Gender Disparities in Healthy Life Expectancy at Older Ages: A Cross-National Comparison

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**Introduction**

Population aging is a key challenge of the 21st Century. By 2050, the number of persons aged 65 years and older is projected to double to 1.5 billion, compared with the 703 million in 2019 (United Nations Population Prospects, 2019 Revision). Survival beyond age 65 is increasing at a fast pace, with high income countries expecting to add a further 7 years of survival, from 17.9 years to 23.9 years in the period. This demographic change marks a remarkable achievement in human history, but it comes with important societal challenges, such as pressures in the healthcare sector, increase in fiscal imbalances and higher disease burden. Most importantly, the drivers and consequences of aging are not gender neutral. Despite their higher longevity, women expect to spend a higher proportion of their lives in poorer health, presenting worse indicators of disability, chronic morbidity, and self-rated health outcomes for all countries in the world (Crimmins et al., 2002; Luy and Minagawa, 2014; Robine et al., 2001; di Lego et al., 2019; 2020; Nepomuceno et al., 2021). In addition, women are the main recipients of formal long-term care services over the age of 65, both at home and in institutional settings, due to their higher prevalence of debilitating conditions such as arthritis, fall-related fractures, and dementia. These conditions limit women’s ability to remain independent, engage in social activities, and often demand long-term care (Freedman et al., 2016). Women also face widowhood at an earlier age, have lower labor force participation rates, and tend to retire earlier with lower income than men, being more exposed to poverty and financial insecurity, as their economic resources are more limited (Ruel and Hauser, 2013). Not only this makes lives more vulnerable for women overall, but it is also incredibly costly: total losses (in terms of GDP) associated to the burden of chronic conditions in extremely aged societies have been shown to be a staggering $16 trillion for China, $5.7 trillion for Japan, and $1.5 trillion for South Korea over 2010-2030 (Bloom et al. 2019). Consequently, in order to ensure healthy and equitable aging for all, gender gaps must be considered and better understood.

Gender disparities in health have often been measured through gaps in healthy life expectancy indicators, as it is a summary measure that allows for quantifying the level of average health across different domains and population groups (Murray et al. 2002; Nusselder et al. 2010; Robine et al. 2009; Van Oyen et al. 2010; Yokota et al. 2019). However, due to the complex interplay between health and mortality, considerable gender differences in mortality and disability can be masked when only the total gap is analyzed.

(Mairey et al. 2014; Nusselder et al. 2010; Nusselder and Looman 2004; Van Oyen et al. 2013, Nepomuceno et al. 2021). Indeed, as health is expected to be highly correlated to mortality, there is no conclusive explanation for why, despite living longer than men, women have overall poorer health, a phenomenon that has been deemed contradictory and referred to as the “male–female health-survival paradox” (Rieker and Bird 2005; Gorman and Read 2006; Kulminski et al. 2008; Oksuzyan et al. 2018; Crimmins et al. 2002; Spiers et al. 2003; Luy and Minagawa 2014; Luy and Wegner-Siegmundt 2015; Luy 2016; Yokota et al. 2019). For this reason, decomposition analyses that evaluate the role of mortality and disability in explaining gender differences in healthy life expectancy have been shown to be important, as considerable gender differences in mortality and disability can be masked when only the total gap is analyzed (Mairey et al. 2014; Nusselder et al. 2010; Nusselder and Looman 2004; Van Oyen et al. 2013, Nepomuceno et al. 2021). Furthermore, gender gaps in health are country-specific, as different countries not only have specific health and mortality trajectories but their own cultural and gender roles, which may in turn affect the differentials (Okojie 1994; WCF 2018). Therefore, it is crucial to quantify health inequalities by gender and across countries with different levels of development in order to retrieve valuable insights for healthy aging at older ages.

In this paper, we quantify the relative contribution of disability and mortality to explain the gender inequality in healthy life expectancy across U.S., England, Korea, China, India, Mexico and selected European countries for years 2014-2015 and 2017-2019 at ages 60 and over. Our work takes advantage of the harmonized versions of data from the international aging and retirement studies developed by the USC Program on Global Aging, Health, and Policy, which allow for a unique opportunity to perform comparisons among identically defined variables across countries. We focus on harmonized HRS (U.S.), ELSA (England), KLoSA (South Korea), CHARLS (China), LASI (India), MHAS (Mexico) and SHARE (EU Countries) due to their unique epidemiological and mortality trajectories coupled with country-specific gender roles, which enable us to investigate gender inequality in health and mortality in different settings. We estimate disability- and chronic-free life expectancies (DFLE and CFLE) for ages 60 and over using the Sullivan Method (Sullivan 1971; Crimmins et al. 2016). For disability, we use the harmonized dummy variable constructed from a 5-item list of activities of daily living (ADLs), which include bathing, dressing, eating, getting in and out of bed, and using the toilet. For chronic diseases, we use the harmonized variables on specific chronic conditions diagnosed by a physician, which include diabetes, heart conditions, arthritis, cancer, stroke and lung disease. The choice of years refers to the most recent waves for which harmonized data on health for this set of countries is available and there is concordance across surveys. We thus used waves pertaining to year 2014-2015 (HRS: Wave 12; ELSA: Wave 7; SHARE: Wave 6; KLoSA: Wave 5; CHARLS: Wave 2; and LASI Wave 1). The only exception is India, since the first wave of LASI was carried on between 2017-2019. We focus on age 60 and above to be coherent towards the definition of old age across countries. While most developed countries define old age as 65, for China and Mexico it is age 60. Lastly, we apply the continuous change decomposition method (Horiuchi et al. 2008) implemented in R by Riffe (2018), so we can split gender differences in healthy life expectancy into mortality and disability/chronic disease effects by age (van Raalte and Nepomuceno 2020; Nepomuceno et al. 2021). By performing cross-country comparisons and looking into countries that have different cultural outlooks on gender we can provide further insights into how gender may interact with health and mortality in countries with different gender norms, welfare state systems, level of socioeconomic development and epidemiological contexts.

**Material and Methods**

**Data**

The data is from the Gateway to Global Aging Data, produced by the Program on Global Aging, Health & Policy that created harmonized versions of sister-HRS studies. The harmonized versions have followed the RAND HRS conventions of variable naming and data structure which allow for cross-country comparisons. We will use the harmonized versions available for HRS (United States), ELSA (England), KLoSA (South Korea), CHARLS (China), LASI (India), MHAS (Mexico), and Europe (SHARE). In order to perform comparisons at points in time that were as close as possible across countries we used survey waves pertaining to year 2014-2015 (HRS: Wave 12; ELSA : Wave 7; SHARE: Wave 6; KLoSA: Wave 5; CHARLS: Wave 2; and LASI Wave 1). The only exception is India, since the first wave of LASI was carried on between 2017-2019.

More generally, we focus on this specific set of countries as our aim is to have the most diverse group of countries while retaining the highest possible level of concordance across the harmonized health variables. Hence, we choose these countries and years due to the following specific reasons: 1. these are the available countries for which the highest possible concordance among surveys is available for health information; 2. these countries have unique epidemiological and mortality trajectories that include countries with fast-paced mortality transitions, such as Korea and slow pioneering countries like Sweden; 3. Different welfare state models and gender roles, which enable us to investigate whether specific gender patterns in inequality in health and mortality emerge in those settings.

Table 1 shows the concordance among surveys across all years available and provide an overview of our variables of interest.

Table 1. Concordance among surveys across all years available



Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153)

We use life tables from the 2022 Revision of World Population Prospects (United Nations 2022). for all countries with the exceptions of England, where the life tables from the ONS estimates, as ELSA does not include Wales.

**Methods**

To examine gender disparities in health expectancy, we estimate the disability-free life expectancy (*DFLE*) and the chronic-free life expectancy (CFLE) using the Sullivan Method (Sullivan, 1971), a methodological approach that has been used before in similar analyses (e.g., Crimmins, Zhang and Saito 2016). For each age group, we estimate the prevalence of disability and at least one chronic doctor diagnosed condition from the survey data for each country and combine it with the total number of person-years lived obtained from the life tables. The number of person-years lived free of disability () is calculated as,

where *nLxi*  is the number of person-years lived without disability between ages *x* and *x+n*, *nLx* is the total number of person-years lived in the age group *x* and *x+n*, and *nπx* is the proportion of disabled individuals in the age group *x* and *x+n*. The same is for chronic-free person-years lived, however with the prevalence for at least one chronic condition instead of prevalence of ADLs, and we call the person-years derived by the same process as .

Then, life expectancy free of disability (*DFLE*) is calculated as:

With its equivalent life expectancy free of chronic disease (*CFLE*):

where *DFLEx* is the number of years lived without disability at age *x*, *w* is the starting age of the open age interval, and *l*x is the number of survivors at age *x*. Similarly, is the number of years lived without chronic conditions at age *x*, *w* is the starting age of the open age interval, and *l*x is the number of survivors at age *x*.

