

Super-Ageing and Unintentional Accidental Deaths in Recent Japan

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Abstract

Introduction: Accidental deaths increase dramatically with age among the elderly. Accidental deaths are attracting increasing attention as the average life expectancy in developed countries increases dramatically and Japan is becoming a super-aged society.

Method: Using 2000-2020 data on unintentional accidental deaths from Japan vital statistics and analysing age-mortality curves.

Results: Transport accidental deaths showed a complex age-dependence pattern, with a sudden increase during adolescence, a temporary decrease during middle age, then an increase with age, peaking in the 80s, and then a decrease again. Except for road traffic accidents, mortality rates generally increased exponentially with age among older people, but the rate of increase varied and in some cases began to decline at very old ages. Road traffic deaths fell significantly between 2000 and 2020, while most other accidental deaths also showed significant reductions over that period. Women died at about one-half the rate of men in the same age group of older people.

Conclusion: The problem of accidental deaths among the elderly is becoming a growing problem with the super-ageing population, and although the recent downward trend is favourable, it is considered to be basically avoidable deaths, so there will be a greater need to strengthen measures to prevent frailty among the elderly.

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Introduction

Japan has become a super-ageing society [1], with approximately 90% of deaths occurring among the elderly aged 65 and over. The mortality rate of unintentional deaths, excluding traffic accidents, increases rapidly with age among the elderly, as is mortality from many other diseases, and it is clear that ageing is a major factor.

The term frailty syndrome is used to describe a condition caused by senility, in which the decline in activity capacity due to the deterioration of brain function and muscle strength leads to deterioration of nutritional status and physical dysfunction, eventually leading to death. Among these, unintentional accidents are the most typical as they are directly influenced by the decline in brain function and muscle strength.

In this article, we have attempted to examine and discuss the age dependency of unintentional deaths from the perspective of physiotherapy.

Method

Data on unintentional deaths based on vital statistics were obtained from the government portal E-Stat [2]. Data from 2000, 2010 and 2020 were compared. Mortality rates were expressed in terms of deaths per 100,000. Ages were grouped from 0-5 years old to 85-90 years old in 2000, and from 0-5 years old to 95-100 years old in 2010 and in 2020. Comparisons between causes of death and between men and women are based on 2020 data. In the detailed accidental deaths, the ages were grouped into 0 years old, 1-15 years, 15-45 years, 45-65 years, 65-80 years and 80 years and over. The distribution of deaths was assumed to be Poisson, or if the denominator was small, binomial. The significance level is $p < 0.05$, unless otherwise stated.

Method

Figure 1 shows the age-mortality curves for transport accidental deaths. Accidental transport deaths rose sharply in the late teens, declined once in the late 20s, but increased with age from the 40s, peaked in the 80s, and then declined again. Between 2000 and 2020, there has been a marked decrease in the rate of deaths from road traffic accidents in each age group (Figure 1a). For women under the age of 65, the mortality rate for transport accidents remains only one-fifth that of men; for women aged 65 and over, the mortality rate has increased, but only by about half that of men in each age (Figure 1b).

The age mortality curves for unintentional accidents, excluding transport accidents, increased exponentially with age (Figure 2). A relatively small but significant decrease was observed between 2000 and 2020 for those aged 65 and over (Figure 2a). The male-to-female ratio of mortality in each age among the elderly was just under twice as high (Figure 2b).

Figure 3 shows the age-mortality curves for falls. The age-mortality curve for falls also shows a monotonically increasing exponential function, but the increase was steeper than for unintentional accidents as a whole. Between 2000 and 2010, a significant decrease in mortality was observed for people aged 65 and over, but it increased again significantly between 2010 and 2020 (Figure 3a). The male-to-female

