The need for home care physicians in Japan – 2020 to 2060

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Abstract

Background Due to the fact that Japan faces the most elderly society in the world, the Japanese government has launched an unprecedented health plan to reinforce home care medicine and increase the number of home care physicians, which means that an understanding of future needs for geriatric home care is vital. However, little is known about the future need for home care physicians. We attempted to estimate the basic need for home care physicians from 2020 to 2060.

Methods Our estimation is based on modification of major health work force analysis methods with previously reported official data. Two models were developed to estimate the necessary number of home care physicians: one based on home care patient mortality, the other using physician-patient ratio, working with estimated numbers of home and nursing home deaths from 2020 to 2060. Moreover, the final process considered and adjusted for future changes in the proportion of deaths occurring at home.

Results Results were highly concordant between our two models. In every instance, the mortality method's mid-range estimation was between the physician-patient ratio method's high- and low-estimations. Furthermore, our estimation is in line with the current number of physicians which was calculated using a different method. Approximately 1.6 times the current 38,000 home care physicians will be needed in Japan in the mid 2030's, peaking at just above 60,000. However, the need for home care physicians is anticipated to begin to decrease by 2040. Conclusion The results indicate that the importance of home care physicians will rise with the growing elderly population, and that improvements in home care could partially suppress the future need for physicians. After the mid 2030's, the supply can be reduced gradually, accounting for the decreasing total number of deaths after 2040. In order to provide sufficient home care and terminal care at home, increasing the number of home care physicians is indispensable. However, the unregulated supply of home care physicians will require careful attention in the future.

Background

Japan has a ballooning elderly population which is the largest in the world. This super ageing society is expected to continue to grow [1, 2]. Projections for 2035 estimate 37,820,000 people aged 65 and above, or 33% of the total population, with further increases to 39.9% in 2060, while the national population has been decreasing since 2008 [3]. Even at present, Japan faces innumerable problems associated with ageing, and the medical field is no exception, particularly in the areas of geriatric and terminal care. One of the most important issues is how and where elderly people spend and end their lives.

The Ministry of Health, Labour and Welfare in Japan (MHLW) has proposed an unprecedented health policy called the "*Regional Healthcare Vision"* [4], to facilitate home medical care, allowing patients to end their lives at home or in a nursing home rather than a hospital. Recently, home death has been emphasized as a way to improve relationships with caregivers and maintain positivity among terminally ill cancer patients [5]. Further, home death is preferred by the majority of patients, caregivers, and the general public in many countries [6]. According to a survey of people aged 55 and above conducted by the Cabinet of Japan [7], more than half (54.6%) of Japanese citizens hoped to die at home, whereas only 13.2% of all deaths in 2017 were at home. These data imply that end of life care in Japan may not be sufficiently patient-centered. In addition, Japan tends to have the longest hospitalizations in the world [8]. If the trend of hospital terminal care continues, rising medical and welfare costs will require vast national expenditures.

In response, the MHLW created the *Regional Health Vision* plan, adjusting and improving various community health systems. The MHLW promotes efficient hospital bed usage, restricts increases in hospital beds, and emphasizes home-visit medical care and nursing homes to encourage elderly people to stay out of hospitals. As the world's fastest ageing country, Japan's policy of promoting home medical care instead of building additional care facilities is unique.

Projecting the home care physician workforce is a significant task. However, we found only a single study by Matsushima et al., and an online news blurb summarizing its estimations for 2025, with poor data considerations [9, 10]. Forecasting needs and training home care physicians have received little attention for several reasons. First, Japan's home care medicine and education systems are still developing. A survey reported that about half of home care physicians (47.3%) do not oversee home death, and only provide care to outpatients [11]. Furthermore, the systems associated with home care are complicated; both internists and general practitioners provide care, and there are four types of associated clinics and hospitals, with variation among nursing homes. This study aims to estimate the future minimum number of physicians required to care for patients at home or in nursing homes, applying two major workforce analysis methods: health and service needs and workforce-to-population ratio [12].

Methods

Figure 1 (here)

Formula 1

Projected annual number of home care physicians = Projected annual number of home and nursing home deaths Mortality one year×Annual average number of patients per physician

Formula 2

Projected annual number of home care physicians = Home care physician-to-patient ratio ×Projected annual home or nursing home death number

The process for estimating future need for home care physicians is summarized in Figure 1. Part 1 projects annual home and nursing home deaths based on estimated statistics from several official sources. Part 2 estimates the annual number of home care physicians who will provide end of life care in person using the figure derived in Part 1, by the following two methods:

Mortality method, Formula 1: Dividing mortality into projected annual home and nursing home deaths gave the projected number of annual home or nursing home patients, which was then divided by the average number of patients per physician.