We then calculate gender gap in *DFLE* as:

And the gender gap in *CFLE* as:

We later split the gender differences in *DFLE* and *CFLE* at age *x* into mortality and disability/chronic effects by five-year age groups. To decompose the gap, we apply the continuous change decomposition method that was developed by Horiuchi et al. (2008) and implemented in R by Riffe (2018). The continuous change decomposition method assumes that covariates (e.g., age-specific mortality rates and age-specific prevalence of disability) change continuously along an actual or hypothetical dimension, such as between two periods or between two populations, thereby modifying aggregate measures such as life expectancy and healthy life expectancy. Each of these tiny changes in the aggregate indices can be approximated by a linear combination of *n* partial derivatives of the function with respect to the covariates (Horiuchi et al. 2008). Then, numerical integration is used to obtain the total contribution of the covariates for the variation of the aggregate measure. This allows us to estimate the contribution of disability and chronic conditions to explaining gender inequality. In addition, the method is very flexible, and can be used for decomposing gaps in different aggregate measures, including healthy life expectancy, as presented by van Raalte and Nepomuceno (2020). Previous research has employed the methodology to estimate gaps in disability for LAC countries (Nepomuceno et al., 2021).

**Results**

We present a descriptive analysis on Table 2 of the survey samples and statistical tests that were performed to assess whether there are significant gender differences across all surveys regarding our variables of interest. Due to the complex survey design, the analyses are weighted and use the Wilcoxon rank-sum test. Overall, observed differences in estimated prevalence across total samples are significantly different for women and men, with women experiencing higher prevalence of ADLs and at least one chronic doctor diagnosed disease. However, when considering differences between both genders for each specific chronic condition, the results are not as straightforward. For Mexico, Korea and England, there is no significant difference between women and men for heart conditions, while for China, US, Europe and India it is significant. Interestingly, while the difference is in favor of women, with men experiencing higher prevalence of heart conditions across most countries, China is the only exception, with a larger share of women reporting having a heart condition compared to men.

Table 2. Weighted survey samples for each country and Wilcoxon rank-sum test for gender differences in variables for each country

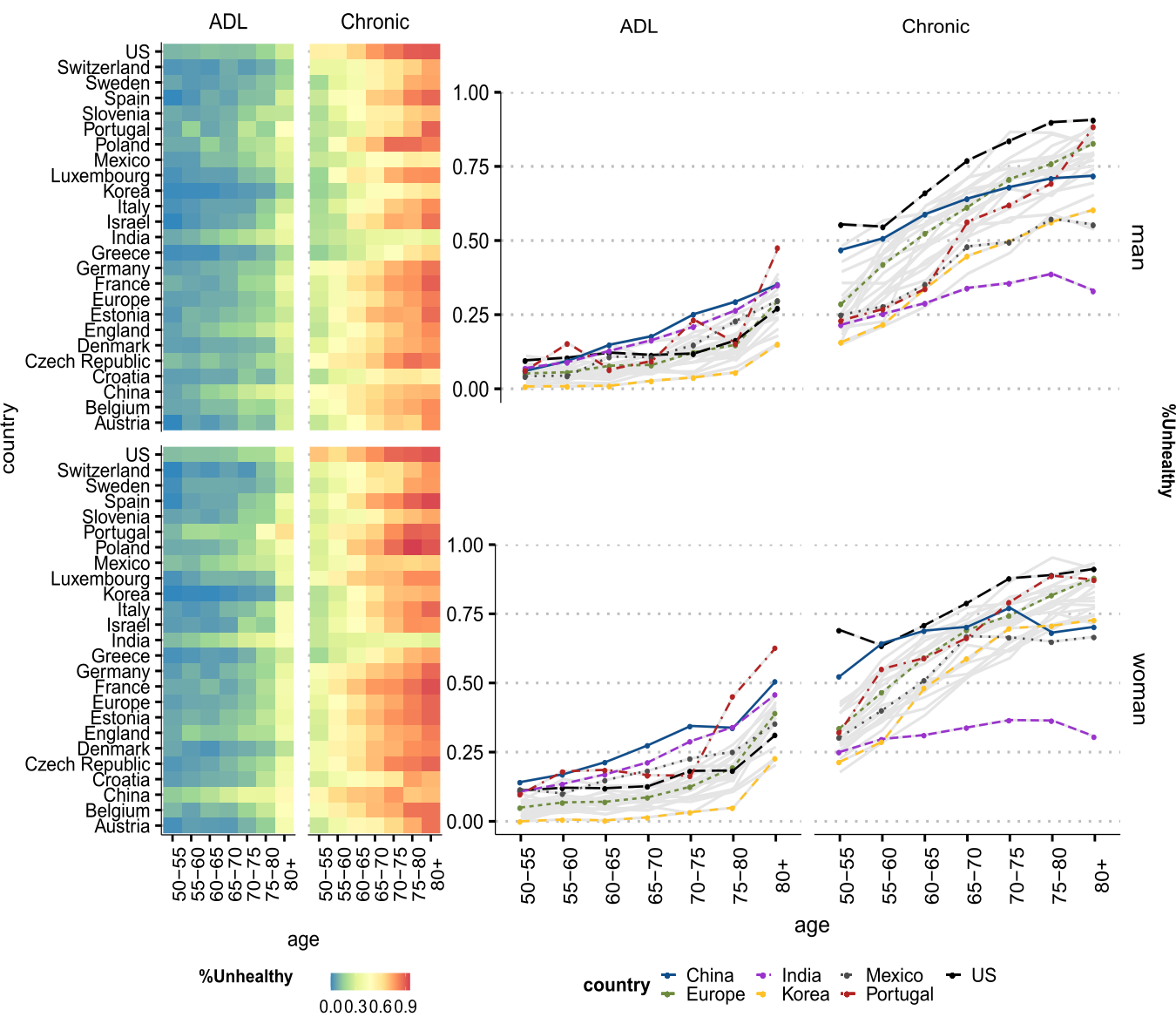


Arthritis is a condition that is significantly different across all samples, with women being disadvantaged when compared to men for all countries. Lung disease is significant in China, US, Mexico and India, but not in Korea, England and Europe, with prevalence being higher among men in China and India, but higher among women in the US and Mexico. Stroke is significantly different between women and men only in China and India, with higher shares of men reporting having had stroke, but not in any other country. Cancer is also more prevalent among women for all countries. However, differences in the overall sample between women and men are not significant for the US. Lastly, larger shares of women have higher number of concomitant conditions, relative to men, with differences across all samples being significant.

*Age-Specific Prevalence*

Using the respective weighted proportions of women and men who report a limitation in activities of daily living (ADL) and of at least one chronic doctor diagnosed disease (Chronic) in the population for each survey, we computed the prevalence of unhealthy individuals for each condition and by 5-year age groups, as shown in Figure 1. The right panel shows most countries in shaded grey lines in the background to show the overall age pattern for women and men, and highlights some countries to present some country range values and examples of countries that deviate from the overall pattern. Overall, the prevalence of ADLs increases with age for both women and men, with a steeper increase happening from ages 70+ in most countries. Women from Portugal have a notable jump in their prevalence from ages 70+, surpassing all other countries considered. The same happens for men above age 80. Aside from this notable exception, most countries have prevalence that are below those of China and India, respectively. Korea presents the lowest prevalence of disability of all countries, both for women and men. Average prevalence is low and with stable and small incremental increases from ages 60+, with the greatest increase starting from age 75. Most values are within the range between Korea and China, which are the extreme low and high levels, respectively, for both women and men. The US age pattern falls between those two range of values Korea and England.

**Figure 1**. Prevalence of unhealthy women and man by activity of daily limitation (ADL) and doctor diagnosed chronic conditions (Chronic), by age, all countries (left panel) and selected countries (right panel).



Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153). *Notes:* Chronic is defined as being diagnosed with at least one of six doctor diagnosed conditions present at all country surveys that were harmonized: 1. Arthritis, 2. Cancer, 3. Diabetes, 4. Heart Conditions, 5. Lung disease, 6. Stroke. For more details on how diagnoses are defined and which criteria are used, refer to the Appendix I on Data. For country-specific profiles for each condition, also see individual figures in Appendix III.

The overall pattern for women across countries is more dispersed than for men, with the difference between Korean women and Chinese and Indian being higher than for men. Compared to the age pattern of men, women have a higher rate of increase in prevalence across all countries with age, with the burden increasing at a much faster pace. Chinese and Indian women have a prevalence rate level at ages 60-65 that is only observed at ages 70-75 for men, a gap of almost 10 years.

