Kagawa University, Kagawa, Japan;
[5] Keio University, Tokyo, Japan;
[6] The University of Tokyo, Tokyo, Japan.

Abstract: Senility is now the third largest cause of death in Japan, comprising 11.4% of the total number of deaths in 2022. Although senility deaths were common in the period before the Second World War, they declined sharply from 1950 to 2000 and then increased up to the present. The recent increase is more than what we could expect from an increasing number of very old persons or the increasing number of deaths at facilities. The senility death description in the death certificate is becoming poorer, with 93.8% of them only with a single entry of "senility". If other diseases are mentioned, those are again vague diseases or conditions. Senility, dementia and Alzheimer's disease, sequelae of cerebrovascular disease, and heart failure are the largest causes of death in which senility is mentioned in the death certificate. The period from senility onset to death is often described within a few months, but it varies. In some cases, the deceased's age was written out of a conviction that the ageing process starts from birth. As senility is perceived differently among the certifying doctors, a standardised protocol to certify the senility death is needed. On the other hand, senility death is the preferred cause of death and many people do not wish to receive invasive medical examinations before dying peacefully. Together with other causes of death related to frailty, there would be a need to capture senility as a proper cause of death, not just as a garbage code, in the aged, low-mortality population.

***Keywords*:** senility, cause of death, Japan

Introduction

While Japan's life expectancy remains one of the longest in the world, the very old population inevitably increase the number of deaths. In 2022, it recorded 1,569,050 (*1*), the second highest in the history of Japanese vital statistics, following 2,115,162 deaths that occurred in 1945 due to the Second World War (WWII) (*2*). The 2022 high death toll was in part due to the increase in COVID-19 deaths, which counted 47,661, 30,877 increase from the previous year. The second largest increase was due to senility deaths, which counted 179,529, 27,502 increase from the previous year. The senility is now the third largest cause of death in Japan. According to the ICD-10 stipulated by WHO, senility is allocated in chapter XVIII of "symptoms, signs or clinical findings, not elsewhere classified". It has been supposed to be an ill-defined cause which should be avoided to be used as the cause of death. In this international context, the "pandemic" of senility in Japan should be studied and clarified. Does the negligence of the certifying doctor cause it, and could the senility death be reduced? This paper aims to describe Japanese realities on why there are so many senility deaths and what could be the possible orientation in the future of the super-ageing society.

Internationally, the proportion of senility deaths over the number of deaths aged 60 years and over varies, and most of the countries which produce cause-of-death statistics based on full registration have a low proportion of senility (Figure 1). Belarus and Japan are the highest, 12%, followed by Russia (7.9%) and South Korea (6.6%). Queen Elizabeth II of the United Kingdom died of "old age" (*3*), but the proportion of senility deaths in England and Wales was only 1.7%. The senility proportions in France, Germany, and the USA are even lower, 0.8%, 0.3%, and 0.2% respectively.

The high proportion of senility deaths in Belarus and Russia could be explained partly due to the order issued in 1989 by the Soviet Minister of Health, Mr. Evgueny Chazov, to classify all deaths after age 80 as

senility unless there is evidence of external causes or a specific diagnosis (*4*). Following this order, senility deaths increased in Belarus with the symmetrical decrease of atherosclerotic cardiosclerosis without hypertensive heart disease (*5*). Hence it is considered that these changes were man-made, by the Soviet order, not the real change of diseases before the death. Similarly, in more recent times in Russia, the exchange between senility, cardiovascular diseases and other causes occurred after the presidential decree issued in 2012 on the circulatory disease mortality reduction by the numerical target (*6*). It is probable that many deaths by circulatory diseases were registered as senility, to achieve the target. While there is ample space for reflection on whether senility and circulatory diseases are truly separable or not, the high rate of senility in Russia and Belarus has its own causes induced by policy. In the case of Japan, there was no such policy to increase senility.

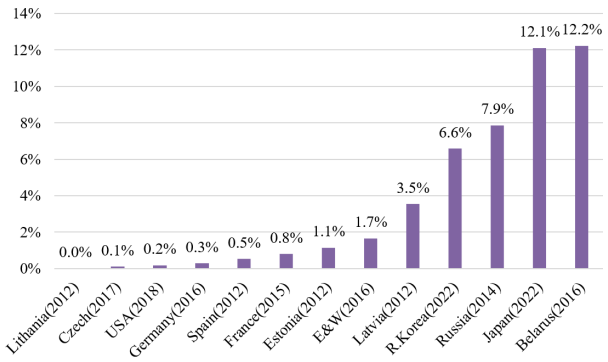

Figure 1. The proportion of senility deaths to deaths aged 60 years and over (various countries). Note: E&W is England and Wales. R. Korea is the Republic of Korea. The number in () denotes the year of the statistics. Data Source: The Human Cause-of-Death Database *https://www.causesofdeath.org*, *KOSIS.kr* for the Republic of Korea, Vital Statistics (Ministry of Health, Labour and Welfare) for Japan.

