ABSTRACT

Background
The Japanese government is committed to enhancing the health-related quality of life of the population. The second phase of Healthy Japan 21 seeks to increase disability-free life expectancy (DFLE) at birth more than life expectancy (LE) at birth for the period of 2013-2024, and to reduce regional inequalities in DFLE. We know relatively little, however, about previous trends in health expectancy particularly at the prefecture-level, and thus the feasibility of reaching these targets remains to be tested.

Methods
Using prefecture-level life tables and data on activity limitation, the present study examines trends and changes in DFLE at birth for 47 Japanese prefectures between 2000 and 2010. We approach DFLE through the absolute number and proportion of disability-free life.

Results
The analyses based on the Sullivan method suggest that LE at birth for 47 prefectures increased steadily between 2000 and 2010. Contrariwise, there is a variation in terms of health expectancy. While the absolute number of years spent without disability increased in some prefectures, the rate of improvement in DFLE lagged behind that in LE for the majority of regions. Further, we noted substantial reductions in the proportion of life free of disability during the past ten years.

Conclusion
Our results show declining health expectancy across Japanese prefectures over the decade 2000-2010. Downward trends become particularly evident when health expectancy is interpreted in relative terms. These results raise the question over the feasibility of the second-phase Healthy Japan 21 target.

INTRODUCTION

Although Japan has long been leading the world in terms of population health status, lifestyle-related diseases, namely chronic illnesses, have gradually become prevalent among the population. With a rapid rise in chronic diseases, the need to develop infrastructure for health promotion has been increasingly recognized. There are three major programs: the "First-Phase Measures for National Health Promotion" in 1978, the "Second-Phase Measures for National Health Promotion" in 1988, and the "National Health Promotion Movement in the 21st Century (Healthy Japan 21) in 2001.[1] The second-phase Healthy Japan 21, launched in July 2012, seeks to improve population health status for the period of 2013-2024, with particular attention given to health-related quality of life. Its preferred measure is disability-free life expectancy (DFLE) at birth, denoting the duration of life spent without limitation of activity due to health problems. The program includes the following two DFLE-related objectives.

The first goal is to improve health expectancy for the next ten years. Specifically, the government seeks to increase DFLE at birth more than life expectancy (LE) at birth between 2013 and 2024. In fact, LE grew faster than DFLE during the past ten years. Between 2001 and 2010 male DFLE at birth increased by 1.02 years (from 69.40 to 70.42 years), while male LE at birth rose by 1.48 years (from 78.07 to 79.55 years). Women experienced a 0.97-year increase in DFLE (from 72.65 to 73.62 years) and a 1.37-year increase in LE (from 84.93 to 86.30 years).[2] The second phase of Healthy Japan 21 seeks to reverse this direction and to enhance health more than longevity between 2013 and 2024. The second goal is to reduce regional disparities in health expectancy. Previous studies have shown health differentials within Japan, including life expectancy at birth,[3] self-rated health status,[4] and the centenarian rate.[5] There is indeed evidence suggesting regional differences in health-related quality of life. The most recent figures,

for 2010, show that the gap in male DFLE at birth was 2.79 years, ranging from 68.95 years (Aomori) to 71.74 years (Aichi), and the difference amounted to 2.95 years among women, from 72.37 years (Shiga) to 75.32 years (Shizuoka).[6]

In the face of a rapid rise in chronic conditions, the Japanese government has been committed to improving the health-related quality of life of the population. An important question, however, has been left open. While studies examining national-level health expectancy abound,[7-8] relatively little is known about the distribution of health expectancy measures at the sub-national level. In particular, trends and changes in health expectancy at the prefecture level remain to be explored. A group of researchers have estimated prefecture-specific health expectancy for various years.[9-10] We cannot, however, directly compare these results to the most recent figures of 2010, because (1) health expectancy in prior research is computed at older ages (e.g., DFLE at 65 years of age), while the 2010 estimates are calculated at birth; and (2) discrepancies exist in the definition of disability across studies.[6,8-9] Consequently, although the second phase of Healthy Japan 21 seeks to improve health expectancy and reduce regional inequalities for the next ten years, we only have a cross-sectional understanding of the distribution of DFLE at the sub-national level.

The present study assesses the feasibility of the headline target of the second-phase Healthy Japan 21 through examining how DFLE at birth has changed during the past ten years in 47 Japanese prefectures. This work analyzes health expectancy through (1) the number of life years free of activity limitation (i.e., DFLE at birth) and (2) the proportion of disability-free life. While most existing studies on health expectancy have tended to focus on the absolute number of healthy years,[7-10] a proportional analysis provides important insights into the relationship

between mortality and morbidity. Combining absolute and relative perspectives therefore produces a more comprehensive picture of the distribution of health expectancy in Japan.

