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Long-term care-free life expectancy before and after the 2006 reform of the National Long-term Care Insurance: The Case of Fukuoka City, Japan

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Abstract

In order to examine the health status of older adults aged 65 and over in Fukuoka City, Japan, we computed a policy relevant measure of health expectancy. Health status is defined using care need level, a measure developed for the Long-Term Care Insurance (LTCI) System in Japan, which started in April 2000. We employed the city's registration data for those aged 65 and over in conjunction with the LTCI System's administrative records between April 2000 and April 2013. We constructed individual monthly histories of long-term care needs status based on these two data sources. We divided the constructed individual monthly history data into two distinct time periods, before the 2006 reforms (April 2000 to April 2006) and after (April 2006 to April 2013) in order to assess the impact of the 2006 reforms to the LTCI System. We applied multistate life table methods for the periods 2000-2005 and 2006-2012 by sex and computed life expectancy by long-term care need level. In general, results show higher life expectancies in all categories of long-term care need for both sexes in the period 2006-2012 (18.8 years), as compared to 2000-2005 (17.2 years). Females have longer life expectancy, long-term care-free life expectancy, life expectancy with care need level 2 or less, and life expectancy with care need level 3 or more except for long-term care-free life expectancy at age 65. However, they have a lower proportion of long-term care-free life expectancy to total life expectancy and a higher proportion of life expectancy with care needs to total life expectancy. Females spend twice as many years with long-term care needs as males do both in terms of absolute years as well as relative length to total life expectancy. This study demonstrated that administrative data for LTCI can be used to monitor health status of older adults in Japan and could be used as a tool to evaluate the system. Unfortunately, currently LTCI administrative records do not include information on death. We urge local municipalities which are the insurers of LTCI as well as Japanese government to build a system to combine LTCI administrative records and information on death.

Introduction

Life expectancy in Japan has been increasing for more than half a century and is currently the highest in the world (World Health Organization, 2015). Life expectancy used to be regarded as an indicator of population health. However, as Crimmins, Hayward, and Saito (1994) have shown, increases in life expectancy do not necessarily mean improvements in population health. With populations aging in developed countries, the proportion of people with chronic and degenerative diseases has been increasing, and life expectancy, as a summary measure of age-specific mortality rates, is not as closely associated with health as before.

The concept of heath expectancy, which combines information on mortality and morbidity, was introduced by Sanders (1964) and Sullivan (1971) as a summary measure of population health. Health expectancy represents both healthy years and unhealthy years of life expectancy. The healthy part of life expectancy is often called the healthy life years, healthy life expectancy, disability-free life expectancy, or active life expectancy depending on the measures used to define health status. In recent years, health expectancy has been gaining ground in policy making. The European Commission has set a target for a two-year increase in healthy life years at birth between 2010 and 2020 in the European Union. In the US, an increase in healthy life expectancy has been one of the priority targets since Healthy People 2000 was announced.

Health expectancy has also been regarded as an indicator of quality of life. In the 1997 World Health Report (World Health Organization, 1997), the Director-General of the World Health Organization (WHO) stated, "Increased longevity without quality of life is an empty prize. Health expectancy is more important than life expectancy."

The Ministry of Health, Labor and Welfare (MHLW) of Japan released their health promotion guideline for the next decade in 2012 (The 2nd Health Japan 21). The first priority of the guideline is to increase disability-free life expectancy. They define health status by limitation of activities, similar to the health status definition used in the EU and the US.

As Saito, Robine, and Crimmins (2014) explain, the definition of health status is always an issue for health expectancy research. There are questions on summary measures of population health such as whether one measure is enough to summarize population health, or whether one measure can cover the health status for the full range of age groups.

In this study, using the multistate life-table method, we utilized administrative data from the Long-term Care Insurance system to compute health expectancy for those aged 65 and above for Fukuoka City, Japan. Although the computed health expectancy is not representative of Japan as a whole, this is the first attempt to use LTCI administrative data and the multistate life-table method to compute health expectancy for an entire population aged 65 and over. We demonstrate that computation of health expectancy using LTCI data provides us valuable information on the health status of older adults and can be used for evaluating the LTCI system and policy making. This study also shows how such data can be used to monitor the health status of older adults in Japan.

Background

Increasing disability-free life expectancy is the first priority in the health promotion guideline for the next decade in Japan. The MHLW defines health status with limitation of activities, and White Paper published by the Japan Ministry of Health, Labor and Welfare (2014) indicate that disability-free life expectancy at birth increased from 69.4 to 70.4 years for males and from 72.6 to 73.6 years for females between 2001 and 2010. The data used for computing disability-free life expectancy are from the Comprehensive Survey of Living Conditions of the People on Health and Welfare. The survey has been conducted every three years since 1986 and has included a question on whether a respondent has difficulty performing usual activities in the community. The question, however, has been asked only of those aged 6 and above. In order to compute disability-free life expectancy at birth, the prevalence rate for those aged 0-5 is assumed to be the same as for those aged 6-9.

Hashimoto et al. (2010) examined trends in health expectancy between 1995 and 2004 using the same survey with a similar definition of health status. They found that both expected years with and without activity limitations increased over the study period for males and females at birth and at age 65. The proportion of expected years without limitation of activities decreased over the same period, however. For instance, the proportion of expected years without activity limitation at birth decreased from 87.1% in 1995 to 85.3% in 2004. Although the decline in the proportion of expected years without limitation of activities is not very large, this is an indication of a worsening quality of life.

The health promotion guideline also recommends monitoring population health by using a question on self-rated health. Yong and Saito (2009) studied trends in healthy life expectancy based on the prevalence of self-rated health from the same survey mentioned above between 1986 and 2004 and found that for both sexes and at all ages after age 25, the gains in life expectancy prior to 1995 were mostly in years of good self-rated health, while the gains thereafter were in years of poor self-rated health. The only exception was for women at age 85, among whom there was an almost continuous increase in the number of years in poor health. The question on self-rated health in the survey is also posed to those aged 6 and above.

The above-mentioned studies applied a prevalence-based method, often called the Sullivan method because the first calculation of disability-free life expectancy was conducted by Sullivan (1971). Health expectancy computed by the Sullivan method represents a population health structure at one point in time. There are other methods of computing health expectancy. A commonly used method of computing health expectancy in the recent past is the multistate life-table method. Although this method has been around in the field of demography for some time, until recently there had not been many studies using it, because it requires longitudinal data. With the increasing availability of longitudinal data and software such as IMaCh (Lievre, Brouard, & Heathcote, 2003) and SPACE (Cai et al., 2010), the multistate life-table method has been applied to health expectancy research (Crimmins, Hayward, Hagedorn, Saito, & Brouard, 2009; Hidajat, Zimmer, & Saito, 2013). The multistate life-table method is able to model dynamic processes that involve multiple and recurrent events, and it allows death rates to differ explicitly by health state.

Few studies applied the method to Japanese longitudinal data using Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) (Liu et al., 1995; Chan, Zimmer, & Saito, 2011; Yong & Saito, 2012). Chan et al. (2011) and Yong and Saito (2012) computed health expectancy using the Nihon University Longitudinal Study of Aging for those aged 65 and over. In the study by Chan, Zimmer, and Saito, health status was defined by ADL, and Yong and Saito defined health status by ADL and IADL. Both studies found that females have longer life expectancies, more healthy years, and more unhealthy years at age 65. However, the proportion of healthy years to life expectancy is higher for males. What this suggests is that females, on average, tend to suffer more unhealthy years in both absolute and relative terms.