Physician-to-patient ratio method, Formula 2: Using national survey data, the ratio of home care physicians to home or nursing home death patients is calculated and applied to projected annual home or nursing home deaths.

Finally, in Part 3, future home physicians divided by adjusted future proportion of home care physicians providing terminal care at home gives total future home care physicians.

Part 1

We first calculated estimates of home and nursing home deaths. In 2017, the National Institute of Population and Social Security Research (IPSS) provided a prediction of future total deaths [13]. Annual IPSS reports consider current and past age, sex, birth, death, and immigration data, providing high, low, and mid-range projections of future deaths.

We calculated future home or nursing home deaths, subtracting deaths on hospitals beds including clinics and geriatric health service facilities (GHSFs), and others including accidental deaths. Importantly, the *Regional Healthcare Vision* aims to facilitate home medical care rather than increasing hospital beds, thus reducing hospital deaths. Hence, we applied three models in our projections. The first assumed total hospital deaths as constant after 2017, given that the Japanese government basically opposes additional hospital beds (pragmatic government model). The second assumed a constant proportion of deaths in hospitals, implying unchanged health policy with increases following current trends (non-intervention model). The third model assumed a 1.1% annual decrease in hospital deaths from 2018 to 2025, following the government's reduction target from 1.31 million to 1.19 million beds by 2025 [14, 15]. This follows reports that available hospital beds correlate with hospital deaths [16]. However, hospital deaths are assumed to be constant after 2025 because of the growing elderly population (dynamic government model).

Government vital statistics in 2017 showed nursing home and GHSF deaths represent 7.5% and 2.5% of all deaths, respectively [17]. The Japan Cabinet study and Fukui et al reported that at most 8.6% and 12% of elderly Japanese prefer nursing homes or GHSFs, respectively [7, 18]. To estimate the minimum number of home deaths, we set the combined proportion of nursing home and GHSF deaths at 12% of all future deaths, and other causes of death at a constant 2.05% using the 2017 vital statistics [17].

After projecting home and nursing home deaths, two methods were used. We must note that the MHLW counts only clinics and hospitals which can provide home care and the number of times it is provided, and not exact numbers of home care physicians and home or nursing home patients.

Part 2

Mortality approach

The first method began by predicting future annual total home and nursing home patients by dividing deaths by mortality: 0.36 [0.32–0.40]/year. Mortality data were derived from a prospective Japanese multi-center home care cohort study [19]. Next, to predict the future number of home care physicians, the estimated total number of patients receiving home and nursing home care was divided by the average yearly number of home care patients per physician (42.2) (Figure 2, Formula 1). This was calculated as follows. The MHLW reported the average number of home care patients per home care support clinic (HCSC) (65.8) [20]. In addition, we calculated the physician-HCSC institution ratio (1.56) from a MHLW survey of home health care [21]. Finally, home and nursing home care patient numbers were divided by average patients per home care physician. Nursing homes were included because many home care physicians also provide care in nursing homes. Thus, serving in a nursing home also qualifies as home care medicine in Japan. Moreover, most Japanese home care medicine is supported by clinics. Therefore, our study also included future home care physicians at clinics.

Physician-to-patient ratio approach

The second method uses the ratio of home deaths to physicians shown in Figure 2, Formula 2. The MHLW does not monitor exact annual numbers of home or nursing home care patients and physicians, but in 2014, it conducted its triennial survey of all medical institutions in Japan, gathering data from one month (September) [22]. We estimated both numbers based on the 2014 survey, which showed hospitals and clinics taking part in home care and numbers of patients who died under a physician's care without incident (8,996). We estimated the number of home care physicians using the home health care survey, which provided the average number of physicians for each type of clinic and hospital [21].

Thus, we assume the precise number of monthly home care physicians (7,998), and consider it equal to the annual number of home care physicians. However, considering the ratio of home deaths to total deaths in September from the 2014 vital statistics, we estimate that 12,486 people died at home during this month; thus, the medical institutions survey might underestimate the number of home deaths because the figures were not reported by medical staff [23]. Hence, we regard 11,088 which is 7,998 times 12,486/8,996 as the highest number of home care physicians in 2014, with the annual number of home deaths being 162,599 [17]. Finally, our estimation uses a doctor-to-patient ratio between 0.0491 and 0.0682 which was applied to projected future home and nursing home deaths.

Part 3

Adjustment for proportion of deaths at home

After calculating the minimum future number of home care physicians, we considered the creation of training systems for home care physicians by adjusting for the proportion of patients dying at home instead of in hospital. Surprisingly, the state of Japanese home care medicine is such that only 52.7% of doctors attended at their patients' deathbeds [11]. Therefore, the minimum number of home care physicians should be about 1.90 times (1/0.527) the number who actually attend at deathbeds. This estimation can be confirmed in the national study [21], which reported that in 2014, 7,998 home care institutions took care of patients until death, but also showed there were at least 20,597 clinics and physicians regularly providing home care during a one-month period.