Historical trend of senility death in Japan

The Japanese national cause of death statistics started in 1875 by the Sanitary Bureau of the Ministry of Home Affairs after the Meiji government launched the *Isei,* the Medical Act. The classification adopted at the time was similar to the Farr classification, and there was a category of constitutional diseases (zenshinbyo) to which senility death was attributed (*7*). The single entry of senility death became available in the cause of death statistics in 1899 when the vital statistics started. The cause-of-death statistics of that year, which was published in 1902, reclassified thousands of cause-of-death descriptions reported by doctors into a classification composed of 46 items, which was comparable both to the existing 12-item classification made by the Sanitary Bureau (*8*) and also the first International Classification of Diseases, which had one chapter for senility (*9*). The number of senility deaths in that year was 55,189, 5.9% of total deaths and 21.4% of the deaths aged 60 years and over (Figure 2). The proportion remained stable with a slight upward trend until 1943. After three years of missing data caused by WWII, both the number and proportion of senility deaths declined in 1947 and kept on declining since then. The sharp decline was recorded in 1950 when the ICD-6 was adopted, and the independent chapter on senility was abolished. The senility was allocated in chapter XVI, "Symptoms, senility, and ill-defined conditions". There were concerns about this change among those in charge of cause-of-death statistics. In the statement of the Japanese Committee to the Sixth Decennial Revision of International Lists of Diseases, Injuries, and Causes of Death, it was stated that the subcommittee in charge had

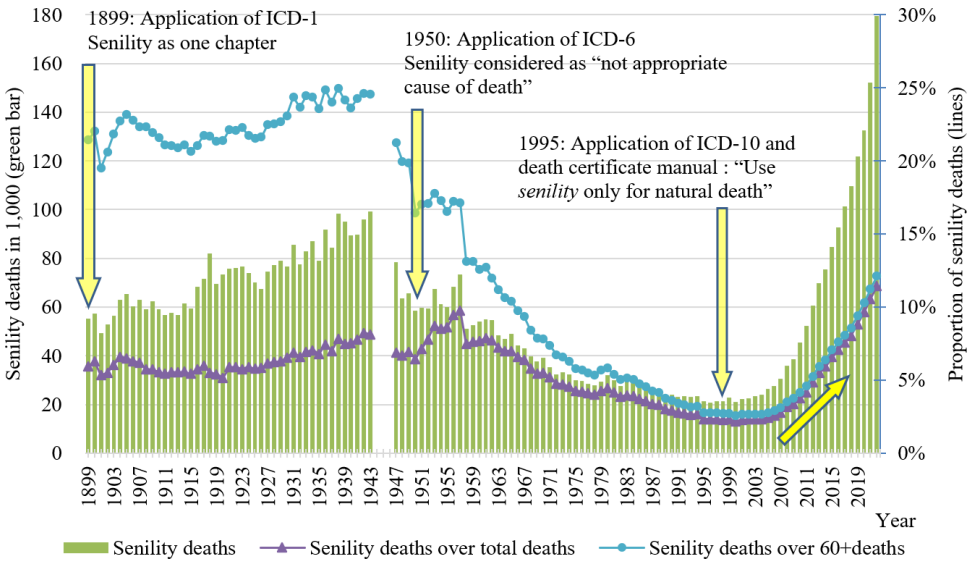

Figure 2. The trend of senility deaths in Japan. Data Source: Vital Statistics (Statistics Bureau until 1943, Ministry of Health and Welfare from 1947 to 1998, Ministry of Health, Labour and Welfare from 1999).

no objection except for senility, but "in the long run, they agreed with the World Health Organization, taking into account the peculiar nature of senility". Having agreed to follow this international decision to allocate senility as an ill-defined cause of death, efforts were made to reduce them, mainly through training and information dissemination to medical doctors to remind them that senility was a garbage code. The number and proportion of senility deaths kept on declining. However, since around the end of the 20th century, the number turned again to an upward trend. At the time of the ICD-10 application in 1995, the death certificate form and death certificate manual were revised, and an explanation was added that stated: "use senility as the cause of death only in the case of so-called natural death, which is an elderly person with no other obvious cause of death" (*10*). Thus, the senility was acknowledged as a proper cause of death. This might trigger the gradual increase of senility death written in the death certificate.