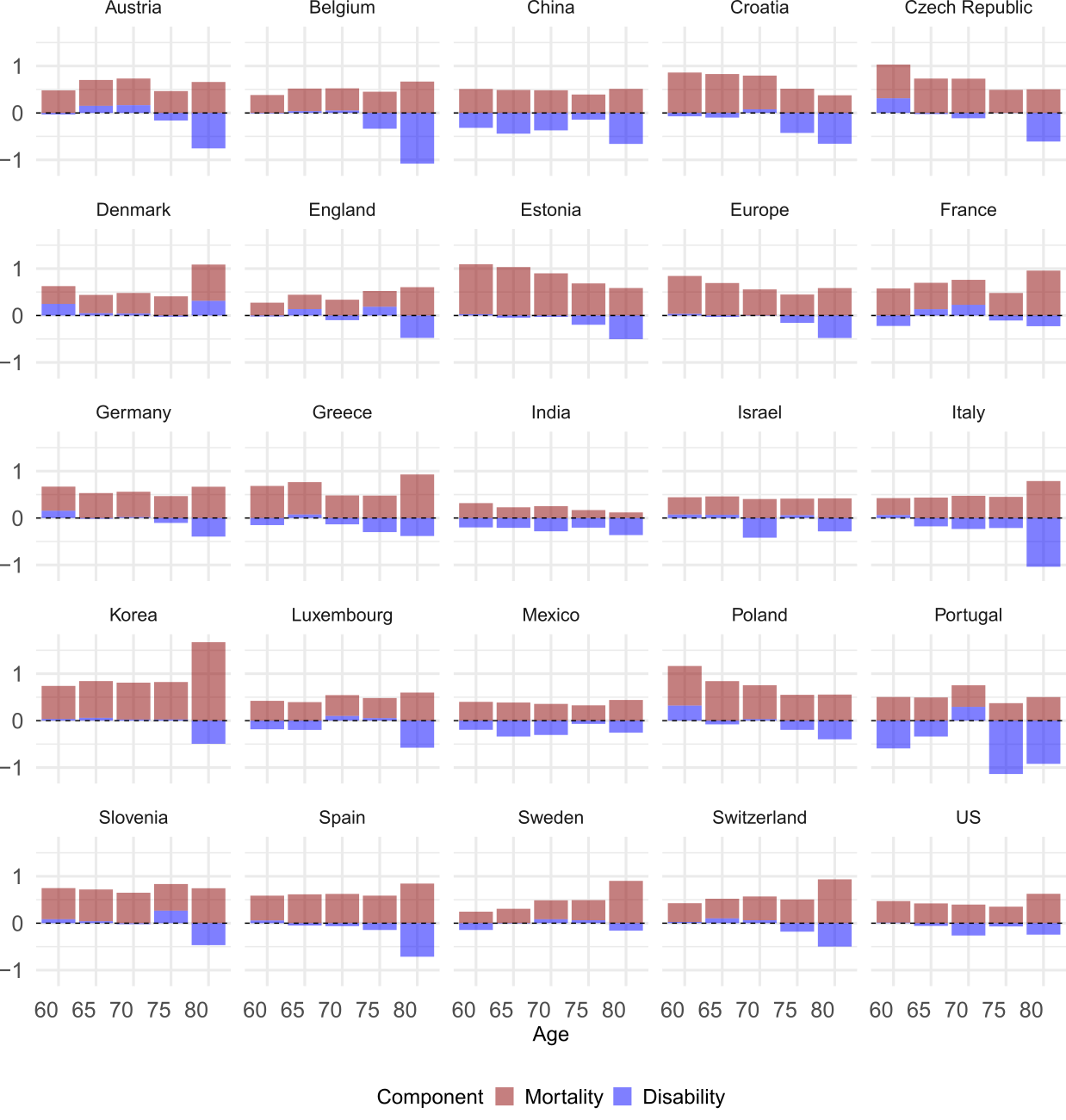
However, the figure changes when we analyze chronic conditions. First, the prevalence of having at least one chronic condition is higher than experiencing limitation in daily activities already at age 50 and increases at all ages for both women and men at all countries. The US has the highest prevalence for women and men at all ages compared to all countries. China is right after the US with the highest prevalence at relatively younger ages (50-60), but then levels off, while other countries still experience and increase in prevalence with age. After age 60, the country with the lowest prevalence of at least one chronic condition is India. Among the countries in the European regions, Portugal and Poland, as shown in the heat map in the left panel are the ones with the highest prevalence of at least one chronic condition at ages above 60.

*Decomposing the gender gap into contributions of mortality, disability and chronic conditions*

As a second step, we combine the age-specific prevalence with the respective lifetables for each country in order to derive disability-free life expectancy (DFLE) and chronic-free life expectancy (CFLE). Afterwards, the continuous change decomposition method (Horiuchi et al. 2008) is implemented to split gender differences in healthy life expectancy into mortality and disability/chronic disease effects by age.

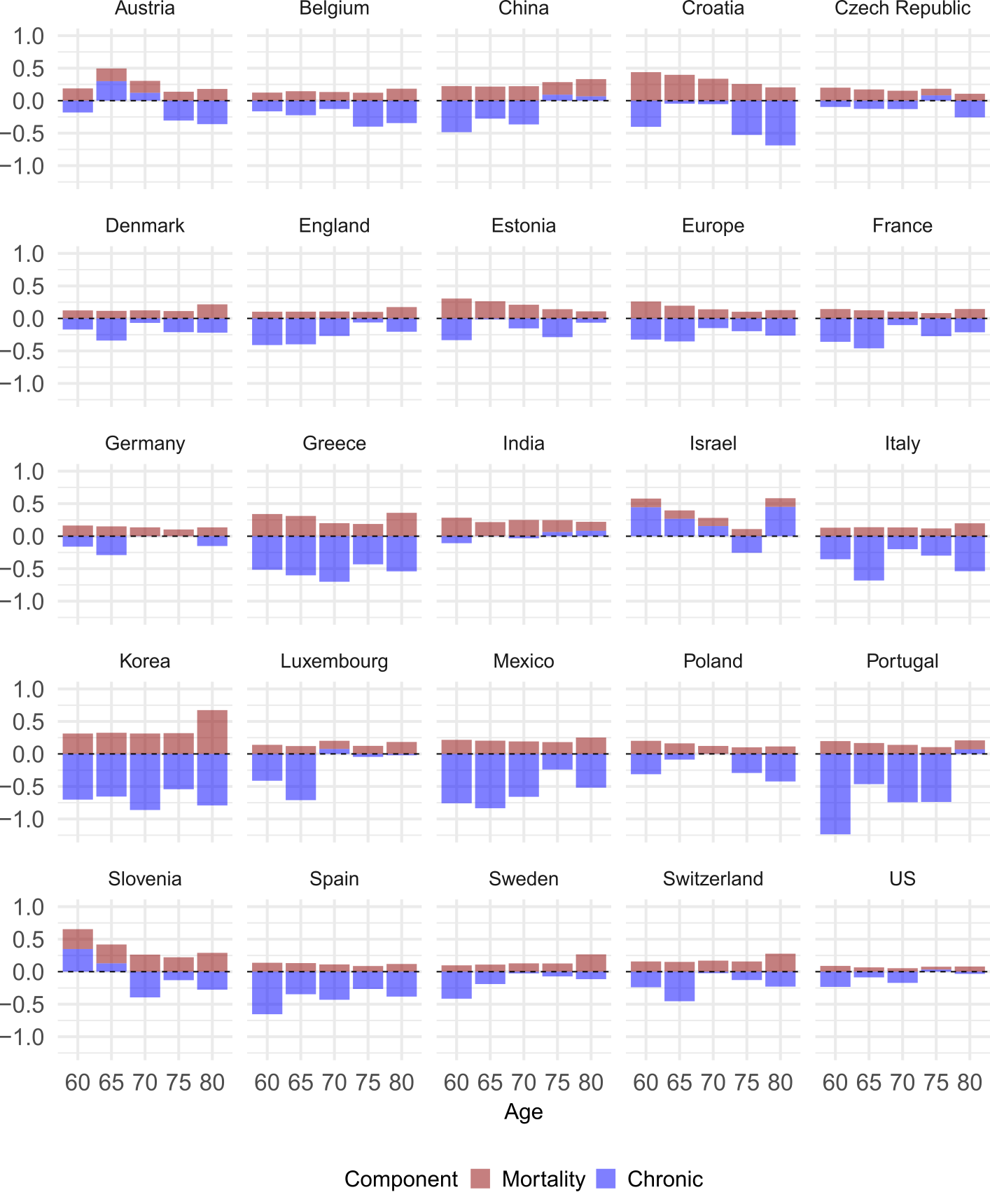
Figure 2 shows the decomposition of the gender gap in DFLE into mortality and disability effects by five-year age groups for all countries, while Table 3 presens the figures for ages 60+. India and Portugal are the only countries where women have a disadvantage relative to men in terms of disability-free life expectancy at age 6o+ (-0.17 and -0.37, respectively). In both countries, this is explained by a larger effect of disability (-1.26 and -2.70, respectively). Korea is the country with one of the highest gaps at ages 60+ in favor of women both in terms of life expectancy (5.56 years) and disability-free life expectancy (4.39 years). The contribution stems mainly from the mortality advantage of women in Korea (4.74 against -0.35 the role of disability).

**Figure 2.** Decomposition of the gender gap in disability-free life expectancy (DFLE) into mortality and disability effects by five-year age groups and country.



Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153). *Notes:* Chronic is defined as being diagnosed with at least one of six doctor diagnosed conditions present at all country surveys that were harmonized: 1. Arthritis, 2. Cancer, 3. Diabetes, 4. Heart Conditions, 5. Lung disease, 6. Stroke. For more details on how diagnoses are defined and which criteria are used, refer to the Appendix I on Data. For country-specific profiles for each condition, also see individual figures in Appendix III.

**Figure 3.** Decomposition of the gender gap in chronic-free life expectancy (CFLE) into mortality and chronic effects by five-year age groups and country.

