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Between curing and caring: years of life expectancy with care needs (YLCN) in Ibero-American countries

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Abstract

Unprecedented gains in life expectancy call for a nuanced understanding of morbidity and its consequences on social care needs. Despite the observed worldwide gender gap in life expectancy and healthy life expectancy, we still do not know how these longer years women are living are affected by social care needs, nor whether there are cross-country differences in this regard. This study measures the Years of Life Expectancy with Care Needs that individuals are expected to live at age 60, combining (multi)morbidity and social care needs states. By decomposing the gender gap in life expectancy without care needs across five Ibero-American countries (Brazil, Colombia, Mexico, Portugal, and Spain), it also explains the differences between men and women in this regard. Results reinforce the health-survival paradox, with women living longer lives and more years in states of multimorbidity and social care needs than men. They also show that in all countries but Spain, the gender gap in years without care needs implies that men are living, on average, longer years than women without healthcare and social care needs. By using an indicator that combines measures of healthcare and social care needs, this study aims to contribute to the evidence required to prepare healthcare systems and social care policies according to ageing populations' specific dynamics and needs.

Keywords Social care needs, Multimorbidity, Healthy life expectancy, Ibero-America, Ageing

Introduction

Unprecedented gains in life expectancy have, for decades, raised questions about individuals' health during the additional years they are expected to live (Crimmins, 1984; Robine et al., 2009). Evidence regarding whether life expectancy improvements are matched by better health outcomes remains mixed (Vaupel, 2010). Nevertheless, population ageing necessitates an understanding of the needs of older individuals, which are particularly relevant for policymakers in charge of guaranteeing the sustainability of healthcare and social care systems, challenged by expected increasing care demands and persistent limited resources for care provision (Khan et al., 2024). In a scenario

of increasing (multi)morbidity, which does not always imply disability, nor social care needs, healthy life expectancy indicators can be refined by jointly accounting for healthcare and social care needs. Furthermore, previous research has emphasised persistent differences in healthy life expectancy across countries and between men and women (Zheng & Canudas-Romo, 2024). This variability, driven by structural indicators related to countries' development and gender differences, might in turn lead to diverse populations' ageing care needs, which is a sign of the varied consequences that mortality trends, multimorbidity, and disability have on individuals.

Through comparisons of five Ibero-American countries, this study measures the Years of Life Expectancy with Care Needs (YLCN) that men and women are expected to live in different states, which account at the same time for healthcare needs, measured as experience chronic conditions, and social care needs, operationalized as limitations for performing Basic Activities of Daily Living (ADL) or/and Instrumental Activities of Daily Living (IADL). This cross-county comparative analysis aims to emphasise the diverse needs of older adults and their gendered differences resulting from scenarios that, despite sharing a common history during the 20th and 21st centuries, have faced differential transformations explained by their demographic, epidemiological, and health trends.

Why measure years of life expectancy with and without care needs?

Empirical studies have attempted to determine whether current mortality tendencies are aligned with morbidity patterns described by one of the following three hypotheses: 'failure of success' (Gruenberg, 1977), 'compression of morbidity' (Fries, 2002), and the 'dynamic equilibrium' (Manton, 1982). Nevertheless, this is still an open debate, because evidence remains mixed (Vaupel, 2010) and conclusions about whether morbidity is compressing or expanding vary by country, gender, cohort, and period of analysis. Therefore, in recent decades, research about the consequences of increasing life expectancy on individuals' lives has shifted the focus from lifespan to healthspan (Olshansky, 2018), by moving from exclusively analysing mortality to complementing it with measures of individuals' well-being, usually through estimations of healthy life expectancy (Saito et al., 2014).

There are different approaches to measuring healthy life expectancy, which depend on the definition of health used. For instance, it has referred to years of life expectancy lived in good self-rated health, active life expectancy, or disability-free life expectancy (based on certain physical/mental functions) (Beltrán-Sánchez et al., 2015), or through the healthy life expectancy measure that is based on the Global Activity Limitation Indicator/Index, known as GALI (Van Oyen et al., 2018). Furthermore, it has also been measured by the absence of specific chronic conditions (Bramajo et al., 2024). These indicators estimate how life expectancy is affected by mortality alongside healthy and unhealthy states.

However, among their limitations are that they usually have a unidimensional definition of health (either self-perceived, focused on chronic conditions, or functional limitations). There are few studies combining different dimensions of well-being (Saito et al., 2014), because they tend to focus exclusively on health indicators. Moreover, when they do focus on functioning measured through Basic Activities of Daily Living (ADL), which are mainly self-care tasks (Katz et al., 1970), they tend to dismiss the broader spectrum

of dependency or social care needs by excluding Instrumental Activities of Daily Living (IADL), which refer to individuals' independence (Lawton & Brody, 1969). Therefore, these measures do not capture care needs comprehensively because they neglect the social care needs that might emerge as consequences of health issues. Nevertheless, this is a critical realm of the challenges posed by ageing populations, especially where resources aren't just needed for dealing with the symptoms of chronic conditions (healthcare) but are also necessary to respond to the consequences that these health issues might have on individuals' independence (social care) (Ouwens et al., 2005; Warner et al., 2011).

In this line, recent literature highlights the importance of understanding chronic conditions and multimorbidity in a nuanced manner by estimating, through multistate models, the life expectancies of individuals experiencing healthy and unhealthy states alongside disability (Lam et al., 2023; Shen & Payne, 2023). These studies measured disability as facing limitations in performing ADL. Building upon this work, in this study, we expanded the notion of disability to social care needs, which has been defined by previous research as facing limitations for ADL and IADL (Vlachantoni, 2019; Vlachantoni et al., 2011). While ADL refers to basic tasks that individuals need to perform for living, like eating, bathing, and getting in or out the bed, IADL are related to tasks that are not basic but needed for living an independent life, for instance, buying groceries, handling money, or taking medications.

Here, this measure of social care needs is combined with healthcare needs, which are operationalised through (multi)morbidity indicators. Based on previous literature, we define having one chronic condition as morbidity and having more than one chronic condition as multimorbidity (Calderón-Larrañaga et al., 2017). The combination of the measures of healthcare needs and social care needs was used to create different states accounting for not having chronic conditions nor social care needs (life expectancy without care needs), and states with care needs, including healthcare needs (morbidity and multimorbidity) and social care needs (facing limitations to perform ADL and IADL). By including social care needs and not only healthcare needs, we acknowledge that the consequences of increasing life expectancies are related to the debate about multimorbidity's compression or expansion, but also to the repercussions that the experience of chronic conditions might have on populations' needs for social care, especially when it comes to policy making and thinking about challenges posed by population ageing. Furthermore, this measure is sensitive to the fact that the effect of morbidity and multimorbidity on individuals' social care needs might vary due to the specific chronic conditions faced and the healthcare systems' responses to their symptoms and outcomes, which highlights that (multi)morbidity does not necessarily translate into social care needs (Cezard et al., 2021; Spiers, 2019).