Administrative data from the Long-term Care Insurance are another measure used to compute health expectancy. In order to better understand the study using administrative LTCI data for health expectancy research, and because the current study employs LTCI administrative data, a brief introduction to the Japanese Long-Term Care

Insurance program is in order. Long-term Care Insurance (LTCI) started April 1, 2000 in Japan as a mandatory social insurance that covers long-term care costs for those aged 65 and over in principle, with some exceptions for those aged 40 to 64. Long-term care services made available by the LTCI include both institutional and home-based care services. The role of insurer is assigned to local authorities, namely municipalities or unions of several municipalities.

The LTCI system is scheduled to be assessed every three years, and amendments were made in 2003, 2006, 2009 and 2012 over the study period. Among the amendments made, the 2006 amendment was the most comprehensive in that it introduced a large-scale program of preventive care. This new program sought to maintain the health and well-being of frail older adults to prevent them from reaching higher care need levels. The preventive care services encouraged older adults to participate in activities to improve their motor and oral functions as well as their nutritional status. However, older adults with lower care need levels also faced a reduction in the benefits for coverage of formal care, such as the home helping service, that were available before the 2006 amendment.

In addition, the 2006 amendment modified LTCI classification levels. As can be seen in Table 1, before the 2006 amendment, there were six classification levels, "support need" and "care need" levels 1, 2, 3, 4 and 5, where the latter levels correspond to higher care needs. In the 2006 amendment, levels with lower care needs were modified such that the former support need and care need level 1 are divided into support need levels 1 and 2 and (new) care need level 1.

[Table 1, about here]

The role of the LTCI classification levels is to determine available amounts of LTCI benefit payouts for each insured. Specifically, the levels define three factors; upper bound of monetary coverage, available services, and price of services. The insured can purchase care services with 90% of monetary coverage from the LTCI up to the upper bound. Care services also can be purchased above the upper bound with 100% out-of-pocket expenses.

The assessment process for classification levels starts as follows. Persons eligible for LTCI who have not been assigned a classification level submit an application for care need assessment to their insurer (with caregiver help when necessary) when they need to use long-term care services, and the assessment process begins. For those already assigned LTCI classification levels, an assessment for an update of the classification levels occurs by request or as mandatory renewal. A request for an update can be made at any time. The schedule of the mandatory renewal is dependent on the previous and current classification level.

Using LTCI data for 2002, Fukuda, Nakamura, and Takano (2005) estimated healthy life expectancy by municipality. They reported that for large cities in Japan the estimated life expectancy without long-term care needs at age 65 ranges between 13.1 and 16.8 years for males and 14.8 and 18.9 years for females. Seko et al. (2012) also utilized the LTCI care need levels to estimate life expectancy with long-term care needs at age 65. They found that expected years with long-term care needs increased from 1.4 to 1.6 and from 3.0 to 3.4 for males and females, respectively, between 2005 and 2009. Although both studies employed LTCI care need levels to compute health expectancy, they used different cut-off points for their computations.

In the current study, administrative data for LTCI from Fukuoka City are used to compute health expectancy. We define health status by long-term care need levels similar to the studies mentioned above. We calculate life expectancies with and without long-term care needs before and after the 2006 LTCI Reform in order to examine the differences in life expectancies between the two time periods. Because life expectancies tend to increase over time, we would expect to observe increases in both expected years with and without long-term care needs between the two time periods. However, the 2006 reform might have affected computed life expectancies with and without long-term care needs. We also pay attention to the differences in long-term care need-free life expectancy by sex.

In addition, by showing rough estimates of life-time long-term care costs by sex based on computed life expectancies with long-term care needs, we could examine the economic effects of differences in life expectancies. This is one advantage of our study, similar to the work conducted by Lubitz, Cai, Kramarow, and Lentzner (2003) in the US. Another advantage to using LTCI data is that institutionalized older adults are included in computing health expectancies. We often miss institutionalized people when health expectancies are computed.

Data and Methods

Data and health status

Data used for the study come from administrative records of Fukuoka City. Fukuoka city, the political, economic, and cultural center of the area, is located in the northern part of Kyushu Island, the southern-most island of four big Japanese islands. During the study period, Fukuoka City was the seventh largest city in Japan with more than 1.4 million people in 2010. As shown in Table 2, the proportion of those aged 65 and over in Fukuoka city was consistently lower than the proportion for Japan, because the city has educational institutions and workplaces that attract young migrants. Nevertheless, the number of those aged 65 and above in Fukuoka city had been increasing rapidly, and the tendency was especially noticeable for older adults living alone.

[Table 2, about here]

With randomly assigned ID numbers for each individual, de-identified administrative records for the entire population of those aged 65 and above living in the city from April 1, 2000 to April 1, 2013 were provided by Fukuoka City. The data include information on gender, date of birth, certified date of each care need level, reason for becoming eligible for LTCI including in-migration and reaching age 65, reason for losing eligibility including out-migration and death, and date of death. In Japan, the fiscal year starts on April 1. Therefore, the years used in the study correspond to fiscal years.

For all previous studies using administrative data from LTCI to compute health expectancy, only those who were certified as eligible for care need levels were included in the computation. One of our study's advantages is that we have information not only for those who are certified as eligible for care need levels but also for those who are just eligible for LTCI. In other words, we have information for the whole population aged 65 and above in Fukuoka City. Tables 3 and 4 illustrate the data from Fukuoka City and how we created longitudinal data from that data. Table 3 shows the first few lines of the data set containing information for all individuals eligible for LTCI from April 1, 2000 to April 1, 2013. This data set includes randomly assigned ID's, dates of birth, dates of death, and sex. Table 4 shows the first few lines of the data set containing randomly assigned ID's, certified care need level, certified date of each care need level, scheduled expiration date of each care need level, and reason for applying for a care need assessment.

[Tables 3 & 4, about here]

With the data shown in Tables 3 and 4, life histories for each eligible person are constructed by month in terms of care needs until they die or until the end of the study period. For instance, a person with the randomly assigned ID 1 was already age 67 on April 1, 2000. Therefore, this person was already eligible for LTCI and certified as care need level 2 at the time LTCI started. The certified care need level changed over the years, and this individual died on December 21, 2006. The person with ID 2 became eligible for LTCI in June 2006 but only certified in 2010 as level 1 and renewed LTCI care need levels in 2011. The person with ID 3 migrated from another municipality and never applied for LTCI certification.

We divided the constructed longitudinal data into two sets, one set for the period April 1, 2000 to April 1, 2006, and the other for the period April 1, 2006 to April 1, 2013. Then, we created a pooled data set for each period based on one-year interval observations, that is, LTCI care need levels on April 1 of two consecutive years. We consider annual changes partly because the mandatory update of care need levels is scheduled in half or one-year intervals. For individuals who experienced multiple changes in care need levels within a single year, the transitions between the care need level on April 1 of one year and the level on April 1 of the next year are ignored.

We defined health status in terms of LTCI care need level and death. Although for our study period we could have had 7 health status categories for the first period and 8 categories for the second period, in order to compare computed life expectancies before and after the 2006 reform and obtain stable transition schedules, we created 3 health states: no long-term care need assessments, care need level 2 or less, and care need level 3 or more. An empirical model to compute multistate life tables is shown in Figure 1.

[Figure 1, about here]

Because our data are based on administrative records, there are retrospective transitions such as elimination of missing people or registration of migrants without a legal record. Because the exact date of retrospective transitions cannot be identified, we eliminated elders who experienced such transitions from our sample. The retrospective transitions for obtaining and losing LTCI eligibility consists of less than 2% of our sample, and their removal likely has only minor effects on our empirical analysis.