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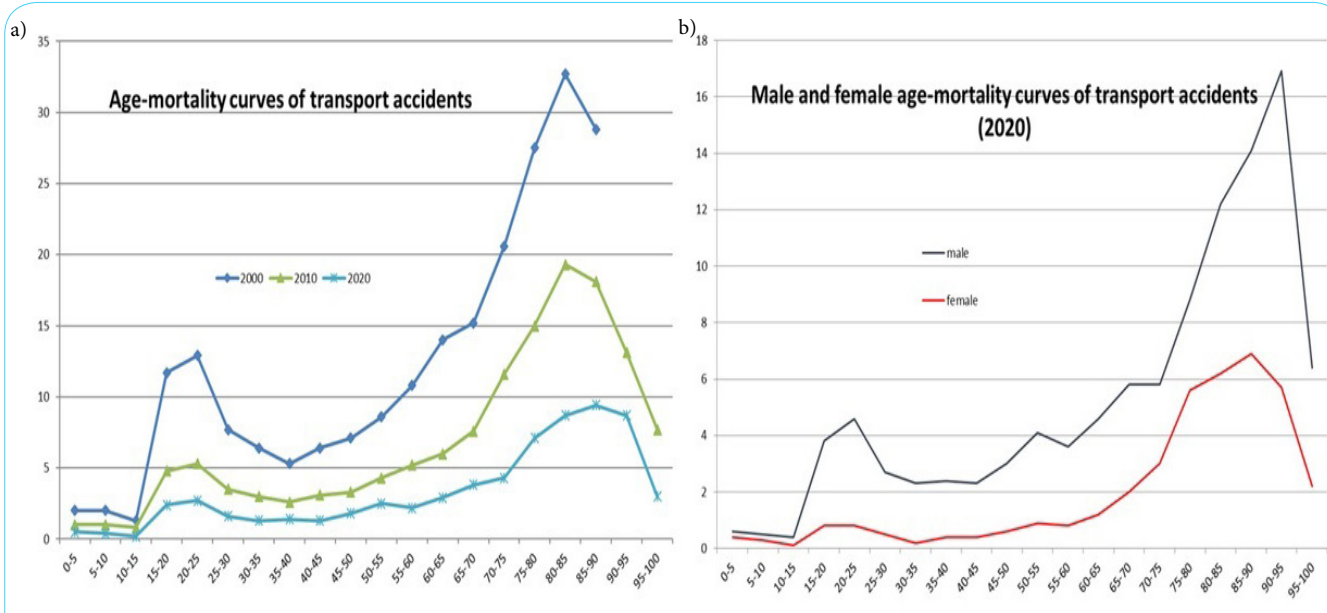


Figure 1: Age-mortality curves of transport accidents. a): Comparison of age-mortality curves for 2000, 2010 and 2020. b): Comparison of age-mortality curves for men and women.

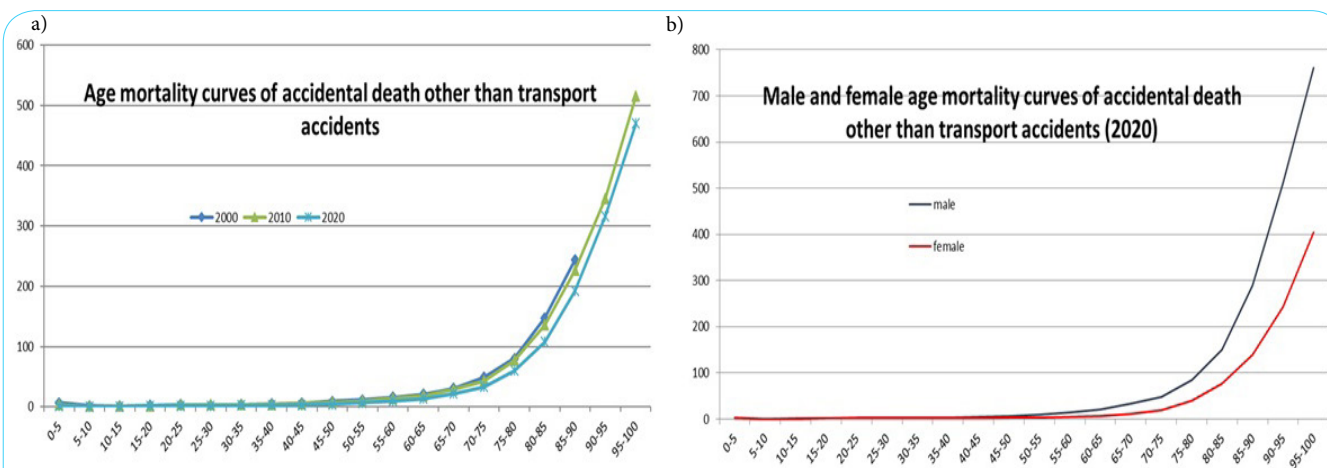


Figure 2: Age-mortality curves of accidental death other than transport accidents. a): Comparison of age-mortality curves for 2000, 2010 and 2020. b): Comparison of age-mortality curves for men and women.