In this context, previous studies have suggested that when the analyses focus on disability indicators (measured through ADL), the compression of morbidity seems to be an appropriate hypothesis. However, when the focus shifts to health status and the presence of chronic conditions, findings tend to align more with the hypothesis of morbidity expansion (Tesch-Römer & Wahl, 2016). Therefore, when studying the relationship between morbidity and mortality, it is essential to consider the comprehensive impacts of (multi)morbidity on individuals' lives, incorporating the implications that multimorbidity may or may not have on their daily lives, especially regarding social care needs.

At the same time, we account for the fact that advancements in medical technology, the success of preventive healthcare systems, and the promotion of healthy behaviours may have improved the health outcomes of individuals with chronic conditions, thereby mitigating their adverse effects on disability and life quality (Head et al., 2021).

Varying years of life expectancy with care needs by country and gender

Results on the expansion and the compression of multimorbidity might be attributed to several factors, including demographic trends, individuals' conditions and trajectories, and countries' specific pathways within the epidemiological and health transitions. In this context, the healthy life expectancy literature has shown variations by country, cohorts, and subpopulations (Saito et al., 2014). These differentials are often explained by the theories of the demographic transition in conjunction with the epidemiological transition, attributing life expectancy increases to shifts in causes of death, where deaths from infectious diseases are progressively replaced by those from non-communicable and chronic diseases (Omran, 1998). However, critics of these frameworks argue that not all populations or subpopulations have experienced mortality declines in the same way or at the same pace (Alvarez et al., 2020; Calazans & Queiroz, 2020) and that the dichotomy between chronic conditions and infectious disease does not hold in practice, as these two types of diseases are related to each other in a complex way (Mercer, 2018).

Furthermore, evidence from Latin America has emphasised that the epidemiological transition should be understood as part of a broader process affected by health determinants, including individual characteristics and behaviours (Frenk et al., 1991). These dynamics suppose varying consequences across countries, especially in middle- and lower-income countries, as well as across regions within the same country that might have experienced the transition differently (Borges, 2017; Gómez-Dantés et al., 2016). For this analysis, we studied mortality, healthcare, and social care needs in the older population (60+) of Brazil, Colombia, Mexico, Portugal, and Spain in 2015. Two European countries and three Latin American countries were selected as representatives of the Iberoamerican region. While Spain and Portugal can be fitted into Omran's 'Western model', the experience of Brazil, Colombia, and Mexico diverge from this traditional model, resulting in a mixed-morbidity scenario and an epidemiological polarization characterized by: (i) stage overlapping, (ii) counter-transitions, and (iii) prolonged transitions with the coexistence of mortality rates caused by infectious diseases and the increase of mortality due to chronic conditions. Hence, these Latin American countries have faced simultaneously different stages of the epidemiological transition, in some periods they have counter-transitioned to a previous stage, and for decades have remained in a stage where infectious diseases still play an important role, even though they coexist with increasing shares of chronic conditions. Additionally, this mix of mortality causes varies widely between regions and segments of populations within the same country, driven, for example, by social or racial stratification (Frenk et al., 1991; Macinko et al., 2019; Palloni & McEniry, 2007). A comparative analysis of these countries explores how these diverse pathways shape ageing populations' health and social care needs. However, most studies on social care needs have focused on comparisons within regions with similar care regimes or exclusively on high-income countries. Despite a shared history among Ibero-American countries, demographic analyses rarely include

comparisons between them, and few studies bridge countries from the Global North and South (Alvarez et al., 2020; Rueda-Salazar et al., 2021).

Moreover, besides these regional disparities, gender inequality in life expectancy and healthy life expectancy indicators has also been broadly reported and is commonly described through the male-female health-survival paradox (Zarulli et al., 2018). Explanations of this paradox refer to the interaction between biological and sociological factors. On the one hand, biological mechanisms are related to hormonal, autoimmune, and genetic explanations; on the other, sociological factors are mainly attributed to differences in risk behaviours (Lindahl-Jacobsen et al., 2013). While women consistently live on average longer than men—a pattern observed in nearly all countries (Austad, 2006)—the size of the gender gap varies across countries and changes over time. Additionally, this higher women's life expectancy is generally accompanied by their longer lives in poorer health states compared to men (Oksuzyan et al., 2010). However, this outcome may vary depending on overall life expectancy and the size of the gender gap. Previous analyses showed that these differences are shaped by both survival inequalities and disparities in the experience of disabilities (Van Oyen et al., 2013), as well as the fact that there are differences regarding mortality and its consequences on healthcare and social care needs after age 60 + are explained by gender (Coppola et al., 2022; Oksuzyan et al., 2010). Moreover, other studies have highlighted women facing higher chances of needing social care (Pickard et al., 2007; Uccheddu et al., 2019).

Nevertheless, there is limited knowledge of how the health-survival paradox behaves when applying a multidimensional framework incorporating (multi)morbidity alongside social care needs—an aspect that forms part of our study objective. Additionally, comparisons of countries that have experienced different pathways and paces during their epidemiological transitions offer a unique opportunity to explore variationsin mortality, morbidity, and limitations patterns, and how this gender gap referring to healthcare and social care needs varies between regions. Therefore, this study aims to explore the behaviour of healthcare and social care needs among five Ibero-American countries in three ways. First, by estimating the Years of Life Expectancy with Care Needs (YLCN) that individuals are expected to live with multimorbidity and limitations for performing ADL and IADL after age 60; second, by conducting cross-country comparisons of the YLCN, along with examining gender differences in these indicators; and thirdly, by decomposing the gender gaps in the life expectancy without care needs after age 60 into the effects of different (multi)morbidity and social care states.