METHODS

Data

Calculating health expectancy requires age-specific mortality data and the proportions of the population in a given health state. Data on mortality for this study are obtained from prefecture-level life tables. The Japanese government publishes life tables for each prefecture every five years, and we utilize data for 2000 and 2010.[11] We use *Kokumin Seikatsu Kiso Chosa* (Comprehensive Survey of Living Conditions of the People on Health and Welfare) for the prevalence of disability. It is a repeated cross-sectional survey conducted annually by Ministry of Health, Labour, and Welfare since 1986. We analyze data for 2001 and 2010, since questions about health are included in a large-scale survey conducted every three years. Due to differences in the timing of data collection, note that there is a one-year discrepancy between information of disability (published in 2001) and life tables (published in 2000), while data points are synchronized in 2010.

Measures

We estimate the prevalence of disability through the following two survey questions: "Are you currently institutionalized in hospitals, clinics, or long-term care facilities?" and "Do you have any limitations in carrying out normal activities due to health problems?" Responses to each question are given as "yes" or "no." The present study combines these two items and estimates the prevalence of long-term and short-term disability. Those who answered "yes" to either question are coded 1 and 0 otherwise. Information is then stratified by gender and five-year age

intervals in accordance with life tables. Since the question on activity limitation was asked only for respondents older than six years of age, values for the youngest population (i.e., those aged between 0 and 5) are imputed with the information for people in the 6-9 age interval. Previous studies have used the same analytical strategy to estimate the prevalence of disability at younger ages.[6]

We first use the Sullivan [12] method and calculate the absolute number of years in which people can expect to live without disability (i.e., DFLE at birth) for men and women in each prefecture for 2000 and 2010. This method applies data on age-/gender- specific prevalence of the health to a standard life table to estimate the average duration of life in which people can expect to live in a given health state. We also compute the proportion of life free of disability by dividing DFLE at birth by LE at birth. We then investigate changes in the absolute number as well as the proportion of disability-free life between 2000 and 2010. The 95% confidence intervals, obtained using the formula provided by Jagger et al.[13], allow us to detect significant changes in DFLE at birth during the study period.

RESULTS

Tables 1 and 2 present the distribution of LE at birth, DFLE at birth, and the proportion of life free of disability for each prefecture in 2000 and 2010. We first focus on the results of men (Table 1). There are large health differentials across prefectures. In 2000, the gap in male LE at birth was 3.2 years, from 75.7 years (Aomori) to 78.9 years (Nagano). The magnitude of inequalities was larger in 2010: there was a 3.6-year difference between Aomori (77.3 years) and Nagano (80.9 years). Disparities exist in terms of health-related quality of life as well. In 2000, men in Nara could expect to live 69.6 years without suffering from disability, while the result for

men in Aomori was 67.0 years. The difference in male DFLE at birth was larger in 2010 (2.8 years between Aomori and Shizuoka). While men in Aomori consistently had the lowest levels of DFLE at birth among 47 prefectures, Shimane (86.1%) and Oita (85.4%) had the lowest levels of the proportion of disability-free life in both years.

Regional differences in health were observed among women (Table 2). In 2000, there was a 2.6-year difference in female LE at birth, ranging from 83.5 years (Aomori) to 86.1 years (Okinawa). The gap was smaller in 2010, with a 1.8-year difference between Aomori (85.4 years) and Nagano (87.2 years). Again, Aomori had the lowest levels of female LE at birth, indicating substantial longevity disadvantages among men and women in the prefecture. Further, health-related quality of life varied between prefectures. In 2000, there was a 3.4-year difference in female DFLE at birth, ranging from 70.2 years (Tokyo) to 73.6 years (Okinawa). Ten years later, the spread slightly decreased to 3.1 years, from 70.6 years (Osaka) to 73.7 years (Gunma). Additionally, the gap in the proportion of life without disability decreased from 4.0 (from 83.2% in Tokyo/Kagawa to 87.2% in Ibaraki) to 3.8 percentage points (from 82.0% in Fukuoka/Oita to 85.8% in Gunma) between 2000 and 2010.

[Tables 1 and 2, about here]

Next, we investigate how health expectancy measures for Japanese prefectures have changed between 2000 and 2010 (Table 3). LE at birth for 47 prefectures steadily increased during the study period. LE increased most in Shiga and Saga (2.4 years for men) and Oita (2.2 years for women). In contrast to improvements in LE at birth for men and women during the past ten years, we found variations in terms of health expectancy. Between 2000 and 2010 male DFLE at birth improved in 45 prefectures, and 17 of them had a significant increase during the study period. Female DFLE at birth improved in 34 prefectures, including 6 prefectures with

significant changes between 2000 and 2010. While these results are encouraging, some prefectures had decreases in DFLE at birth during the study period. Among men, Niigata and Nara experienced reductions in the absolute number of disability-free years by 0.9 year and 0.4 year, and the absolute number of disability-free years declined in 13 prefectures among women. In fact, between 2000 and 2010 male DFLE at birth increased more than longevity only among five prefectures (i.e., Akita, Ishikawa, Shimane, Kochi, and Nagasaki), and none experienced improvements in health larger than those in longevity in the case of women.

