Artículo de revista:

Bramajo, Octavio; Permanyer, Iñaki; Blanes, Amand. November 2022. “Regional inequalities in life expectancy and lifespan variation by educational attainment in Spain, 2014–2018.” *Population, Space and Place* (ISSN 1544-8452) https://doi.org/10.1002/psp.2628.

Received: 9 November 2021 | Accepted: 22 October 2022

DOI: 10.1002/psp.2628

RESEARCH ARTICLE

WILEY

Regional inequalities in life expectancy and lifespan variation by educational attainment in Spain, 2014–2018

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Funding information

European Research Council; Agència de Gestió d'Ajuts Universitaris i de Recerca

Abstract

Two important sources of inequality in mortality are regional variation and individuals' socioeconomic status. While many studies have investigated the effect that each of these two factors might have had on mortality levels separately, they have rarely been studied simultaneously. Using linked data from the Spanish National Institute of Statistics, we study regional levels of life expectancy and lifespan inequality by sex and educational attainment in contemporary Spain (2014–2018). In all regions, life expectancy was higher (and lifespan variation lower) for individuals with higher educational attainment and among women. We find a negative relationship between life expectancy and lifespan inequality across subnational regions among all sex-education groups. However, the relationship is much weaker among the highly educated. These findings suggest that spatial conditions still matter as health determinants, but even more among individuals with disadvantaged socioeconomic positions, not only in terms of lower life expectancy but also of higher lifespan variation.

KEYWORDS

educational attainment, life expectancy, lifespan inequality, Spain, spatial inequality

1 | INTRODUCTION

The unprecedented increases in longevity in the 20th century around the world could certainly be considered a success story (Riley, 2005, 2015). Given the almost universal desirability of living long lives, it is important to look not only at 'efficiency'—that being how efficient societies are in generating and sustaining years of life (or how long we live *on average*)—but also at 'equity': how (un)equally distributed longevity (or any other health outcome) is. National-level averages inevitably mask some degree of heterogeneity (dispersion) in the underlying distribution of health, so the study of inequalities within countries is becoming a prominent issue in global policy-making and research agendas. The study of these disparities brings on aggregate value for monitoring the health situation in a given population. On the one hand, regional differences in health are relevant because they reflect contextual factors that might vary within countries: differential provision or access to health, differences in infrastructure, different average living standards and so on (Cutler et al., 2006). On the other hand, differences in mortality across socio-economic (SES) groups are important because they indicate how those contextual factors affect those individuals from different social standings, revealing the existence of social inequalities and their magnitude (Marmot, 2005). Unfortunately, mortality differentials by SES are not easily measurable because of the difficulty of accurately linking mortality registers with SES indicators, and they have typically been only investigated one population at a time.

When investigating differences across Spanish regions and SES groups, we look at two fundamental health outcomes: life expectancy and lifespan inequality. While the former is a well-known 'health efficiency' indicator measuring the average number of years individuals are expected to live, the latter informs us about the variability in the ages at which individuals die—thus being a key marker of health heterogeneity that, according to van Raalte et al. (2018), is 'the most fundamental of all inequalities'. Exploring the relationship between life expectancy and lifespan inequality is important, among other things, to assess whether the normatively desirable goals of (i) living longer lives and (ii) sharing them equitably (i.e., long lives are enjoyed by everyone) can be achieved simultaneously or not. In general, while these two health indicators tend to be negatively related (i.e., higher life expectancy tends to be associated with lower lifespan inequality; Aburto et al., 2020; Smits & Monden, 2009; Vaupel et al., 2011), very little is known about their relationship when we differentiate across SES groups and the analysis is performed at the regional level. A few studies have investigated the joint behaviour of these measures (life expectancy and lifespan variation) either across SES groups (e.g., Permanyer et al., 2018; van Raalte et al., 2014; Sasson, 2016a, 2016b) or at the regional level (Illsley & Le Grand, 1993; Wilson et al., 2020), but not combining both dimensions simultaneously. This is an issue that we aim to address in this paper. Our main research questions are as follows:

1. What are the levels of life expectancy and lifespan variation across Spanish subnational regions? How do these indicators vary by educational attainment? Are they different for women and for men?
2. What is the relationship between life expectancy and lifespan variation across subnational regions by educational attainment group and sex? In which groups is the relationship stronger/weaker?

2 | BACKGROUND

2.1 | Social and spatial differences in mortality

In a way, mortality represents the final chapter of the biographies of individuals, and as a result, it is considered the ultimate indicator of the health of individuals (Rosero-Bixby & Dow, 2009). The existence of a positive relationship between health and socioeconomic status or position of individuals is not surprising and is something of common knowledge. But as Preston and Taubman (1994) point out, identifying the magnitude of such association is critical for the scientific dimension.

In health research, the socioeconomic position of individuals refers to their standing in a hierarchical social structure and is related to a series of social and economic factors that influence or determine such standing (Galobardes et al., 2006; Lynch et al., 2000). Those factors are usually associated with income, wealth, educational attainment and other aspects relevant to the well-being of individuals (Brown & McDaid, 2003). Since those aspects that indicate the social position are generally correlated, they have been used alternatively for different studies in the matter as proxies. The social position of an individual does not necessarily work by itself as a causal mechanism that results in better health (Brown et al., 2012; Hayward et al., 2015; Hummer & Lariscy, 2011). But certainly, a higher education could be related to the possibility of adopting certain technologies that are critical for ensuring their good health (Fogel & Costa, 1997). Furthermore, by being exposed to a certain accumulation of risks across the life course (e.g., working in physically demanding jobs, engaging in activities that may be detrimental to health like alcohol or drug consumption), individuals may present better or worse health outcomes that are socially mediated (Marmot, 2005).

It is also apparent from the latter that the aspects that are linked with poor health outcomes cannot be purely individual, but often the structural, material and social conditions of the environment in which people live their lives must also be considered. Spatial inequalities in health, as their name suggests, are the result of unequal access to new technologies and distribution of resources (health provisions, medical care, sanitation, food rich in nutrients). From a population standpoint, those inequalities usually manifest in several negative health outcomes, including mortality (Chetty et al., 2016; Regidor et al., 2016; Reques et al., 2015; Vierboom et al., 2019). Even with similar deprivations at a household level or a similar individual socioeconomic position, individuals who have access to proper health facilities or even good, paved roads could have a health advantage when compared to those lacking such access. Social relationships happen in space, and social inequalities occur at a spatial level as a result, in an existing material context (Lynch et al., 2000). In this approach, inequalities come from differential exposure to certain life-long experiences and situations that negatively impact the health of individuals. This exhibition is usually accompanied by a lack of resources of different kinds (social, physical or health), both individually and at the general level, combining human, cultural and sociopolitical processes (Lynch et al., 2000; Montez et al., 2016). Many times, it is the presence and aptitude of health, technology and social protection systems throughout the territory that have played a leading role in increasing not only the length but also the quality of life of individuals (Behrman et al., 1998). Henceforth, considering the spatial dimension is critical for identifying health inequalities.

2.2 | Key measures of health and mortality: The need to go beyond averages

Traditionally, life expectancy at birth has been used as one of the key indicators to compare mortality levels across populations by demographers, actuaries and other professionals and scientists. Life expectancy is a construct that is derived from an artefact known as a life table or mortality table (Preston et al., 2001). Life expectancy enjoys well-deserved popularity because it has some important properties that make it desirable for analysis. Not only it can deal with differential age–structure components and give a net measure of mortality (unlike crude death rates), but life expectancy also offers an easily interpretable indicator that is conventionally measured in years.

This measure, while undeniably powerful and useful to measure the mean level of mortality, also has some limitations. One of them is based on the idea that life expectancy is a measure that gives an average value. Why this could be seen as a limitation? Because it assumes that a given cohort would live a certain quantity of time on average, but it does not tell us about the dispersion of mortality (van Raalte et al., 2018). Two populations can have the same life expectancy but very different patterns in terms of the distribution of deaths in a life table: mortality can be expanded, with a larger proportion of deaths occurring at younger ages, or compressed, with a larger proportion of deaths population occurring at higher ages (Kannisto, 2000).

While some individuals from a more disadvantaged socioeconomic position may outlive others from a more advantaged socioeconomic position (Vaupel et al., 2021), lower life expectancies are associated with higher variabilities at the time of death (Németh, 2017; Vaupel et al., 2011), resulting in a double burden: those who had higher mortality also tended to have a higher age-of-death variability, which can be related with a higher number of premature deaths (Permanyer et al., 2018; Seaman et al., 2019).

The increase in heterogeneity (expressed in a larger group variation) also allows identifying worse health conditions for a particular group, usually associated with preventable causes. For instance, most pension systems are designed by considering average life expectancy, but in a high variability scenario with some strong inequalities in lifespan, such design may be unbalanced, favoring some individuals with better health and increasing social inequality, working regressively (Brønnum-Hansen, 2017). This implies that the study of variations in lifespan and health is not only theoretically important for understanding demographic dynamics in a given population but also for very practical reasons. From a policymaker's point of view, it may allow a more efficient allocation of resources in health, to the design of pension systems that regard equity as an important principle. From an individual standpoint, higher knowledge of how uncertainty in lifespan operates could provide insights into some critical decisions, such as applying for a mortgage or getting particular life insurance (Edwards, 2013).