Methods

Study design

This study employs a cross-sectional analysis to compare healthcare needs (measured as multimorbidity), social care needs (measured through the experience of limitations), and mortality across five countries. To achieve this, the study integrates indicators of chronic conditions and limitations in performing ADL and IADL as proxies for healthcare and social care needs, with mortality measures, to estimate Years of Life Expectancy with Care Needs (YLCN). The methodological approach involves three sequential steps: First, the prevalence of chronic conditions and limitations is estimated using weighted samples. Second, the Sullivan's method (1971)is applied to estimate the YLCN by combining states of healthcare and social care needs through the weighted prevalence in each

state. Finally, a stepwise decomposition is used to analyse the gender gap in life expectancy without healthcare and social care needs at age 60, measuring the contribution of different states to this gap. Five states are considered based on the combination of healthcare and social care needs: (A) 0 chronic condition without social care needs; (B) 1 chronic condition without social care needs; (C) 0 or 1 chronic condition with social care needs; (D) 2 + chronic conditions without social care needs; and, (E) 2 + chronic conditions with social care needs (see the measures section for more details). The results are disaggregated by country, gender, and age group. The measures here provided are based on period data, which supposes several limitations, widely recognised by literature (Barendregt et al., 1997): first, it assumes that the observed prevalence and mortality rates are going to remain the same in the future; second, we assume a stationary population. Despite these limitations, Sullivan's method is useful for comparing different populations at a specific moment, especially when longitudinal data isn't available. Furthermore, among their main qualities is that this method allows using different states and shares the properties of life expectancy indicators by accounting for populations' age structures.

Data

Data used to estimate the prevalence of healthcare and social care needs came from four surveys conducted in five Ibero-American countries: ELSI (Brazil), MHAS (Mexico), SABE (Colombia), and SHARE (Portugal and Spain). These surveys share similar objectives, designs, and questions (see Table 1 for more details). The analysis focused on data collected in 2015, a year in which all the surveys used were conducted. Although more recent data (2020–2021) were available for all countries, except Colombia, they were excluded due to attrition and selection bias resulting from the data collection challenges during the COVID-19 pandemic, affecting sample size and prevalence estimations, especially in Brazil and Portugal. The prevalence estimated for each one of the analysed states was weighted by using survey-specific sample weights based on their survey designs. Mortality data, specifically the mortality rates (mx), came from the Human Mortality Database (HMD) for the European countries and from official national statistics for Brazil (IBGE), Colombia (DANE), and Mexico (CONAPO), which published lifetables for 2015. While debates about the quality of Latin American mortality data persist, the official statistics of these countries have improved over the past decades, resulting in more reliable mortality registries and curated life tables (Gonzaga et al., 2018).

Measures

In this study, healthcare needs are defined as ever having been diagnosed by a doctor with one or more of the following chronic conditions: heart attack, high blood pressure, stroke or cerebral vascular disease, diabetes, chronic lung diseases, cancer, arthritis, or rheumatism; here morbidity was interpreted as having one chronic condition meanwhile, multimorbidity referred to reporting two or more chronic conditions. Social care needs were operationalised as experiencing at least one limitation in performing ADL or IADL. These limitations include dressing, bathing, eating, getting in or out of bed, using the toilet, shopping for groceries, taking medications, or managing money (see Table S1 and Table S2 in the supplementary materials for further details about the prevalence of chronic conditions and limitations). The chronic conditions and limitations

Table 1 Analysed surveys' technical details

Surveys' name	Country	Period	Design	Participants' characteristics	Sampling	Representativeness
Estudo Longitudinal da Saúde dos Idosos (ELSI).	Brazil	2015–2016 (Wave 1) 2019–2021 (Wave 2)	Longitudinal	Community-dwelling adults aged 50 years or older	Based on selection stages that combined stratification of primary sampling units (municipalities), census tracts, and households	National
Estudio Nacional de Salud, Bienestar y Envejecimiento (SABE)	Colombia	2015	Cross-sectional	Community-dwelling adults aged 60 years or older	Sampling based on multiple stages based on clusters and strata for rural and urban areas	National
Mexican Health and Aging Study (MHAS)	Mexico	2001 (Baseline) 2003 2012 2015 2018 2021	Longitudinal	Community-dwelling adults aged 50 years or older and their spouses/partners, regardless of their age	Sample in all the states of the country including urban and rural areas, over-sample in households in the six states that account for 40% of all migrants to the U.S	National
Survey of Health, Aging and Retirement in Europe (SHARE)	Spain Portugal and 25 other European countries, and Israel	2004–2006 (Wave 1) 2006–2010 (Wave 2) 2008–2011 (Wave 3) 2011–2012 (Wave 4) 2013 (Wave 5) 2015 (Wave 6) 2017–2018 (Wave 7) 2019–2020 (Wave 8)	Longitudinal	Community-dwelling adults aged 50 years or older and their spouses/partners, regardless of their age	Participants are selected if they have their regular domicile in the respective SHARE country. In wave 1 all household members born 1954 or earlier were eligible for an interview, from the second wave sample refreshment was done in all but the third wave	National and regional for the included European countries

were selected based on their availability in all the analysed surveys (see Table S3 in the supplementary materials for further information). To measure social care needs, harmonisation and reclassification processes were necessary to create a dummy variable in the Latin American countries, which provided different response options; further details can be found in Table S4 in the supplementary materials.

Years of Life Expectancy with Care Needs (YLCN) at age 60 were calculated for each state using the Sullivan method (1971). To achieve this, prevalence rates were estimated by decennial age groups (60–80+), gender, and country and weighted according to the survey designs. Decennial abridged lifetables were used to account for mortality.

Different cut-off points for the last age group were tested before deciding to keep it open-ended after age 80. In previous analysis, we tested 85 + and 90+. However, given small sample sizes in the surveys used for this final age group, the prevalences for Sullivan's method and the decomposition results were highly variable, especially in the Latin American countries, therefore we decided to set the same cutting point for all the analysed countries, which enhanced comparability but in turn might imply an underestimation of life expectancy after age 60 among the European countries.

The 10-year abridged lifetables were built from single-year lifetables for each country. We also tried to use estimates based on 5-year age groups, but due to the division of states by gender and age groups, the sample sizes in some countries, like Portugal, were too small, resulting in significant variability in prevalence estimates. The Sullivan Method was used as follows: using the mortality rates from the life tables and the prevalence rates from the surveys, we estimated YLCN by calculating the remaining average years individuals are expected to live at age 60 and the number of years expected to be lived in each state based on the prevalence. Specifically, we summed the person-years lived between age x and x + n (Lx), multiplied them by the prevalence of the specific state, and divided by the number of survivors at the corresponding age (lx). Confidence intervals for these measures were estimated following the approach proposed by Hauet (2001).