The proportion of senility deaths to the deaths aged 60 years and over was high before WWII, at around the level of 20 to 25%. After WWII, it declined until it hit the lowest, 2.0%, in 2000 and increased again to 12.1% in 2022. If we consider the decision of WHO, that senility is an ill-defined cause, is legitimate, the high proportion of senility in recent times suggests the quality of cause-of-death statistics in Japan is deteriorating. However, we need to look closely further at the data.

The age structure of senility death changed greatly from 1900 to 2022 (Figure 3). In the early 20th century, most of the senility deaths were aged 70s and 80s, whereas the majority of recent senility deaths are more than 90 years and over. If senility death results from the natural, genetic, intrinsic process of human ageing, then there should be the same amount of senility deaths at the same age. Life expectancy doubled from around 40 to 85 years during the same period, so the deaths that occurred after the life expectancy, or the appropriate age that people accept to die, could be easily labelled as senility. If so, the senility death is not truly natural but ill-defined, influenced by ageism. Or, it might suggest the natural ageing process evolved along with the extension of life expectancy.

Senility has never been the top cause of the deaths of older persons (Figure 4). Before WWII, the largest causes were cerebrovascular and digestive organ diseases. After WWII, cancer, cerebrovascular, and heart diseases were the main killers. Cancer mortality was low in the pre-WWII period, but it increased enormously after WWII. The low cancer mortality in the pre-WWII period could be partly due to the limited knowledge and technology to diagnose cancer, and hidden cancer deaths might be included in the senility deaths. The increasing proportion of cancer from 1950 to 2000 is in parallel with the decreasing proportion of senility. After 2000, the cancer-senility relation continued but in the opposite direction; the proportion of cancer decreased while senility increased. The possible explanation for this trend is that medical technology development cured diseases notably cancer, and pushed longevity further but not to eternity, resulting in the senility increase.

The structure of the recent increase in senility death

The senility death increase after 2000 is caused partly due to the increase in the total number of deaths, especially very old people. In 2022, among 179,529 senility deaths, 88% (158,638) were aged 85 years and over (Figure 5). However, the ageing of deaths is not the only reason. By age, the senility death rate is increasing steadily (Figure 6). For example, among those aged 95 to 99 years and over, the senility death rate per population was 3.0% in 2005 but increased to 8.3% in 2022. As the all-cause mortality of that age group did not increase in the same period, the increase in the senility death rate implies that senility is over-utilized or preferred as the cause of death in the death

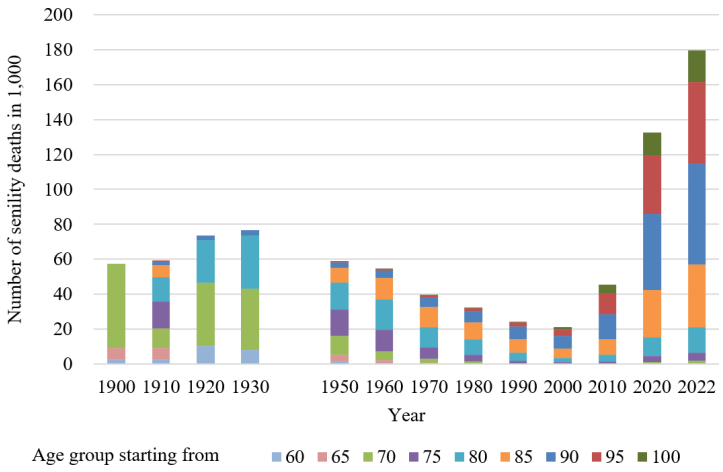

Figure 3. Senility deaths by age group. Data Source: Vital Statistics (Statistics Bureau until 1943, Ministry of Health and Welfare from 1947 to 1998, Ministry of Health, Labour and Welfare from 1999).

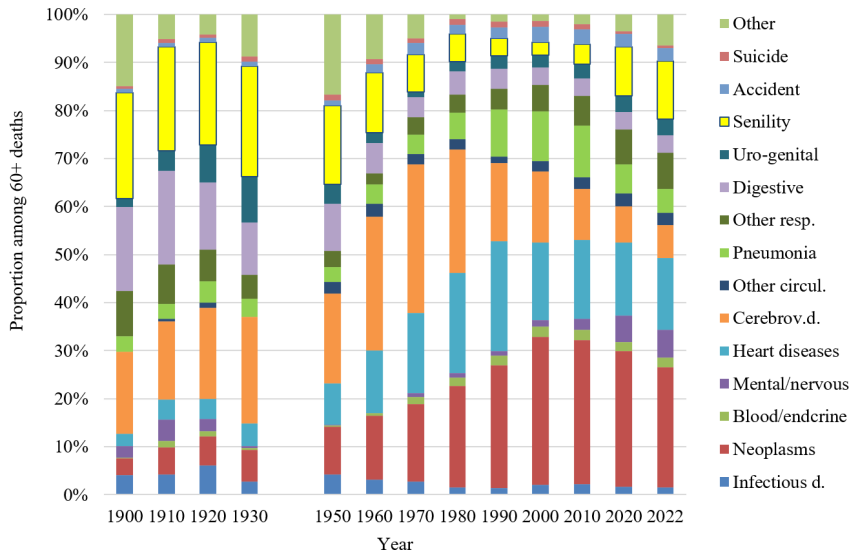

Figure 4. The proportion of major causes of deaths aged 60 years and over. Data Source: Vital Statistics (Statistics Bureau until 1943, Ministry of Health and Welfare from 1947 to 1998, Ministry of Health, Labour and Welfare from 1999).