Therefore, in the last years, researchers focused on the importance of individual lifespans as a focal point for inequalities and developed a series of indicators to consider lifespan variability in a population (Edwards & Tuljapurkar, 2005; van Raalte & Caswell, 2013; Vaupel et al., 2011). However, it should be noted that lifespan inequality indicators do not seek to replace life expectancy, but to provide an additional dimension to the health situation of a particular population, with an emphasis on variability. After all, just like life expectancy, lifespan inequality measures are derived from a life table, so they are not entirely independent from each other (Aburto et al., 2019). Broadly speaking, current empirical evidence indicates that life expectancy and lifespan variation measures are negatively correlated (Edwards, 2011; Permanyer & Scholl, 2019; Smits & Monden, 2009; Vaupel et al., 2011; Vigezzi et al., 2022), although a decline in mortality may not necessarily result in a lower lifespan variation.

2.3 | Previous contributions

Health inequalities across space and social class have been very well documented in the literature by using efficiency-based measures such as life expectancy or relative risks in mortality (Brønnum-Hansen, 2000; Gallo et al., 2012; Lariscy, 2011; J. P. Mackenbach et al., 1997; Montez et al., 2019; Regidor et al., 1995; Reques et al., 2015). The general consensus found that educational attainment is one of the main drivers of health disparities, but that association sometimes varied by region or other important contextual factors (Kemp & Montez, 2020; Montez et al., 2019): for instance, regions with higher levels of deprivation in Spain also tend to present higher mortality, arguably due to their less-than-optimal provision of services to the population among other factors (Regidor et al., 2015; Reques et al., 2015). A previous study also found that Spain has one of the thinnest educational disparities in mortality across Europe (J. P. Mackenbach et al., 2019), but only focusing on national averages. Likewise, the literature on lifespan inequality has been expanding considerably since the turn of the 21st century, with many studies focusing on trends at a national level (Aburto & van Raalte, 2018; Illsley & Le Grand, 1993; Le Grand, 1987; Permanyer & Scholl, 2019; Seaman et al., 2016; Vaupel et al., 2011). However, studies investigating differences in life expectancy and lifespan variability simultaneously across subnational regions or SES groups are much scarcer. On the one hand, studies by different proxies of SES (educational attainment, occupational class, disposable income) were done previously at a national level (Brønnum-Hansen, 2017; Permanyer et al., 2018; Sasson, 2016b; van Raalte et al., 2014, 2018). Furthermore, some studies were conducted in the United States comparing lifespan variability by race/ethnicity groups, such as Hispanic populations, non-Hispanic Whites and non-Hispanic Blacks (Firebaugh et al., 2014; Lariscy et al., 2016). In both cases, the authors found that the groups with the lowest mortality had lower lifespan variability (this being, less heterogeneity in mortality) as well. On the other hand, studies conducted at the subnational level have not considered the SES component but mostly focused on the spatial variation of mortality and lifespan variation (Illsley & Le Grand, 1993; Wilson et al., 2020; Xu et al., 2021). Seaman et al. (2019) also analysed lifespan variation at a subnational level, differentiating by deprivation-based areas as a proxy of the overall SES of those spatial units.

Other relevant research directly discusses the interplay between socioeconomic status and the role of space. For instance, evidence from England and Wales indicates that higher educational attainment and social class reduce rural–urban mortality disparities, working as a protective factor in regard to environmental exposures (Allan et al., 2019). Elo et al. (2019) also point out that education and mortality are negatively correlated, and this association stands true across all areas in the United States, either metropolitan or nonmetropolitan.

Moreover, greater social cohesion and a growing economic environment seem to diminish inequalities in women's mortality across space (Montez et al., 2016).

Life expectancy in Spain was among the lowest in Europe during the first half of the 20th century. However, dramatic mortality reductions in the last decades have placed Spain among the world's most longevous countries. Previous studies indicate, though, that, in spite of these accelerated improvements, significant differences in mortality persist at a regional level (Gispert et al., 2007; Miqueléiz et al., 2015; Regidor et al., 1995, 2011; Reques et al., 2015), indicating that autonomous communities (the name used to define first-level political and administrative in Spain) such as Andalusia or Extremadura (some of the poorest of the country) had a higher mortality than the average of the country. These inequalities were also evident when considering differential educational attainment (Blanes & Trias-Llimós, 2021; Permanyer et al., 2018; Reques et al., 2015), with a higher mortality in lower-educated individuals. In Spain, we can identify a rather clear geographic pattern of mortality, with the Southern and Western regions experiencing higher amenable mortality (Benach & Yasui, 1999; Regidor et al., 2015; Reques et al., 2015). On the contrary, the Northern provinces, in spite of their overall lower mortality and higher education, tend to present a higher number of mortality attributable to conditions such as cancer (Aragonés et al., 2009; García-Torrecillas et al., 2019; Santos-Sánchez et al., 2020).

Studies on Spain that focus on socioeconomic differentials at an individual level have been scarce, given the difficulties to obtain individual-level data on mortality at the national level. This has meant that previous studies studying socioeconomic differences in mortality focused on some particular regions (Huisman et al., 2004; Mackenbach et al., 2008) and that were performed using aggregate-level data (Miqueleiz et al., 2015; Regidor et al., 2016; Reques et al., 2014, 2015). Some of these studies (Mackenbach et al., 2008; Reques et al., 2014) indicated that mortality differences by educational attainment in Spain seemed to be smaller when compared to other European countries. Furthermore, other studies indicate that there is a clear geographical pattern in death rates for the lower-educated population across autonomous communities in Spain, but not for the higher educated (Miqueleiz et al., 2015; Reques et al., 2015). This would suggest that space is a stronger determinant of mortality for the lower-educated people than the higher educated in Spain. However, the role of lifespan inequality and its relationship with life expectancy across regions remains unknown.

Previous studies have found that reductions in mortality at young ages simultaneously contribute to increased life expectancy *and* reduced lifespan variation (Aburto et al., 2020; Nigri et al., 2021; Permanyer & Shi, 2022), thus leading to a negative relationship between both indicators (i.e., higher longevity associated with lower lifespan inequality). In turn, mortality improvements at older ages contribute to an increase in both life expectancy and lifespan variation, thus conducing towards a positive relationship between both indicators. Given this, and since deaths among the highly educated tend to occur at older ages than those with lower education (Permanyer et al., 2018; van Raalte et al., 2012; Sasson, 2016a, 2016b), we hypothesize that the relationship between life expectancy and lifespan variation across subnational regions might be more negative among the lower educated (see below). Furthermore, the choice of lifespan variation indicators may alter the strength and even the direction of the relationship between life expectancy and lifespan variation (Vigezzi et al., 2022). For this reason, we explore if there is any difference in this relationship when considering both absolute and relative measures of lifespan variation.

2.4 | Research hypotheses

Following the discussion from the previous sections, we now present the research hypotheses corresponding to our research questions (applied to the Spanish case).

Hypothesis 1: Life expectancy is higher for highly educated groups and for women across subnational regions. Lifespan variation is higher for lower-educated groups and for men across subnational regions.

Hypothesis 2: The association between life expectancy and lifespan variation across regions is stronger for individuals with lower educational attainment, owing to the higher prevalence of deaths occurring at younger ages for that group.

Hypothesis 3: The relationship between life expectancy and lifespan variation might differ when inequality is measured in absolute or relative terms.

3 | MATERIALS AND METHODS

For this analysis, we used a combination of data sources. We performed a cross-sectional type of analysis considering deaths and population exposures by sex and educational attainment in each Autonomous Community (the first-level political and administrative units) of Spain.

Population exposures resulted from summing the reported population from 2014 to 2018 (having 1st of July of 2016 as the centre point for population exposure) and deaths for the same period, both provided by the Spanish National Institute of Statistics (Instituto Nacional de Estadística or INE). The mortality file from INE provided death counts and population exposure by sex and educational attainment for each one of the autonomous communities in Spain, which correspond to the European standard NUTS-2 classification: Andalusia, Aragón, Asturias, Balearic Islands, Canary Islands, Cantabria, Castile and León, Castile-La Mancha, Catalonia, Valencian Community, Extremadura, Galicia, Madrid, Murcia, Navarra, Basque Country, La Rioja, Ceuta and Melilla. For our analyses, Ceuta and

Melilla have been merged into a single unit due to data constraints. Figure 1 presents the geographical distribution of those autonomous communities in the country. INE used a matching algorithm linking registered deaths to population databases, including censuses, municipal population registers, the ministry of education and the Public State Employment Service, to obtain the deaths according to educational attainment, when possible. This mortality data was used successfully by previous studies (Blanes & Trias-Llimós, 2021; Permanyer et al., 2018; Trias-Llimós & Spijker, 2022) to measure both life expectancy and lifespan variability trends by educational attainment in Spain (at a national level). The INE also provided the total estimates of the population by sex, age and educational attainment in Spain. With these registers, we can determine, at an aggregate level and for each autonomous community, death counts and population exposures in the chosen period.

The bottom truncation for the estimations was set at age 35, to give a reasonable amount of time for individuals to complete their educational attainment. To make comparisons as robust as possible we decided to establish two separate groups in terms of educational attainment as a proxy of socioeconomic position. As previously stated, education, income and aspects that suggest individuals' social position are often strongly correlated. However, educational achievements are considered a more stable attribute, while income is often a more fluctuating feature throughout the life course (Smith, 2004). We opted to split between individuals with 'lower educational attainment' (individuals who, at most, completed the first cycle of secondary education, which is equivalent to 8 years of mandatory schooling, or Level 2 in the normalized ISCED-2011 classification) and individuals with 'higher educational attainment' (who had more than 8 years of education, or ISCED-2011 Level 3 and above). This is partly due to relative data scarcity in some autonomous communities, but also, due to strong compositional differences in regard to the value of education in terms of socioeconomic position: some years ago, having a university degree was less frequent, and earning a secondary degree was enough to relate to a strong socioeconomic position. That being said, and despite the rapid expansion of education in Spain, many adults still have not reached 8 years of education, making the cutoff point reasonable and robust enough for the analysis.