After this, we decomposed the gender gap in life expectancy without care needs (state A: no chronic condition without social care needs) at age 60 by different states using a stepwise approach. To do so, we used an adapted version of the approach previously introduced by Van Raalte and Nepomuceno (2020) for decomposing healthy life expectancy. While these authors focused on two states (healthy and unhealthy), our analysis incorporated the five previously mentioned states by considering life expectancy at age 60 with and without care needs, which implies to estimating life expectancy at age 60 using Sullivan's method and subtracting from the remaining life expectancy at age 60 the average years expected to be lived in all states with care needs (B, C, D, E). The stepwise method allows for the decomposition of differences without assuming continuity in the dimension being decomposed (gender). While it is commonly used to compare differences in life expectancy within a population at two time points, it can also be applied to compare different populations or subpopulations, like men and women. Although Van Raalte and Nepomuceno (2020) showed that this decomposition could also be done by using Horiuchi et al.'s (2008) method instead, we found the results to be similar. However, the stepwise doesn't assume continuity in the dimension being decomposed, which is reasonable when decomposing differences between time, but not between genders. Confidence intervals of the decomposition could be estimated using the Monte Carlo approach or using bootstrap methods. However, given that prevalences were estimated with weighted samples and that these surveys have very different designs, the Monte Carlo approach was more convenient. Previous research has shown that, in any case, these methods lead to very similar results (Hendi, 2023). All analyses were conducted using R statistical software (version 4.3.2). The *DemoTools* and *DemoDecompose* packages were used to transform single-year life tables into abridged ones and to decompose the gender gap. Further details are provided in the supplementary materials–Methodological details.

Results

Our results are presented in the order defined by our methodological approach. First, we show the state-specific prevalence rates used to calculate the Years of Life Expectancy with Care Needs (YLCN), followed by the estimation of the YLCN at age 60, along with the percentage of total remaining years. Finally, we present the results of decomposing the gender gap in years of life expectancy without care needs (YL without CN), defined as living without a chronic condition and without social care needs–State A, across the other states. All results are presented by country and disaggregated by age group, gender, and state, alongside confidence intervals for the results of the Sullivan method and the stepwise decomposition. Information about the percentual distribution of the non-weighted sample by gender and age group can be found in Table 2. Across all analysed countries, a higher proportion of women than men was surveyed. Additionally, most of the sample is concentrated in the youngest age group (60 to 69 years), ranging from 38.06% for Spanish women to 59.01% for Brazilian men. It is worth mentioning the differences in the sample distribution by age group between the Latin American and European countries. In the former, the 80 + age group constitutes less than 15% of the sample, whereas in the latter, the percentage is notably higher, reaching the highest proportion among Spanish women (29.60%).

Figure 1 presents the prevalence of the five analysed states by age and gender. In general, all the countries followed similar patterns despite differences in levels. The youngest age group (60–69 years) shows a higher prevalence of individuals in states without any chronic condition or 1 chronic condition without social care needs (states A and B). However, as age increases, the prevalence of these states decreases, while other states—particularly those involving 2 + chronic conditions with or without social care needs (states D and E)—become more prominent. In general, women and men follow similar patterns within each country. However, the prevalence of states D and E is consistently higher among women across all age groups. Brazilian women have the highest prevalence in these states, reaching 49.00% in the youngest age group and 56.60% in the oldest. In contrast, the prevalence of these states together is notably lower among Mexican and Colombian men. State C (none or one chronic condition and social care needs) consistently shows the lowest prevalence, especially among the younger age groups, ranging from 2.52% among Spanish men aged 60–69 years to 31.48% among Portuguese women aged 80+.

Based on these prevalence rates and corresponding mortality measures, YLCN were estimated. Mortality behaviour was generally consistent across countries (see Fig. S1 in the supplementary materials for further details), showing lower mortality rates for women compared to men. As expected, Latin American countries exhibited higher mortality rates at younger ages, with a more pronounced gender gap in mortality. Colombia is the country with the widest gender gap. In Latin American countries, these differences tend to diminish after age 40, displaying a similar result of a narrowing gender gap in mortality; in European countries, the gap starts to increase after age 50 and is driven by men's higher mortality.

Figure 2 presents the partition of life expectancy across the different analysed states, while Fig. 3 shows them as a percentage of the life expectancy at age 60. In order to test the significance of these differences, confidence intervals were estimated for the life expectancies by state (Saito et al., 2014), these estimations are presented in Table 3. The

Table 2 Percentual sample distribution by country, gender and age group estimated by column

Age group	Brazil		Colombia		Mexico		Spain		Portugal	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
	n **= 2172**	***n*** **= 3260**	***n*** **= 10,112**	***n*** **= 13,582**	***n*** **= 4068**	***n*** **= 5798**	***n*** **= 2064**	***n*** **= 2414**	***n*** **= 601**	***n*** **= 662**
60–69	59.01	54.70	58.61	55.42	52.93	54.01	45.72	39.66	51.31	43.20
70–79	29.32	30.29	29.65	30.63	32.12	31.39	33.51	30.71	31.85	31.45
80+	11.65	14.98	11.70	13.93	14.92	14.58	20.75	29.60	16.82	25.33

highest life expectancy at age 60 was observed among Spanish women (27.32 years), whereas the lowest was recorded for Brazilian men (20.09 years). As anticipated, women in all analysed countries have a higher life expectancy after age 60 than men, with the biggest gender gap in life expectancy observed in Spain (4.45) and the smallest in Mexico (1.58). Moreover, women are expected to live, on average, more years than men after age 60 in states implying multimorbidity-related states (2 + chronic conditions), regardless of whether they require social care (states D and E). However, these results were only statistically significant for Colombia. Additionally, women are expected to spend more years with social care needs, either with one or without 2 + chronic conditions (combining states C and E). These remained consistent when analysing the percentage of YLCN by each included state, as shown in Fig. 3.

Comparisons between countries become more direct when considering the percentage of YLCN by state. For instance, Brazilian and Colombian women are expected to live more than half of their life expectancy at age 60 in states with healthcare needs (respectively 53.70% and 50.38% when combining states D and E), while Mexican men are expected to live about one-quarter of their remaining lives in these states (26,51%). Additionally, Brazilian (52.66%), Colombian (57.30%), Mexican (61.50%), Portuguese (56.70%) and Spanish (58.63%) men are expected to live more than half of their remaining life expectancies without multimorbidity and social care needs.

When estimating the confidence intervals for the Years of Life Expectancy with Care Needs (YLCN) and the Years of Life Expectancy without Care Needs (YL without CN), we evidenced the lack of statistical significance for some states and countries, probably resulting from small sample sizes, when partitioning them by gender, age group and states. Results provided in Table 3 show that there are statistically significant differences in the YLCN between men and women in all the analysed countries. However, these differences between men and women weren't statistically significant for all the countries when considering states B, C, D, E, except for Colombian men and women in state D. Moreover, gender differences of YL without CN (state A) were also significant in the case of Colombia and Mexico.