Perhaps the most startling features of the present results come from proportional analyses (Figures 1a and 1b). The proportion of life free of disability declined in the majority of prefectures for both genders. Decreases in proportions were observed in 38 prefectures among men. Niigata experienced the largest decline of 3.1 percentage point, followed by Nara (by 2.5 percentage points) and Kanagawa (by 1.9 percentage points). Downturns were much steeper among women. The proportion of healthy life decreased across 45 out 47 prefectures, with the largest decline in Oita (by 3.3 percentage points). The exceptions were Gunma and Ishikawa where the proportion of disability-free life remained unchanged or slightly improved. Overall, these results suggest that, in contrast to uniform improvements in longevity, health-related quality of life has declined in many areas over the 2000-2010 decade. Downward trends in health expectancy become particularly evident when results are converted into relative values.

[Table 3, and Figures 1, 2, about here]

DISCUSSION

Compared to the large body of work on health expectancy at the national level, research has yet to be conducted on trends and changes in prefecture-level health expectancy. This research has

focused on the absolute number and proportion of disability-free life for 47 Japanese prefectures between 2000 and 2010, and demonstrated downward trends in health-related quality of life at the subnational-level in Japan. In particular, there are two important findings. First, there was a marked rise in LE at birth during the past decade. The average duration of life increased uniformly for men and women in 47 prefectures. These results suggest improvements in length of life throughout the country. Second, in spite of increases in LE at birth, there is a large between-prefecture variation in health expectancy. While the absolute number of disability-free years increased in the majority of regions during the ten-year period, several prefectures had decreases in DFLE at birth. The results of proportional analyses further revealed downturns in health expectancy. The proportion of disability-free life decreased in 38 prefectures among men, and women in all the prefectures, except for Gunma and Ishikawa, had declines in the proportion of healthy life during the past ten years.

These results suggest discrepancy between the rate of increase in longevity and that in health for the majority of prefectures in Japan. In the face of increasing chronic illnesses, an extension of life years can lead to longer yet diseased lives.[14] The present findings provide evidence for precisely such a hypothesis, that is, the expansion of morbidity.[15] Using national-level data on self-rated health, Yong and Saito [7] found that the gains in LE were mainly due to increases in years of poor health for the period of 1995-2004. Our results lend further support for the expansion of morbidity hypothesis at the sub-national level over the decade 2000-2010. Among men, DFLE at birth increased more than total LE only in 5 prefectures, and among women, although the absolute number of disability-free years increased in several prefectures, none of them exceeded the size of increases in length of life. This issue is of great importance for social policy in Japan. The second phase of Health Japan 21 sets the target to improve DFLE at

birth more than LE at birth between 2013 and 2024, but the goal was not reached for many prefectures during the period 2000-2010. The European Union (EU) seeks an increase of two healthy life years (HLYs) at birth in the 27 member countries for the next ten years,[16] but there is evidence to suggest widening disparities in HLYs across countries. [17] Trends between 2000 and 2010 indeed raise the question of whether the headline target of the second-phase Healthy Japan 21 will be attainable for not.

Increases in unhealthy years have important implications for future medical and care requirements and pension provision in Japan. Several explanations are discussed for the reason of increasing disability. First, chronic diseases have become much more prevalent over time. Between 1999 and 2011, for example, the number of patients suffering from diabetes rose by 30%, and the number of Alzheimer's disease patients rose from 29,000 to 366,000 during the same period [18]. Given that chronic illnesses are powerful risk factors for disability [19-20], increases in these health conditions might have resulted in more people who experience activity-limiting conditions. Second, the introduction of a new care policy might be related to the expansion of disability. In April 2000, the Japanese government launched the long-term care insurance (LTCI) policy under which people aged 65 and above are eligible for in-home and institutional long-term care services. The needs for care are determined by the levels of difficulties in activities of daily living, such as walking, bathing, and toileting. Some scholars argue that the new policy led to increases in the number of persons who report health problems in order to be eligible for LTCI services. [21] The number of certified individuals for LTCI services has in fact doubled between 2000 and the present.[22]

In addition, policies need to address factors responsible for regional health inequalities. Since the pioneering study by Jagger et al.,[23] researchers have begun to identify factors linked

to health expectancy. In this study, for example, a level of a nation's wealth, measured by GDP per capita and elderly care expenditures, is positively associated with the number of years spent without disability at 50 across 25 European countries in 2005. There is a wide diversity in socioeconomic conditions, welfare characteristics, or climate within Japan. In 2010, for example, population density per square kilometer varied from 69.6 persons in Hokkaido to 6,044.8 persons in Tokyo, and prefectural income per capita ranged from 2,025,000 JPY (20,250 USD) in Okinawa to 4,306,000 JPY (43,060 USD) in Tokyo. [24] These macro-level factors are known to be related to Japanese people's physical health status. [5] As the second phase of Healthy Japan 21 aims to reduce regional disparities in health expectancy, policymakers and researchers should focus on mechanisms underlying differentials in health-related quality of life between prefectures.