Moreover, we assumed that the proportion of those dying at home would gradually increase from 52.7% to 65.3% by 2040. This number (65.3%) is calculated as follows. As noted above, there are 4 types of clinics providing home care: enhanced single center HCSCs (345), enhanced multi-center HCSCs (2,593), ordinary HCSCs (11,624), and ordinary clinics, according to the latest figures from 2015 [22]. The MHLW and Nomura et al report the proportion of patients dying at home for each of the 3 HCSC types (76.1%, 64.9%, 65.5% and 77.8%, 88.3%, 59.3% respectively) [11, 21]. We multiply the number of each type of HCSC and each study's proportion of patients dying at home and average the results of the two studies. Finally, the averaged result is divided by the total number of HCSCs.

The formula is as follows:

HCSC home death proportion = Σ number of HCSCs × proportions of home deaths Total number of HCSCs

Average HCSC home death proprtion =

(Average HCSC home death proprtions from both studies) /2

Results

Figure 2 (here)

Past death numbers and locations, which are collected as a national vital statistic with 99.9% of death records, can be seen in Figure 2 (1954—2017) [17]. In the 1950s, most people in Japan died at home, though the proportion decreased until the early 21st century, while hospital deaths increased rapidly. Previously, Japan had nursing homes and GHSFs, which are essentially short-term nursing homes. After 1994, the government began counting nursing homes and GHSFs, and both have increased gradually.

The future projection shows the pragmatic government model (constant hospital deaths), suggesting that home and nursing home deaths will rise from 340,000 in 2020 to just below 600,000 until 2040 and then begin trending downwards to 480,000 in line with total deaths.

In our projections, a similar trend is seen in the dynamic government model. The number of deaths will rise steeply from 370,000 in 2020 to 530,000, and keep rising to 680,000 until 2040, when it will begin gradually decreasing to around 570,000. On the other hand, if the proportion of hospital deaths is steady until 2060, indicating no change in government health policy (non-intervention plan), the number of home care or nursing home care patients will stay constant at around 300,000. The trends found in the 3 models parallel each other quite closely, as shown by the bold lines in Figure 3. (Supplement 1)

Projected need for home care physicians

Figure 3 (here)

Mortality method (health and service needs approach)

Based on projected numbers of at home and nursing home deaths, the number of home care physicians attending at the time of death calculated using mortality (mid-range) in Figure 3 (bold lines) shows that demand will decrease gradually after 2040 before stabilizing. The pragmatic and dynamic government models both show over 35,000 home care physicians attending at the time of death by 2040, while the non-intervention model projects a steady trend hovering around 20,000. Additionally, among the mortality method estimates (high, mid, and low range), the differences between the high-mid and mid-low estimates in 2020 are about 9,000 and 7,000, respectively. Thereafter, the differences will gradually decrease to 5,000 and 4,000, respectively, by 2060. (Supplement 2)

Figure 3 (dotted lines) also reveals a similar up-and-down trend projected using the physician-to-patient method, suggesting that in 2040, the pragmatic and dynamic government models imply a need for 2–3 times more home care physicians than the non-intervention model.

Projection of total number of home care physicians after final adjustment

Figure 4 (here)

Our final results are shown in Figure 4, which illustrates minimum and total home care physicians using the mid-range death estimate and the mortality method with and without adjustment for the proportion of home deaths (52.7 → 65.3%). Demand for physicians will rise year by year without considerable

development of home care medicine, but with improvement, the need for physicians will stabilize after the mid 2030's. The current number of home care physicians is not precisely known because rather than directly counting home care physicians and patients, the Japanese government records numbers of clinics or visits to patients' homes. However, it is estimated to be around 38,000 (35,000 at clinics and 3,000 at hospitals). Nomura et al reported that in 2017, 4,386 clinics represented around 20% of all Japanese clinics providing home care medicine, and the number of physicians per-clinic was 1.6, suggesting that there are 35,088 home care physicians at all clinics [11]. Moreover, the MHLW survey shows 2,692 hospitals gave regular home care service in September of 2017 [23]. Because regular home care visits by physicians happen twice a month in Japan, we regard 2,692 as the annual number of hospitals providing home care medicine. After calculating that the number of physicians per-clinic is 1.1 based on anther MHLW survey [21], there appear to be about 3,000 (2,961) home care physicians at hospitals.

Sensitivity analysis

Figure 5 (here)

For sensitivity analysis, we compare projected numbers of home care physicians in 2040 in Figure 5. The mid-range projections using the mortality method in all three plans fall between the projections from the physician-to-patient method. In addition, the present (2017) number of home care physicians is estimated to be around 38,000 (including 35,000 at clinics). This is slightly above but very near our mortality method's (mid) estimation of 34,646 in 2017. We regard this difference as within an acceptable range because our estimation using the mortality method is mainly focused on home care physicians who engage in home care as a part of their regular work at home care support clinics, rather than part-time. In contrast, the present number of home care physicians includes those who provide home care as a minor part of their jobs at ordinary clinics or hospitals.