Table 4 presents the gender gap, resulting from subtracting the estimated years of women from those of men, in life expectancy at age 60 and Years of Life expectancy with and without care needs by state. As anticipated, the gap in life expectancy is always positive because women are expected to live longer than men across all countries. Moreover, this gap is always positive when it comes to YLCN because women will live on average more years than men in states related to healthcare and social care needs. Finally, in all countries but Spain, women are expected to live fewer years than men without care needs (state A) because the value of the gap is negative. In Spain, this positive value in the gap means that men will live more years with care needs than their counterparts. However, the difference in state A didn't have statistically significant results for Spain (see Table 3).

To further analyse these differences, we decomposed the gender gap in years without healthcare and social care needs (state A) by all the other states (B to D), referring to years with healthcare and social care needs (see Fig. 4). The decomposition was done for all the analysed countries, but Spain, where the gender gap was positive. The results of this decomposition are provided in Fig. 4 and should be interpreted as follows: positive values (bars above the 0 line) imply a contribution to reducing the gender gap, while

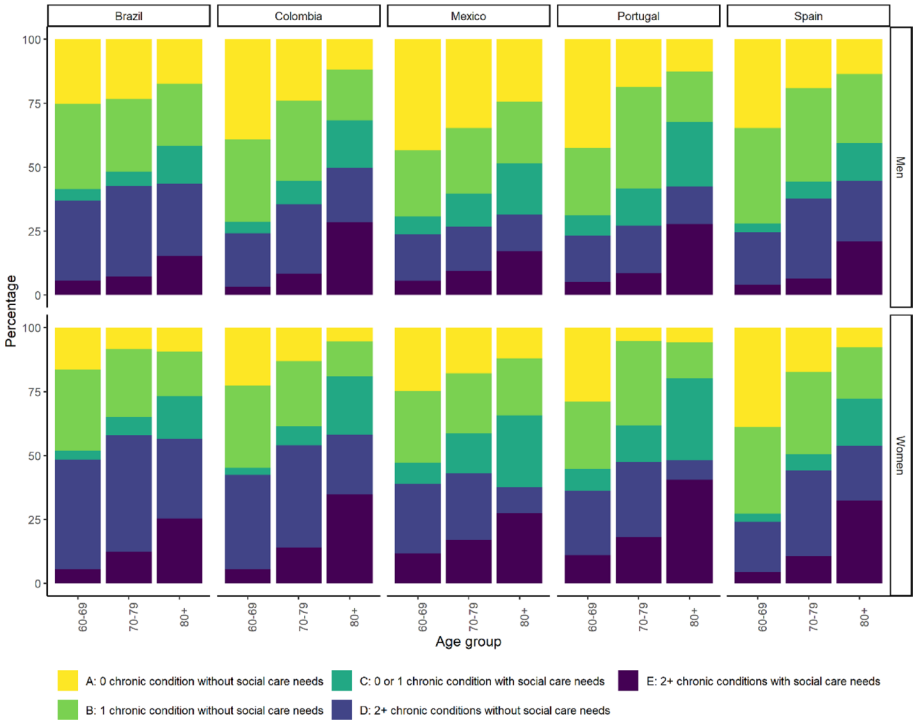

Fig. 1 Relative distribution of the states to estimate life expectancy with and withoutcare needs at age 60, by country, gender and age group

negative ones (bars below the 0 line) imply an exacerbation of the gender gap. For all the countries but Brazil, the states D and E (2 + chronic conditions with and without social care needs) explain why women live fewer years than men without care needs. Even though these states do play a role, their contributions were smaller when compared to the other countries, particularly referring to state E in the youngest age group (60–69 years).

We also tested the significance of these results by estimating confidence intervals using the Monte Carlo approach (Hendi, 2023). In general, the contributions of each state were statistically significant for explaining the gender gap by age group in all countries (see Table 5). However, it should be noted that confidence intervals overlapped between those aged 70 to 79 and 80 + in Mexico for state E.

Discussion

This study provides a nuanced understanding of the consequences of increasing life expectancy on populations' healthcare and social care needs in selected Ibero-American countries. Aligned with other studies, we stress the importance of estimating the average time individuals are expected to live with chronic diseases and different levels of dependency and disability (Lam et al., 2023; Shen & Payne, 2023). To our knowledge, no previous study has accounted for social care needs, including not only ADL but also IADL, alongside healthcare needs (by measuring chronic conditions) in their healthy life expectancy estimations, nor have they decomposed the gender gap in Years of Life with Care Needs (YLCN). By introducing the indicator of YLCN, our analysis offered a detailed perspective of how the relationship between multimorbidity and social care needs should be considered when understanding the consequences of gains in life

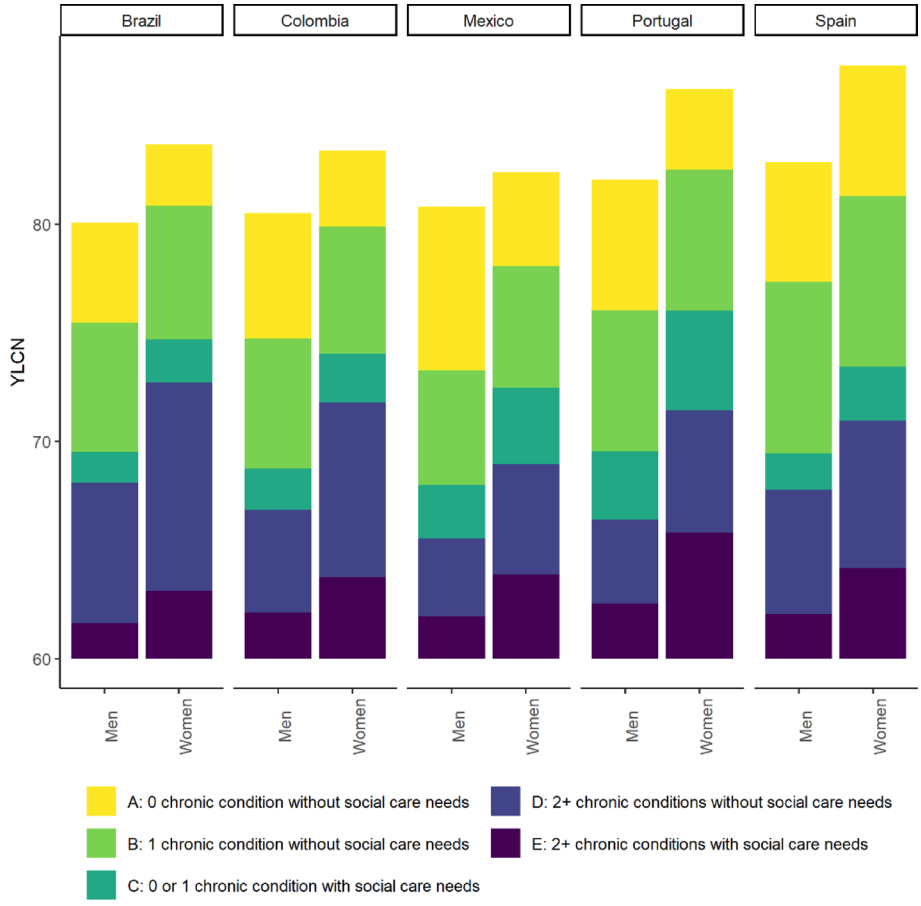

Fig. 2 Relative distribution of the states to estimate life expectancy with and withoutcare needs at age 60, by country, gender and age group

expectancy on healthcare and social care systems, which implies moving beyond debates about the compression or expansion of morbidity to account simultaneously for healthcare and social care needs.