For simplicity, individuals who obtained or lost LTCI certification on multiple occasions were eliminated from the sample. An example would be individuals who moved out of and then back into Fukuoka city. Elders with such transitions make up less than 0.1% of our sample.

After the removal of elders with retrospective transitions, the reasons for obtaining LTCI eligibility are reaching age 65, moving in from a municipality other than Fukuoka, entering Japan from another country, and getting Japanese nationality. On the other hand, reasons for losing LTCI eligibility in our data are death, moving out, departure from Japan, and losing Japanese nationality. Among the reasons for losing eligibility, reasons other than death are defined as right censoring.

Statistical method

Based on the pooled data sets created from the longitudinal data set we constructed, we first employ a nonparametric method to compute transition rates by single years of age, $\mathbf{M}_{ij,}$ among health states in order to construct multistate life tables. We used age 95 and over as an open-ended category. Then, transition rates were converted to transition probability, $\mathbf{P}_{ij,}$ using the following formula as suggested by Rogers and Ledent (1976) and by Wilekens et al. (1982):

$$\mathbf{P}_{ij} = (\mathbf{I} + 1/2\ \mathbf{M}_{ij})^{-1} (\mathbf{I} - 1/2\ \mathbf{M}_{ij})$$

where i and j denote LTCI care need level based health states. $\mathbf{P}_{ij}$ are used to construct multistate life tables described by Schoen (1988). Following Cai et al. (2010), we utilize a bootstrap method to estimate standard errors and percentile confidence intervals for life-table functions. Because we obtain population data, we do not need to adjust the bootstrap method for the stratified sampling scheme as in Cai et al. (2010).

The multistate life-table method could construct two kinds of life tables, that is a population-based multistate life table and a status-based multistate life table. A population-based multistate life table is similar to a conventional life table, and age is the only variable considered to construct the life table. Life-table function e_x for a particular health state in a population-based life table means, on average, the number of expected years lived in the particular health state at age x. In contrast, a status-based multistate life table considers age as well as health status at that age. Only those who are in a particular health state at a particular age are considered for constructing the life table. In other words, an entire radix of the population are in a particular health state starting at a particular age. Therefore, a table showing results for status-based multistate life tables is often a summary of status-based multistate life tables. In the current study, tables showing computed e_x at 3 ages, 65, 75, and 85, by sex with 3 living health states are based on 18 (=3x2x3) status-based multistate life tables.

We computed very rough lifetime care need cost estimates using results from population-based and status-based multistate life tables. The costs are estimated as a multiplication of state-specific life expectancy and potential care costs. For the potential costs, the no long-term care need level is zero, and the cost for two care need level categories is computed as a mean of monetary upper bounds of care need levels within the category. Specifically, costs for care need level 3 or more are computed as follows:

potential cost for care need level 3 or more
=(US$3,000+US$2,550+US$2,250)*12/3*expected remaining years in care need level 3 or more

Costs for care need level 2 or less are also computed in the same manner.

Results

Table 5 reports the descriptive statistics data used in this study. The population for the period 2000-2005 and 2006-2012 is 242,342 and 308,733, respectively. A comparison of the two periods reveals that the ratio of those who were certified for LTCI classification levels at least once increased from 17% to 21% for males and 27% to 32% for females.

[Table 5, about here]

Transition probabilities

We computed 12 transition schedules among health states based on long-term care need levels including retention probabilities for each period. Figure 2 shows computed transition probabilities from each long-term care need level to death in two periods for males, and Figure 3 shows the corresponding probabilities for females. As can be seen in Figure 2, in the second period, mortality is slightly lower for those without long-term care needs. Probabilities of dying for those with long-term care need level 2 or less and with long-term care need level 3 or more do not differ much between the two periods. The observed pattern of mortality schedules is similar for females. However, the level of mortality schedules is lower for females than for males.

[Figures 2 & 3, about here]

Transition probabilities in the two periods from long-term care need level 2 or less to no long-term care needs and to long-term care need level 3 or more for males are shown in Figure 4. The return to no long-term care needs gradually declines across ages, and until around age 80, return transitions are higher in the second period. Transition probabilities to long-term care need level 3 or more are lower, in general, in the second period. As shown in Figure 5, the pattern observed for females in the transition probabilities from long-term care need level 2 or less to other long-term care need levels in the two periods are similar to those for males. However, changes across ages in these transition probabilities are steeper for females than for males.

[Figures 4 & 5, about here]

Transition probabilities from no long-term care needs to care need level 2 or less and to death by sex for the period 2006-2012 are shown in Figure 6. Mortality schedules shown here are already shown in Figures 2 and 3. However, we want to contrast these transitions as main sources of differences in computed life expectancies by sex. Patterns observed for the period 2000-2005 are similar and are not shown here. Females have lower mortality schedules across ages and higher transition probabilities to care need level 2 or less for almost all ages.

[Figure 6 about here]

Life expectancy at age 65 without long-term care, with LTCI care need level 2 or less, and with LTCI care need level 3 or more

Table 6 shows published life expectancy at age 65 for Japan and Fukuoka City in 2000, 2005, and 2010 and computed life expectancy at age 65 for Fukuoka City for the period 2000-2005 and 2006-2012 by sex. The published life expectancy for Fukuoka City is slightly higher than the one for Japan for both sexes in the 2000s. The computed life expectancy at age 65 for the first period 2000-2005 appears to be slightly lower than the published life expectancy in 2000. However, the computed life expectancy at age 65 for the second period seems to be closer to, or the same as, the published life expectancy for 2010. The results for the second period indicate that the computed life expectancies based on the population-based multistate life table are very reliable.

[Table 6, about here]

Table 7 is based on the population-based multistate life-table method and shows total life expectancy, long-term care-free life expectancy, life expectancy with LTCI care need level 2 or less, and life expectancy with LTCI care need level 3 or more at ages 65, 75, and 85 for two periods by sex. Life expectancies in the second period are higher partly due to increases in total life expectancy. For males, total life expectancies increased from 17.25 years in the first period to 18.77 years in the second period and, for females, from 22.22 years in the first period to 24.06 years in the second period. The only exception is long-term care-free life expectancy for females at age 85. It decreased about half a year. In the second period, on average, males at age 65 are expected to have 15.56 years of long-term care-free life expectancy, 2.16 years in care need level 2 or less and 1.05 years in care need level 3 or more, regardless of their care need level at that age. For females, the corresponding number of years are 17.02, 4.43, and 2.61, respectively. Females have about 1.5 more years in long-term care-free life expectancy at age 65, but they are expected to live with long-term care more than twice as long as males. In general, differences between the two time periods at selected ages of long-term care-free life expectancies and life expectancies with care need level 2 or less are large and their 95% confidence intervals do not overlap. The differences in life expectancies with care need level 3 or more are large only for females at selected ages.

It is also interesting to compare life expectancies by sex. On average, life expectancy for females is about 5 years longer at age 65 compared to that for males, and females have longer long-term care-free life expectancies and longer life expectancies with LTCI care need level 2 or less and 3 or more. The expected time spent in LTCI care need level 2 or less and 3 or more for females is twice as long as that for males at age 65. Based on the second period results, at age 65, males can expect to live 3.2 years with long-term care, while at the same age, females need to prepare to live with long-term care for more than 7 years.