Our results should be interpreted in light of the study's limitations. Our first limitation concerns with the measure of health. Our disability variable is based on the question asking whether or not respondents have limitations in carrying out daily activities. We chose to use this item because DFLE at birth published in 2010 are based on this survey question. [6] Recently, there has been a growing interest in classifying the levels of disability, using data on activities of daily living (ADL) and instrumental activities of daily living (IADL).[25] *Kokumin Seikatsu Kiso Chosa*, however, only asks respondents to specify the type of activity-limitations, such as standing-up, toileting, and doing exercises. A development of a more detailed disability measure should be a subject of future research.

The second caveat has to do with the institutionalized population. Although the rate of institutionalization remains low in Japan [26], institutionalized individuals nevertheless influence the computation of health expectancy. We therefore incorporated data on institutionalization in

hospitals, clinics, or long-term care facilities. One should note, however, that those staying at elderly nursing homes are not included in sample. As a result, our results might be overestimated by excluding those who are in nursing homes, thereby undervaluing the prevalence of disability among Japanese elders.

Finally, we cannot directly compare the number of disability-free years presented here to DFLE measures published in 2010. This study utilized publicly available life tables and computed the expected number of years free of disability for each prefecture in 2000 and 2010. As the latest prefecture-level life tables (i.e., 2010) became available only in 2013, the 2010 estimates are based on prefecture-level mortality calculated by a group of researchers.[6] Readers should therefore be reminded of differences in methods between out study and existing research on this topic.

In sum, we find evidence that the rate of increase in health lagged behind that in longevity for the majority of prefectures over the decade 2000-2010, thereby raising the question over the feasibility of the Japanese government's health promotion target. Downward trends in health-related quality of life become particularly evident when heath expectancy is converted into relative values. These results suggest difficulty in forecasting the development of health expectancy for the next ten years.

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Table 1. Life expectancy (LE) at birth, disability-free life expectancy (DFLE) at birth, and the proportion of disability-free life (%), men, 2000-2010