Discussion

We found that Japan will need an additional 22,000, or 1.59 times the current number of home care physicians by the mid 2030's. However, our study also shows that developing home care may help suppress the growing overall need for physicians. Further, demand for home care physicians will diminish after 2040.

Based on our projections, demand for home care physicians will have at least doubled by 2040. The estimation of future hospital deaths was based on three assumptions: the pragmatic and dynamic government models, and the non-intervention model. Among these, the non-intervention model is unrealistic considering dropping hospital admission statistics including total hospitals, total beds, and average stay length [23]. The dynamic government model (about 54,000—125,000 physicians in 2040) might underestimate the number of hospital deaths because of the steadily increasing aged population despite the whole population shrinking and the present and future longest life expectancy in the world until the year 2100, which implies a constant need for hospital beds [1]. Considering this, we believe that the pragmatic model (about 46,000—100,000 physicians in 2040) is the most realistic projection. Hence, in order to supply sufficient home health care smoothly preparing for growing aged population, our results suggest that the Japanese government must increase the number of skilled home care physicians. However, the results also suggest that demand for home care physicians will decrease long-term. Therefore, reduction in home care physician training should be considered in the 2030's.

Our analysis employed two methods: the health and service needs method, and the workforce-to-population ratio method. In the first, we used mortality among home care patients in the previous multi-center study with a sufficiently narrow 95% confidence interval. We regarded this as a modification of the health and service needs approach which, though simple, supplies reliable projections by considering the influence of multiple factors such as political action and patient needs for home care physicians. Second, the physician-to-patient ratio method, which is a variant of the workforce-to-population method, is straightforward and widely used [24]. Although it has some potential drawbacks such as future homogeneity of the physician-to-patient ratio, we used it in a supplemental capacity, and it produced similar results.

While our methods depend on some assumptions, our estimations are highly reliable. This is evidenced by the small difference between our mortality method mid-estimation and the present number of home care physicians in 2017, which are reached through wholly different methods. Where the mortality method is based on the number of future home deaths and mortality, the present number of home care physicians is based on counts of clinics and hospitals and physicians per institution. Furthermore, our results agree with past studies forecasting numbers of physicians, which anticipated increases into the 2030's [25, 26]. We are therefore convinced that our projections are not unreasonable.

While many medical workforce analyses have covered physicians, primary care physicians, surgeons, specialists, and nurses, we are aware of no published reports projecting home care physicians at the time of this writing. The problems of an ageing society are not peculiar to Japan and industrialized countries; the elderly population in developing regions is increasing more rapidly than in developed regions [2]. Much might be learned from Japan's response to these issues. This study employed relatively simple methods with potential for broad application: the health and service needs approach and the workforce-to-population ratio approach [11].

There are some limitations to our study. First, our estimations were limited by the accuracy of available data, including the fact that the future nursing home death number was based on patient preferences [18]. Also, our mortality data comes from an interim analysis presented at an annual conference, although we believe the figures are precise [19]. Second, while our two methods produced similar projections, which suggests valid estimations, it is difficult to completely account for present and future variability, such as drastic changes in health policy or natural calamities. Our results depend on the average yearly number of home care patients per physician, which can vary over time and according to public policy. Geographical disparities and other variables such as future development of nurse practitioners affect the number of physicians, with wide gaps between physician-rich and physician-poor areas [27]. Finally, practical

constraints required us to make several assumptions in applying the available data. For example, we applied the physician-to-patient ratio from home deaths in 2014 to future home and nursing home deaths. With accurate nursing home physician data, we could estimate more precisely. Further, while the mortality approach mainly focuses on home care support clinics, the physician-to-patient ratio approach includes home care support and ordinary clinics. All of these limitations should factor into further studies projecting numbers of home care physicians.

Conclusion

Our findings indicate an increasing need for home care physicians through 2040, anticipated to rise to at least 60,000, which is about 1.6 times the current number. However, demand for these physicians will decrease, then stabilize by 2060. The improvement of home care medicine could positively influence changes in the physician workforce.

Abbreviations

MHLW: The Ministry of Health, Labour and Welfare in Japan (MHLW)

IPSS: National Institute of Population and Social Security Research in Japan

GHSF: Geriatric health service faculties

HCSC: Home care patients per home care support clinic

Declarations

Ethics approval and consent to participate

This study was approved by the Jikei University School of Medicine ethics committee. The Jikei University School of Medicine's homepage showed the notification of our study. There were no consents to participate and participants in our study because our study is a kind of workforce analysis using open data on the internet, not using data of individual participants.