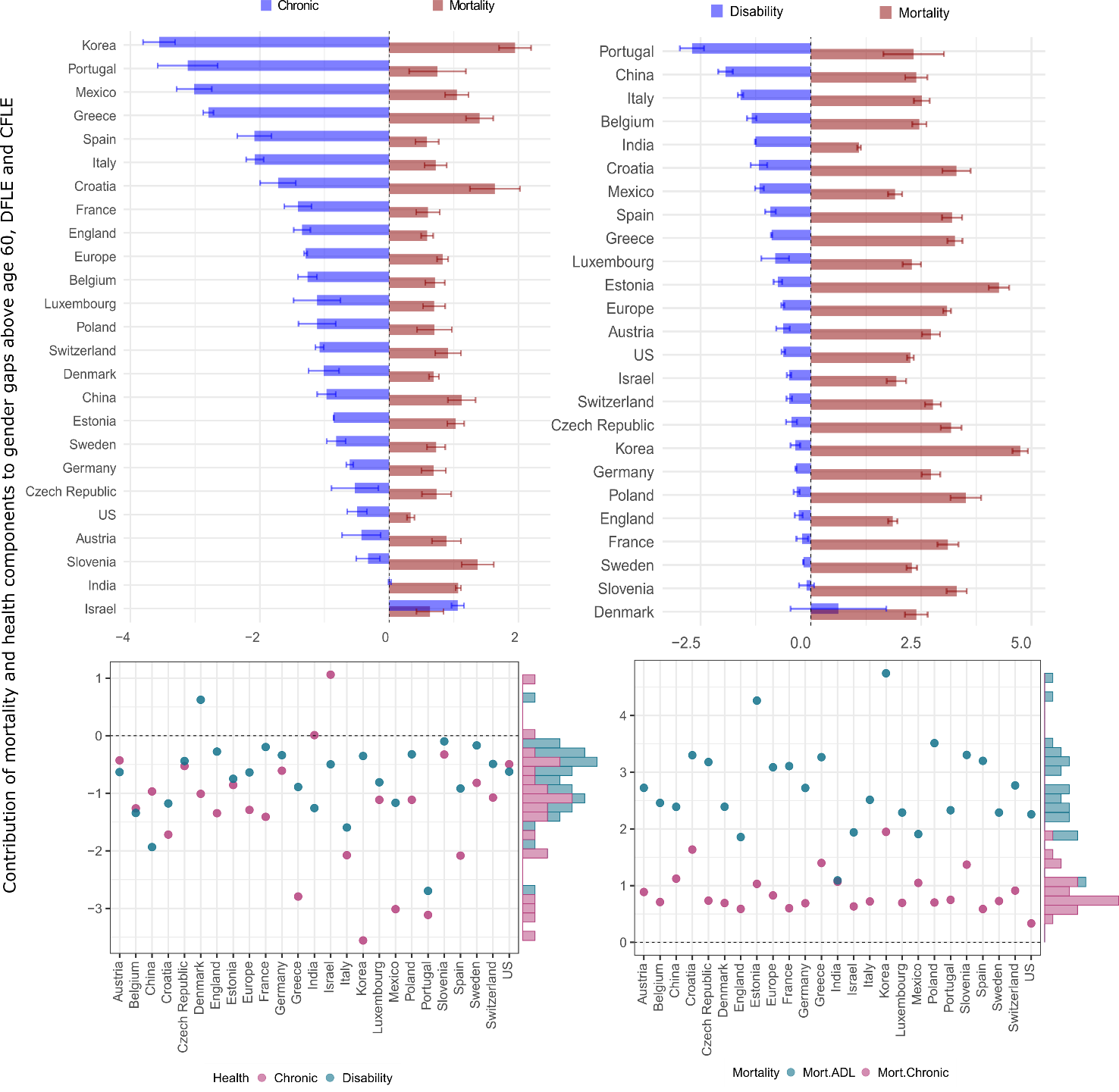
Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153). *Notes:* Chronic is defined as being diagnosed with at least one of six doctor diagnosed conditions present at all country surveys that were harmonized: 1. Arthritis, 2. Cancer, 3. Diabetes, 4. Heart Conditions, 5. Lung disease, 6. Stroke. For more details on how diagnoses are defined and which criteria are used, refer to the Appendix I on Data. For country-specific profiles for each condition, also see individual figures in Appendix III.

In Mexico, the combination of a high prevalence of disability among women (-1.17 years) and a smaller women’s mortality advantage (2.64 years) resulted in men and women having a similar number of healthy years of life after age 60, a result that goes in line with previous analysis that focused on Mexico City for year 2000, using the SABE survey (Nepomuceno et al., 2021).

Figure 3 presents the same results but for decomposing the gender gap in CFLE, while Table 4 shows the values for ages 60+. Interestingly, the figure changes, and mort countries have a negative gender gap in CFLE, representing a disadvantage towards women also in terms of absolute number of years lived free from at least one chronic condition. As shown in country-specific figures in the Appendix, this is mostly driven by the large impact of arthritis among women. Most of the gap for chronic-free life expectancy is thus explained by the role of chronic conditions and not mortality.

Figure 4 focuses on age 60+ and shows how would countries be differently ranked according to the highest impact of health on both DFLE (right top panel) and CFLE (left top panel) as components of the decomposition (with 95%CI intervals on the bars. For 95% CI estimates on all indicators refer to Tables A1-2 in the Appendix). In the bottom part of Figure 4 we show the range of value distribution of each component of the decomposition, with a marginal distribution on the right. The contribution to the gender gap in CFLE for Korea is driven by a strong effect of chronic conditions, placing Korea as the country for which the gap is more strongly explained by chronic disease, followed by Portugal and Mexico. For DFLE Portugal is the first and Korea is ranked among the lowest contribution of disability to explain the gender gap in DFLE.

**Figure 4.** Decomposition of the gender gap in disability-free life expectancy (DFLE) and chronic-free life expectancy (CFLE) at ages 60+ into mortality and chronic effects by country.



Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153). *Notes:* Chronic is defined as being diagnosed with at least one of six doctor diagnosed conditions present at all country surveys that were harmonized: 1. Arthritis, 2. Cancer, 3. Diabetes, 4. Heart Conditions, 5. Lung disease, 6. Stroke. For more details on how diagnoses are defined and which criteria are used, refer to the Appendix I on Data. For country-specific profiles for each condition, also see individual figures in Appendix III.

Table 3. Decomposition of the gender gap (women-men) in total life expectancy (LE), disability-free life expectancy (DFLE) and life expectancy with disability (LEWD) into mortality and disability effects at age 60

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Country | LE | DFLE | Components | | LEWD | Components | |
| Mortality | Disability | Mortality | Disability |
|  |
| US (HRS) | 2.99 | 1.63 | 2.26 | -0.62 | 1.35 | 0.73 | 0.62 |  |
| China (CHARLS) | 3.81 | 0.45 | 2.39 | -1.93 | 3.36 | 1.43 | 1.93 |  |
| Mexico (MHAS) | 2.64 | 0.74 | 1.91 | -1.17 | 1.89 | 0.73 | 1.17 |  |
| India (LASI) | 1.63 | -0.17 | 1.09 | -1.26 | 1.79 | 0.54 | 1.26 |  |
| Korea (KLOSA) | 5.56 | 4.39 | 4.74 | -0.35 | 1.17 | 0.82 | 0.35 |  |
| England (ELSA) | 2.68 | 1.58 | 1.86 | -0.28 | 1.10 | 0.82 | 0.28 |  |
| Europe (SHARE) |  |  |  |  |  |  |  |  |
| (*Pooled*) | 4.15 | 2.45 | 3.09 | -0.64 | 1.70 | 1.07 | 0.64 |  |
| Austria | 3.70 | 2.09 | 2.72 | -0.63 | 1.61 | 0.98 | 0.63 |  |
| Belgium | 3.53 | 1.12 | 2.46 | -1.34 | 2.42 | 1.07 | 1.34 |  |
| Croatia | 4.28 | 2.12 | 3.30 | -1.18 | 2.15 | 0.98 | 1.18 |  |
| Czechia | 4.17 | 2.74 | 3.18 | -0.44 | 1.43 | 0.99 | 0.44 |  |
| Denmark | 2.99 | 3.01 | 2.39 | 0.62 | -0.02 | 0.60 | -0.62 |  |
| Estonia | 5.65 | 3.51 | 4.26 | -0.75 | 2.13 | 1.38 | 0.75 |  |
| France | 4.53 | 2.91 | 3.11 | -0.20 | 1.62 | 1.42 | 0.20 |  |
| Germany | 3.64 | 2.38 | 2.72 | -0.34 | 1.26 | 0.92 | 0.34 |  |
| Greece | 4.01 | 2.37 | 3.27 | -0.89 | 1.63 | 0.74 | 0.89 |  |
| Israel | 2.80 | 1.44 | 1.94 | -0.50 | 1.36 | 0.87 | 0.50 |  |
| Italy | 3.51 | 0.92 | 2.51 | -1.59 | 2.59 | 0.99 | 1.59 |  |
| Luxembourg | 3.07 | 1.48 | 2.29 | -0.81 | 1.59 | 0.78 | 0.81 |  |
| Poland | 5.01 | 3.19 | 3.51 | -0.32 | 1.82 | 1.50 | 0.32 |  |
| Portugal | 4.15 | -0.37 | 2.33 | -2.70 | 4.51 | 1.82 | 2.70 |  |
| Slovenia | 4.31 | 3.21 | 3.30 | -0.10 | 1.10 | 1.00 | 0.10 |  |
| Spain | 4.37 | 2.28 | 3.20 | -0.92 | 2.08 | 1.17 | 0.92 |  |
| Sweden | 2.73 | 2.12 | 2.29 | -0.17 | 0.61 | 0.45 | 0.17 |  |
| Switzerland | 3.26 | 2.28 | 2.77 | -0.49 | 0.99 | 0.49 | 0.49 |  |

Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153)