Accurate measures of lifespan variation (like 'life disparity' and 'lifetable entropy'—see below) generally demand a high level of granularity. To have consistent life tables (which are based on single age deaths and population exposures for each educational category), a large number of observations are required. For this reason, having three educational groups (based on years of education) in all regions was not feasible for this study, particularly for the smallest regions with low exposures at the older age groups. We decided to prioritize a greater coverage (by including all regions) at the expense of,

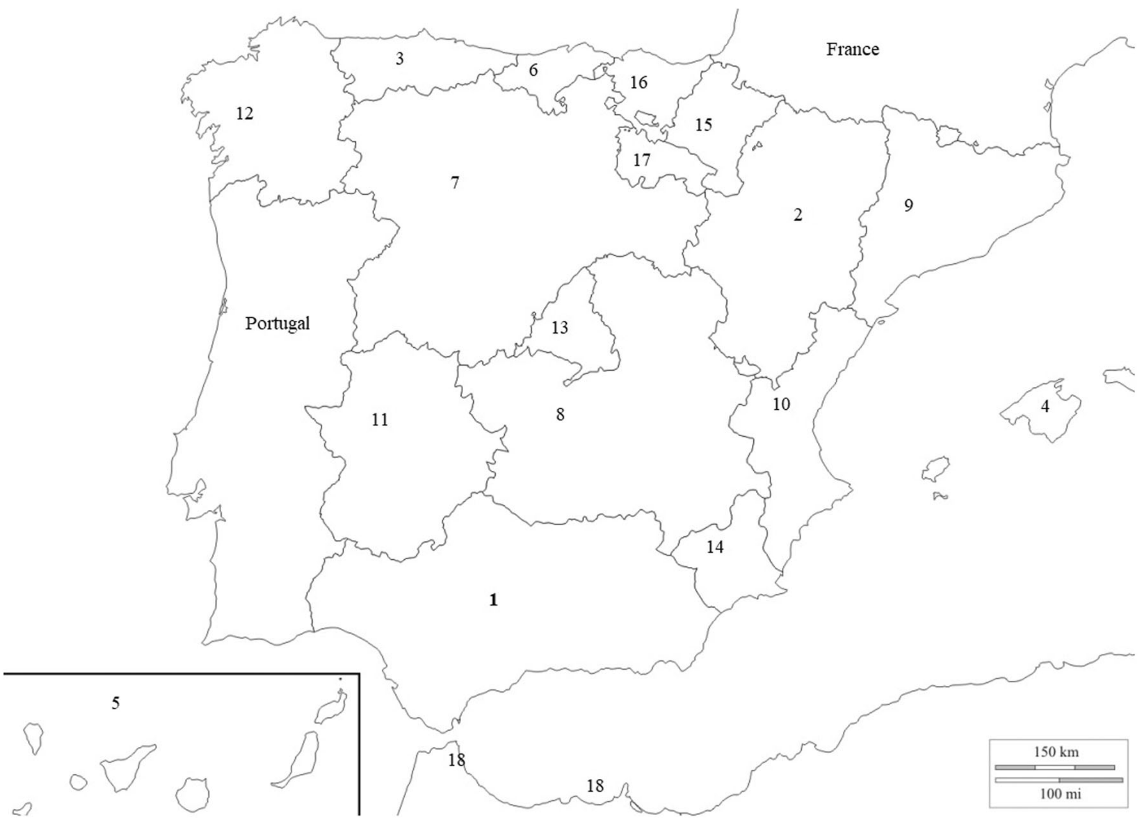

FIGURE 1 Map of Spain by autonomous communities. 1, Andalusia; 2, Aragon; 3, Asturias; 4, Balearic Islands; 5, Canary Islands; 6, Cantabria; 7, Castile and León; 8, Castile-La Mancha; 9, Catalonia; 10, Valencian Community; 11, Extremadura; 12, Galicia; 13, Madrid; 14, Murcia; 15, Navarra; 16, Basque Country; 17, La Rioja; 18, Ceuta and Melilla. *Source*: Author's elaboration

potentially, some accuracy in our estimations by having only two educational levels (factually splitting the middle education age groups into lower and higher). To better illustrate this point, in part of the Supporting Information: Figures 1S and 2S, we added death rates and population exposures for three autonomous regions where this problem becomes evident. One of these cases was Andalusia (the largest region of Spain, containing almost 20% of the population), where the distribution of death rates by age and educational attainment suggests a better consistency when considering two educational categories instead of three. We also added some of the smallest regions like La Rioja and Ceuta and Melilla, where using a two-group approach offers more reasonable mortality estimates as well. This was mostly because of the rather small population exposure at higher ages in those cases, not only because higher male mortality results in fewer survivors but also because there may be fewer females with access to high education at the more advanced ages).

From now on we will refer to these two groups as Low education/High education (in terms of educational attainment, strictly). Educational attainment could not be identified in less than 1% of the overall deaths. Therefore, a single mean proportional imputation was used to establish the educational attainment for those cases. We will be using the open-end interval for ages 100 and above as the closing value for the life table (top truncation).

Given that we are dealing with single age interval death counts and exposures, fluctuations may occur at a given age in regard to the distribution of deaths. Therefore, we opted for smoothing the death counts following standard procedures commonly used in the literature, that is, assuming that mortality follows a Poisson probability distribution (Scott, 1981). We fitted death counts with a one-dimensional Poisson P-spline, specially tailored for mortality data, using the *MortalitySmooth* package (Camarda, 2012). Once death counts were smoothed, death rates by single age intervals were simply calculated as the quotient between the smoothed deaths and the given population by educational attainment.

In the analysed period, a total of 1,626,092 deaths were reported: 806,057 for females and 820,035 for males. Population exposures by sex and educational attainment can be found in Table A1, along with the population distribution in Spain by age (Figure A1)—where it can be seen that, as age increases, the absolute number of individuals with higher educational attainment decreases.

3.1 | Longevity and lifespan variation indicators

We estimated life expectancy at age 35 using standard lifetable methods (see Preston et al., 2001). In the last years, several indicators of lifespan inequality have been developed, using both absolute and relative measures (for a good review of those indicators and methods, see van Raalte & Caswell, 2013). Those measures tend to be strongly correlated to each other and offer similar results in terms of interpretation. The debate on whether lifespan inequality should be measured with absolute or relative indicators is long and inconclusive, as it all depends on (inherently subjective) value judgements regarding what transformations should leave inequality unchanged (e.g., translations or rescalings). Therefore, we opted to present a pair of measures that are highly related to each other: life disparity and the lifetable entropy index (an absolute and a relative inequality measure, respectively).

Life disparity (colloquially known as e-dagger, or $e^{\dagger}$) is an absolute measure of inequality (i.e., its values are not affected when the same constant is added to all elements of the distribution) that expresses the number of life-years lost due to death (van Raalte & Caswell, 2013; Vaupel & Romo, 2003; Vaupel et al., 2011). The smaller the value, the smaller the variation of the age at death in a given population. In the limit, if everyone died at the same age, $e^{\dagger}$ would be zero. Life disparity is defined as the sum of deaths times the remaining life expectancy at all different ages above 35, or in formal terms:

$$e^{\dagger}(35) = \frac{1}{\ell_{35}} \sum_{y=35}^{\omega-1} d_y \bar{e}_y,$$

with ℓ_{35} being the quantity of survivors at age 35, d_y the lifetable death distribution and $\bar{e}_y$ the remaining life expectancy at a given age y.

The lifetable entropy (also known as $\bar{H}$ or Keyfitz–Leser entropy) was first derived by (Leser, 1955), but it was proposed as a lifetable function by (Keyfitz, 1977) and can be considered as the relative counterpart for life disparity. Lifetable entropy is a relative measure of inequality (i.e., its values remain unchanged when all elements of the distribution are rescaled by the same constant) that is obtained simply by dividing the life disparity index $e^{\dagger}(x)$ by the value of life expectancy e_x at a given age (in this case, age $x = 35$). Just like life disparity, a higher value of $\bar{H}$ indicate a larger inequality in the corresponding age-at-death distribution. This measure has the property to capture the dimensionless variation in the length of life when compared to life expectancy at birth or at a given age (35 in our case)

$$\bar{H}(35) = \frac{e^{\dagger}_{35}}{e_{35}}.$$

We also calculate the overall standard deviation (SD) of life expectancy and lifespan inequality indicators across autonomous communities. Finally, we explored the correlations between life expectancy and lifespan variation indicators across autonomous communities separately by sex and educational attainment together with linear graphical associations.