[Table 7, about here]

We should also pay attention to the proportions of expected time spent in each state. As can be seen in Table 8, the proportions of long-term care-free life expectancy to total life expectancy in the second period for selected ages are slightly smaller compared to those in the first period, although absolute numbers are larger in the second period. At the same time, the proportions of life expectancy with LTCI care need level 2 or less are larger, while the proportions for care need level 3 or more are smaller in the second period for all selected ages. Patterns of proportions for females are similar to those for males.

[Table 8, about here]

Tables 9a and 9b show results for males from status-based multistate life tables for the first and second periods, and Tables 10a and 10b do the same for females. As described in the methods section, status-based multistate life tables consider age as well as the initial health status at that age. Therefore, it is very important to keep in mind that results from the population-based multistate life-table method shown in Table 7 are based on 4 constructed multistate life tables corresponding to each panel in the table, namely, one for males in the period 2000-2005, one for males in the period 2006-2012, one for females in the period 2000-2005, and one for females in the period 2006-2012. However, the results shown in Tables 9a, 9b, 10a, and 10b are based on 9 status-based multistate life tables. Each line of these four tables corresponds to a status-based multistate life table constructed starting at the age shown with the initial care need level specified. For instance, those who are aged 65 and without any long-term care needs could expect to live 17.34 more years, on average (Table 9a). Of these 17.34 years, 14.38 years can be expected to be long-term care-free, 1.90 years with care need level 2 or less, and 0.99 years with care need level 3 or more. In contrast, those who are the same age with LTCI care need level 3 or more could expect to live only 7.08 years. Of these 7.08 years, 1.57 years are without long-term care, 1.48 years with care need level 2 or less, and 4.03 years with care need level 3 or more. There are large differences between older adults with different care need levels at the initial age in terms of length and quality of remaining life.

[Table 9a, about here]

For males who are without long-term care needs at selected ages, the results from status-based multistate life tables show that total life expectancy and life expectancies by long-term care need status are all higher in the period between 2006-2012. Males have about 1.5 years longer life expectancy at age 65 (18.86 years vs 17.34 years) in the second period, and most of the difference is concentrated in long-term care-free life expectancy (15.68 years vs 14.45 years). Increases in life expectancy with long-term care need level 2 or less and 3 or more are very small. The pattern in the differences in life expectancies between two periods are similar in general for those who do not need long term care at selected ages. In contrast, for males with long-term care need level 3 or more at age 65, the difference in life expectancy between the first and the second period is about half a year, and the difference mainly comes from those years in LTCI care need level 3 or more. For those males with care need level 2 or less, total life expectancy increased from the first period to the second. Long-term care-free life expectancy also increased significantly at the selected ages in Tables 9a and 9b, and life expectancy with care need level 2 or less increased slightly for the selected ages. However, years spent in the LTCI care need level 3 or more decreased over the same period.

[Table 9b, about here]

As can be seen in Tables 10a and 10b, for females, the pattern of differences between the two periods for total life expectancy and life expectancy by care need levels is similar to the pattern for males. However, there is a noticeable difference in life expectancies between males and females whose initial long-term care need level is 2 or less. Of the changes observed in the two periods, for selected ages, the increase in life expectancy and long-term care-free life expectancy from the first period to the second period is the largest. For instance, in the first period, females with long-term care need level 2 or less at age 65 had 16.24 years of life expectancy and 5.48 years of long-term care-free life expectancy. In the second period, life expectancy increased by 2.35 years and long-term care-free life expectancy by 2.23 years.

[Tables 10a & 10b, about here]

In terms of the proportion of life expectancy by long-term care need level to total life expectancy, three points should be mentioned based on results shown in Table 11 for males and Table 12 for females for the two periods. First, for both males and females, the proportion of long-term care-free life expectancy to total life expectancy at age 65 increased for those whose initial care need level status was 2 or less. This point is the only noticeable difference between the two time periods for both sexes. Second, in terms of differences by sex, males with no long-term care needs at selected ages are expected to spend a higher proportion of their remaining life in a no long-term care need level compared to their female counterparts. For males, the proportion of long-term care-free life expectancy is more than 80% of their expected remaining life, while for females it is about 70%. In addition, for females, the proportion of life expectancy with long-term care need level 3 or more to total life expectancy is twice as long as that for males at selected ages. And third, for those whose care need level is 3 or more, the proportion of remaining years by care need level does not differ by sex.

[Tables 11 & 12, about here]

Estimated lifetime costs of long-term care

Table 13 shows estimated lifetime care costs at ages 65 and 85 based on life expectancies by long-term care need level computed by population-based and status-based multistate life tables. Life expectancies computed by population-based multistate life tables indicate that, on average, males spend 60.4 thousand dollars at age 65 and 65.4 thousand dollars at age 85. The estimated lifetime cost for females at age 65 is 137.9 thousand dollars and 131.5 thousand dollars at age 85. The estimated lifetime care costs at age 65 and 85 are not so different for both sexes, because computed life expectancy with long-term care needs at both ages are not different. However, the estimated lifetime care costs based on status-based multistate life tables are very different by age, sex, and long-term care need levels. Because the expected remaining years are much fewer at age 85, lifetime care costs are smaller at age 85 compared to those at age 65, regardless of sex and long-term care need levels. Males without any long-term care needs at ages 65 and 85 could expect to spend about 60 thousand dollars and 54 thousand dollars, respectively. The corresponding figures for females are 137 thousand dollars and 109 thousand dollars. Females could expect to spend a significantly larger amount of lifetime care costs regardless of their age and long-term care need level. In terms of differences by long-term care need levels, the lifetime care costs are much higher for females, but the differences in costs among long-term care need levels are larger for males. The lifetime care cost for those who are certified long-term care need level 3 or more are about twice as high as costs for those who do not need any long-term care at selected ages.

[Table 13, about here]

Discussion

In the study, we computed life expectancy by long-term care need level using LTCI administrative records in Fukuoka City, Japan and applied multistate life-table methods for the periods 2000-2005 and 2006-2012 by sex. In general, results from population-based multistate life tables show higher life expectancies in all categories of long-term care need levels for selected ages and both sexes in the period 2006-2012. Females have longer life expectancy, long-term care-free life expectancy, life expectancy with care need level 2 or less, and life expectancy with care need level 3 or more except for long-term care-free life expectancy at age 65. However, they have a lower proportion of long-term care-free life expectancy to total life expectancy and a higher proportion of life expectancy with care needs to total life expectancy. Females spend twice as many years with long-term care needs as males do both in terms of absolute years as well as relative length to total life expectancy.

Results from status-based multistate life tables reveal that the results from population-based multistate life tables reflect life expectancies for those without any long-term care needs. This fact is understandable because as shown in Table 5, the shares of person years for those who needed long-term care at least once during the study periods are only about 10% of males' total and about 20% of females' total. Regardless of initial care need levels, females have longer total life expectancy, long-term care-free life expectancy, and life expectancies with care needs. Females spend about 10 percentage points less in long-term care-free life expectancy and almost twice as many years with care needs as do males.. However, if proportions were carefully examined, differences by sex are not that different at all selected ages for those who need long-term care.

Differences in total life expectancy and in life expectancies by care need levels between the sexes for those without long-term care at selected ages are mainly caused by mortality. Females have lower mortality schedules throughout the age range considered in this study. In addition, differences are observed in the transition from no care needs to care need level 2 or less by males and females in the period under study. Females are more likely to become care need level 2 or less. For this transition, appropriate social environments may need to be considered. In 2010, 65.2% of males at age 85 were still married compared to 11.9% of females (\Statistics Bureau of Japan, 2011). This fact suggests that when males need long-term care at age 85, more than half of them have a wife. However, when females need long-term care at the same age, only 11.9% of them have a husband. Of course, they may ask for help from their children, but their choices are more limited than those of their male counterparts.