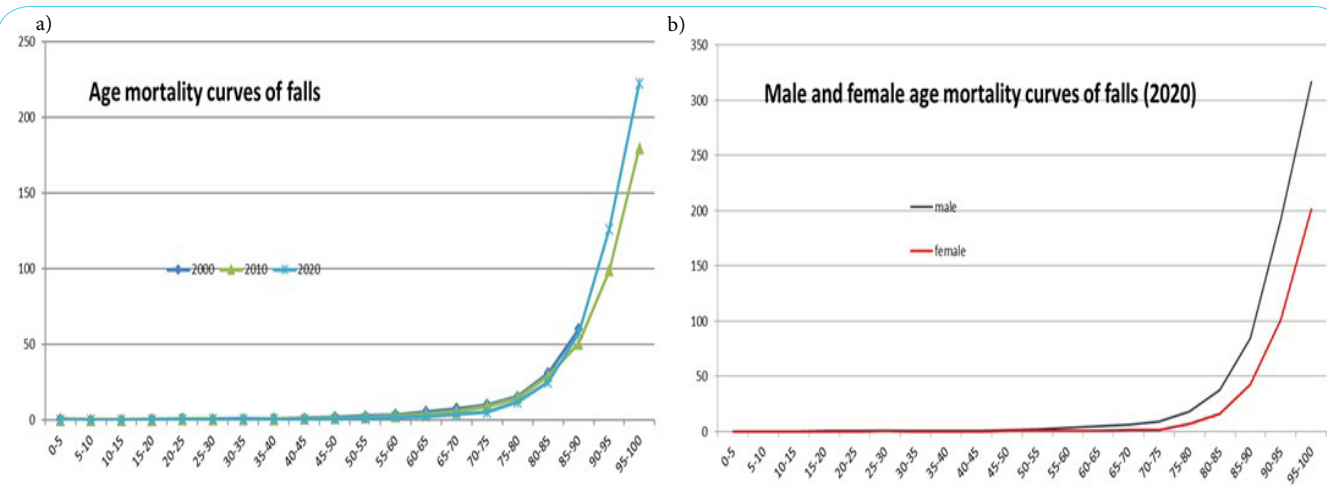


Figure 3: Age-mortality curves of falls. a): Comparison of age-mortality curves for 2000, 2010 and 2020. b): Comparison of age-mortality curves for men and women.

mortality ratio at older ages was also around twice as high here (Figure 3b)

Mortality curves of drowning and submersion are shown in Figure 4. In Japan, about 70% of deaths from drowning and submersion for the people 65 and over occurred during bathing in a bath. significant decrease was observed between 2000 and 2020 for those aged 45 and over (Figure 4a). In females, mortality decreased significantly with age in the 90-95 and 95-100 classes, in addition to the fact that the mortality curve is lower than in males (Figure 4b). In males, mortality continued to increase in 95-100, but was not statistically significant.

The age-mortality curves for suffocation increased exponentially with age but slightly less rapid than those for falls (Figure 5). A clearly significant decrease was observed between 2000 and 2020 for those aged 65 and over (Figure 5a). The male-to-female ratio of mortality in each age among the elderly was just under twice as high (Figure 5b).

As seen in Figure 6a, traffic accidents (9.8%), falls (25.1%), drowning (19.2%) and suffocation (20.6%) account for a relatively high percentage of unintentional accidental deaths. Of these, road traffic deaths account for nearly 40% of all deaths from the age of one

year and over to under 45, but the proportion gradually decreases after the age of 45. A particularly increasing proportion of deaths in older age groups are due to falls, which account for 32.0% of deaths among people aged 80 and over, and consequently are the leading cause of death in unintentional accidents. Figure 6b shows a further breakdown within falls by age group. While younger people, with the exception of infants, were predominantly killed by falls from high places, the older the age, the greater majority were killed by falls on the same plane (90.2% in 80 years and over). The majority of drownings in the elderly occurred in the bath, accounting for 80.0% among those aged 80 and over (Figure 6c). Accidental ingestion of food accounted for more than 50% of deaths from suffocation in people aged 45 years and over, and nearly 70% if included regurgitation of gastric contents (Figure 6d).