	LE (years)		DFLE (years)				% of life without disability	
	2000	2010	2000		2010		2000	2010
			years	95% CIs	years	95% CIs		
1 Hokkaido	77.6	79.2	67.9	(67.3-68.5)	68.7	(68.0-69.4)	87.5	86.7
2 Aomori	75.7	77.3	67.0	(66.4-67.6)	67.6	(66.9-68.3)	88.5	87.4
3 Iwate	77.1	78.5	66.9	(66.3-67.5)	68.1	(67.5-68.8)	86.8	86.8
4 Miyagi	77.7	79.7	68.3	(67.8-68.8)	68.9	(68.3-69.5)	87.9	86.5
5 Akita	76.8	78.2	67.5	(66.9-68.0)	69.1	(68.5-69.7)	87.9	88.4
6 Yamagata	77.7	80.0	68.6	(68.0-69.1)	69.5	(68.9-70.1)	88.2	86.9
7 Fukushima	77.2	78.8	68.0	(67.4-68.6)	68.6	(67.9-69.2)	88.1	87.0
8 Ibaraki	77.2	79.1	68.8	(68.2-69.4)	69.7	(69.1-70.4)	89.1	88.1
9 Tochigi	77.1	79.1	67.9	(67.4-68.5)	69.3	(68.7-69.9)	88.1	87.6
10 Gunma	77.9	79.4	68.9	(68.3-69.5)	69.8	(69.1-70.4)	88.4	87.9
11 Saitama	78.0	79.6	68.5	(67.8-69.2)	69.2	(68.6-69.8)	87.8	86.9
12 Chiba	78.0	79.9	69.3	(68.7-69.9)	69.9	(69.1-70.7)	88.9	87.5
13 Tokyo	78.0	79.9	68.1	(67.6-68.6)	68.7	(68.1-69.3)	87.3	86.0
14 Kanagawa	78.2	80.3	69.2	(68.7-69.7)	69.6	(69.0-70.1)	88.5	86.6
15 Niigata	77.7	79.5	69.4	(68.9-69.9)	68.6	(68.0-69.1)	89.3	86.2
16 Toyama	78.1	79.7	68.5	(68.0-69.1)	69.2	(68.6-69.9)	87.8	86.9
17 Ishikawa	78.0	79.7	67.6	(67.0-68.3)	69.8	(69.1-70.5)	86.7	87.6
18 Fukui	78.5	80.5	68.6	(68.0-69.2)	69.6	(68.9-70.3)	87.4	86.5
19 Yamanashi	77.9	79.6	68.4	(67.8-69.0)	69.7	(69.0-70.4)	87.8	87.6
20 Nagano	78.9	80.9	69.4	(68.8-70.0)	69.9	(69.3-70.6)	88.0	86.4
21 Gifu	78.1	79.9	68.9	(68.3-69.5)	69.4	(68.7-70.0)	88.2	86.8
22 Shizuoka	78.2	80.0	68.8	(68.2-69.4)	70.4	(69.9-70.9)	88.0	88.0
23 Aichi	78.0	79.7	69.1	(68.5-69.7)	70.2	(69.6-70.8)	88.6	88.1
24 Mie	77.9	79.7	68.1	(67.5-68.7)	69.4	(68.7-70.1)	87.5	87.1
25 Shiga	78.2	80.6	68.6	(68.0-69.2)	69.3	(68.6-70.0)	87.7	86.0
26 Kyoto	78.1	80.2	68.3	(67.6-69.0)	69.1	(68.3-69.8)	87.4	86.1
27 Osaka	77.0	79.0	66.9	(66.3-67.5)	68.0	(67.4-68.6)	86.9	86.1
28 Hyogo	77.6	79.6	67.9	(67.3-68.4)	68.4	(67.8-69.1)	87.5	86.0
29 Nara	78.3	80.1	69.6	(68.9-70.2)	69.2	(68.4-69.9)	88.8	86.4
30 Wakayama	77.0	79.1	67.3	(66.7-67.9)	69.4	(68.7-70.1)	87.4	87.7
31 Tottori	77.4	79.0	67.5	(66.9-68.0)	68.7	(68.0-69.3)	87.2	86.9
32 Shimane	77.6	79.5	66.9	(66.2-67.5)	69.3	(68.6-69.9)	86.1	87.1
33 Okayama	77.8	79.8	67.9	(67.3-68.5)	68.2	(67.5-68.9)	87.2	85.5
34 Hiroshima	77.8	79.9	67.3	(66.7-67.9)	68.9	(68.2-69.6)	86.5	86.2
35 Yamaguchi	77.0	79.0	68.3	(67.7-68.9)	69.3	(68.6-70.0)	88.7	87.7
36 Tokushima	77.2	79.4	66.8	(66.2-67.5)	68.5	(67.8-69.2)	86.6	86.3
37 Kagawa	78.0	79.7	67.7	(67.1-68.3)	68.4	(67.7-69.1)	86.8	85.8
38 Ehime	77.3	79.1	67.3	(66.7-67.9)	68.3	(67.6-69.0)	87.1	86.4
39 Kochi	76.9	78.9	65.5	(64.9-66.2)	67.7	(66.9-68.4)	85.2	85.8
40 Fukuoka	77.2	79.3	67.4	(66.9-67.9)	68.3	(67.7-68.8)	87.3	86.1
41 Saga	76.9	79.3	66.4	(65.8-66.9)	68.7	(68.1-69.3)	86.3	86.7
42 Nagasaki	77.2	78.9	66.1	(65.4-66.7)	67.8	(67.1-68.5)	85.6	86.0
43 Kumamoto	78.3	80.3	68.4	(67.8-69.0)	68.8	(68.1-69.5)	87.4	85.7
44 Oita	77.9	80.1	67.5	(66.8-68.2)	68.4	(67.7-69.2)	86.7	85.4
45 Miyazaki	77.4	79.7	67.9	(67.3-68.5)	69.4	(68.6-70.1)	87.7	87.1
46 Kagoshima	77.0	79.2	68.0	(68.0-68.6)	69.2	(68.5-69.9)	88.2	87.4
47 Okinawa	77.6	79.4	68.6	(68.0-69.3)	69.1	(68.3-69.8)	88.4	87.0

Table 2. Life expectancy (LE) at birth, disability-free life expectancy (DFLE) at birth, and the proportion of disability-free life (%), women, 2000-2010