The computed life expectancies by multistate life tables show the results of the combined effects of many transition schedules (12 transition schedules in this study). As discussed in the results section, both males and females whose initial long-term care need level is 2 or less have a higher proportion of long-term care-free life expectancy in the second period compared to the first period. In order to have a higher proportion of long-term care-free life expectancy for those who are care need level 2 or less at age 65 in the study, the transition probabilities to return to no long-term care needs should be higher. Figures 4 and 5 show exactly the case. A possible reason for this is that the transition probabilities to return to no long-term care needs increased because of improvements in the functioning status of older adults. This may have been caused by the 2006 reform in the LTCI system. Although we do not have any clear evidence for this at the moment, we should be able to tackle this issue in the future.

Within each sex and period, we observe large differences in the remaining years as well as in the quality of life in the remaining years. Males with care need level 3 or more could expect to live less than half as long as those with no long-term care needs. Most of their remaining life could be spent with care need level 3 or more. For females, the differences among initial care need levels in terms of remaining years spent in different care need levels are smaller. Females with care need level 3 or more could expect to live at least about half as long as those who do not need any long-term care at the selected ages. These differences somehow suggest a stronger resilience among females.

What we should pay more attention to from these results is the fact that some individuals who are care need level 3 or more at selected ages can expect to live some years without any long-term care or with care need level 2 or less. Another thing we could learn from the status-based multistate life table results is that we could achieve gains in life expectancies by improving one's long-term care need level. For instance, for females who are care need level 2 or less in the period 2006-2012, total life expectancy at age 65 is 18.59 years, and long-term care-free life expectancy is 7.71 years (Table 10b). If they stay at the same care need level at age 75, they could expect to live 13.02 years, and 2.39 of those remaining years could be without long-term care. However, if their long-term care need level is improved to no long-term care needs, then, total life expectancy for females at age 75 is 16.05 years and long-term care-free life expectancy is 9.28 years. About 3 and 7 years gain in total life expectancy and long-term care-free life expectancy, respectively. Of course, such results may be affected by how long they stay in the same long-term care need level. The experience of those who just reach the long-term care need level may differ from those who have been in the level for many years. In order to examine such a situation, we would need to apply the semi-Markov model, but this is not our purpose in the current study.

Our study has some limitations. First, this study is based on LTCI administrative records from a city in Japan, Fukuoka City. We cannot generalize the results to the Japanese population. At the very least, however, we are able to show what we can learn from LTCI administrative records. And second, LTCI administrative records provide data only for those individuals who applied for long-term care need level certification. No similar data is available for those who never applied. Thus, we must be very cautious in interpreting the results, especially those from the first period, 2000-2005. This is because for the first couple of years after the LTCI system was implemented in 2000, the LTCI was underutilized. Life expectancies computed for the first period could have been affected by the fact that the data do not reflect correct transition schedules. As shown in Table 7, computed total life expectancy at selected ages for the period are slightly lower than what we could expect based on published life tables for Fukuoka City. If those who are supposed to be certified for long-term care remain as no long-term care needs, then, mortality schedules should have been higher than what they appear to be. This obviously yields lower life expectancies.

Notwithstanding the study’s limitations, we believe that this is the first study computing life expectancies by LTCI administrative records for a population aged 65 and over. These life expectancies can be used as a tool for evaluating long-term care policy as well as evaluating long-term care services. We could compute life expectancies by LTCI care need level and sex using long-term care services as a stratifying factor. Then, we might be able to identify services which could lead to improvements in long-term care need levels.

Conclusion

In this study we computed life expectancies by long-term care need level using LTCI administrative records and multistate life-table methods by sex for the periods 2000-2005 and 2006-2012. We demonstrated that LTCI administrative records can be a useful source for monitoring the functioning health status of older adults aged 65 and over. It is, however, difficult to apply the methods used here to other municipalities or Japan as a whole at this time. This is because information on death is not linked in the system. Municipalities and the Japanese government should consider a system to connect LTCI administrative records and information on death. By linking these two bodies of information, one could replicate the study shown here. LTCI administrative records contain more detailed information on functioning such as ADLs and IADLs as well as dementia and could be linked to other information other than death, such as living arrangements, and income. If the Japanese government established such a system, we could analyze a huge amount of data, so-called big data. We could monitor the health status of older adults in terms of functioning by using LTCI administrative records. Just by linking existing administrative records, we could learn a lot more about the health status of older adults in Japan without conducting additional longitudinal surveys.

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Figure 1. Empirical model to compute multistate life tables