Table 4. Decomposition of the gender gap (women-men) in total life expectancy (LE), chronic-free life expectancy (CFLE) and life expectancy with at least one chronic condition (LEWC) into mortality and chronic effects at age 60

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Country | LE | CFLE | Components | | LEWC | Components | |
| Mortality | Chronic | Mortality | Chronic |
|  |
| US (HRS) | 2.99 | -0.16 | 0.33 | -0.49 | 3.15 | 2.65 | 0.49 |  |
| China (CHARLS) | 3.81 | 0.15 | 1.12 | -0.97 | 3.66 | 2.69 | 0.97 |  |
| Mexico (MHAS) | 2.64 | -1.97 | 1.05 | -3.01 | 4.60 | 1.59 | 3.01 |  |
| India (LASI) | 1.63 | 1.08 | 1.07 | 0.01 | 0.55 | 0.56 | -0.01 |  |
| Korea (KLOSA) | 5.56 | -1.61 | 1.95 | -3.56 | 7.17 | 3.62 | 3.56 |  |
| England (ELSA) | 2.68 | -0.76 | 0.59 | -1.35 | 3.44 | 2.09 | 1.35 |  |
| Europe (SHARE) |  |  |  |  |  |  |  |  |
| (*Pooled*) | 4.15 | -0.46 | 0.83 | -1.29 | 4.61 | 3.33 | 1.29 |  |
| Austria | 3.70 | 0.46 | 0.89 | -0.43 | 3.24 | 2.81 | 0.43 |  |
| Belgium | 3.53 | -0.55 | 0.71 | -1.26 | 4.08 | 2.82 | 1.26 |  |
| Croatia | 4.28 | -0.08 | 1.64 | -1.72 | 4.36 | 2.64 | 1.72 |  |
| Czechia | 4.17 | 0.21 | 0.73 | -0.53 | 3.96 | 3.43 | 0.53 |  |
| Denmark | 2.99 | -0.32 | 0.69 | -1.01 | 3.31 | 2.30 | 1.01 |  |
| Estonia | 5.65 | 0.17 | 1.03 | -0.86 | 5.47 | 4.62 | 0.86 |  |
| France | 4.53 | -0.81 | 0.60 | -1.41 | 5.34 | 3.93 | 1.41 |  |
| Germany | 3.64 | 0.08 | 0.69 | -0.61 | 3.56 | 2.95 | 0.61 |  |
| Greece | 4.01 | -1.39 | 1.40 | -2.79 | 5.40 | 2.61 | 2.79 |  |
| Israel | 2.80 | 1.69 | 0.63 | 1.06 | 1.11 | 2.17 | -1.06 |  |
| Italy | 3.51 | -1.36 | 0.72 | -2.08 | 4.86 | 2.79 | 2.08 |  |
| Luxembourg | 3.07 | -0.42 | 0.70 | -1.11 | 3.49 | 2.37 | 1.11 |  |
| Poland | 5.01 | -0.41 | 0.70 | -1.11 | 5.42 | 4.31 | 1.11 |  |
| Portugal | 4.15 | -2.37 | 0.75 | -3.11 | 6.51 | 3.40 | 3.11 |  |
| Slovenia | 4.31 | 1.04 | 1.37 | -0.33 | 3.26 | 2.94 | 0.33 |  |
| Spain | 4.37 | -1.50 | 0.59 | -2.08 | 5.86 | 3.78 | 2.08 |  |
| Sweden | 2.73 | -0.09 | 0.73 | -0.82 | 2.83 | 2.01 | 0.82 |  |
| Switzerland | 3.26 | -0.16 | 0.91 | -1.07 | 3.42 | 2.35 | 1.07 |  |

Source: Gateway to Global Aging Data, Produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153)

**Discussion**

Measuring gender disparities in health and mortality and what contributes to the gender gap across different countries is key for understanding what drives the gap. Different countries not only have specific health and mortality trajectories but their own cultural and gender roles, which may in turn affect the differentials. Cross-national comparisons are thus important to further shed light into the topic. Embracing a macro perspective on gender gaps is key for reducing health inequalities within and between populations and ensuring equal opportunities for healthy aging. The fact that in many places, women live longer and expect to spend a higher proportion of their lives in poorer health has startling effects on their well-being since poorer health for women usually means non-lethal, but debilitating conditions such as arthritis, fall-related fractures, and dementia, which limit their ability to remain independent, engage in social activities, and usually demand long-term care (Freedman et al., 2016). Because women face widowhood at an earlier age, have lower labor force participation rates, and tend to retire earlier with lower income than men, they are more exposed to poverty and financial insecurity, as their economic resources are more limited (Ruel and Hauser, 2013).

Furthermore, health is a fundamental element of human capital and individual productivity, so gender inequality in health can have profound macroeconomic implications (Bloom and Canning 2004; Prettner et al. 2013). Because women live longer than men but face greater morbidity during their lives, they experience higher productivity losses and lower labor force participation (Bonilla and Rodriguez 1993; Case and Paxson 2005b; Luy and Minagawa 2014; Oksuzyan et al. 2018). This gender inequality accumulates over the life-course, exposing older women to poverty and poor health conditions, imposing a burden to both pension and health systems (Weil 2007). Consequently, investing in female health has shown to have a strong effect on economic development in both the short and the long run. In the short run, it increases productive participation in the labor market and consequently the level and growth of economic output; on the long-run, it directly impacts intergenerational transmission of human capital, since healthier women lead to healthier offspring (Bloom et al. 2014a). Lastly, gender inequality in health is correlated to country-specific levels of development and to societal roles of women and men (Okojie 1994; WCF 2018).Therefore, to quantify health inequalities by gender and across countries with different levels of development can provide valuable insights for healthy ageing.

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**Appendix I**

Data characteristics

US (HRS):

We are using the Harmonized version B HRS: 37,495 observations. October 2018- There is a new updated version C, until 2019 that was updated now in 2022 and contains 42,233 observations. It is a Respondent level file so each row represents a unique Respondent. This leaves us with 18,747 observations using only wave 12 (year 2014) of HRS.

Mexico (MHAS):

Version B.4 incorporates the latest released version of MHAS data, and adds several new variables. It contains 22,016 observations or rows- 22016. We are using the Harmonized VERSION B.4 (2001-2015), February 2022, for the MHAS data. The Mexican Health and Aging Study (MHAS) is a longitudinal household survey dataset for the study of health, economic position, and quality of life among the elderly. MHAS datasets as of September 2020. The MHAS (Mexican Health and Aging Study) Version B.4 incorporates the latest released version of MHAS data, and adds several new variables. It contains 22,016 observations or rows. It is a Respondent-level file so each row represents a unique Respondent. We will focus on Wave 4, which is for years 2014/2015. We will have 17,616 observations.

England (ELSA):

We are using the Version G.2 (2002-2019), July 2021 for The English Longitudinal Study on Ageing (ELSA). It is a longitudinal household survey dataset for the study of health, economic position, and quality of life among the elderly (panel survey of people aged 50 and over and their partners, living in private households in England). Version G.2 incorporates the latest released version of ELSA data, which includes eleven main modules and the associated datasets, and adds variables and observations from Wave 9 with a total of 19,802 observations. It also adds new variables and adjustments and corrections. We will focus on Wave 7, nonetheless. The samples have been drawn from households which previously responded to the Health Survey for England (HSE). The seventh wave was conducted between June 2014 and May 2015 and included a refreshment sample selected from HSE 2011-2012.

India (LASI)

The Longitudinal Aging Study in India (LASI) is a multidisciplinary, internationally harmonized panel study designed to be nationally representative of India’s population aged 45 and older. LASI is a joint project of three partnering institutions: International Institute for Population Sciences (IIPS), Harvard T.H. Chan School of Public Health (HSPH), and University of Southern California (USC). The first wave was conducted between 2017 and 2019 in 35 of India’s 36 states and union territories (except Sikkim). This initial sample, as released by USC, included 42,951 households and 72,262 individuals. The LASI sampling plan is complex and was based on the 2011 Indian Census with a multistage, stratified cluster sample design. The sample design includes three distinct selection stages in rural areas and four stages in urban areas. We use Version A.2 that makes corrections using the January 2021 released version of Wave 1 of the LASI data.

Europe (SHARE)

This is Version F in the harmonized files and incorporates the latest released version of SHARE data, release 8.0.0, and adds observations from Wave 8. It contains 139,620 observations or rows. It is a Respondent-level file so each row represents a unique Respondent. It also adds new variables and adjusts and corrections. We focus on data from SHARE Wave 6, with the release 8.0.0 as of February 2022. SHARE uses a multistage stratified sample. Its weighting variables make its data representative of the target populations in constituent countries. Wave 6 does not still have full coverage of European countries, with the following countries only added in Wave 7: Finland, Lithuania, Latvia, Slovakia, Romania, Bulgaria, Malta and Cyprus.

China -CHARLS

The China Health and Retirement Longitudinal Study (CHARLS) is a longitudinal study of individuals over age 45 in China. Version D incorporates the latest released version of CHARLS data, and adds variables for Wave 4. It contains 25,586 observations or rows. It is a Respondent-level file so each row represents a unique Respondent; The sample population was selected as part of a stratified, multistage probability design. We will use Wave 3. As we concentrate on ages 50 and above due to the other samples we do not include individuals younger than 50. This leaves us with a sample size of 16,344 individuals.