Our results are consistent with previous evidence that emphasises differences in life expectancy between European and Latin American countries, explained by the diverse processes of the epidemiological and health transitions (Frenk et al., 1991). Moreover, our findings are aligned with the health-survival paradox, which suggests that women's longer life expectancies are associated with more years in states characterised by multimorbidity (Oksuzyan et al., 2010). A robust body of literature compares the gender gap in longevity between different countries (Austad, 2006; Oksuzyan et al., 2010). Nevertheless, our results underscore the importance of considering healthcare and social care needs when assessing the consequences of ageing. One of our main contributions is to show that healthcare needs and social care needs aren't always faced by older individuals. Additionally, we emphasise that after age 60, individuals face different states of healthcare and social care needs, as in general, men will live more than half of their life expectancies after age 60 in states without care needs, and that this is about a third for women.

Another key finding comes from the decomposition of the gender gap in life expectancy without care needs. We found that men are expected to live more years than

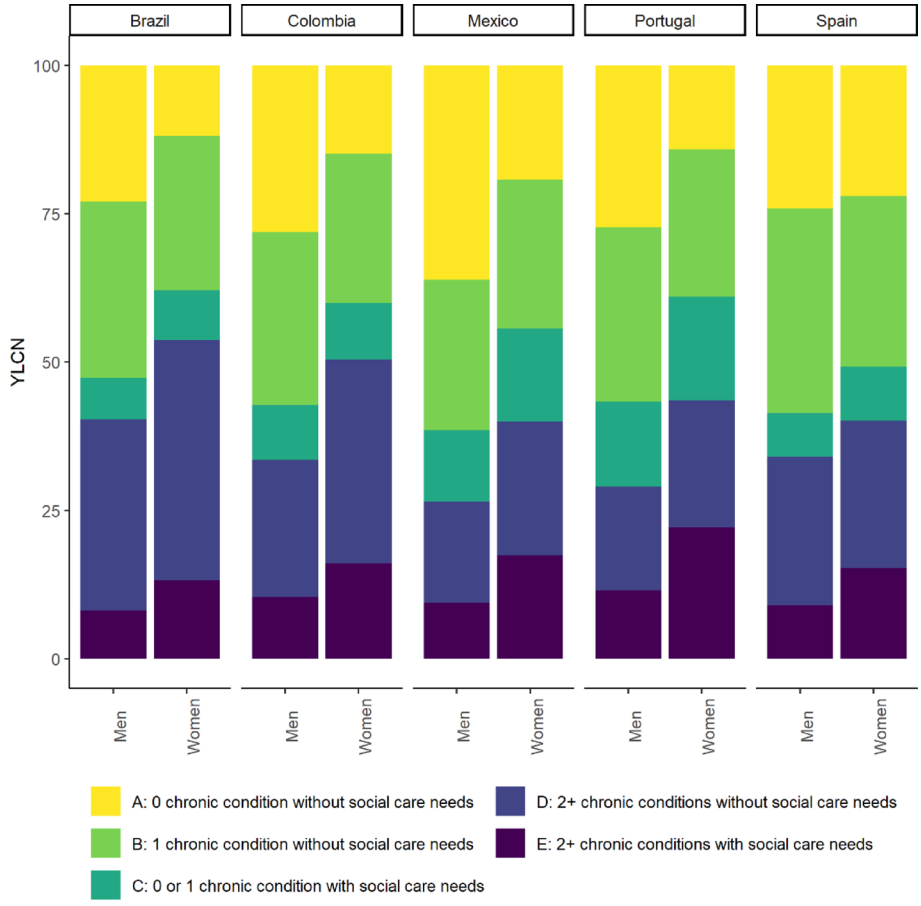

Fig. 3 Relative distribution of the states to estimate life expectancy with and withoutcare needs at age 60, by country, gender and age group

women without care needs in all countries but Spain, and that this gap is mainly explained given that they tend to spend less time with multimorbidity (states E and D), regardless they were facing limitations or not. Furthermore, our analysis of the gender gap shows that differences in the number of years individuals are expected to live without care needs are related to different states. A bigger gender gap in life expectancy without care needs was observed in Latin American countries, as other studies have shown (Palloni & Pinto-Aguirre, 2011; Van Oyen et al., 2013), probably due to the selection of men surviving to age 50. Given that before this age, most men's deaths are due to violent causes, and that men from a lower economic status are more prone to die by these causes (García & Aburto, 2019). A selection bias may be taking place, increasing the years without care needs that men are living when compared to women.

Despite the qualities of the YLCN, which, like other measures based on Sullivan's method, allow for comparison across populations by accounting for their age structures, the usage of this method implies some limitations to our analysis. Firstly, our estimations assume a stationary population; this is a common assumption of period life tables. However, when estimating YLCN, we are also assuming that the estimated prevalences of healthcare and social care needs will remain constant over time (Imai & Soneji, 2007). Secondly, the lack of statistical significance for almost all the gender differences by states, with the exceptions of Colombia for state A and D, and Mexico for state A, are probably

Table 3 Life expectancy after age 60 by state and years of life expectancy with and without care needs by gender and country