Other relevant information such as the absolute distribution of deaths, death rates and the population exposures by educational attainment and sex for Spain can be found in Figures A1–A3. As expected, death rates for males are higher than for females, independently of educational attainment, and the Low education group has a higher mortality than the High education group (Figure 2a). It also can be seen that at younger ages, the majority of the population has a higher educational attainment, but near age

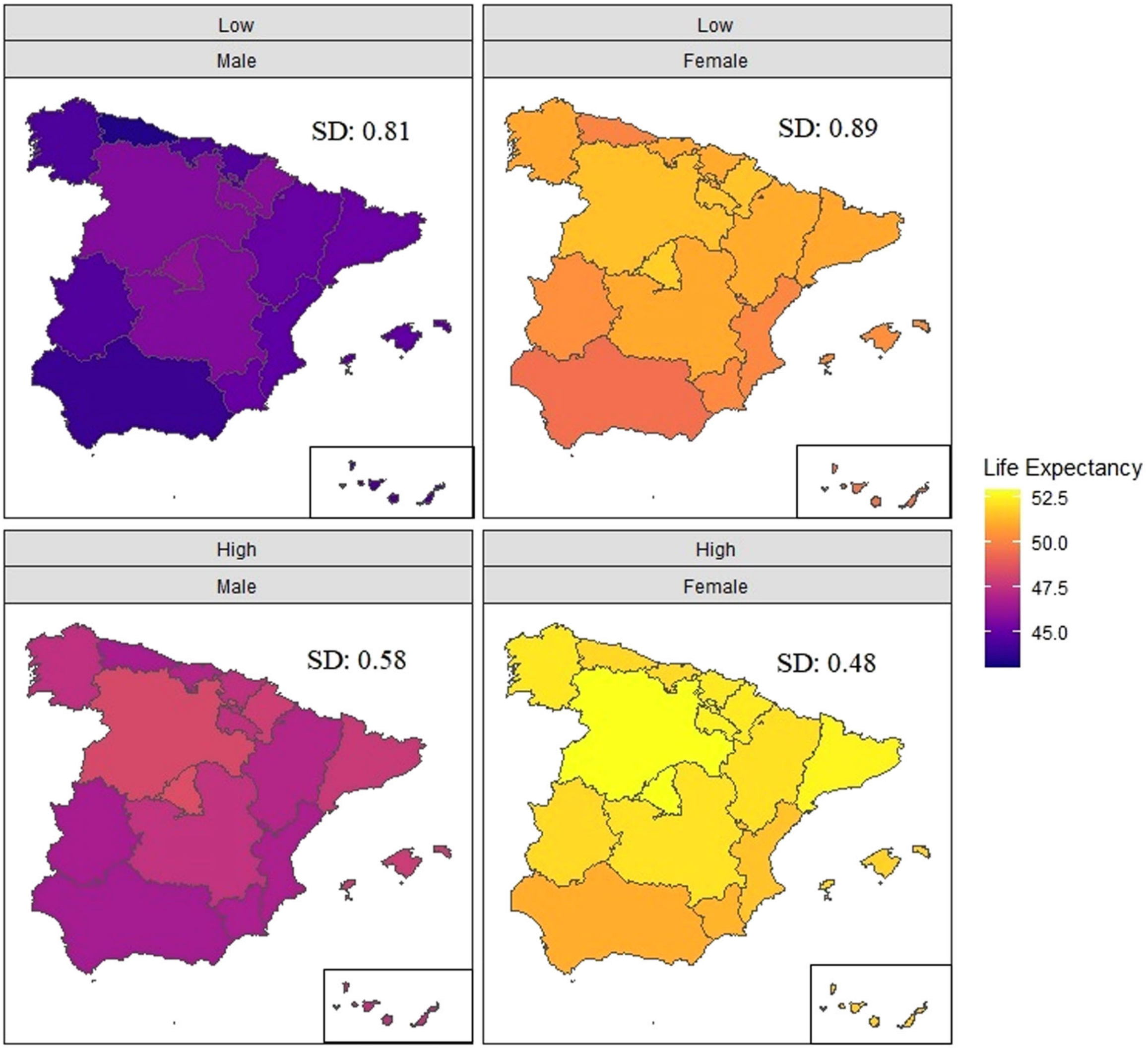

FIGURE 2 Life expectancy at age 35 and above by sex and educational attainment in Spanish autonomous communities. SD, standard deviation. *Source*: Authors' calculations based on Instituto Nacional de Estadística

55 and above the situation is reversed (Figure 3a). This composition change is the result of the greater access to education that has occurred in Spain (and in many other societies around the world) in the last decades.

4 | RESULTS

Figure 2 maps the results of the estimates for life expectancy at age 35, separately by sex and educational attainment for each autonomous community. The values used to generate this map are presented in Table A2. As can be observed, in all cases life expectancy at age 35 is higher for individuals with high education in comparison to their low education counterparts. Those differentials are larger for males than for females: differences are between almost 2 and 3.3 years for males, and between 1 and 2 years in the majority of cases for females. At the national level, the average difference in life expectancy by educational attainment is 2.6 years for males and 1.6 years for females. The autonomous communities of Madrid, Castile and León, Basque Country, La Rioja and Navarra have the highest life expectancies, and Andalusia, Murcia, Extremadura and Asturias the lowest.

When comparing males with females who have the same educational attainment, we can observe that differences in life expectancy at age 35 are larger in individuals who are part of the Low education group than those who are in the High education group. The SD of the life expectancy indicator across autonomous communities is larger for individuals in the Low education group when compared to their higher education counterparts (i.e., there is more variability in life expectancy across regions among the lower educated). SD is larger for males than for females in the High education group (0.58 vs. 0.48 SD, respectively), and interestingly enough, the opposite occurs in the Low education group (0.81 SD for males and 0.89 SD for females). This seems to indicate that lower-educated females have the highest heterogeneity for this indicator, and higher-educated females are the more homogeneous of the four combinations.

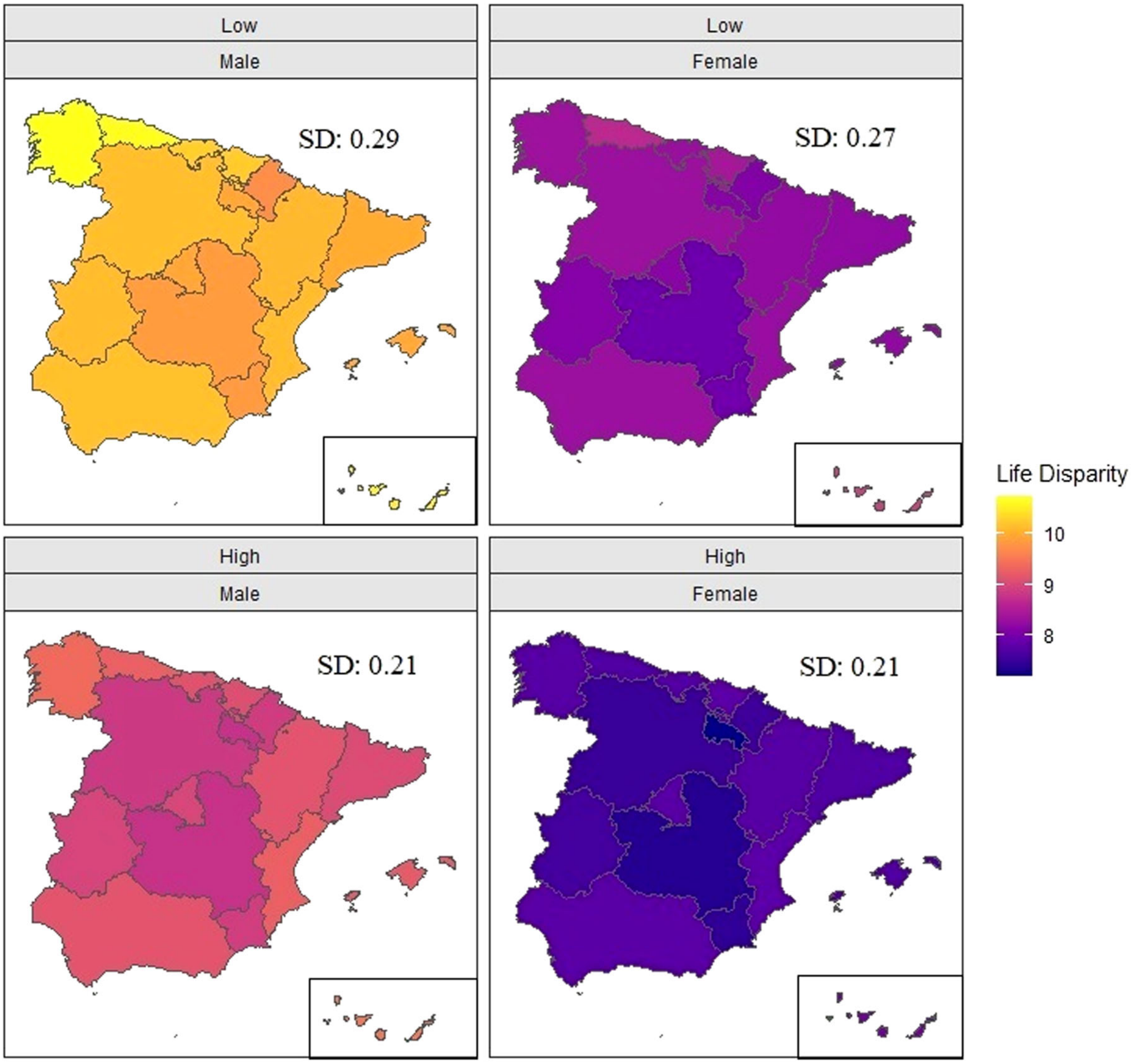

FIGURE 3 Life disparity at age 35 and above by sex and educational attainment in Spanish autonomous communities. SD, standard deviation. *Source*: Authors' calculations based on Instituto Nacional de Estadística

Figure 3 presents the results of the estimations for life disparity at age 35 and above across autonomous communities by sex and educational attainment (the values used to generate these maps are shown in Table A3). In general terms, Murcia, Castile-La Mancha, La Rioja and Basque Country have lower values of life disparity, and Galicia and Asturias have higher values. Individuals in the Low education group tend to present higher levels of lifespan inequality (ranging from 9.7 to 10.7 years for males and 7.9 to 9 years for females) than their counterparts in the High education group (with values between 8.8 and 9.5 years for males and 7.2 to 8.1 years for females). When considering the overall estimation for Spain, the gap in variability by educational attainment for males (slightly above 1 year) practically doubles the estimation made for females (0.5 years)—see Table A3. As expected, the sex gaps at a national level are wider for individuals belonging to the Low education group (with a nearly 1.9 years differential) than for the High education group (the sex gap being 1.38 years in that case). In terms of variability across regions, SD is larger for males and females with low education (0.29 and 0.27 SD, respectively) when compared to their high education counterparts (0.21 SD both for males and females), which may imply that the latter group is more homogeneous, independently of sex.