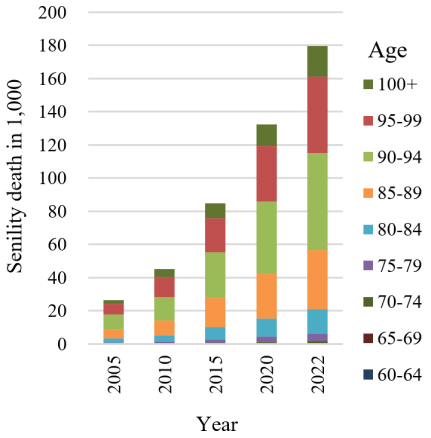

Figure 5. Number of senility deaths by age. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare).

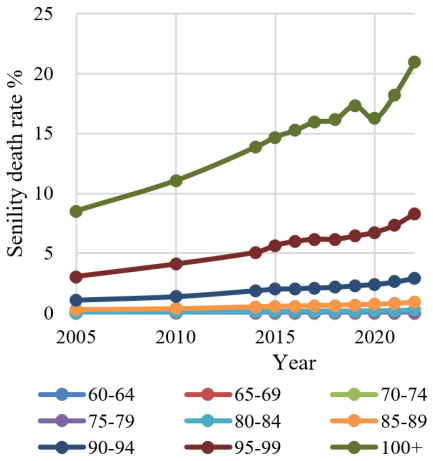

Figure 6. Age-specific senility death rate. Note: The decrease and increase in the senility death rate of centenarians from 2020 to 2022 show the irregularities under the mortality fluctuation during the COVID-19 pandemic, which would need further investigation. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare).

certificate.

By place of death, an increasing number of senility deaths are occurring in facilities (Figure 7). In 2022, 32% of senility deaths occurred in hospitals, which also included clinics and designated "long-term care beds" in the hospitals. 17% occurred at home, including elderly housing with care service. 2% occurred at "other" locations, such as the daycare service center or the house of family member. The largest proportion, 49%, occurred in facilities, composed of those covered by the Long-term Care Insurance Act (Intensive Care Home for the Elderly, Long-term Care Health Facility, or Integrated Facility for Medical and Long-term Care), or other types of facilities (Fee-based Home for Elderly, Low-cost Home for the Elderly or Nursing Home for the Elderly).

For all causes of death, along with the long-term care services expansion since public insurance was introduced

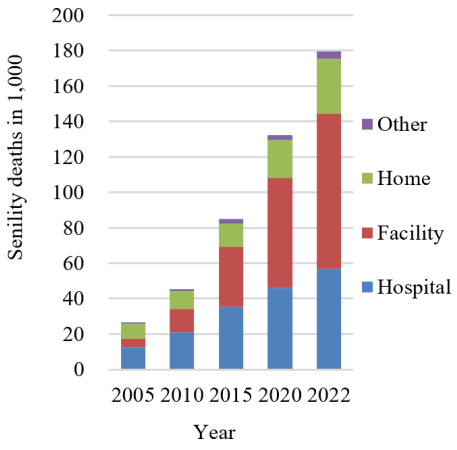

Figure 7. Number of senility deaths by place of death. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare).

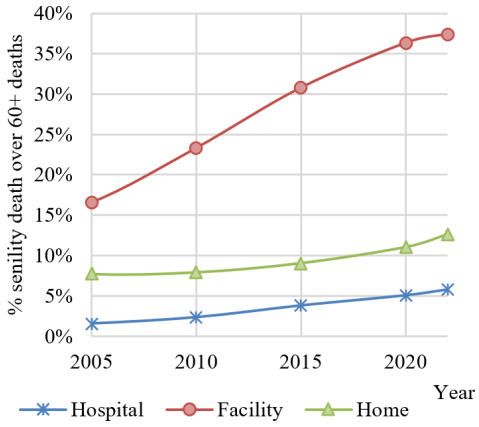

Figure 8. Senility death proportion by place of death. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare).

in 2000, the number of deaths occurring in facilities has been increasing. However, even among the deaths that occurred in facilities, the proportion of senility deaths is increasing much more than deaths that occurred in hospitals or at home (Figure 8). One explanation is that those who do not have any particular curable diseases but progressing frailty move out from the hospital or home to a facility and stay there for a certain period until they end their life by senility. Another explanation is, as in the increase of senility mortality by age, that more and more doctors prefer to use senility as a cause of death, especially at facilities.