Sex	Country	Life expectancy after age 60	Years of life expectancy with care needs (states B, C,D, and E)	Years of life expectancy without care needs (state A)	Years of life expectancy with care needs by states B, C, D and E			
		LE	YLCN	YL without CN	B	C	D	E
Men	Brazil	20.09	15.479 [14.172–16.786]	4.612 [2.427–6.797]	5.969 [3.85–8.087]	1.407 [−1.009–3.824]	6.461 [4.329–8.592]	1.642 [−1.173–4.458]
Women	Brazil	23.68	20.863 [20.093–21.634]	2.819 [1.084–4.554]	6.165 [4.572–7.759]	1.981 [0.22–3.742]	9.585 [8.143–11.027]	3.132 [1.465–4.800]
Men	Colombia	20.51	14.744 [13.959–15.529]	5.769 [4.846–6.693]	5.987 [4.951–7.023]	1.883 [0.749–3.018]	4.737 [3.615–5.859]	2.137 [0.864–3.411]
Women	Colombia	23.4	19.914 [19.456–20.372]	3.490 [2.693–4.286]	5.87 [5.088–6.653]	2.253 [1.478–3.029]	8.033 [7.245–8.821]	3.758 [2.800–4.715]
Men	Mexico	20.82	13.287 [12.115–14.458]	7.536 [6.078–8.993]	5.272 [3.778–6.766]	2.495 [0.654–4.336]	3.561 [1.907–5.214]	1.96 [0.33–3.589]
Women	Mexico	22.41	18.084 [17.327–18.84]	4.323 [2.985–5.661]	5.62 [4.346–6.895]	3.519 [2.039–4.998]	5.053 [3.713–6.392]	3.892 [2.539–5.245]
Men	Portugal	22.07	16.043 [13.228–18.858]	6.025 [1.832–10.218]	6.488 [2.843–10.134]	3.151 [−2.461–8.763]	3.855 [0.103–7.606]	2.549 [−1.214–6.312]
Women	Portugal	26.25	22.536 [20.504–24.568]	3.715 [−0.216–7.646]	6.524 [3.249–9.798]	4.591 [1.011–8.171]	5.609 [2.131–9.087]	5.813 [2.689–8.936]
Men	Spain	22.87	17.352 [15.671–19.034]	5.521 [3.461–7.58]	7.889 [5.658–10.121]	1.681 [−1.452–4.813]	5.722 [3.23–8.214]	2.06 [−1.266–5.386]
Women	Spain	27.33	21.311 [19.892–22.73]	6.017 [4.254–7.78]	7.879 [6.042–9.716]	2.481 [0.261–4.701]	6.765 [4.72–8.811]	4.185 [1.808–6.563]

Confidence intervals are provided in squared brackets

Table 4 Differences between women and men in life expectancy at age 60 and years of life expectancy with and without care needs by state and country

	Life expectancy	Years of life expectancy with care needs (states B, C, D and E)	Years of life expectancy without care needs	Years of life expectancy with care needs by states B, C, D and E			
	LE	YLCN	A	B	C	D	E
Brazil	3.59	5.38	− 1.79	0.20	0.57	3.12	1.49
Colombia	2.89	5.17	− 2.28	− 0.12	0.37	3.30	1.62
Mexico	1.58	4.80	− 3.21	0.35	1.02	1.49	1.93
Portugal	4.18	6.49	− 2.31	0.04	1.44	1.75	3.26
Spain	4.45	3.96	0.50	− 0.01	0.80	1.04	2.13

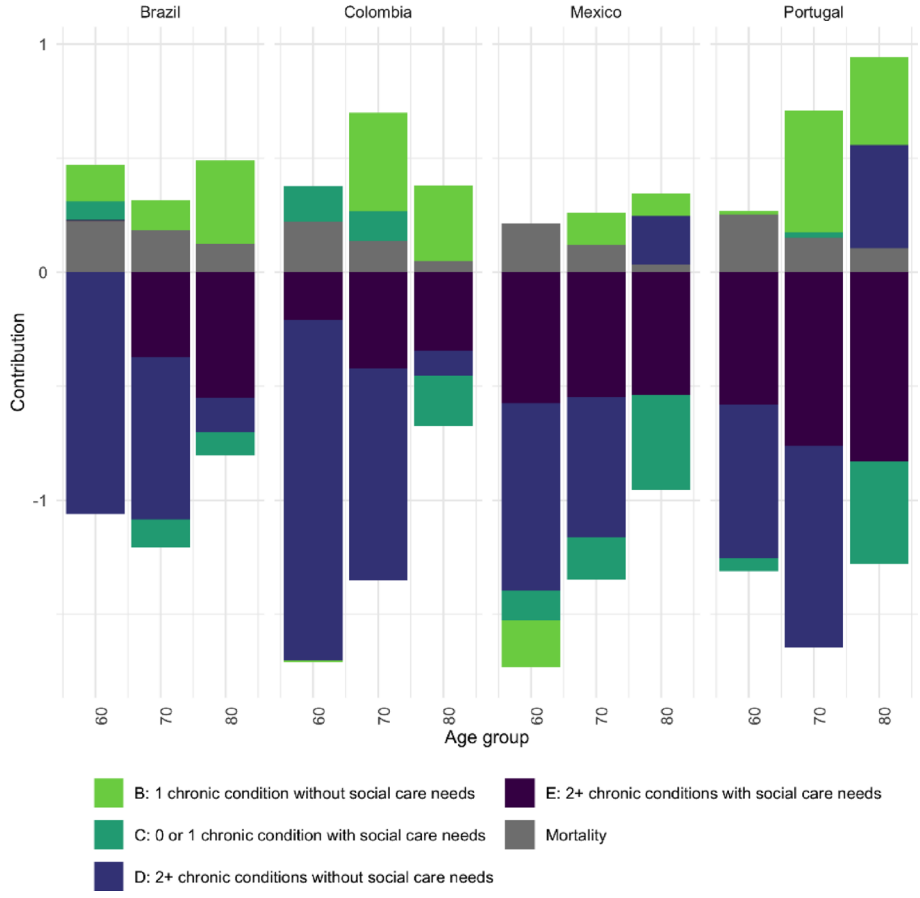

Fig. 4 Relative distribution of the states to estimate life expectancy with and withoutcare needs at age 60, by country, gender and age group

result from the small sample sizes. Nevertheless, our estimations did show statistically significant results when comparing the gender differences in the YLCN (when considering states B to D together) for all the analysed countries.