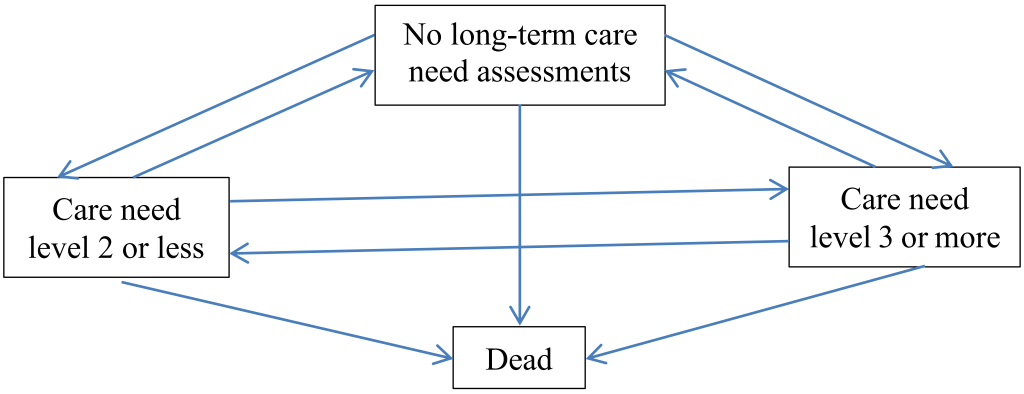


Figure 2. Transition Probabilities to Death: Males

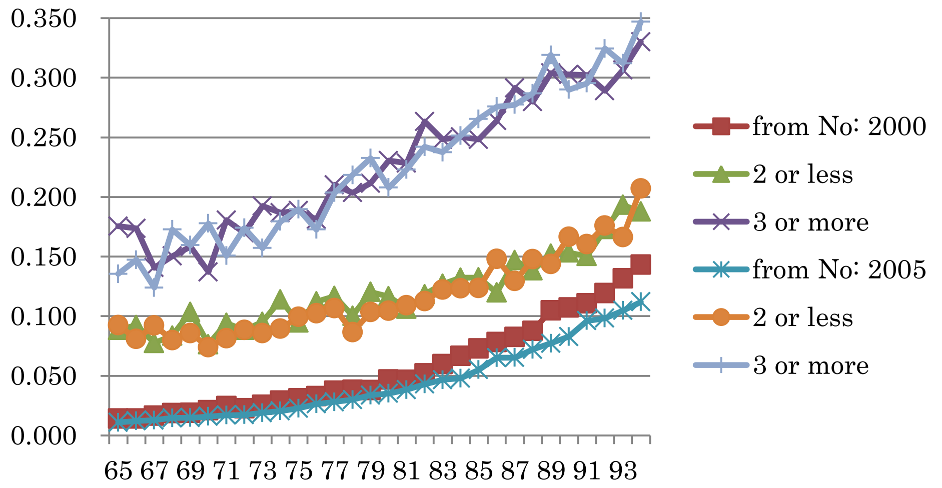
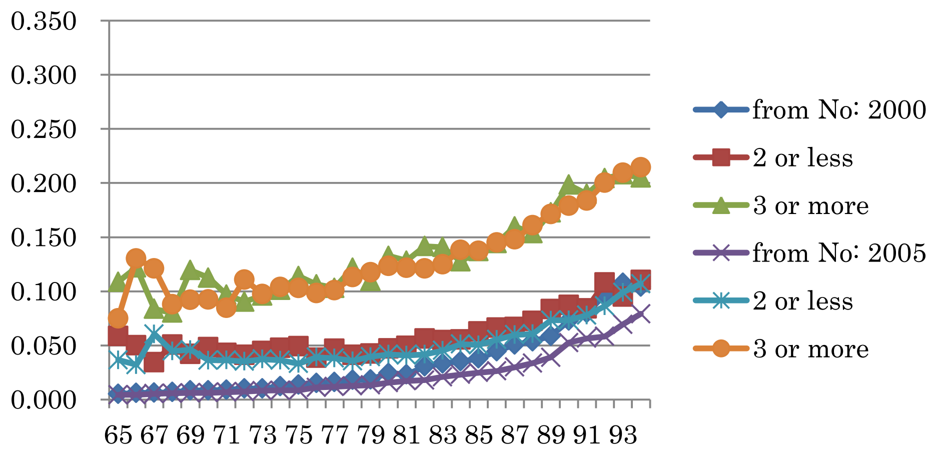


Figure 3. Transition Probabilities to Death: Females



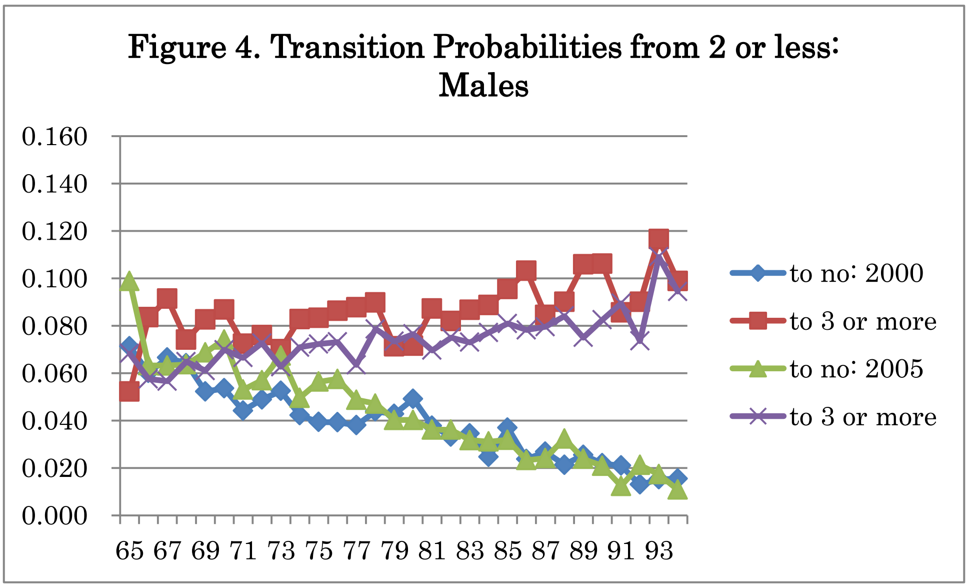


Figure 4. Transition Probabilities from 2 or less:
Males
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
65 67 69 71 73 75 77 79 81 83 85 87 89 91 93
to no: 2000
to 3 or more
to no: 2005
to 3 or more

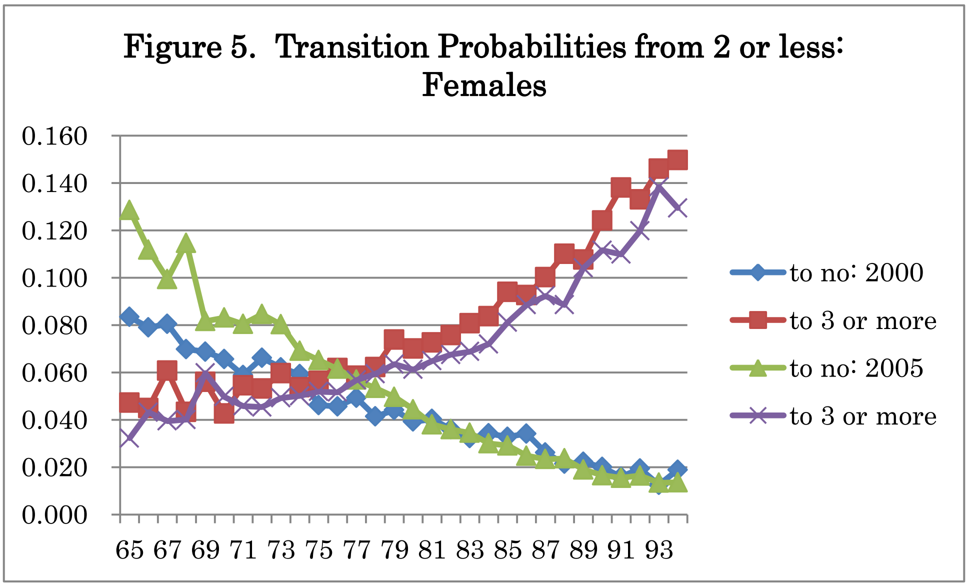


Figure 5. Transition Probabilities from 2 or less:
Females
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
65 67 69 71 73 75 77 79 81 83 85 87 89 91 93
to no: 2000
to 3 or more
to no: 2005
to 3 or more

Figure 6. Transition probabilities from no long-term care needs to care needs level 2 or less and death by sex: 2006-2012

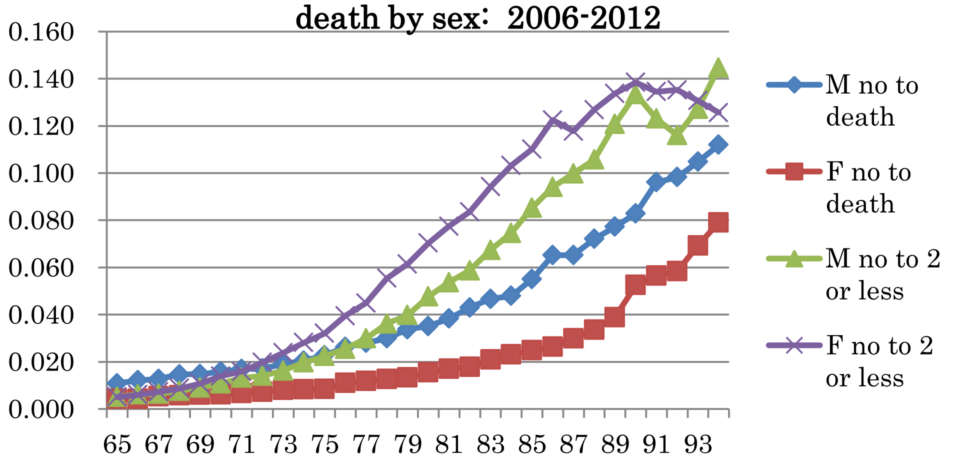


Table 1. Changes in Care Need Levels Before and After April 1, 2006

Degree of Severity	Before March 31, 2006	After April 1, 2006	Amount of monetary upper bound per month*
most severe	Care Need Level 5	Care Need Level 5	US$3,000
	Care Need Level 4	Care Need Level 4	2,550
	Care Need Level 3	Care Need Level 3	2,200
	Care Need Level 2	Care Need Level 2	1,600
	Care Need Level 1	Care Need Level 1	1,350
		Support Need Level 2	850
least severe	Support Need	Support Need Level 1	400