Description of senility in the death certificate

Since the ICD-6 was adopted by the newly created WHO in 1948, it was decided that the underlying cause, the disease or injury that initiated the train of morbid events leading directly to death, should be designated as the cause of death for primary tabulation (*11*). To determine the underlying cause, multiple descriptions of diseases and injuries which led to the death are required. Currently, the Japanese death certificate form provides one cell to describe the direct cause, three cells to describe other causes which caused the direct cause, and one cell to describe related diseases and injuries. The duration from the onset of each disease or injury to death must also be filled. All this information is used to determine the underlying cause of death to be published in the Vital Statistics by the Ministry of Health, Labour and Welfare. Since 2003, the online transmission of death registration from the municipality level to the national level has started (*12*), and these data containing death certificate information became available for research purposes under the Statistics Act.

The senility death, defined here as a death in which the underlying cause is senility, is increasing, but the description in the death certificate is becoming poorer. The proportion of senility deaths in which only one word of senility was written on the death certificate was 93.8% in 2020, up from 87.4% in 2005 (Table 1).

The most described other disease in the death certificate of senility death was unspecified heart failure (I50.9) until 2016. Due to the adoption of the ICD-10 2013 revision in 2017, the death mentioning both senility and unspecified heart failure was no longer defined as senility death. In 2020, the diseases mentioned in the senility death were general symptoms (R68.8), malaise and fatigue (R53), unspecified respiratory failure (J96.9), muscle wasting (M62.5), and dysphagia (R13), followed by other degenerative diseases and conditions (Table 2).

On the other hand, the senility-related deaths, defined here as the deaths in which senility is mentioned in any part of the death certificate, are more than the senility deaths. In 2020, senility-related deaths counted 218,001, 1.7 times more than the senility deaths. The underlying causes of those deaths were mostly senility, followed by dementia and Alzheimer's disease, sequelae of cerebrovascular disease, heart failure, pneumonitis due to solids and liquids (aspiration pneumonia), and pneumonia, organism unspecified (Table 3). These

Table 1. Number of cause descriptions of senility deaths

Number of sections with meaningful information	2005	2010	2015	2020
0	6	6	25	16
1	9,233	31,642	73,531	123,459
2	1,233	4,361	6,888	7,630
3	91	477	647	448
4	2	29	36	21
5	1	1	1	0
6	0	2	0	0
Total	10,566	36,518	81,128	131,574
1 item only %	87.4%	86.6%	90.6%	93.8%
Senility deaths not reported online	15,794	8,824	3,682	866
Total senility deaths	26,360	45,342	84,810	132,440

Note: The cases with no meaningful information (for example, 16 cases in 2020) are presumably cases in which separate communication was made to determine the underlying cause of death other than online registration. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare), microdata provided pursuant to Articles 32 and 33 of the Statistics Act.

diseases are important causes of death, and they are intertwined with senility. Also, if these diseases are written on the death certificate, the death will not be a senility death due to the coding rule. However, it is questionable if these deaths are distinctively different from senility deaths.

Another information we can obtain from death certificate data is the duration from the onset of diseases to death. The duration from senility onset to death among senility-related deaths is shown in Figure 9. The most frequent duration is one month, and the proportion has recently increased. Together with the frequent duration of two or three months, it could be said that most doctors perceive the senility process within a few months. However, not a negligible number of senility-related deaths mention the senility duration as 1 week or 1 year. Also, in some death certificates, 177 in 2020, the deceased's age was written as the duration of senility out of a conviction that the ageing process starts from birth. The senility duration is perceived quite differently among the certifying doctors.

Table 2. Diseases mentioned in the senility death (2020)

No.	Name of disease	ICD-10	*n*	%
1	Senility	R54	130,556	99.2%
2	General symptoms	R68.8	778	0.6%
3	Malaise and fatigue	R53	557	0.4%
4	Respiratory failure	J96.9	358	0.3%
5	Muscle wasting nec.	M62.5	334	0.3%
6	Dysphagia	R13	263	0.2%
7	Acute respiratory failure	J96.0	222	0.2%
8	Eating disorder	F50.9	166	0.1%
9	Shock, unspecified	R57.9	147	0.1%
10	Gangrene, nec.	R02	117	0.1%
	Other diseases and injuries		974	0.7%
	Total		131,574	100.00%

Note: "nec." stands for "not elsewhere classified". Total *n* (131,574) is the number of senility deaths reported online. It is less than the sum of all rows, as a death might have more than one disease written on the death certificate. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare), microdata provided pursuant to Articles 32 and 33 of the Statistics Act.