There are other limitations of our analysis that are beyond the assumptions of Sullivan's method and the uncertainty around our estimations. Compared to official life expectancy reports, our estimations tend to be slightly higher. This discrepancy arises from the fact that our last age group of analysis is relatively young (80+) in a scenario of ageing populations, when many deaths occur after age 80. This limitation likely affected the estimations for European countries more than the Latin American ones; therefore,

Table 5 Contributions by state to the gender gap in life expectancy without care needs (state A) after age 60 by age group and country

Age	Country	B	C	D	E	Mortality
60–69	Brazil	0.161 [0.158–0.164]	0.081 [0.079–0.082]	− 1.058 [− 1.061 to − 1.055]	0.004 [0.002–0.005]	0.225 [0.224–0.225]
70–79	Brazil	0.132 [0.128–0.135]	− 0.123 [− 0.125 to − 0.121]	− 0.709 [− 0.713 to − 0.706]	− 0.374 [− 0.376 to − 0.372]	0.184 [0.183–0.184]
80+	Brazil	0.367 [0.363–0.371]	− 0.101 [− 0.104 to − 0.098]	-0.153 [− 0.156 to − 0.149]	− 0.551 [− 0.554 to − 0.547]	0.123 [0.123–0.124]
60–69	Colombia	− 0.01 [− 0.02 to − 0.001]	0.154 [0.150–0.158]	− 1.491 [− 1.5 to − 1.482]	− 0.21 [− 0.215 to − 0.206]	0.223 [0.222–0.225]
70–79	Colombia	0.431 [0.421–0.442]	0.133 [0.126–0.139]	− 0.928 [− 0.938 to − 0.917]	− 0.422 [− 0.43 to − 0.415]	0.135 [0.134–0.137]
80+	Colombia	0.333 [0.323–0.343]	− 0.224 [− 0.234 to − 0.213]	− 0.108 [− 0.119 to − 0.098]	− 0.344 [− 0.356 to − 0.332]	0.048 [0.047–0.050]
60–69	Mexico	− 0.206 [− 0.212 to − 0.200]	− 0.131 [− 0.134 to − 0.127]	− 0.821 [− 0.827 to − 0.815]	− 0.574 [− 0.578 to − 0.570]	0.213 [0.213–0.214]
70–79	Mexico	0.139 [0.133–0.145]	− 0.186 [− 0.191 to − 0.182]	− 0.614 [− 0.619 to − 0.608]	− 0.547 [− 0.552 to − 0.543]	0.121 [0.121–0.122]
80+	Mexico	0.100 [0.094–0.107]	− 0.414 [− 0.42 to − 0.408]	0.212 [0.207–0.217]	− 0.539 [− 0.545 to − 0.533]	0.033 [0.033–0.033]
60–69	Portugal	0.015 [0.001–0.029]	− 0.057 [− 0.066 to − 0.048]	− 0.672 [− 0.685 to − 0.658]	− 0.581 [− 0.59 to − 0.572]	0.254 [0.252–0.256]
70–79	Portugal	0.534 [0.517–0.551]	0.025 [0.013–0.037]	− 0.882 [− 0.896 to − 0.867]	− 0.763 [− 0.774 to − 0.752]	0.150 [0.148–0.153]
80+	Portugal	0.384 [0.370–0.398]	− 0.448 [− 0.463 to − 0.432]	0.453 [0.441–0.464]	− 0.829 [− 0.845 to − 0.813]	0.106 [0.103–0.108]

Confidence intervals are provided in squared brackets

we should be cautious in our conclusions for individuals after age 80+, but we also probably underestimated the years women spent with care needs. This is one of the challenges of cross-country comparisons; however, our estimations aimed to show the differences in the years spent with healthcare and social care needs, and are not precisely informative of life expectancies for each country.

Another limitation of our analysis is that the data used were collected in 2015. While more recent information is available for some other countries, we prioritised comparing these Ibero-American countries. Moreover, although Brazil, Spain, and Portugal have more recent longitudinal data, much of it was collected during the COVID-19 pandemic, which might have affected its quality. Regarding data collection, the analysed states were constructed based on self-reported variables, which may introduce underreporting bias. This is particularly relevant in Latin American countries, where individuals often face access barriers to healthcare services and limited resources in the diagnosis and treatment of diseases, which can affect the measurement of morbidity. Despite improvements in mortality data from Latin American countries, it is also worth mentioning that these

data may still suffer from under-registration and coverage issues (Gonzaga et al., 2018). Moreover, the measure of social care needs may be affected by two sources of bias: on the one hand, underreporting by individuals already receiving help for their limitations (who may not report them as such); on the other hand, our measure assumes that facing limitations for performing ADL and IADL implies needing someone's support for performing the task and, therefore, a need for social care needs, which might not always be the case. This assumption is particularly relevant in countries where responses to facing limitations are dichotomous (Mexico, Spain, and Portugal). Finally, our results depended on the harmonisation process that made comparable data from different surveys. To achieve this, we included surveys that shared similarities in their design, sample, objective, and questions, and we decided to work with individuals aged 60 + to ensure comparability across all analysed countries. Additionally, we tested different methods for operationalising our variables of interest and evaluated several alternatives to achieve consistency in the presented results.

Conclusions

This study demonstrates the value of combining estimations of healthcare and social care needs to improve our understanding of individuals' needs, as well as how to adapt curing and caring services to ageing populations. By estimating YLCN, we demonstrate that healthy life expectancy indicators can be indicative of population health but not necessarily reflect the care needs that individuals might face. Furthermore, our results show that having healthcare needs due to the presence of a chronic condition is not always linked to social care needs and that the health-survival paradox is not only explained by men's mortality but also by how they experience chronic conditions and limitations. Finally, comparisons of the Ibero-American countries contribute to explaining the gender differences and provide useful insights into the specific challenges of ageing populations. We know that women are living longer years than men and that these years are usually lived in poorer health than men. However, the needs that underlie these unhealthy years entail accounting at the same time for their healthcare and social care needs.

Abbreviations

YLCN	Years of life expectancy with care needs
YL without CN	Years of life expectancy without care needs

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s41118-025-00279-8.

Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

Supplementary Material 4.

Supplementary Material 5.

Supplementary Material 6.

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Author contributions
MCJ was in charge of conceptualising and designing the study, as well as of data curation, analysis, and manuscript preparation. JS reviewed, provided feedback, and prepared the manuscript. ER supported the analysis of the results and reviewed and prepared the manuscript. LCA provided support for data curation and analysis and provided feedback to the manuscript.

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Data availability
All the analysed data presented here comes from publicly available sources. The data coming from surveys about ageing populations in each one of the analysed countries can be accessed in their official repositories [ELSI: https://elsi.cpqrr.fiocruz.br/en/home-english/; SABE: https://www.dane.gov.co/index.php/estadisticas-por-tema; MHAS: https://www.mhasweb.org/Home/index.aspx; SHARE: https://share-eric.eu/data/]. The Human Mortality Database was also used, and it is available in its repository [https://www.mortality.org/]. Finally, official data from Brazilian (IGBE), Colombian (DANE), and Mexican (CONAPO) statistical departments is also accessible through their official websites [Respectively: https://www.ibge.gov.br/ ; https://www.dane.gov.co/ ; https://www.gob.mx/conapo]. Data generated from these sources was analysed and presented in the Supplementary materials, referring to the methodological details.

Declarations

Competing interests
The authors declare that they have no competing interests.

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