KLOSA- Korea

The Korean Longitudinal Study of Ageing (KLoSA) is a panel survey of people aged 45 and over and their partners, living in private households in Korea. The survey elicits information about demographics, income, assets, health, cognition, family structure and connections, health care use and costs, housing, job status and history, expectations, and insurance. KLoSA surveys respondents every two years. Funded by the Korean Ministry of Labor, the Korean Institute of Labor (KLI) collected the first two waves, and the Korea Employment Information Service (KEIS) collected the Waves 3, 4, 5 and 6 of KLoSA, with the first wave of the KLoSA survey being conducted in fall/winter of 2006. The sample population was selected as part of a stratified, multi-stage area probability design. The first component of this sampling framework is the probability proportional to size (PPS) systematic sampling of the 2005 (South Korean) Census enumeration districts after stratifying by the location (15 major metropolitan cities and provinces) and characteristic of the district (urban or rural, and apartment building or non-apartment dwelling). Households were selected within PSUs from a listing of households in the Census identified as age-eligible; that is, inhabited by at least one person 45 years of age and older. This initial sample included 10,254 respondents age 45 and over. The second wave was conducted in 2008 and had 8,688 respondents. The third wave was conducted in 2010 and had 7,920 respondents. The fourth wave was conducted in 2012 and had 7,486 respondents. There was no refresher sample in Waves two through four. In 2014, a refreshment sample of individuals born in 1962 or 1963 was drawn and it included 920 individuals, which were added to the 7,029 remaining core sample respondents for a total of 7,949 Wave 5 respondents. The sixth wave was conducted in 2016 and had 7,490 respondents. We will focus on Wave 5. We use the hamornized Version C that contains 11,174 observations or rows. It is a Respondent-level file so each row represents a unique Respondent.

**Appendix II: Tables with confidence intervals**

Table A1. Decomposition of the gender gap (women-men) in total life expectancy (LE), disability-free life expectancy (DFLE) and life expectancy with disability (LEWD) into mortality and disability effects at age 60, with 95% CI.

Table A2. Decomposition of the gender gap (women-men) in total life expectancy (LE), chronic-free life expectancy (CFLE) and life expectancy with at least one chronic doctor diagnosed condition (LEWC) into mortality and chronic effects at age 60, with 95% CI

**Appendix III: Country-Specific Figures**

Figure A.1 Age-specific prevalence for health conditions, women and men, US (HRS)

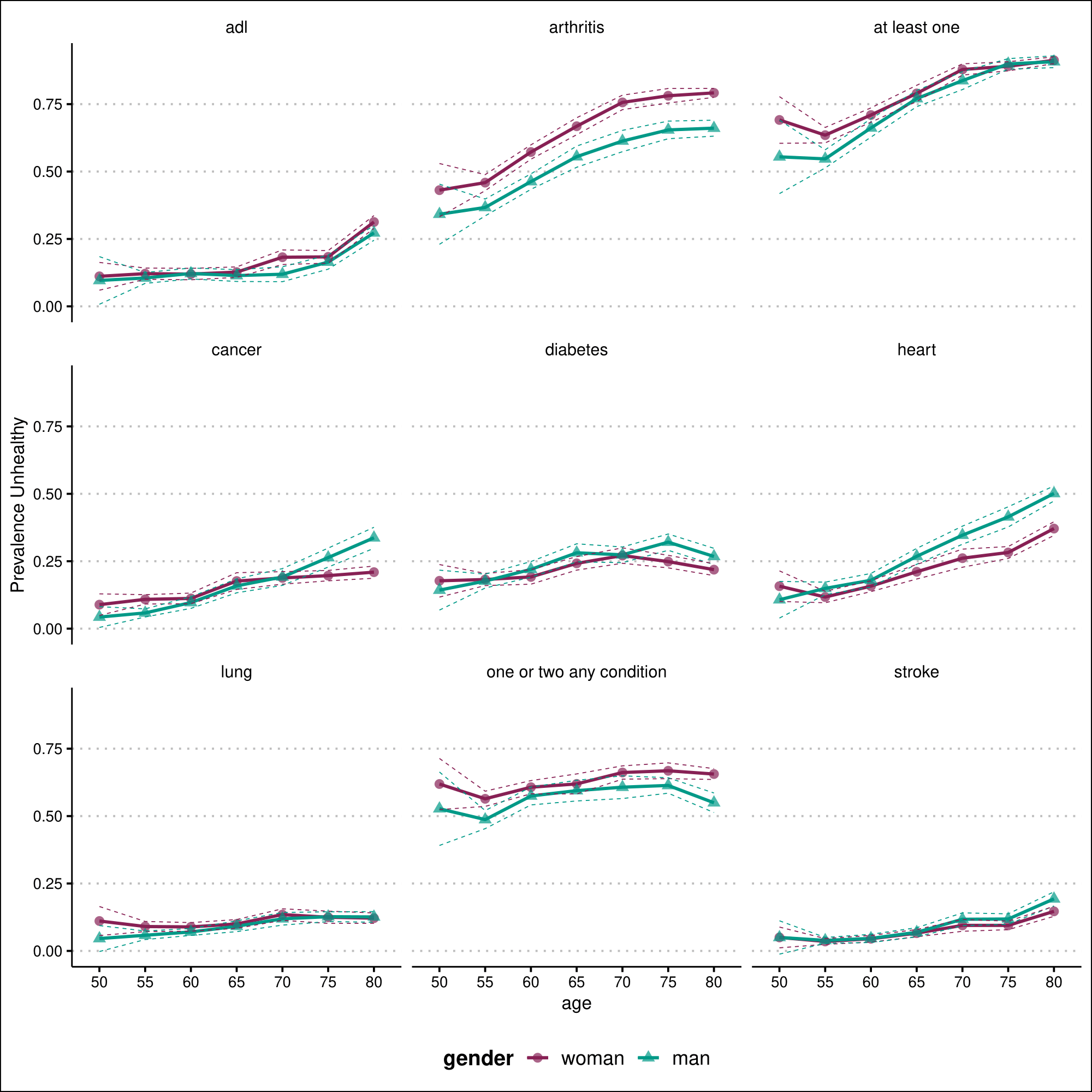


Figure A.2 Age-specific prevalence for health conditions, women and men, England (ELSA)

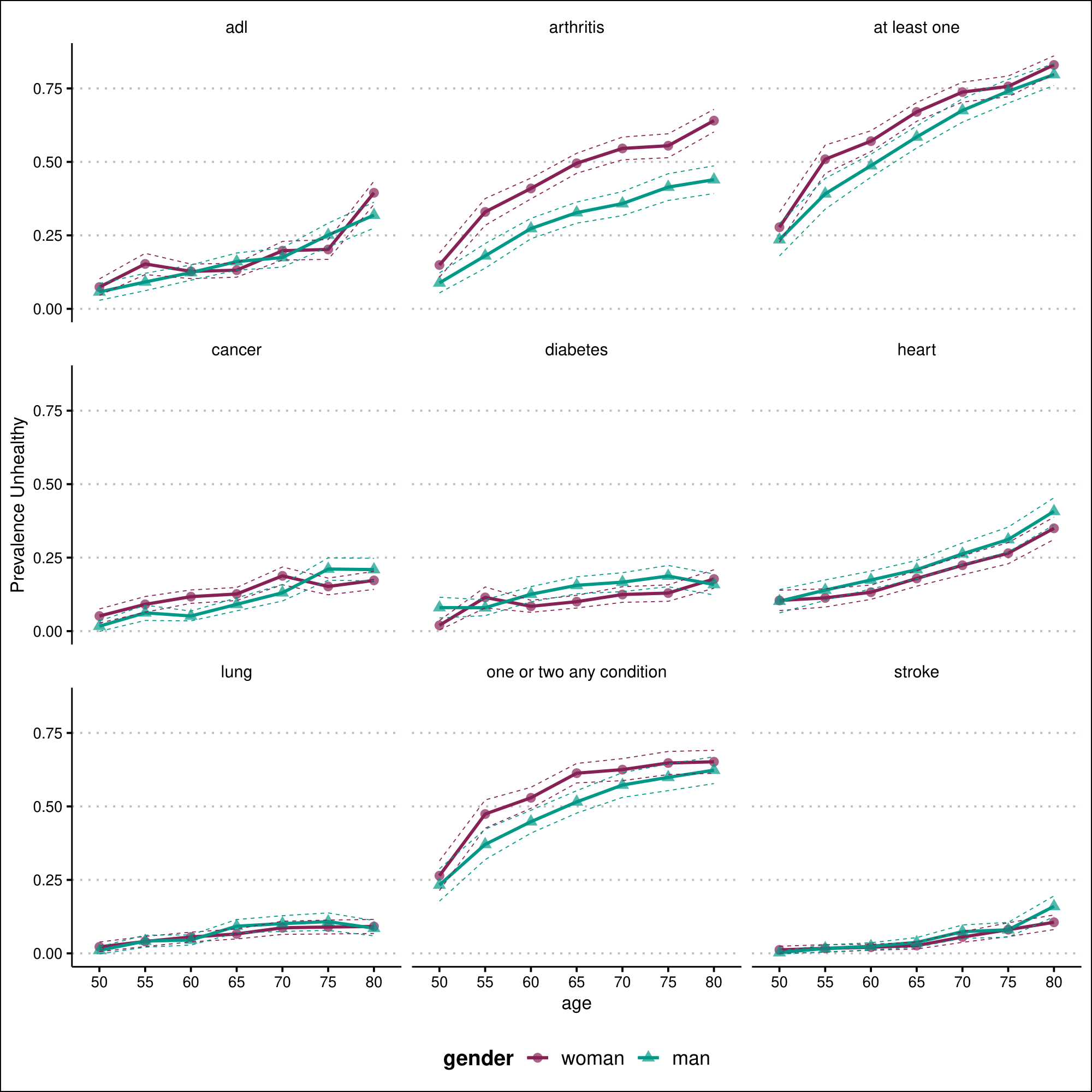


Figure A.3 Age-specific prevalence for health conditions, women and men, Korea (KLOSA)