	LE (years)		DFLE (years)				% of life without disability	
	2000	2010	2000		2010		2000	2010
			years	95% CIs	years	95% CIs		
1 Hokkaido	84.8	86.3	70.8	(70.1-71.5)	71.4	(70.6-72.2)	83.5	82.7
2 Aomori	83.5	85.4	71.8	(71.1-72.4)	71.3	(70.6-72.0)	86.0	83.5
3 Iwate	84.5	85.9	71.1	(70.5-71.8)	71.3	(70.6-72.0)	84.2	83.0
4 Miyagi	84.7	86.4	71.1	(70.5-71.7)	72.1	(71.5-72.8)	84.0	83.5
5 Akita	84.3	86.0	71.7	(71.1-72.3)	72.4	(71.7-73.0)	85.1	84.2
6 Yamagata	84.6	86.3	71.6	(71.0-72.2)	72.0	(71.3-72.7)	84.6	83.4
7 Fukushima	84.1	86.1	72.3	(71.7-72.9)	72.3	(71.6-73.0)	86.0	84.0
8 Ibaraki	84.1	85.8	73.4	(72.7-74.0)	72.7	(72.0-73.4)	87.2	84.8
9 Tochigi	84.0	85.7	71.8	(71.2-72.5)	72.7	(72.1-73.4)	85.5	84.9
10 Gunma	84.4	85.9	72.4	(71.8-73.0)	73.7	(73.0-74.4)	85.8	85.8
11 Saitama	84.3	85.9	70.5	(69.7-71.3)	71.2	(70.6-71.9)	83.7	82.9
12 Chiba	84.4	86.2	71.8	(71.1-72.5)	71.9	(71.0-72.7)	85.1	83.4
13 Tokyo	84.4	86.4	70.2	(69.7-70.8)	71.7	(71.1-72.3)	83.2	83.0
14 Kanagawa	84.7	86.7	72.0	(71.4-72.6)	72.6	(72.0-73.2)	85.0	83.8
15 Niigata	85.2	87.0	72.7	(72.1-73.3)	72.4	(71.7-73.0)	85.3	83.2
16 Toyama	85.2	86.8	72.2	(71.6-72.8)	72.9	(72.3-73.6)	84.7	84.0
17 Ishikawa	85.1	86.8	71.0	(70.3-71.7)	72.5	(71.7-73.3)	83.5	83.5
18 Fukui	85.4	87.0	72.2	(71.5-72.8)	72.9	(72.2-73.6)	84.5	83.8
19 Yamanashi	85.2	86.7	72.9	(72.3-73.5)	73.1	(72.3-73.8)	85.6	84.3
20 Nagano	85.2	87.2	71.7	(71.0-72.3)	72.7	(72.0-73.4)	84.1	83.3
21 Gifu	84.3	86.3	71.7	(71.1-72.4)	72.8	(72.1-73.5)	85.1	84.3
22 Shizuoka	84.9	86.2	72.9	(72.2-73.5)	73.5	(73.0-74.0)	85.8	85.2
23 Aichi	84.2	86.2	71.5	(70.8-72.2)	73.1	(72.4-73.8)	84.9	84.8
24 Mie	84.5	86.3	72.0	(71.4-72.7)	72.3	(71.6-73.0)	85.2	83.8
25 Shiga	84.9	86.7	71.6	(70.9-72.2)	71.0	(70.3-71.8)	84.3	81.9
26 Kyoto	84.8	86.6	71.2	(70.5-72.0)	72.1	(71.3-72.9)	84.0	83.2
27 Osaka	84.0	85.9	70.7	(70.1-71.4)	70.6	(70.0-71.2)	84.2	82.2
28 Hyogo	84.3	86.2	70.4	(69.7-71.0)	71.6	(71.0-72.3)	83.5	83.1
29 Nara	84.8	86.6	72.1	(71.3-72.8)	71.5	(70.7-72.3)	85.0	82.6
30 Wakayama	84.3	85.7	71.2	(70.6-71.9)	72.1	(71.4-72.8)	84.5	84.1
31 Tottori	84.9	86.1	71.6	(70.9-72.2)	71.7	(71.0-72.4)	84.3	83.2
32 Shimane	85.4	87.1	71.8	(71.2-72.5)	73.2	(72.5-73.8)	84.1	84.0
33 Okayama	85.2	86.9	72.1	(71.5-72.8)	71.7	(71.0-72.4)	84.7	82.5
34 Hiroshima	85.1	86.9	71.3	(70.7-71.9)	70.7	(70.0-71.5)	83.8	81.4
35 Yamaguchi	84.6	86.1	71.9	(71.2-72.5)	72.4	(71.6-73.2)	85.0	84.1
36 Tokushima	84.5	86.2	70.9	(70.2-71.5)	70.7	(70.0-71.5)	83.9	82.1
37 Kagawa	84.8	86.3	70.6	(69.9-71.2)	71.3	(70.6-72.0)	83.2	82.6
38 Ehime	84.6	86.5	71.9	(71.2-72.5)	72.0	(71.2-72.7)	85.0	83.2
39 Kochi	84.8	86.5	70.8	(70.1-71.5)	71.6	(70.8-72.4)	83.4	82.7
40 Fukuoka	84.6	86.5	71.3	(70.8-71.9)	71.0	(70.3-71.6)	84.3	82.0
41 Saga	85.0	86.6	71.2	(70.6-71.9)	71.8	(71.1-72.5)	83.8	82.9
42 Nagasaki	84.8	86.3	70.9	(70.3-71.6)	71.3	(70.6-72.1)	83.7	82.7
43 Kumamoto	85.3	87.0	72.3	(71.7-73.0)	71.9	(71.2-72.6)	84.8	82.7
44 Oita	84.7	86.9	72.2	(71.5-72.9)	71.3	(70.5-72.0)	85.3	82.0
45 Miyazaki	85.0	86.6	72.1	(71.4-72.8)	73.1	(72.4-73.8)	84.8	84.4
46 Kagoshima	84.7	86.3	71.5	(70.8-72.1)	72.4	(71.6-73.1)	84.4	83.8
47 Okinawa	86.1	87.0	73.6	(72.9-74.3)	72.9	(72.1-73.7)	85.5	83.8