Discussion

The fact that accidental death rates increase with age is likely to become increasingly important as life expectancy increases. Aside from suffocation in infancy, drowning and road traffic accidents in the late teens and twenties, the majority of unintentional accidents, like other causes of death, increase with age, suggesting that they are strongly related to ageing. Many also showed that, again, as with other

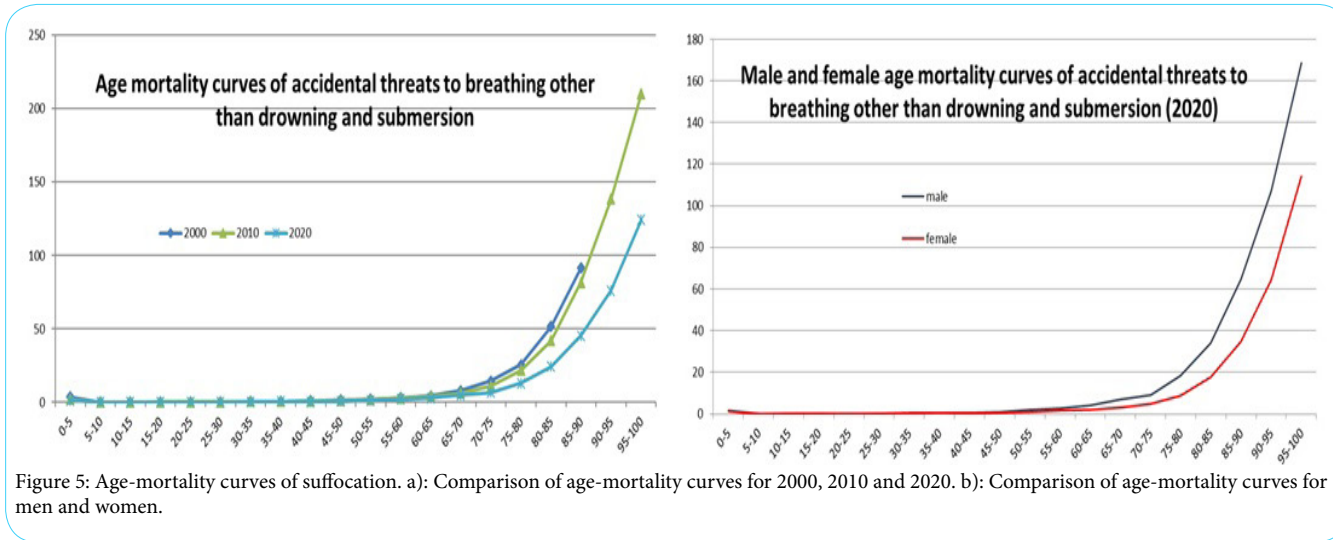
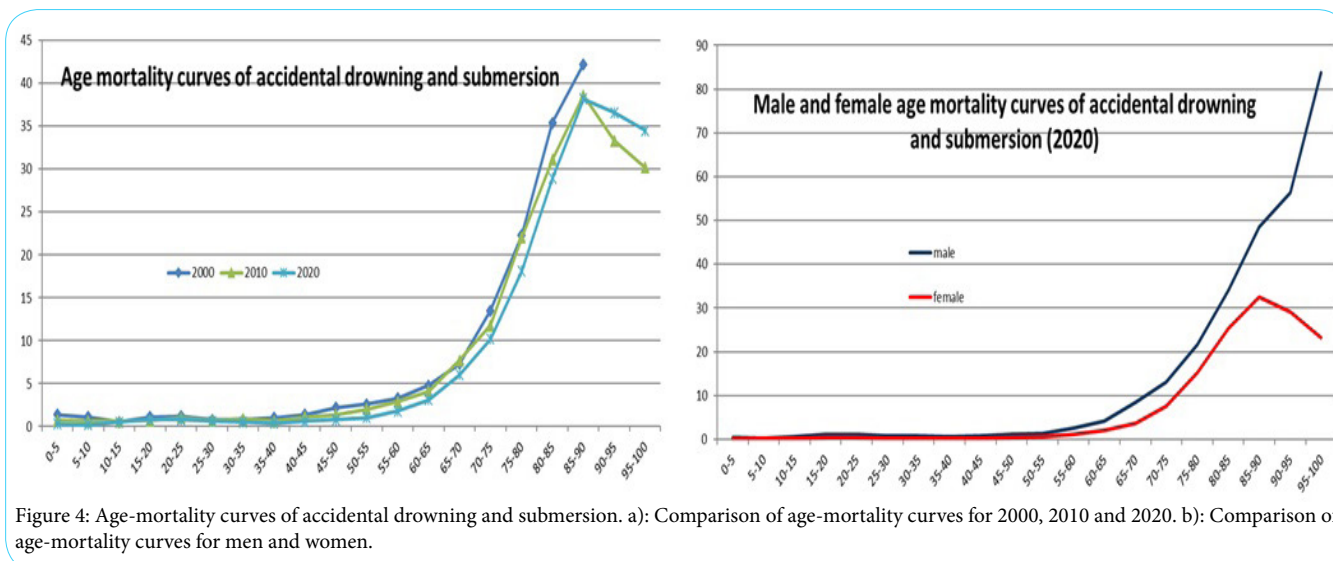