Consent for publication

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

M. Matsushima is a program director for the Jikei Clinical Research Program for Primary-care, an adviser for the Centre for Family Medicine Development (CFMD) practice based research network, and has received lecture fees and travel allowances from CFMD for lectures.

Y. Satoi and Y. Hinata are current residents in family medicine at CFMD.

T. Watanabe, K. Yokobayashi are former residents in family medicine at CFMD.

Y. Fujinuma is a program advisor for the Jikei Clinical Research Program for Primary-care, and has received lecture fees and travel allowances from The Jikei University School of Medicine.

E. Yoshida, Y. Satoi, Y. Hinata, and H. Iwata are currently trainees in the Jikei Clinical Research Program for Primary-care.

T. Watanabe, K. Yokobayashi, and Y. Sugiyama are former trainees in the Jikei Clinical Research Program for Primary-care.

There is no potential competing interest to be declared relevant to this work other than the above description.

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Authors' contributions

HI, as the lead author, developed the methods, collected data sources, and contributed to the whole process of manuscript preparation.

MM helped to develop the mortality method and contributed to the whole process of manuscript preparation.

DS, KY, and YF helped to develop the mortality method and research the Japanese home care medicine system.

TW contributed to the description of the system of home care medicine in Japan and advised on the mortality figure and mortality method calculations.

Y. Satoi, EY, and YH gave general advice and checked calculations and data sources for both methods.

Y. Sugiyama recalculated the whole process and estimated the present number of home care physicians.

SS checked the references and their validity and compatibility with our manuscript.

All authors have checked the manuscript critically at least four times.