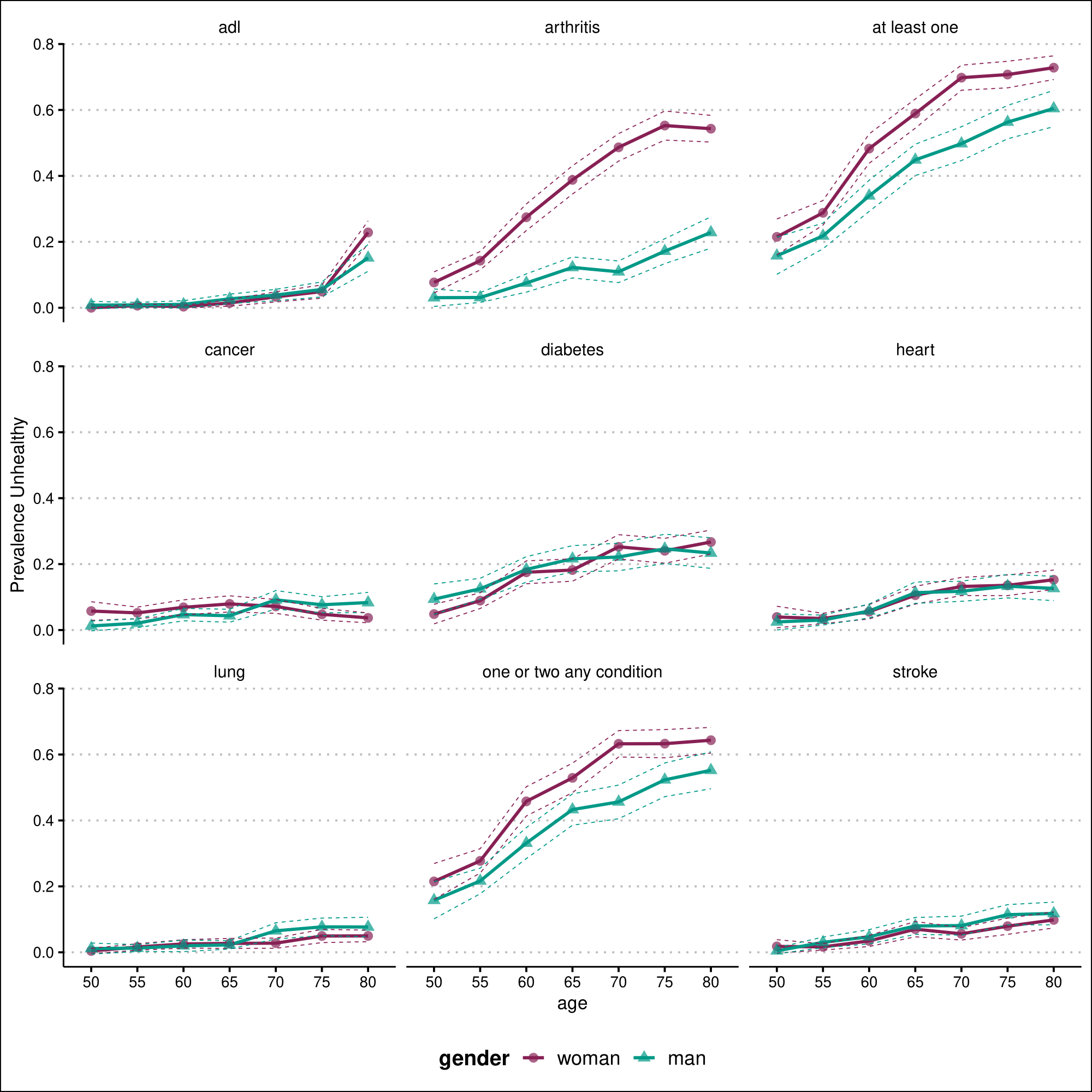


Figure A.4 Age-specific prevalence for health conditions, women and men, India (LASI)

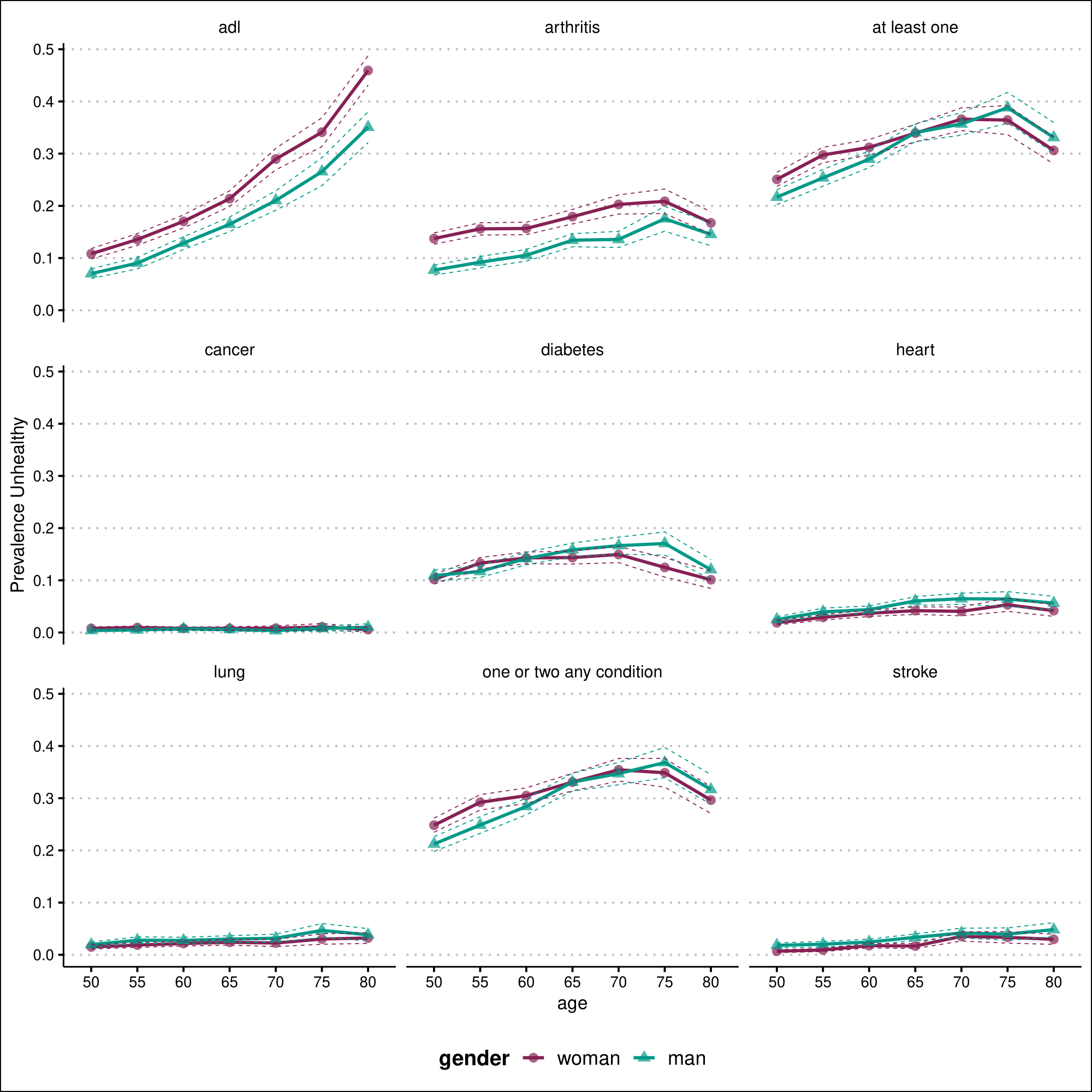


Figure A.5 Age-specific prevalence for health conditions, women and men, Mexico- MHAS