* US$1≈JPY120

Table 2. Fukuoka City at a Glance by Census

	2000	2005	2010
Population	1,341,470	1,401,279	1,463,743
Number of those aged 65 and over	177,771	213,380	254,085
Proportion of those aged 65 and over for Fukuoka City	13.3%	15.2%	17.4%
Proportion of those aged 65 and over for Japan	17.4%	20.2%	23.0%
Number of those aged 65 and over who live alone	36,695	45,461	59,995

Sources: Census of Japan, various years

Table 3. Simplified Data for Those Aged 65 and Over in Fukuoka City Between April 1, 2000 and April 1, 2013, Including Those Who are Certified Care Needs Level

Randomly Assigned ID	Date of birth	Reason became eligible for LTCI	Date became eligible for LTCI	Reason losing eligibility	Date of death	Sex
1	19330815	Age 65	20000401			F
1	19330815	Age 65	20000401	Death	20061221	F
2	19410608	Age 65	20060608			M
3	19200122	In-migration	20040930			F

Table 4. Simplified Data for Those Who are Certified LTCI Care Needs Level

Randomly Assigned ID	Care needs level	Date care need level is certified	Date certified care need level is expired	Date certified care need level ended	Date certified care need level is revoked	Reason for application
1	2	20000401	20010331	20010331		new
1	3	20010401	20020331	20020331		renew
1	2	20020401	20030331	20030331		renew
1	3	20030401	20040331	20040331		renew
1	3	20040401	20050331	20050331		renew
1	4	20050401	20060331	20060331		renew
1	5	20060401	20070331	20061220		renew
1					20061221	other
2	1	20101001	20110930	20110930		new
2	1	20111001	20120930	20120930		renew
2	2	20121001	20130930			renew

Table 5. Descriptive Statistics. Standard Deviations in Parentheses

		2000-2005		2006-2012	
		Male	Female	Male	Female
Population		98,815	143,527	127,687	181,046
number of person with care need level certified at least once		16,929	38,556	26,843	57,286
number of death		18,556	19,362	25,948	27,442
number of right censored	Survival	77,005	117,914	97,587	146,494
	Other reasons	3,254	6,251	4,152	7,110
total person years		446,454	676,408	651,941	978,990
person years for those without certified care need level		402,466	557,727	570,267	762,006
person years for care need level 2 or less		28,334	78,199	55,251	146,039
person years for care need level 3 or more		15,654	40,382	26,423	70,945
mean age		72.40(6.74)	74.20(7.82)	72.96(7.01)	74.94(8.20)
mean spell length		4.52(1.83)	4.71(1.77)	5.11(2.21)	5.41(2.12)

Note: Standard deviations in parentheses

Table 6. Published Life Expectancy at Age 65 for Japan and Fukuoka City in 2000, 2005 and 2010 and Computed Life Expectancy at Age 65 for Fukuoka City for the Period 2000-2005 and 2006-2012 by Sex

	2000	2000-2005	2005	2006-2012	2010
Males					
Japan	17.5		18.1		18.7
Fukuoka City (published)	17.6		18.6		18.9
Fukuoka City (computed)		17.2		18.8	
Females					
Japan	22.4		23.2		23.8
Fukuoka City (published)	22.7		23.8		24.1
Fukuoka City (computed)		22.2		24.1	

Sources:

Japan Ministry of Health, Labour and Welfare, *Municipal life table*, various years.

Japan Ministry of Health, Labour and Welfare, *Complete life table*, various years.

Table 7. Life Expectancies by Long-Term Care Need Level by Sex for Selected Ages in 2000-2005 and 2006-2012 Based on Population-Based Multistate Life Tables

Sex	Period	Age	Tota life expectancy	Long-term care-free life expectancy			Life expectancy with care need level 2 or less			Life expectancy with care need level 3 or more		
					95%L	95%U		95%L	95%U		95%L	95%U
Male	2000-2005	65	17.25	14.33	14.25	14.42	1.92	1.87	1.96	1.00	0.97	1.04
		75	10.67	7.53	7.45	7.61	2.05	1.99	2.10	1.09	1.06	1.13
		85	6.00	2.86	2.79	2.95	1.98	1.90	2.06	1.16	1.10	1.21
	2006-2012	65	18.77	15.56	15.48	15.64	2.16	2.12	2.19	1.05	1.03	1.08
		75	11.53	8.10	8.03	8.17	2.29	2.25	2.33	1.14	1.12	1.17
		85	6.27	2.89	2.82	2.95	2.19	2.13	2.25	1.20	1.16	1.24
Female	2000-2005	65	22.22	15.63	15.56	15.70	4.11	4.05	4.17	2.48	2.43	2.54
		75	14.19	7.57	7.51	7.63	4.01	3.95	4.07	2.61	2.55	2.67
		85	8.02	2.46	2.41	2.52	2.86	2.79	2.92	2.70	2.63	2.78
	2006-2012	65	24.06	17.02	16.96	17.08	4.43	4.38	4.48	2.61	2.57	2.65
		75	15.52	8.30	8.25	8.35	4.46	4.41	4.51	2.76	2.71	2.81
		85	8.59	2.37	2.33	2.42	3.37	3.33	3.43	2.84	2.79	2.89

Table 8. Proportion of Life Expectancies by Long-Term Care Need Levels to Total Life Expectancy by Sex for Selected Ages in 2000-2005 and 2006-2012: Based on Population-Based Life Tables

Sex	Period	Age	Long-term care-free life expectancy	Life expectancy with long-term care need level 2 or less	Life expectancy with long-term care need level 2 or less
Male	2000-2005	65	83.1	11.1	5.8
		75	70.6	19.2	10.2
		85	47.8	33.0	19.3
	2006-2012	65	82.9	11.5	5.6
		75	70.2	19.8	9.9
		85	46.0	34.9	19.1
Female	2000-2005	65	70.2	18.5	11.2
		75	53.4	28.2	18.4
		85	30.7	35.6	33.7
	2006-2012	65	70.7	18.4	10.8
		75	53.5	28.7	17.8
		85	27.7	39.3	33.0

Table 9a.

Males **Life Epectancies for Males by Long-term Care Need Level at Selected Ages in 2000-2005**

2000-2005

Based on Status-Based Multistate Life Tables

Initial state	Age	Tota life expectancy	Long-term care-free life expectancy	95%L	95%U	Life expectancy with care need level 2 or less	95%L	95%U	Life expectancy with care need level 3 or more	95%L	95%U
no long-term	65	17.34	14.45	14.38	14.54	1.90	1.85	1.94	0.99	0.96	1.02
care needs	75	11.09	8.17	8.09	8.25	1.94	1.88	1.99	0.98	0.95	1.02
	85	6.65	4.03	3.95	4.12	1.72	1.64	1.80	0.90	0.85	0.95
care needs level	65	10.22	3.60	3.17	4.05	4.86	4.60	5.12	1.76	1.62	1.90
2 or less	75	7.09	1.25	1.14	1.37	4.36	4.23	4.51	1.48	1.40	1.57
	85	5.17	0.40	0.35	0.46	3.59	3.47	3.71	1.18	1.11	1.25
care needs level	65	7.08	1.57	1.19	2.01	1.48	1.26	1.71	4.03	3.68	4.39
3 or more	75	4.97	0.46	0.38	0.55	0.96	0.86	1.07	3.55	3.40	3.70
	85	3.45	0.10	0.08	0.13	0.62	0.54	0.69	2.73	2.62	2.84