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Figures

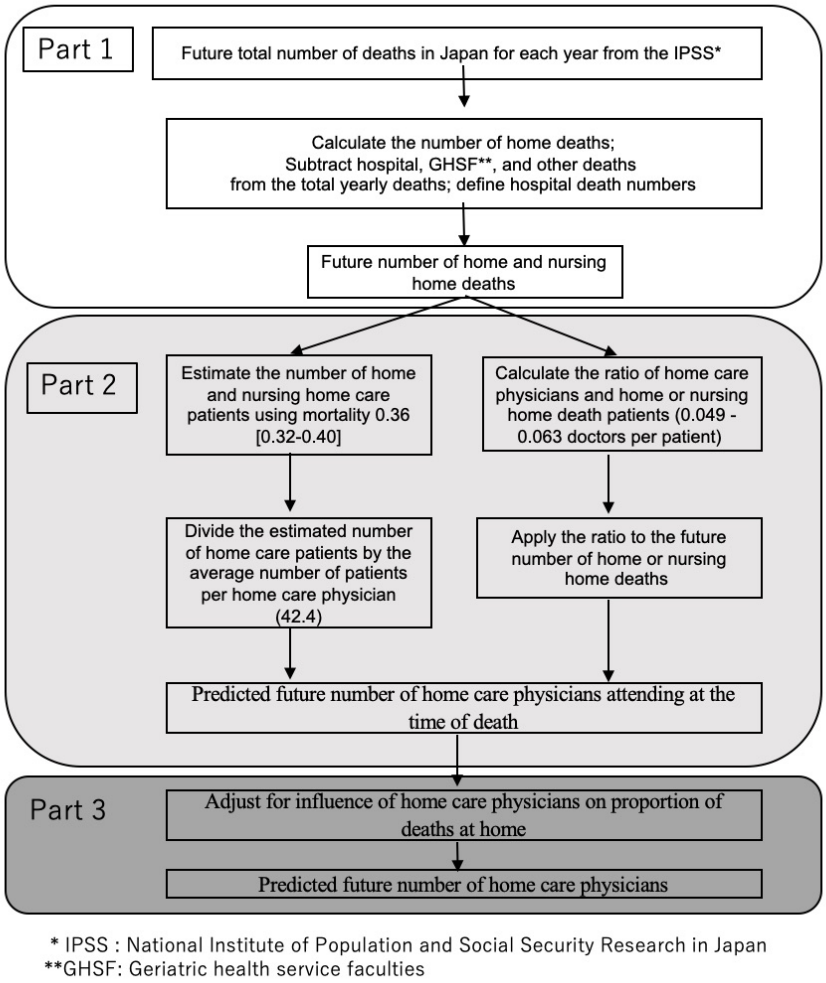
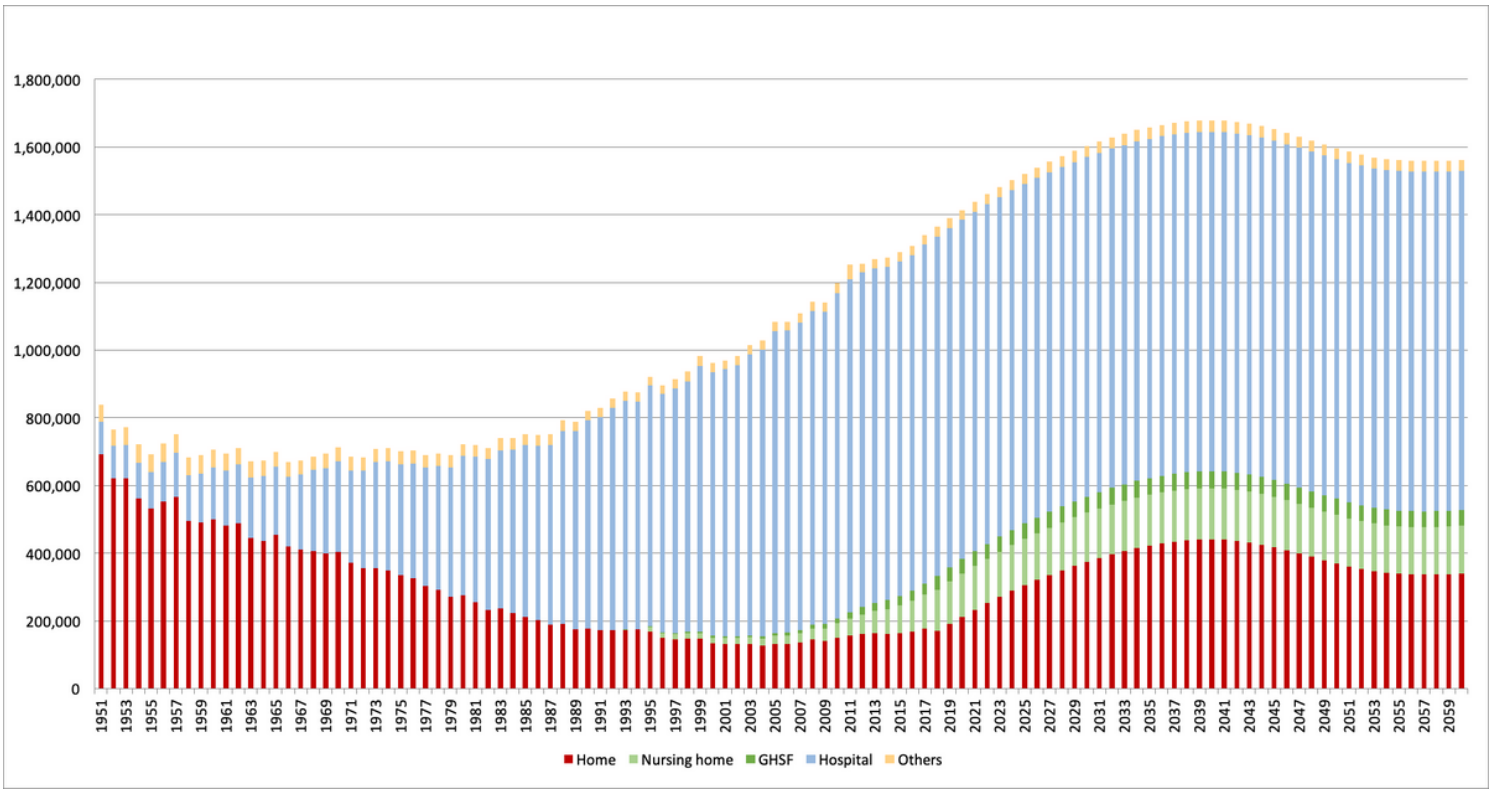


Figure 1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Home
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GHSF
Hospital
Others