Table 3. Changes in life expectancy (LE) at birth, disability-free life expectancy (DFLE) at birth, and the proportion of disability-free life (%), stratified by gender, 2000-2010

	Men			Women		
	LE	DFLE	%	LE	DFLE	%
1 Hokkaido	1.6	0.8	-0.8	1.5	0.6	-0.8
2 Aomori	1.6	0.6	-1.0	1.9	-0.5	-2.5
3 Iwate	1.4	**1.2**	0.0	1.4	0.2	-1.2
4 Miyagi	2.0	0.6	-1.4	1.7	1.0	-0.5
5 Akita	1.4	**1.6**	0.5	1.7	0.7	-0.9
6 Yamagata	2.3	0.9	-1.4	1.7	0.4	-1.2
7 Fukushima	1.6	0.6	-1.1	2.0	0.0	-2.0
8 Ibaraki	1.9	0.9	-1.0	1.7	-0.6	-2.5
9 Tochigi	2.0	**1.4**	-0.5	1.7	0.9	-0.6
10 Gunma	1.5	0.9	-0.5	1.5	**1.3**	0.0
11 Saitama	1.6	0.7	-0.9	1.6	0.7	-0.7
12 Chiba	1.9	0.6	-1.4	1.8	0.0	-1.7
13 Tokyo	1.9	0.6	-1.3	2.0	**1.5**	-0.2
14 Kanagawa	2.1	0.4	-1.9	2.0	0.6	-1.2
15 Niigata	1.8	-0.9	-3.1	1.8	-0.3	-2.1
16 Toyama	1.6	0.7	-0.9	1.6	0.7	-0.7
17 Ishikawa	1.7	**2.2**	0.9	1.7	**1.5**	0.1
18 Fukui	2.0	1.0	-0.9	1.6	0.8	-0.7
19 Yamanashi	1.7	**1.3**	-0.3	1.5	0.1	-1.3
20 Nagano	2.0	0.5	-1.5	2.0	1.0	-0.8
21 Gifu	1.8	0.5	-1.4	2.0	1.0	-0.8
22 Shizuoka	1.8	**1.6**	0.0	1.3	0.6	-0.6
23 Aichi	1.7	1.1	-0.5	2.0	**1.6**	-0.1
24 Mie	1.8	**1.3**	-0.3	1.8	0.3	-1.5
25 Shiga	2.4	0.7	-1.7	1.8	-0.5	-2.4
26 Kyoto	2.1	0.8	-1.3	1.8	0.8	-0.8
27 Osaka	2.0	1.1	-0.8	1.9	-0.2	-2.0
28 Hyogo	2.0	0.6	-1.5	1.9	**1.3**	-0.3
29 Nara	1.8	-0.4	-2.5	1.8	-0.5	-2.4
30 Wakayama	2.1	**2.1**	0.3	1.4	0.9	-0.4
31 Tottori	1.6	**1.2**	-0.3	1.2	0.1	-1.1
32 Shimane	1.9	**2.4**	1.0	1.7	**1.3**	-0.1
33 Okayama	2.0	0.3	-1.8	1.7	-0.4	-2.2
34 Hiroshima	2.1	**1.6**	-0.3	1.8	-0.6	-2.4
35 Yamaguchi	2.0	1.0	-1.0	1.5	0.5	-0.9
36 Tokushima	2.2	**1.6**	-0.3	1.7	-0.2	-1.8
37 Kagawa	1.7	**0.7**	-0.9	1.5	0.7	-0.6
38 Ehime	1.8	1.0	-0.7	1.9	0.1	-1.7
39 Kochi	2.0	**2.1**	0.5	1.7	0.8	-0.7
40 Fukuoka	2.1	0.9	-1.2	1.9	-0.4	-2.3
41 Saga	2.4	**2.4**	0.4	1.6	0.5	-0.9
42 Nagasaki	1.7	**1.8**	0.4	1.5	0.4	-1.0
43 Kumamoto	2.0	0.4	-1.7	1.7	-0.4	-2.1
44 Oita	2.2	0.9	-1.2	2.2	-1.0	-3.3
45 Miyazaki	2.3	**1.5**	-0.7	1.6	1.0	-0.4
46 Kagoshima	2.2	1.3	-0.9	1.6	0.9	-0.5
47 Okinawa	1.8	0.4	-1.5	0.9	-0.7	-1.7

Note: Significant changes between 2000 and 2010 are in bold.