The importance of senility as a cause of death

Back in 1948, when WHO adopted the ICD-6, senility was attributed to an ill-defined cause of death. 70 years later, the increasing number of senility deaths in Japan does not mean that it became a well-defined cause of death. The increase is more than what could be expected from the increase in deaths of very old people, and at facilities. The death certificate description is becoming poorer, as most of the senility death certificates only mention one word: "senility".

However, senility is a preferred cause of death in Japan. According to a survey conducted in 2020, 81.5% of people think senility is a peaceful death, and only 7.3% think that senility deaths are caused by insufficient medical services (*13*). In addition, many people do not wish to receive invasive medical examinations before dying or to give those painful procedures to the family member before death. More than half (57.2%) of people do not wish to receive either a blood test, X-ray test, CT test, or endoscopic test if she or he faces senility death, and 48.5% of respondents wish not to give those tests to the family member (*14*). Further, home care physicians tend to respect the wish of the patient or their family for a peaceful death (*15*). All these preferences contribute to the increasing number of senility deaths in Japan, where the death certificate made by the doctor is handed to the family member who is responsible for the death registration at the municipality office.

Is it medically wrong to certify the death as senility? The doctors who deliver home medical care have a common understanding of how to certify senility death; most doctors consider the gradual decrease in daily activities and eating, the absence of any other diseases,

Table 3. The underlying causes of death of the senility-related death (2020)

No.	Name	ICD-10 code	person	%
1	Senility	R54	130,484	59.9%
2	Dementia and Alzheimer's disease	F01, F03, G30	19,955	9.2%
3	Sequelae of cerebrovascular disease	I69	10,146	4.7%
4	Heart failure	I50	9,256	4.2%
5	Pneumonitis due to solids and liquids	J69	4,301	2.0%
6	Pneumonia, organism unspecified	J18	3,503	1.6%
7	Cerebral infarction	I63	3,051	1.4%
8	Parkinson's disease	G20	2,111	1.0%
9	Chronic kidney disease	N18	2,076	1.0%
10	Unspecified diabetes mellitus	E14	1,715	0.8%
11	Other degenerative diseases of nervous system, not elsewhere classified	G31	1,268	0.6%
12	Essential (primary) hypertension	I10	1,259	0.6%
13	Fracture of femur	S72	1,189	0.5%
	Other diseases and injuries		27,687	12.7%
	Total		218,001	100.0%

Data Source: Vital Statistics (Ministry of Health, Labour and Welfare), microdata provided pursuant to Articles 32 and 33 of the Statistics Act.

and continuous care for months to years are important factors so that they can confidently certify the senility death (*15*). It is not certain yet if these criteria are also applied to senility deaths in facilities, where half of senility deaths are occurring at present. A standardised protocol to certify the senility death is needed.

However, we cannot simply assume that senility is used for an old person's uncertain, or even dubious death. For those deaths, heart failure or pneumonia, instead of senility, is used as the cause of death, which is the case in some criminal incidents in Japan (*16*).

Internationally, Japan's high proportion of senility deaths is outstanding. On the contrary, the proportion of deaths by dementia, including Alzheimer's disease, is lower in Japan. Some argue that dementia should be regarded as an underlying cause and needs proper attention (*17*), but others, especially neurologists, consider dementia should not, and could not be the underlying cause of death as it is a natural process of ageing. The causality of dementia and senility is not yet certain, and further research should clarify the mechanism. However, one can say that the high senility death proportion is offset by the low dementia death proportion in Japan compared to other countries. For example, in England and Wales, the top cause of death has been dementia, while senility deaths are rare. When these two causes are combined, the proportion to all-cause deaths by age shows a similar level between the two countries (Figure 10). The proportion to deaths aged 60 years and over is almost identical, with 13.2% for England and Wales and 13.3% for Japan in 2021.

In addition to dementia and senility, there are other similar causes of death related to frailty, such as cachexia, malnutrition or incontinence (*18*). While the interconnectivity and causality between these various frailty and senility-related diseases are to be clarified, there would be a need to capture them as proper causes of death in the aged, low-mortality population, not just