Figure 2

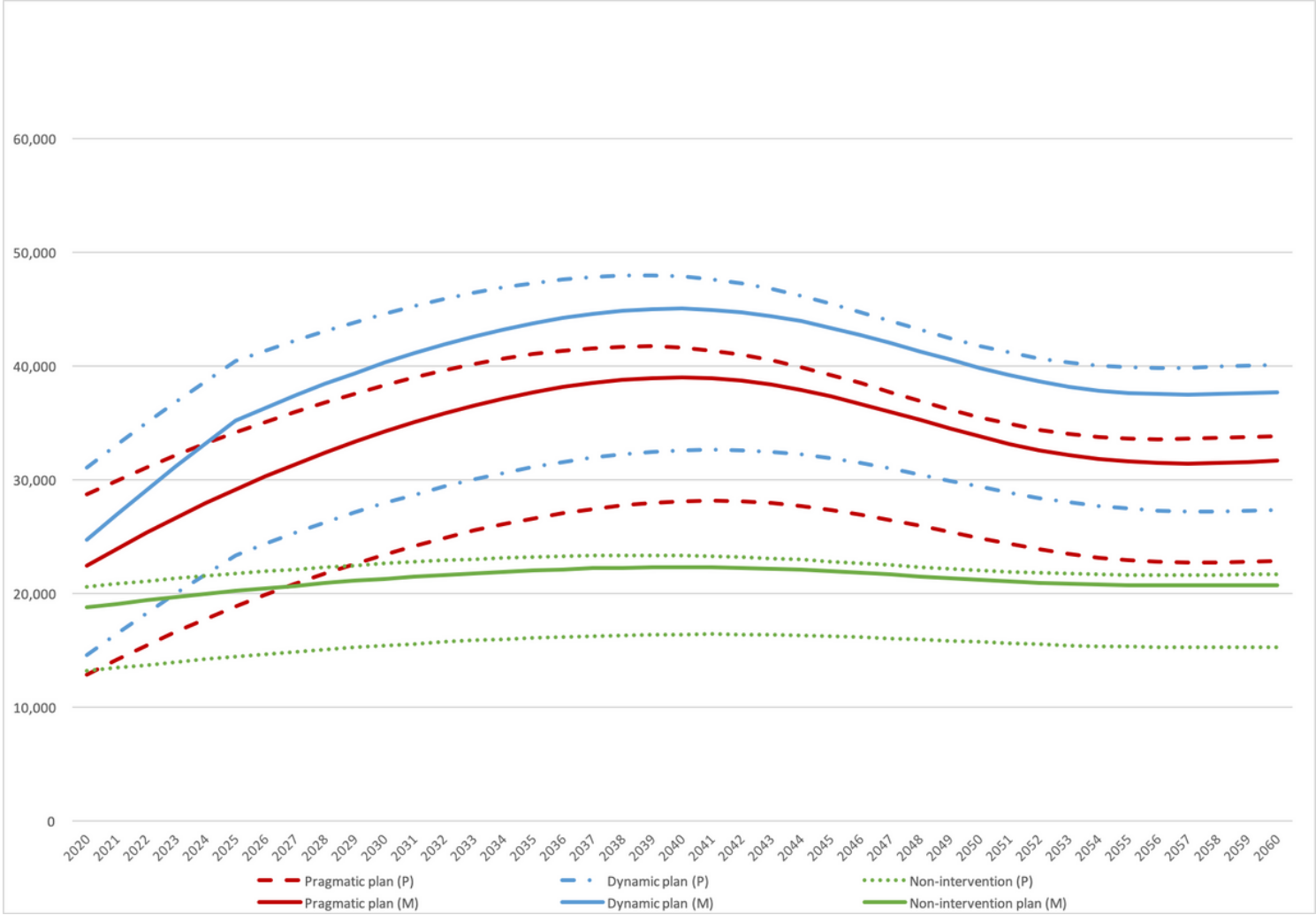
60,000
50,000
40,000
30,000
20,000
10,000
0
Pragmatic plan (P)
Dynamic plan (P)
Non-intervention (P)
Pragmatic plan (M)
Dynamic plan (M)
Non-intervention plan (M)