Figure 1. Changes in the proportion of disability-free life (in percentage point), men, 2000-2010

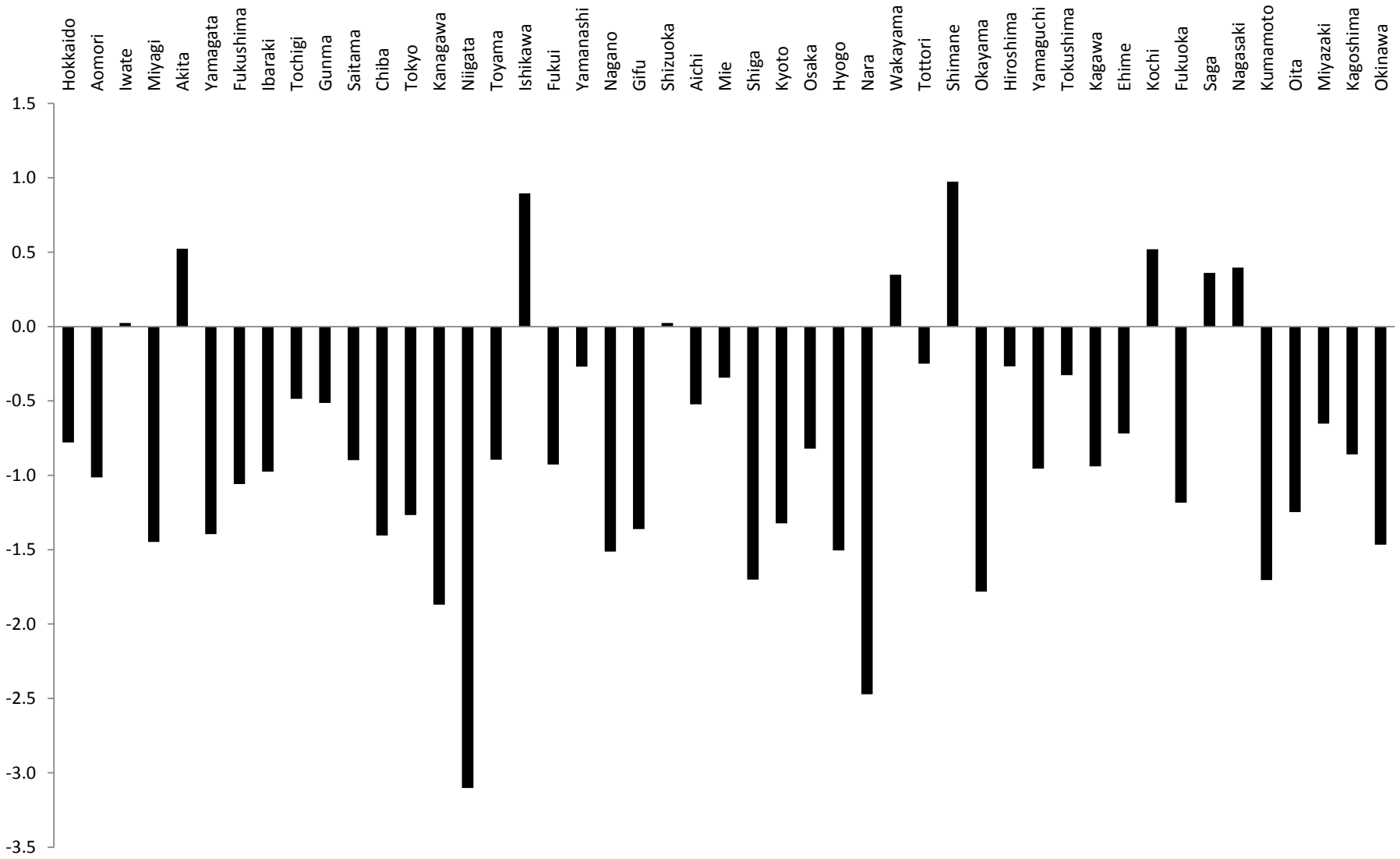

Figure 2. Changes in the proportion of disability-free life (in percentage point), women, 2000-2010