Figure 4 presents the results of the lifetable entropy index, or $\overline{H}$, at age 35 for the different autonomous communities (the values used to create these maps are shown in Table A4). Just like in the previous case, the same autonomous regions are highlighted by their more extreme values. Results in Figure 4 indicate that males are those who had a higher variability, and also that differences by educational attainment tend to be higher for males than for females. It also has to be noted that, like the previous cases, differences by sex for the Low education group are larger than for the High education group across regions. SD, as was the case for previous indicators, is larger for those with a lower educational attainment (0.010 SD for males and 0.008 for females) and smaller for those with a higher educational attainment (0.006 SD for males and 0.004 for females) across autonomous communities.

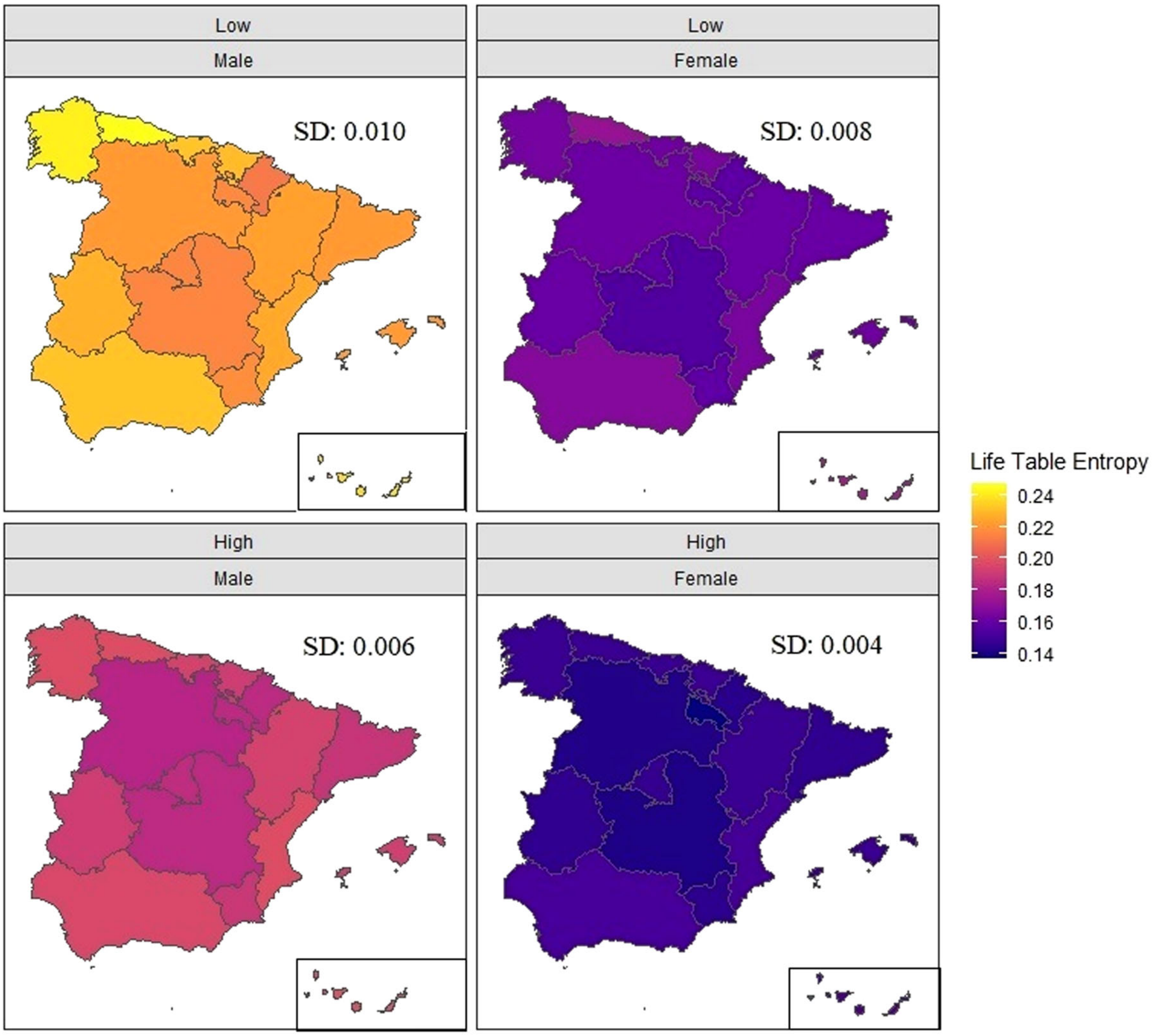

FIGURE 4 Lifetable entropy between ages 35 and above by sex and educational attainment in Spanish autonomous communities. SD, standard deviation. *Source*: Authors' calculations based on Instituto Nacional de Estadística

To summarize the health situation of the autonomous communities individually, Figure 5 shows the difference in the values obtained for each of them minus the value of the national average for the analysed indicators. Positive differentials indicate a higher value than the national average (which is normatively desirable for indicators like life expectancy) and negative values indicate a lower value as compared to the overall country (which for life disparity or the lifetable entropy should mark a better performance than the national average). This was done for all four available combinations of sex and educational attainment.

As can be seen in Figure 5, some autonomous communities systematically perform above the national mean in terms of life expectancy and below the national mean in terms of lifespan inequality (e.g., this is the case of Navarre, Madrid and Castile and León). At the other extreme, other communities systematically perform worse than the national mean (i.e., below the national mean in terms of longevity and above the national mean in terms of lifespan inequality) across most sex-education combinations analysed in this study (e.g., this is the case of Ceuta and Melilla, the Canary Islands or Andalusia). The relationship between life expectancy and lifespan inequality is not clear in many cases, given that in certain communities there was a degree of heterogeneity in the differentials: Extremadura or Murcia, for instance, have lower life expectancies than the national average but also a lower life disparity at age 35 when compared with the average. Another example of this could be seen in Basque Country and La Rioja, where females fared better when compared to the national average both in life expectancy and lifespan variation, but this was not the case for males. Interestingly enough, in many autonomous communities, some indicators, like life expectancy, present positive differentials when compared to the national average for the Low education group, but negative for those in the High education group, as it seems to be the case for Aragon, Canary Islands or the Valencian Community, to name a few examples of this trend. In other words, this acts as a remainder of the complexity of how health indicators fare for different combinations of sex and educational attainment when considering the spatial dimension.

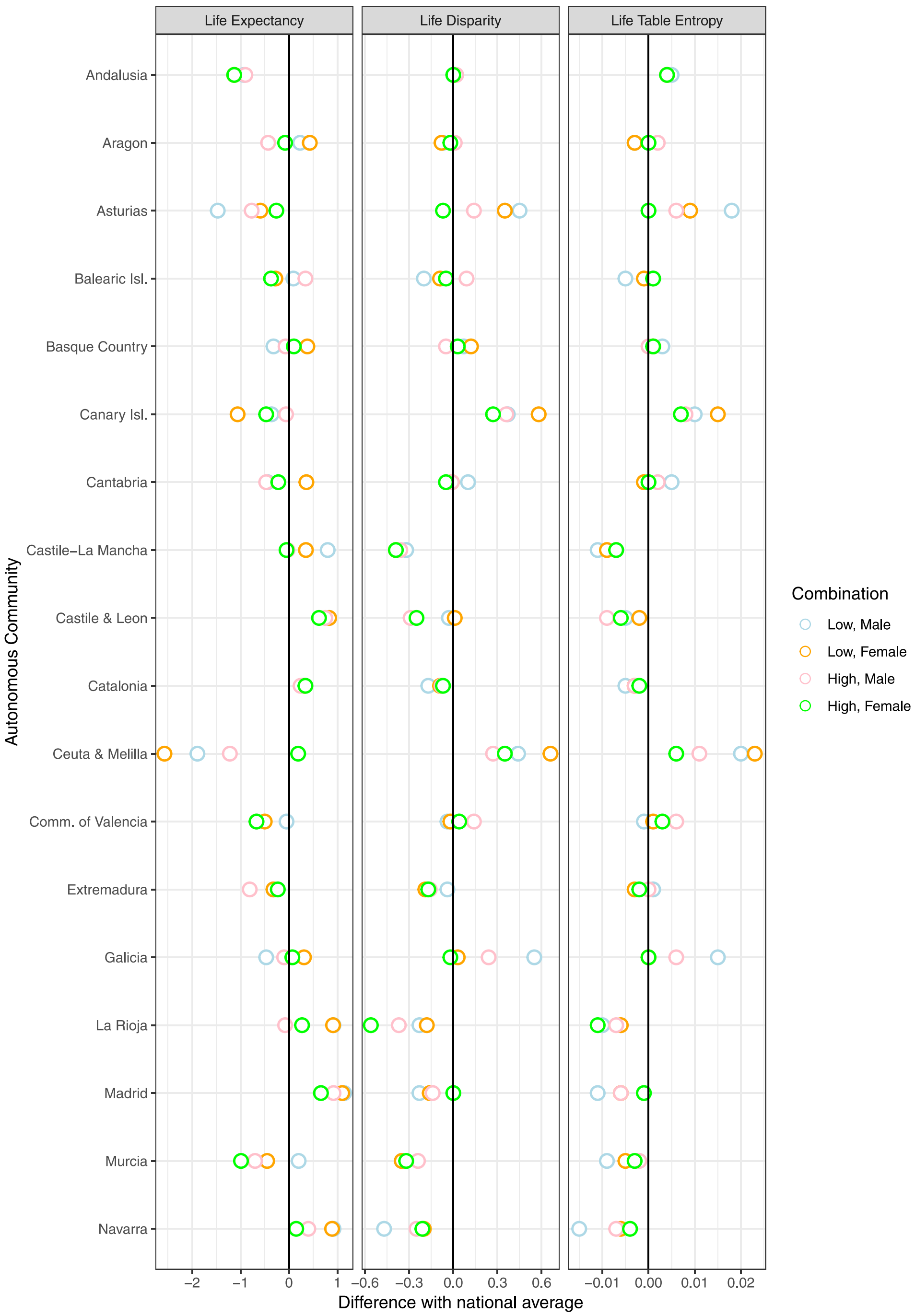

FIGURE 5 Difference between the autonomous communities and Spain for selected indicators at age 35. *Source*: Authors' calculations based on Instituto Nacional de Estadística