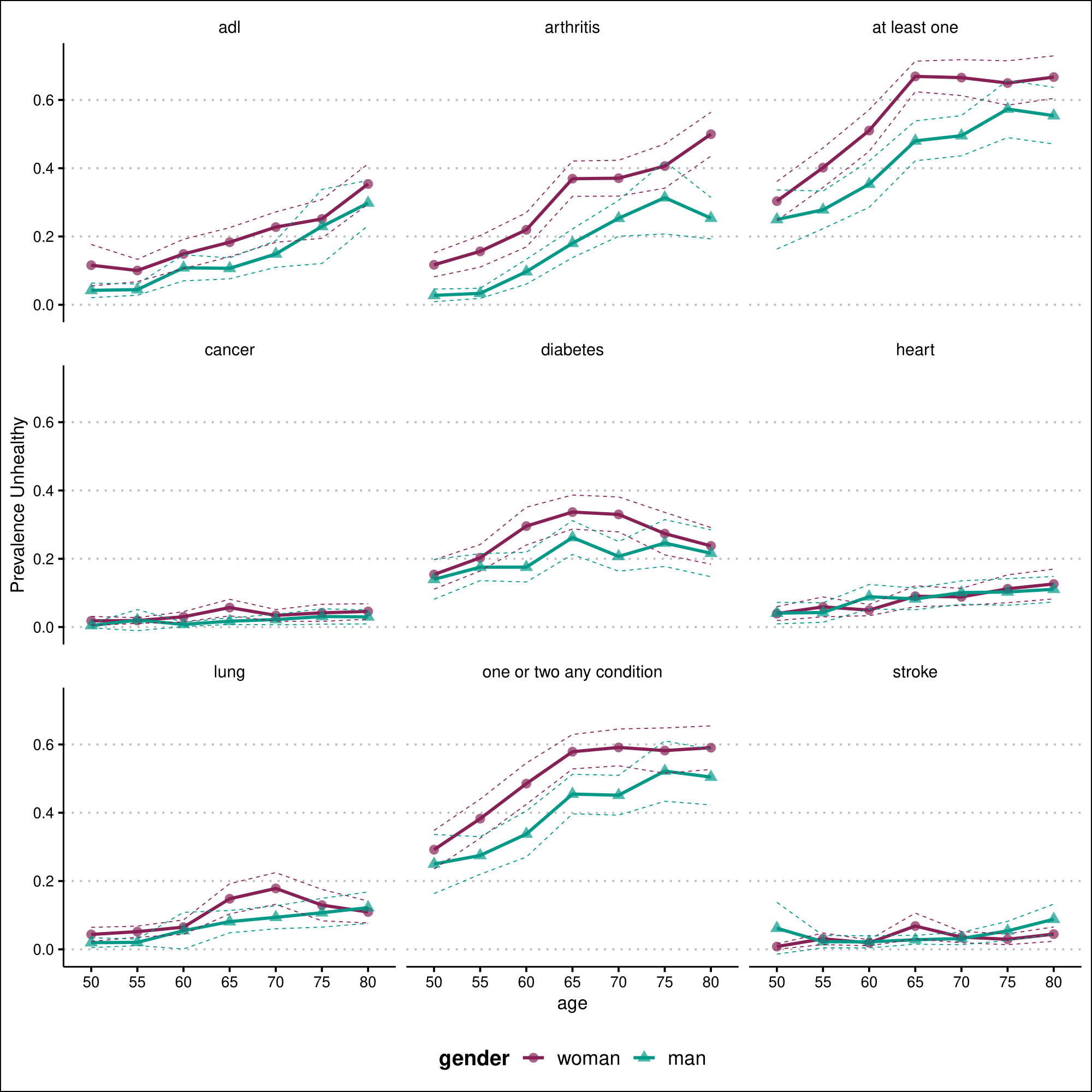
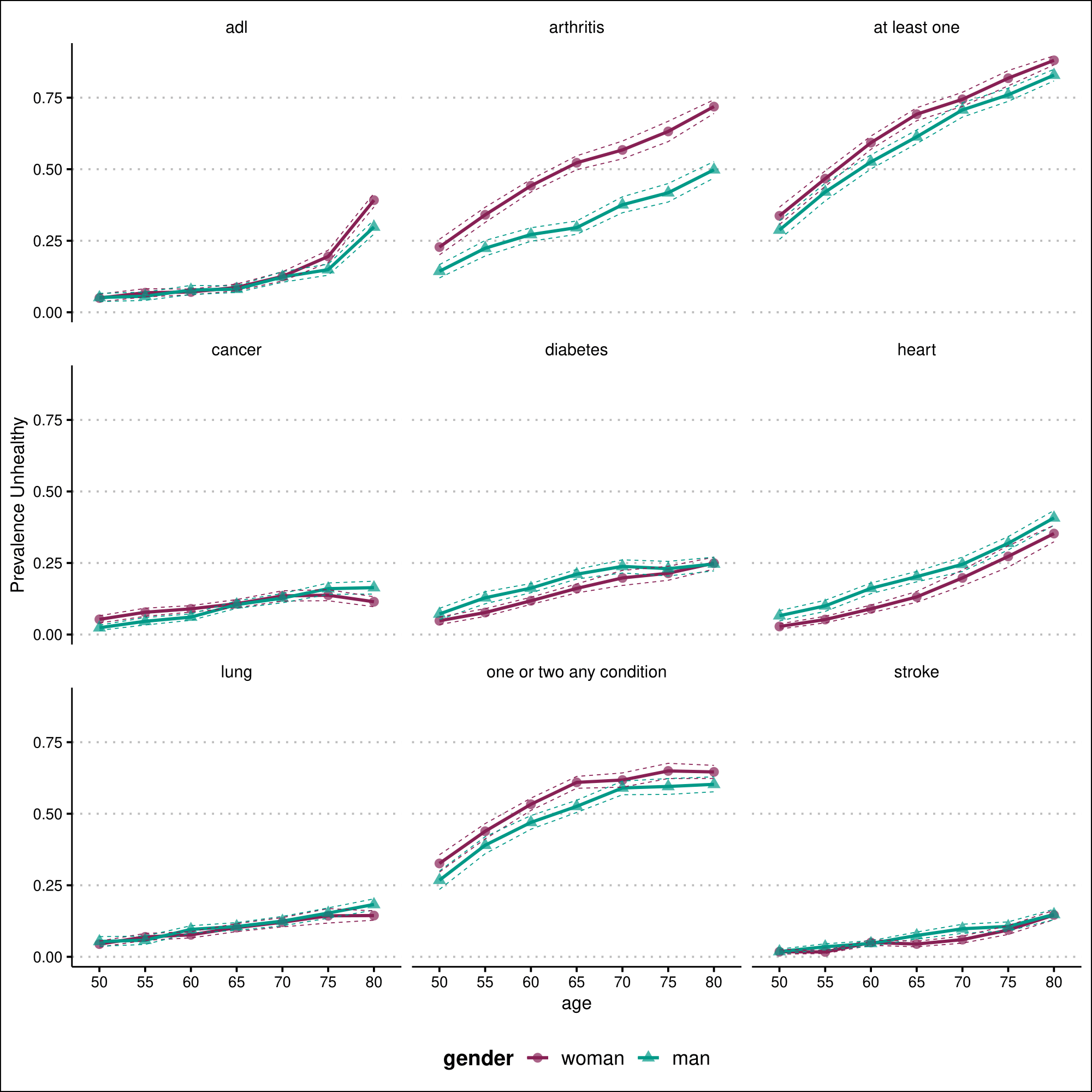


Figure A.6 Age-specific prevalence for health conditions, women and men, Europe (SHARE)



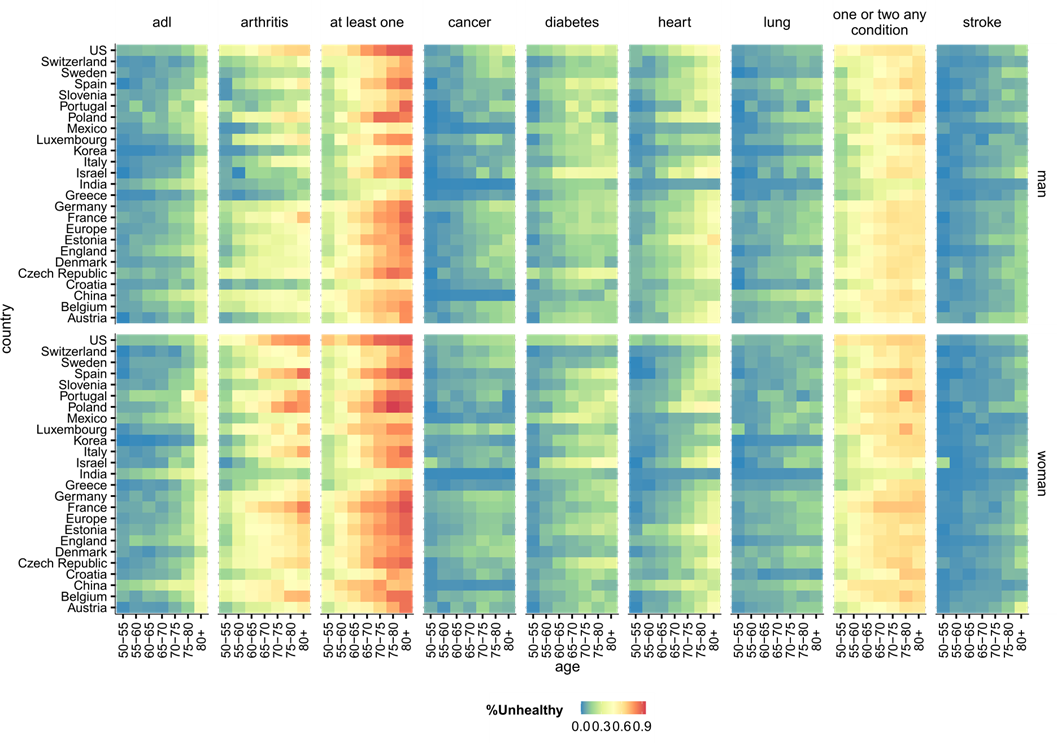


Figure A.7 Age-specific prevalence for all health conditions included, by age and country, women and men