Figure 6: Proportion of detailed accidental deaths for each age group in 2020. a): Percentage breakdown of unintentional accidental deaths for each age group. b): Percentage breakdown of accidental deaths by fall for each age group. c): Percentage breakdown of accidental deaths by drowning and submerging for each age group. d): Percentage breakdown of accidental deaths by suffocation other than drowning and submersion for each age group

causes of death, male mortality rates exceeded those of females at each age. The difference in social and daily activities between men and women may be one of the reasons why men are more likely to cause accidental deaths. However, the sex ratio is still around twice as high in the 80s and beyond, and there are large differences between men and women in the elderly even for causes of death such as asphyxia, which should be less related to social activity. As with other causes of death from disease, the faster ageing process in men than in women, resulting in faster physical decline and deterioration of the brain's ability to make decisions, is a possible reason why men are more likely to die from unintentional accidents.

Transport accident deaths showed a complex age-dependent pattern, with a sudden increase during adolescence, a temporary decrease during middle age, then an increase with age, peaking in the 80s, and then a decrease again. The increase during adolescence is thought to be due to immaturity in the ability to drive motorcycles and cars and to excessively vigorous behaviour, while the increase from adolescence to old age is thought to be related to a decline in

physical and mental capacity by the ageing. The subsequent decline is assumed to be due to a marked decrease in activity, which in turn reduces the chances of being involved in a transport accident. It is well known that transport accident deaths have decreased significantly in Japan in recent years, and it has been pointed out that this is due to the introduction of compulsory seat belt use and stricter controls on drunken driving [3,4]. When looking at the age-fatality rate curve, a decrease is observed in all age groups, and even among older people. This suggests that most of transport accidental deaths are typical of avoidable deaths, even among older people.

Drowning is much more common cause of unintentional death among the elderly in Japan than in the west, possibly due to the East Asian cultural preference for slow bathing in deep tubs [5]. It seems necessary to search for a safe bathing method for the elderly without lowering their quality of life.

Falls account for the largest proportion of accidental deaths among the elderly, and falls on the same plane increase rapidly among those over the age of 80. In short, the progress of aging makes daily life,

which should be safe for young people, dangerous to lead to death. Risk factors for deaths due to falls include like lower extremity weakness, gait deficit, balance deficit and visual deficit directly related to frailty syndrome [6,7]. Therefore, muscle strengthening and balance training as preventive measures, and making daily life barrier-free are important from the standpoint of physical therapy [8]. Curiously, mortality due to fall in elder people is significantly increased from 2010 to 2020. This trend was confirmed by year to year analysis during this period. It is possible that the elderly people are more likely to have accidents due to increased activity during this period.

2020 is the period when the Covid-19 epidemic started, and the possibility of its impact on unintentional deaths cannot be ruled out, but when compared with the 2019 data (not shown), no significant differences against the trend were observed.

Nearly 70% of choking in the elderly was caused by food or vomit. The decline of swallowing function due to aging is greatly involved, and recovery of swallowing function together with aspiration pneumonia is an issue for speech therapists and physical therapists. Japan's unique eating habits, such as New Year's rice cakes, unfortunately contribute to suffocation among the elderly [9,10].

Age dependency varies with the type of accident, but the basic principle is that mortality increases rapidly with age, which can be modified by activity and other factors in the case of traffic accidents and drowning, for example. However, the rate of exponential increase itself appears to be clearly different depending on the type of accident, which may be assumed to be due to the fact that several factors within the ageing process have different rates of decline, which also have different effects depending on the type of accident.

In any case, it is necessary to pay sufficient attention to the fact that the possibility of being involved in an accident without being aware of it increases with age, and while it is important to improve the environment, such as making it barrier-free, it is also necessary to regulate behaviour, such as setting limits on the qualifications for driving a car.

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An important point is that, in connection with frailty syndrome, it is necessary from the point of view of physiotherapy to consciously strengthen measures against frailty, since promoting physical activity and brain activation can lead to the prevention of accidental deaths among the elderly.

Competing Interests

The authors declare that they have no competing interests.

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