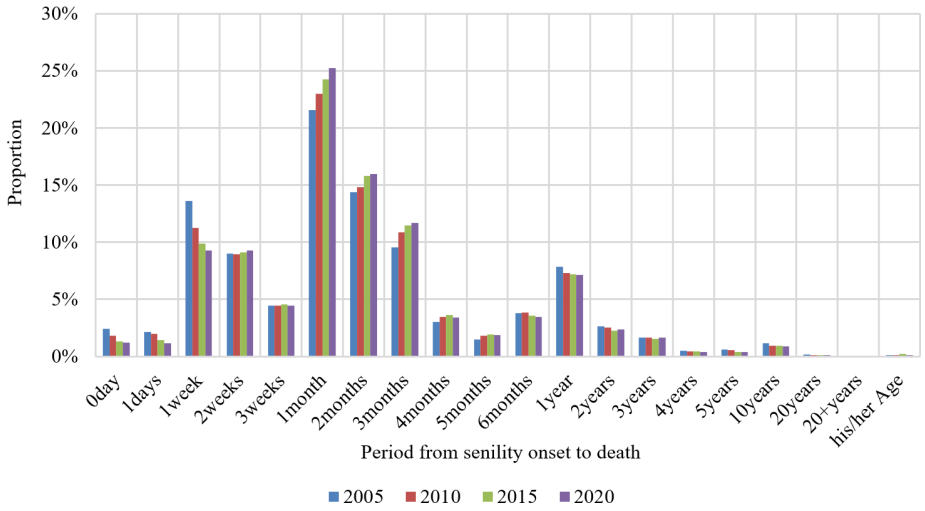

Figure 9. The period from senility onset to death. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare), microdata provided pursuant to Articles 32 and 33 of the Statistics Act.

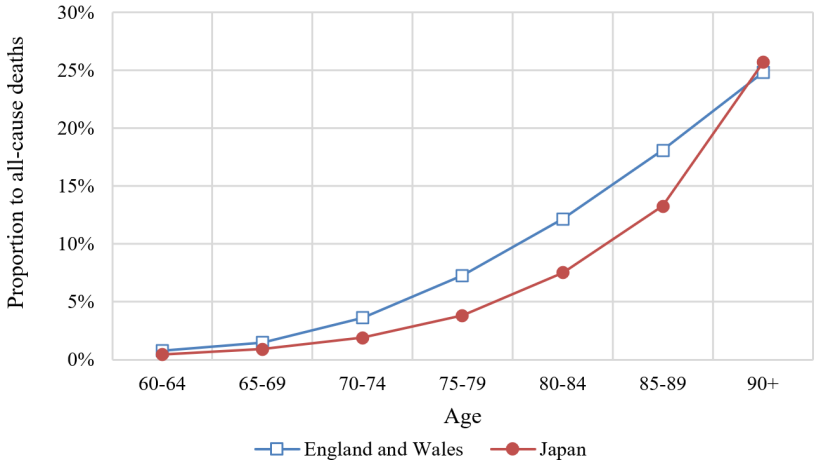

Figure 10. Proportion of dementia and senility deaths, Japan and England & Wales (2021). Note: Dementia is the sum of F01-F03, G30, senility is R54. Data Source: Vital Statistics (Ministry of Health, Labour and Welfare) for Japan, NOMIS Mortality Statistics (Office for National Statistics) for England and Wales.

as garbage codes.

Conclusion

The high proportion of senility deaths in Japan could be a sign of the deteriorating quality of cause-of-death statistics. To avoid an easy description on the death certificate only with one word, "senility", a clear, objective guideline is needed so that certifying doctors judge correctly the senility death. However, considering the similarity with the post-Soviet countries, or England & Wales, the high level of senility deaths in Japan could not be just a statistical quality issue.

Historically, the gradual increase of senility deaths towards the end of the 1940s drastically turned to a decline from 1950 to 2000. This was due to the advocacy training to doctors not to write senility in the death certificate. But also, the senility death proportion declined when the cancer death proportion increased. If we assume that the high proportion of pre-WWII senility deaths was partly due to undiagnosed cancer, then the medical progress in diagnosing cancer in the post-WWII period contributed to the reduction of senility deaths. If we apply this analogy, the increasing senility deaths at present could again decrease if or when we have new technologies. In the near or far future, when we can control the human ageing mechanism, we will be able to stop ageing and reduce senility deaths. Technology development is already on the horizon, especially at the genetic level.

However, for now, we are still living within the conventional limit of human lifespan, which would be, at most, 120 years. How to live better and die better within this limit is a common interest of all human beings, and analysing senility deaths would give many insights on that.

Funding: This research was supported by the Research Grant of the Ministry of Health, Labour and Welfare of Japan, "Research on analysis and evaluation method development of multiple causes of death under the transformation of population health and disease structure (20AB1001, FY2020–2022)", "Research aimed at improving Japan's cause of death and disease statistics through the application of ICD-11" (23AB0201, FY2023-2025), and IPSS research project "Modeling and Comprehensive Analysis of Population, Economy and Society of Ultra-Longevity".

Conflict of Interest: The authors have no conflicts of interest to disclose.