Figure 3

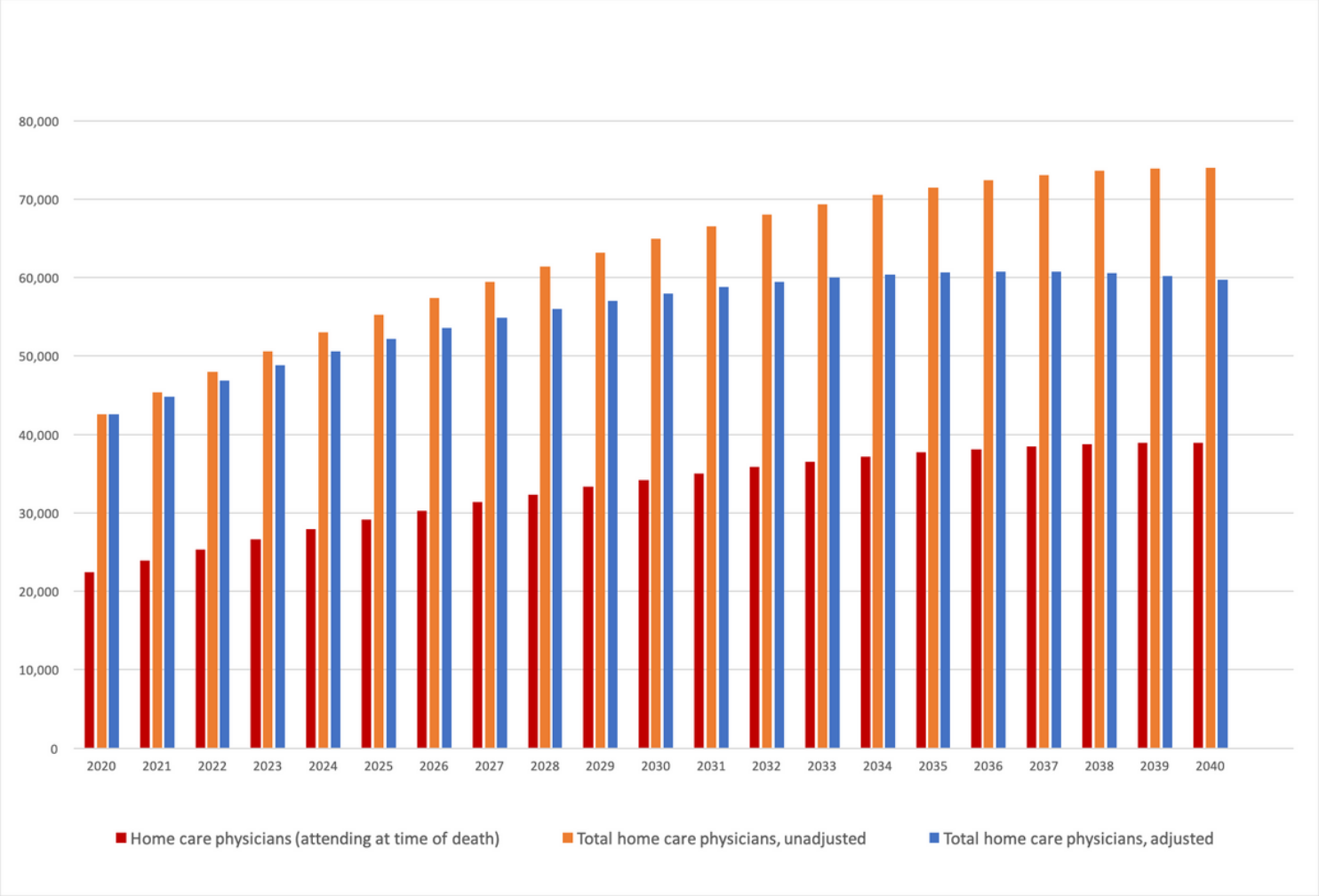

Figure 4

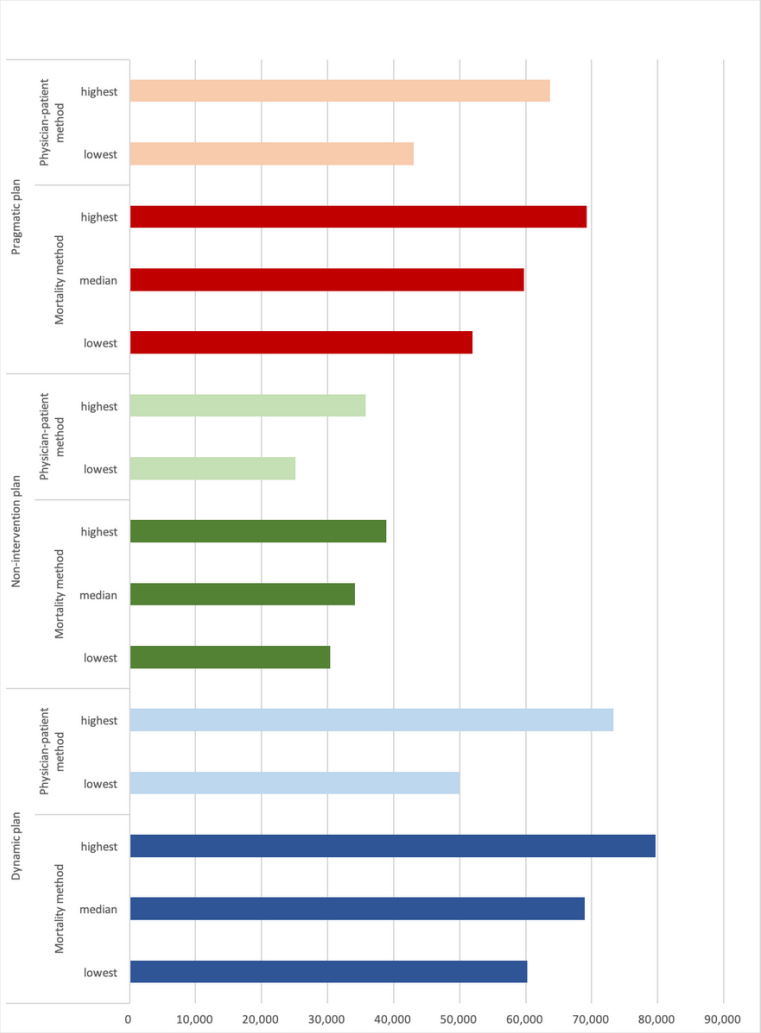

Figure 5

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- supplement1.png
- supplement2.png