To visualize the relationship between remaining life expectancy at age 35 and life disparity at age 35 and above, we did a simple series of cross-sectional scatterplots (separately by sex and educational attainment, given the scale disparities), as shown in Figure 6. Correspondingly, Figure 7 presents the relationship between life expectancy and lifetable entropy. This was done to explore the relationship between life expectancy and lifespan variation measures for each combination of sex and educational attainment and sex. The figures indicate that, at least at an ecological level, there does seem to be a significant association between life expectancy and life disparity in individuals with lower educational attainment (with the slope of the line indicating that higher life expectancy correlates with lower life disparity), and considering the values of the adjusted R^2, it is even stronger for the lifetable entropy, presented in Figure 7. However, this was not the case for individuals with higher educational attainment in both sexes and types of measures, where the association between life expectancy and lifespan variation measures was considerably weaker. When using life disparity as a measure of

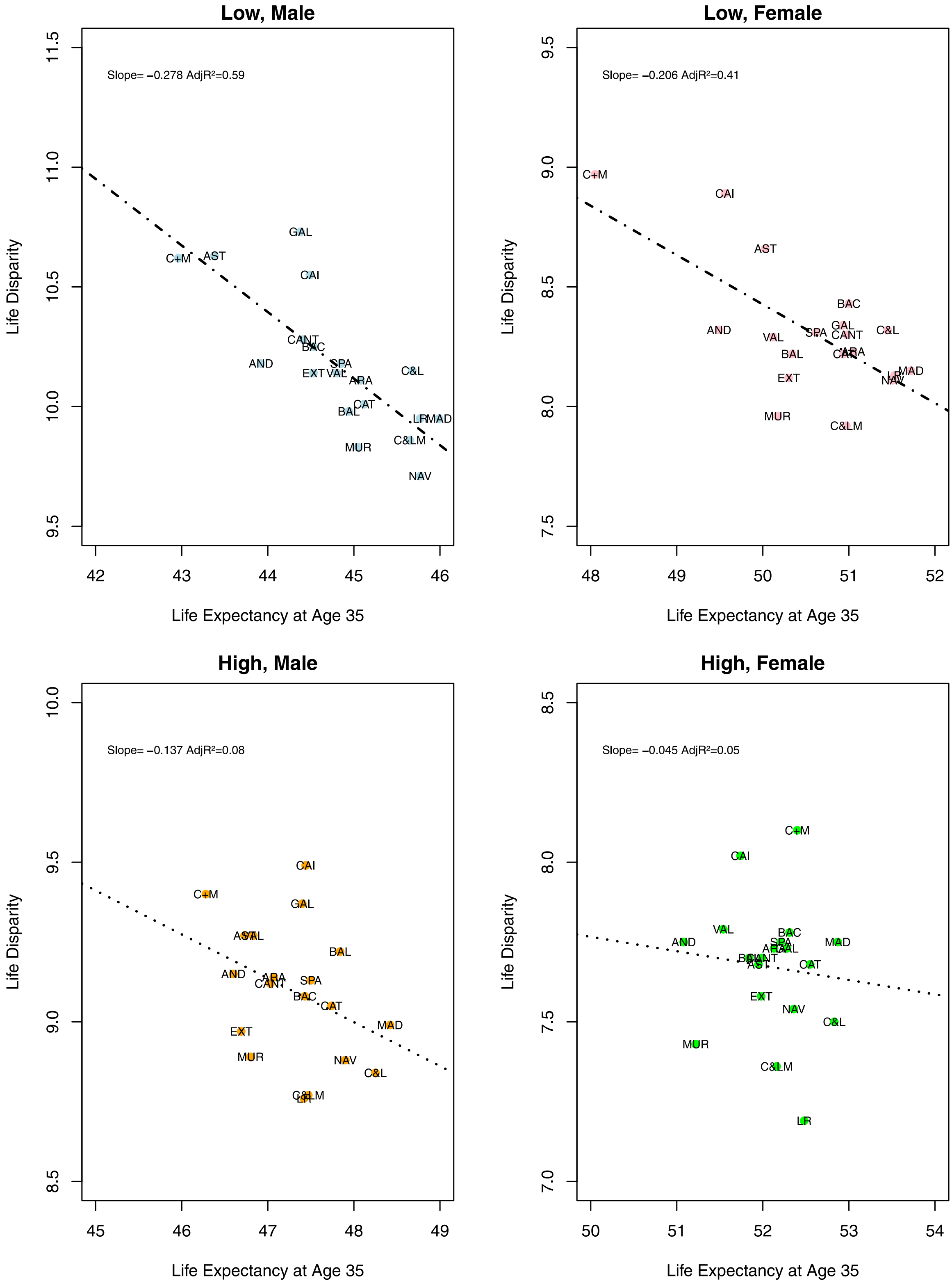

FIGURE 6 Scatterplot between life expectancy and life disparity by sex and educational attainment across autonomous communities, Spain 2014–2018. AND, Andalusia; ARA, Aragon; AST, Asturias; BAC, Basque Country; BAL, Balearic Islands; CAI, Canary Islands; CANT, Cantabria; CAT, Catalonia; C+M, Ceuta and Melilla; C&L, Castile and León; C&LM, Castile-La Mancha; EXT, Extremadura; GAL, Galicia; LR, La Rioja; MAD, Madrid; MUR, Murcia; NAV, Navarra; VAL, Valencian Community. *Source*: Authors' calculations based on Instituto Nacional de Estadística

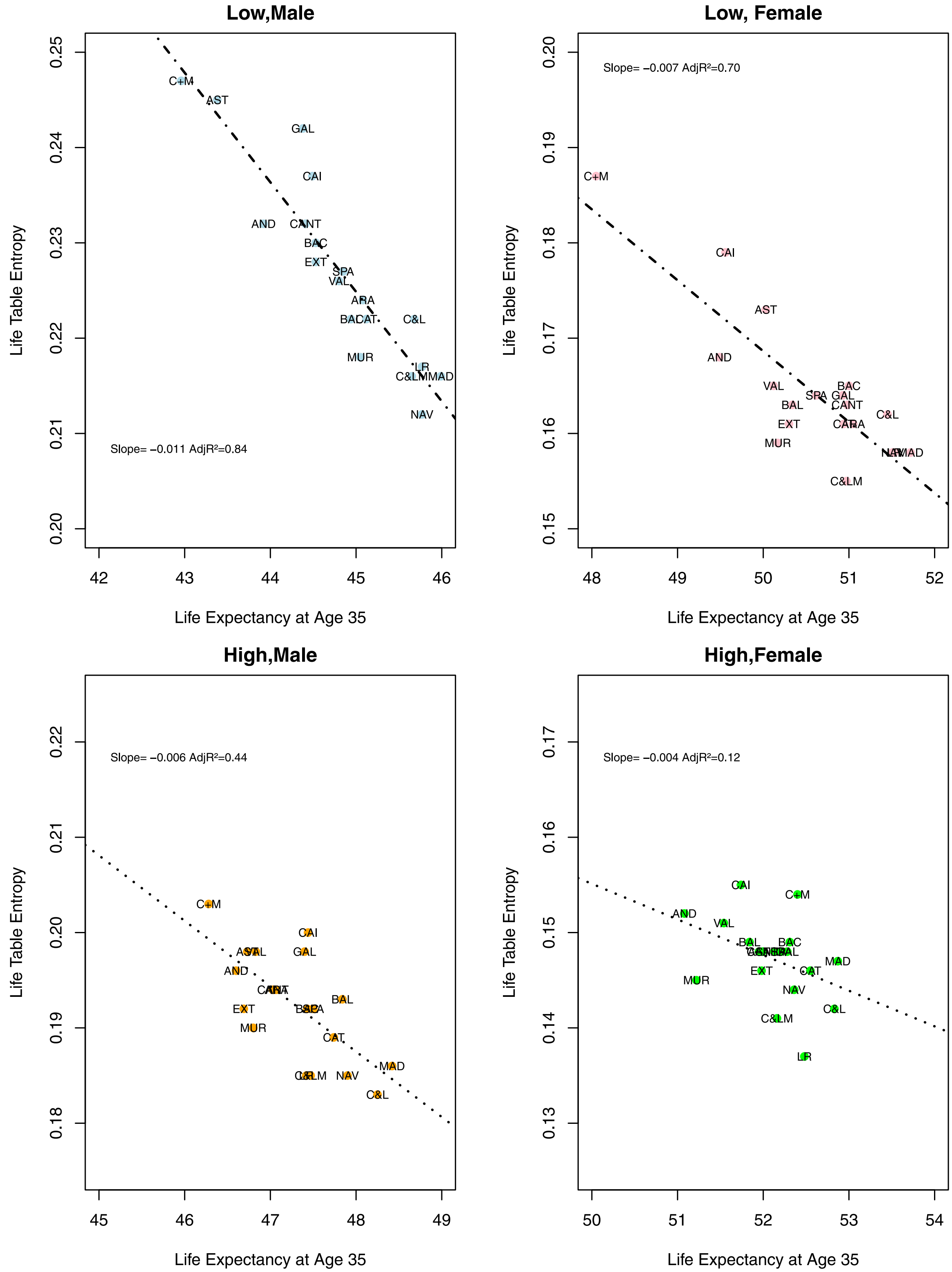

FIGURE 7 Scatterplot between life expectancy and life table entropy by sex and educational attainment across autonomous communities, Spain 2014–2018. AND, Andalusia; ARA, Aragon; AST, Asturias; BAC, Basque Country; BAL, Balearic Islands; CAI, Canary Islands; CANT, Cantabria; CAT, Catalonia; C+M, Ceuta & Melilla; C&L, Castile and León; C&LM, Castile-La Mancha; EXT, Extremadura; GAL, Galicia; LR, La Rioja; MAD, Madrid; MUR, Murcia; NAV, Navarra; VAL, Valencian Community. *Source*: Authors' calculations based on Instituto Nacional de Estadística