References

1. Ministry of Health, Labour and Welfare. Vital Statistics 2022. 2023. *https://www.mhlw.go.jp/toukei/list/81-1a.html* (accessed November 3, 2023). (in Japanese)
2. Department of Health Statistics, Ministry of Welfare. Vital Statistics 1946. 1949; Supplement (No.1) pp.14-15, (No.3) pp.22-23. *https://dl.ndl.go.jp/pid/3048767* (accessed December 12, 2023). (in Japanese)
3. National Records of Scotland. Registrar General releases extract of death entry for HM The Queen. 2022. *https://www.nrscotland.gov.uk/news/2022/registrar-general-releases-extract-of-death-entry-for-hm-the-queen* (accessed November 3, 2023).
4. Meslé F, Shkolnikov V, Hertrich V, Vallin J. Tendances récentes de la mortalité en Russie par cause 1965-1994. Institut National d'Études Démographiques (Paris), 1996. (In French and Russian)
5. Grigoriev P. About Belarus data on causes of death. 2019. *https://www.causesofdeath.org/Data/BLR/20201223/BLR_bd.pdf* (accessed December 6, 2023).
6. Danilova I. Consistency of time series in cause-specific mortality over the ICD-10 period. Presentation made at the 5th Human Mortality Database Symposium, 13-14 May, Berlin, Germany, 2019. *https://mortality.org/File/GetDocument/Public/HMD_5th_Symposium/Public/Danilova_pres.pdf* (accessed December 6, 2023).
7. Hayashi R. Causes of death statistics of Hygiene Bureau, Ministry of Interior: Process of establishment and characteristics. *https://mhlw-grants.niph.go.jp/system/files/2019/191021/201905004A_upload/201905004A0011.pdf* (accessed November 3, 2023). (in Japanese)
8. Statistics Bureau of the Cabinet. 1903. Report of the survey on cause of death classification. *https://dl.ndl.go.jp/pid/805886* (accessed December 8, 2023). (in Japanese)
9. Jacques Bertillon. Nomenclatures des maladies. Imprimerie Typographique de l'Ecole d'Alembert, Montévrain, France, 1903; p.15. (in French)
10. Ministry of Health, Labour and Welfare. Death certificate, birth certificate and still-birth certificate writing manual. Zaidan Houjin Kousei Toukei Kyoukai, Tokyo, Japan, 1995; p.28. (in Japanese)
11. WHO (World Health Organization). 2016. International statistical classification of diseases and related health problems, 10th revision, Volume 2, Instruction manual, Fifth edition. *https://icd.who.int/browse10/Content/statichtml/ICD10Volume2_en_2019.pdf* (accessed December 8, 2023).
12. Ministry of Health, Labour and Welfare. 2022. On the situation of vital statistics survey going online). Statistical Commission, Subcommittee of Planning, the 3rd Working Group, material 2-2 on 26th July 2022. *https://www.soumu.go.jp/main_content/000826754.pdf* (accessed November 19, 2023). (in Japanese)
13. Imanaga T, Toyama T. Internet survey on senility as the cause of death for the general public. Journal of Japanese Association for Home Care Medicine. 2021; 2:19-26. (in Japanese)
14. Imanaga T, Toyama T. What kind of medical care would the general public like to receive when they become senile? From internet survey on senility as the cause of death for the general public. Journal of Japanese Association for Home Care Medicine. 2022; 3:52-59. (in Japanese)
15. Imanaga T, Toyama T. Survey on the diagnosis of senility as the cause of death in home medical care. An Official Journal of the Japan Primary Care Association. 2018; 41:169-175. (in Japanese)
16. Asahi Shinbun. Pneumonia as the cause of death even

though it was a murder case. 2023. *https://www.asahi.com/articles/ASR4X528SR4XUNHB006.html* (accessed December 5, 2023). (in Japanese)
17. Okumachi Y, Yamashita D, Higo T and Takata T. Causes and background of death in elderly patients with advanced dementia. Japanese Journal of Geriatrics. 2015; 52:354-358. (in Japanese)
18. Trias-Llimós S, Barbieri M, Egidi V, Frova L, Grippo F, Meslé F, Pappagallo M, Désesquelles A. Frailty at death: An examination of multiple causes of death in four low mortality countries in 2017. Demographic Research. 2023; 49:13-30.

Received December 8, 2023; Revised December 23, 2023; Accepted December 25, 2023.

Released online in J-STAGE as advance publication January 2, 2024.

**Address correspondence to*:
Reiko Hayashi, National Institute of Population and Social Security Research (IPSS), Hibiya Kokusai Building 6th Floor, 2-2-3 Uchisaiwaicho, Chiyoda-ku, Tokyo 100-0011, Japan.
E-mail: hayashi-reiko@ipss.go.jp