Tabe 9b. **Life Expectancies for Males by Long-Term Care Need Level at Selected Ages in 2006-2012**

Based on Status-Based Multistate Life Tables

Initial state	Age	Tota life expectancy	Long-term care-free life expectancy	95%L	95%U	Life expectancy with care need level 2 or less	95%L	95%U	Life expectancy with care need level 3 or more	95%L	95%U
no long-term	65	18.86	15.68	15.61	15.76	2.14	2.10	2.17	1.04	1.02	1.06
care needs	75	12.07	8.88	8.82	8.94	2.17	2.13	2.21	1.03	1.00	1.06
	85	7.23	4.38	4.30	4.46	1.91	1.85	1.97	0.95	0.91	0.99
care needs level	65	11.20	4.53	4.09	5.01	4.99	4.77	5.21	1.68	1.55	1.82
2 or less	75	7.65	1.65	1.54	1.75	4.57	4.46	4.67	1.43	1.38	1.49
	85	5.24	0.42	0.38	0.46	3.72	3.63	3.80	1.10	1.06	1.15
care needs level	65	7.61	1.72	1.30	2.19	1.39	1.16	1.64	4.50	4.15	4.86
3 or more	75	4.96	0.46	0.39	0.54	0.79	0.72	0.86	3.71	3.60	3.83
	85	3.27	0.09	0.07	0.12	0.41	0.36	0.46	2.77	2.68	2.85

Table 10a. **Life Expectancies for Females by Long-Term Care Need Level at Selected Ages in 2000-2005 Based on Status-Based Multistate Life Tables**

Initial state	Age	Tota life expectancy	Long-term care-free life expectancy	95%L	95%U	Life expectancy with care need level 2 or less	95%L	95%U	Life expectancy with care need level 3 or more	95%L	95%U
no long-term	65	22.29	15.73	15.66	15.80	4.09	4.03	4.15	2.47	2.42	2.53
care needs	75	14.60	8.39	8.33	8.45	3.74	3.68	3.80	2.47	2.42	2.53
	85	8.77	4.13	4.07	4.19	2.42	2.36	2.49	2.21	2.14	2.29
care needs level	65	16.24	5.48	5.04	5.94	7.77	7.45	8.10	2.99	2.82	3.17
2 or less	75	11.88	1.83	1.74	1.91	7.03	6.91	7.16	3.02	2.94	3.11
	85	7.79	0.52	0.49	0.56	4.66	4.57	4.75	2.60	2.52	2.68
care needs level	65	11.65	2.35	1.91	2.94	3.24	2.77	3.68	6.06	5.55	6.62
3 or more	75	8.78	0.83	0.74	0.92	2.33	2.18	2.48	5.62	5.45	5.82
	85	5.77	0.18	0.16	0.20	0.89	0.83	0.95	4.70	4.59	4.81

Table 10b. **Life Expectancies for Females by Long-Term Care Need Level at Selected Ages in 2006-2012 Based on Status-Based Multistate Life Tables**

Initial state	Age	Tota life expectancy	Long-term care-free life expectancy	95%L	95%U	Life expectancy with care need level 2 or less	95%L	95%U	Life expectancy with care need level 3 or more	95%L	95%U
no long-term	65	24.11	17.10	17.04	17.16	4.41	4.36	4.46	2.60	2.56	2.64
care needs	75	16.05	9.28	9.23	9.34	4.18	4.13	4.23	2.59	2.55	2.64
	85	9.76	4.58	4.52	4.65	2.87	2.82	2.93	2.31	2.26	2.36
care needs level	65	18.59	7.71	7.27	8.20	7.85	7.61	8.13	3.03	2.89	3.16
2 or less	75	13.02	2.39	2.31	2.47	7.47	7.38	7.57	3.16	3.09	3.22
	85	8.31	0.51	0.49	0.54	5.16	5.09	5.22	2.63	2.58	2.69
care needs level	65	12.40	2.89	2.39	3.47	3.17	2.73	3.63	6.34	5.79	6.87
3 or more	75	8.96	0.81	0.73	0.89	1.92	1.81	2.04	6.23	6.06	6.40
	85	5.76	0.16	0.14	0.17	0.74	0.69	0.78	4.87	4.78	4.96

Table 11. Propotion of Life Expectancies by Long-Term Care Need Level in Two Periods: Males

2000-2005					2006-2012				
	Age	Long-term care-free life expectancy	Life expectancy with care need level 2 or less	Life expectancy with care need level 3 or more		Age	Long-term care-free life expectancy	Life expectancy with care need level 2 or less	Life expectancy with care need level 3 or more
no long-term	65	83.4	10.9	5.7	no long-term	65	83.2	11.3	5.5
care needs	75	73.6	17.5	8.9	care needs	75	73.5	18.0	8.5
	85	60.7	25.8	13.5		85	60.5	26.4	13.1
care need level	65	35.3	47.6	17.2	care need level	65	40.4	44.6	15.0
2 or less	75	17.7	61.4	20.9	2 or less	75	21.5	59.7	18.7
	85	7.8	69.4	22.8		85	8.1	70.9	21.0
care need level	65	22.2	20.9	56.9	care need level	65	22.6	18.3	59.1
3 or more	75	9.2	19.3	71.4	3 or more	75	9.3	15.9	74.8
	85	3.0	17.9	79.1		85	2.9	12.5	84.6

Table 12. Propotion of Life Expectancies by Long-Term Care Need Level in Two Periods: Females

2000-2005	Age	Long-term care-free life expectancy	Life expectancy with care need level 2 or less	Life expectancy with care need level 3 or more	2006-2012	Age	Long-term care-free life expectancy	Life expectancy with care need level 2 or less	Life expectancy with care need level 3 or more
no long-term	65	70.6	18.3	11.1	no long-term	65	70.9	18.3	10.8
care needs	75	57.5	25.6	16.9	care needs	75	57.8	26.0	16.1
	85	47.2	27.6	25.2		85	46.9	29.4	23.6
care need level	65	33.8	47.8	18.4	care need level	65	41.5	42.2	16.3
2 or less	75	15.4	59.2	25.4	2 or less	75	18.4	57.4	24.3
	85	6.7	59.9	33.4		85	6.2	62.1	31.7
care need level	65	20.2	27.8	52.0	care need level	65	23.3	25.5	51.2
3 or more	75	9.5	26.5	64.0	3 or more	75	9.0	21.4	69.6
	85	3.1	15.5	81.4		85	2.7	12.8	84.5

Table 13. Estimated Life Cost for Long-Term Care Based on the Period 2006-2012, Results by Sex

Unit: 1,000

				Total	2 or less	3 or more
Males	pop-based		65	60.4	27.7	32.7
			85	65.4	28.2	37.2
	status-based	no needs	65	59.7	27.5	32.3
			85	54.0	24.5	29.5
		2 or less	65	116.4	64.1	52.2
			85	82.0	47.8	34.2
		3 or more	65	157.7	17.9	139.8
			85	91.2	5.3	85.9
Females	pop-based		65	137.9	57.0	81.0
			85	131.5	43.4	88.1
	status-based	no needs	65	137.4	56.7	80.7
			85	108.6	37.0	71.6
		2 or less	65	195.1	101.0	94.1
			85	148.1	66.3	81.8
		3 or more	65	237.8	40.7	197.1
			85	160.7	9.5	151.2