lifespan inequality, the $R^{2²}$ coefficient drops from 0.59 to 0.08 for males and from 0.41 to 0.04 for females when comparing the lower versus the highly educated. When lifespan inequality is assessed via the lifetable entropy index, the R^2 coefficient drops from 0.83 to 0.44 for males and from 0.7 to 0.11 for females.

5 | DISCUSSION AND CONCLUSIONS

In this paper, we have investigated regional variations in life expectancy and lifespan inequality by educational attainment and sex in contemporary Spain. As expected, we observe that the remaining average life expectancy at age 35 is lower for those individuals with lower educational attainment. The gap favoring those individuals with higher educational attainment, on average, is 2.6 years for males and 1.6 years for females at a national level, but with differences between 1.65 and 3.3 years in some autonomous communities for the former and between 1 and 2 (with a clear outlier of 4 years in the small overseas territories of Ceuta and Melilla) for the latter. These gaps seem to be small when compared to some European countries, such as Denmark or Finland (van Raalte et al., 2011, 2018) or other countries like the United States (Montez et al., 2019; Sasson, 2016a), but are on par with other western European countries, such as Belgium or the Netherlands (J. P. Mackenbach et al., 2019)—with the added value of presenting lifespan variation indicators, reflecting how heterogeneous mortality is across the country. We also have to keep in mind that the disparities presented in this paper are contingent upon the chosen criterion to define the educational groups (which does not necessarily coincide with the criteria used in other papers).

When comparing the sex gap in individuals with similar educational attainment, we see that differentials (females minus males) are larger for those with lower educational attainment, and narrower for those with higher educational attainment. This finding is consistent with the notion that a better socioeconomic position may be more 'protective' in general for males in terms of life expectancy gains (Gallo et al., 2012; Kitagawa & Hauser, 1973; Permanyer et al., 2018; van Raalte et al., 2012). Furthermore, the higher standard deviation of life expectancies across regions among the lower educated indicates a greater degree of heterogeneity in that group, while the opposite happens among the highly educated. However, the gaps between regional and national levels of life expectancy and lifespan inequality often change direction when looking across the different sex-education group combinations, reminding us about the unique role that space has when shaping mortality differentials—especially when interacting with other dimensions.

In a similar fashion, as differences in life expectancy, the educational gap (high education minus low education) was wider for males than for females, and wider for males than females with a similar educational attainment. Our findings are thus in line with the results of Seaman et al. (2019), who report that variations in age at death were larger for the more deprived areas and that for the least deprived areas the age-at-death distribution tended to be more concentrated. Another of the main findings in this paper is that we identified a strong negative linear relationship between average remaining life expectancy and remaining lifespan variability for those individuals with a lower educational attainment (i.e., lower life expectancy tends to be associated with higher age-at-death variability) across autonomous communities, but such relationship is not as strong for those who have a higher educational attainment, where a linear relationship is not apparent. While such relationship between life expectancy and lifespan variation measures was tested previously at a cross-national level (Aburto et al., 2020; Vaupel et al., 2011) or at a regional level (Wilson et al., 2020), the differential strength of such relationship at the regional level by educational attainment was never explored before. It is noteworthy that the negative association between life expectancy and lifespan variation measures is stronger (both in terms of R^2 and slope) among the lower-educated individuals independently of sex, even if females in the Low education group have a lower mortality than males in the High education group. This is possibly explained by the fact that a greater dispersion (as shown in the higher average standard deviation between regions for the lower educated) may result in a stronger correlation between life expectancy and lifespan variation measures.

We also have to mention that the relationship between life expectancy and lifespan variability is stronger when inequality is measured with relative indicators rather than absolute ones. This owes to the fact that relative measures, like the lifetable entropy, are typically normalized, including life expectancy at age 35 in the denominator, thus increasing the strength of the relationship between both indicators. In a way, this is a reminder of the advantages and disadvantages of using absolute and relative measures when addressing lifespan variation and other measures of inequality (Wilson et al., 2020). On the one hand, relative measures are not as affected as absolute ones by the choice of the (sometimes arbitrary) bottom age at which we cap the age-at-death distributions (35 in this paper). On the other hand, correlations might be amplified when using relative measures because of their own normalization properties (Aburto et al., 2020).

In terms of mortality inequality across regions, the study conducted by Reques et al. (2015) indicates that inequalities in age-adjusted mortality rates were the lowest in the central provinces of the Iberian Peninsula and the highest in the outside provinces. Correspondingly, some of the largest gaps in life expectancy at age 35 in this paper were found in the regions that border with the Mediterranean Sea (Andalusia, Asturias, Galicia, Catalonia, the Canary and Balearic Islands and Overseas territories). The fact that inequalities in mortality are the largest could be related to the fact that access to healthcare is more uneven in these regions. However, this was not the case for lifespan variation, where a clear pattern of differences by region is not as evident, possibly due to the heterogeneity in mortality of the higher-educated individuals.

These results suggest that space matters, but even more so for individuals with a lower educational attainment when discussing, not only health and mortality on average but also its heterogeneity. The weaker relationship between life expectancy and lifespan inequality among the highly educated suggests that space may be comparatively less relevant in terms of mortality and lifespan variation for those with a more advantaged socioeconomic position. As the differential variability of our indicators suggests, the higher-educated individuals are part of a more homogeneous group than those with lower education. The goods and services that directly or indirectly promote health might be more easily accessible to highly educated individuals, irrespective of where they live and the specificities of local contexts. These results have public policy implications, given that lifespan inequality as a concept is also relevant to certain institutions. From a pension standpoint, this could imply that more equity on the system could be achieved with a dedicated focus on individuals with larger remaining lifespan variability (in this case, individuals with a lower educational attainment that live in particular autonomous regions). A greater heterogeneity, manifested in higher risks of premature mortality and a more unequal distribution of deaths, make also harder for certain individuals to adequately plan for their future or amass savings or other assets (van Raalte et al., 2018). Apart from the potential exclusions from the labour market, gender disparities and difficulties in getting a good pension, this means lower-educated individuals then face another additional burden across their life course given the way these institutions are designed in Spain (Domínguez-Rodríguez et al., 2020). From a healthcare and public policy perspective, more resources for these particular groups could possibly reduce variability in health across regions.

This paper has some limitations. It is important to remember that the 'Low' and 'High' educational attainment groups created in this paper are somewhat arbitrary and not completely homogeneous. A different definition of these groups could lead to different results: for instance, comparing only individuals with no education with those with post-university degrees would probably give a wider differential in life expectancy. Therefore, an average differential of 2.65 years in life expectancy (the average differential in life expectancy presented in males for those with higher education minus lower education) across two given groups may be hiding a greater degree of inequality in mortality, and the association between life expectancy and lifespan inequality may have a different strength if another educational categorization was presented instead. However, as mentioned in the methodological section, the granularity required for adequately capturing lifespan variation measures forced us to consider only two categories if we wanted to include all regions.

The education expansion experienced in Spain (and many other countries around the world) has affected the age composition of the different educational attainment groups over time, with the lower educated being increasingly prevalent in older birth cohorts. Such compositional change, though, is unlikely to overly affect the main conclusions of this paper because (1) we are only inspecting health outcomes at a fixed point in time, and (2) our lifetable-based health indicators (life expectancy and lifespan inequality) are not affected by the structure of the population.

There is also the fact that the role of educational attainment as a proxy for socioeconomic position, while reliable, is imperfect: since we are analysing outcomes at an individual level (mortality by the educational attainment of individuals), we are not able to measure any effects related to the household composition, income or any differential assets that they may have that might affect their socioeconomic positions, limiting the scope of the conclusions. There is also the nature of causation when considering the impact of educational attainment: is education just a proxy for socioeconomic position, or does it offer by itself some mechanisms that directly affect the probabilities of dying? More educated individuals may choose to avoid exposure to behaviours that may be detrimental to their own health (Cutler et al., 2006; Marmot, 2005; Smith, 2004; Soares, 2007), but this could explain only a part of all of the differentials shown here. With the data at hand, we are not able to decipher which causal mechanisms are operating here.

We also would like to highlight the matter of age truncation used to produce the estimates. Spain is considered a low mortality country; therefore, choosing age 100 and above as the top truncation may produce slightly different estimates than if we tried to model the mortality curve for the centenarians with other statistical procedures (that could inevitably rely on strong and potentially unjustified assumptions). But since the number of survivors after age 100 is relatively small, we believe that the produced estimations are a very reasonable reflection of the overall mortality of each group and any potential differences with a different truncation would be minimal (and irrelevant to the trends and gradients presented in this paper).

We have to mention as well that the data given and produced by the INE is calibrated with their own protocols, but unfortunately, we have no manner to test the precision of the data by ourselves. Other studies for the United States found a disparity in record linkage for some population subgroups (Lariscy, 2011). Overall, though, the matching algorithm used by the INE produces reasonable and consistent results (i.e., we observe the spatial, sex and educational gradients in death rates and life expectancy going in the expected direction), so we do not have reasons to think that there might be a sensible difference in the results due to inaccuracy in the matching records.

Finally, there is also the question of temporal availability: unfortunately, the provided data were good enough to perform a single estimate in a given period, instead of a trend analysis, as is the case with other studies in Spain (Permanyer et al., 2018 the clearest example), limiting the scope of our findings and potentially not considering other aspects that may be playing part in mortality differentials, such as birth cohorts. However, unlike the Permanyer et al. (2018), study, we were available to provide estimates for each autonomous community in Spain and to verify the relationship between life expectancy and lifespan variation by educational attainment. Furthermore, we were able to explore how the relationship between life expectancy and lifespan variation changes its intensity for different levels of educational attainment, something that has not been documented before at the regional/subnational level. Future research should be focused on (i) exploring the mechanisms that result in such variation, and also considering the critical role of space as a key health determinant (both in terms of average mortality and variability) for individuals with a lower socioeconomic position, and (ii) unravelling how much of the variations in these health indicators is attributable to space, socioeconomic status or other determinants.

ACKNOWLEDGEMENTS

Some of the results presented in this paper are part of the ongoing Doctoral Dissertation of Octavio Bramajo to obtain the degree of Doctor in Demography from the Autonomous University of Barcelona. Funding for this study was provided by the ERC Consolidator given to Iñaki Permanyer as a Principal Investigator (Grant Number 864616), project 'Healthy Lifespan Inequality: Measurement, Trends and Determinants' (HEALIN) and by an FI-AGAUR 2021 doctoral grant, which Octavio Bramajo is a recipient of.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Bramajo, O., Permanyer, I., & Blanes, A. (2022). Regional inequalities in life expectancy and lifespan variation by educational attainment in Spain, 2014–2018. *Population, Space and Place*, e2628. https://doi.org/10.1002/psp.2628

APPENDIX

See Figures A1-A3.

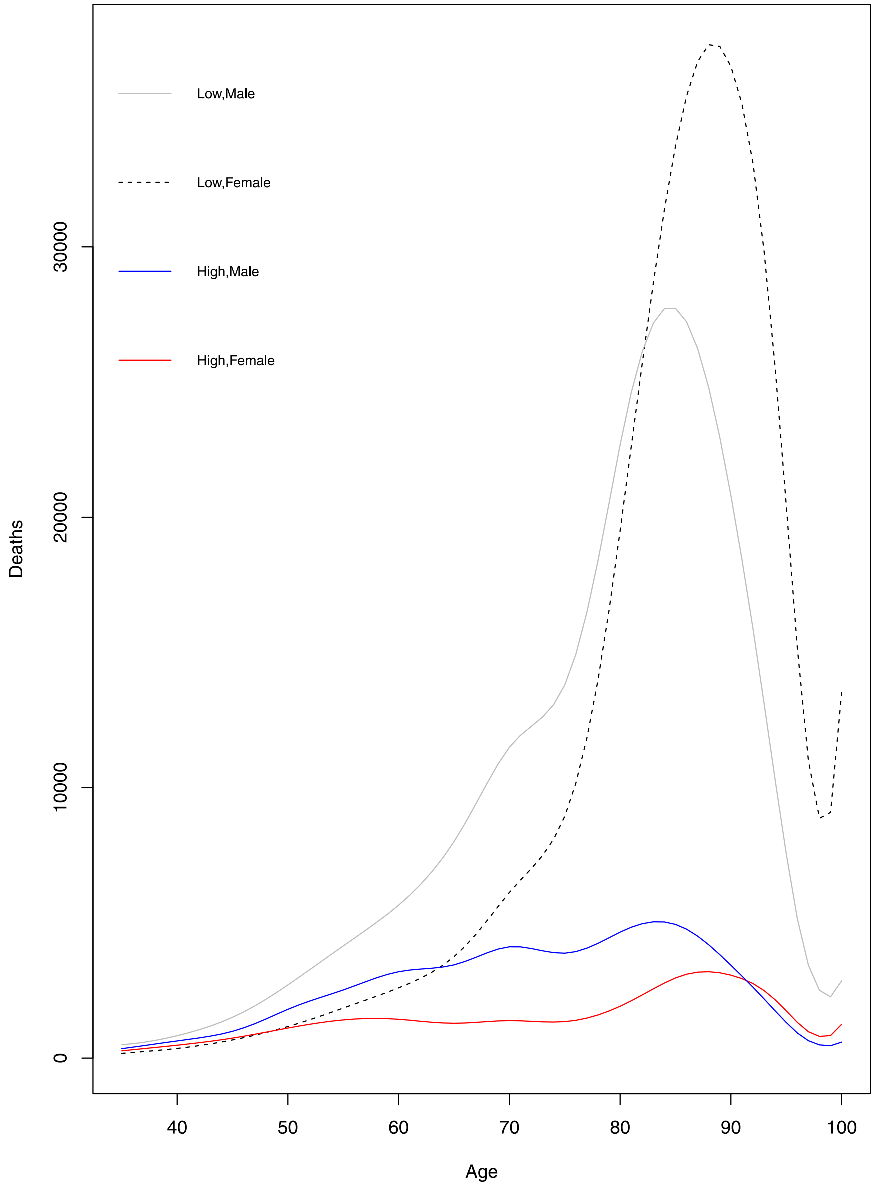

FIGURE A1 Smoothed distribution of death counts by sex and educational attainment for Spain, 2014–2018. *Source*: Authors' calculations based on Instituto Nacional de Estadística

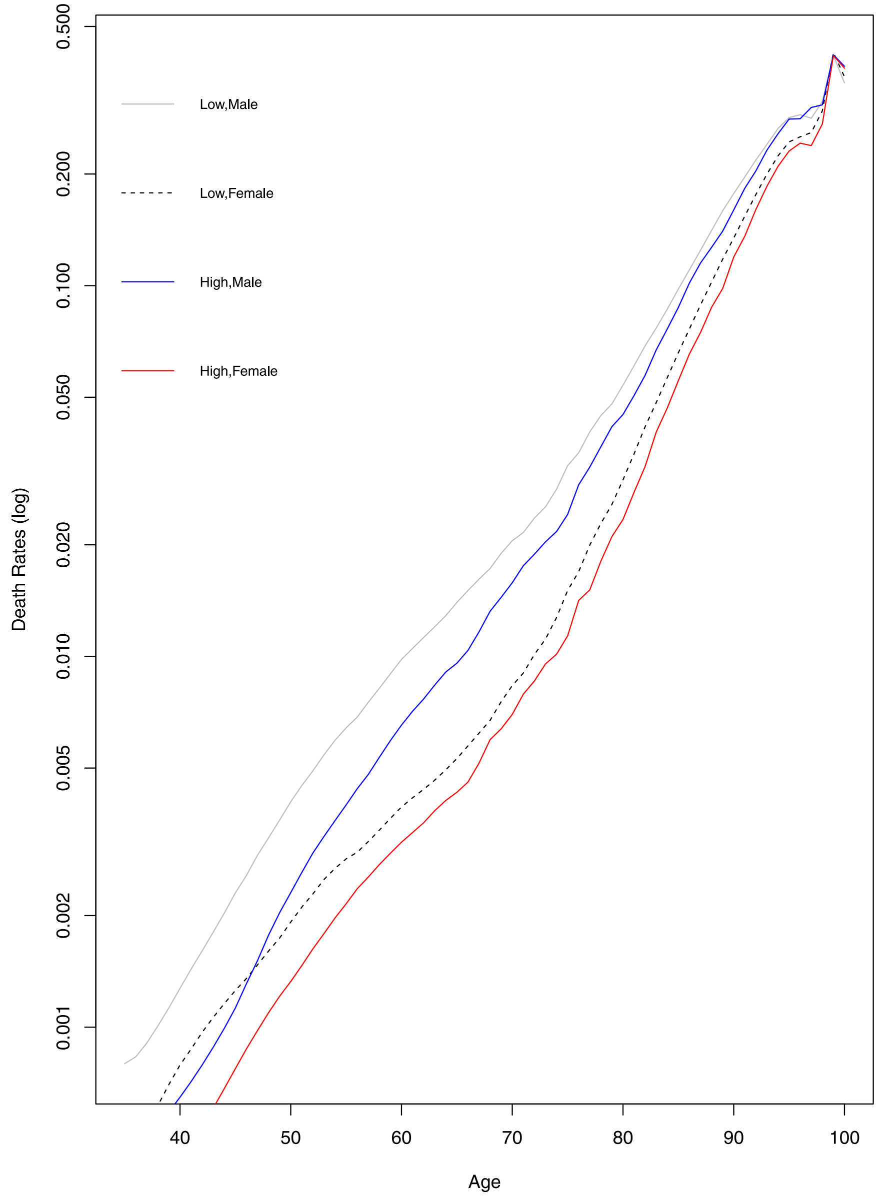

FIGURE A2 Smoothed death rates by sex and educational attainment for Spain, 2014–2018. *Source*: Authors' calculations based on Instituto Nacional de Estadística

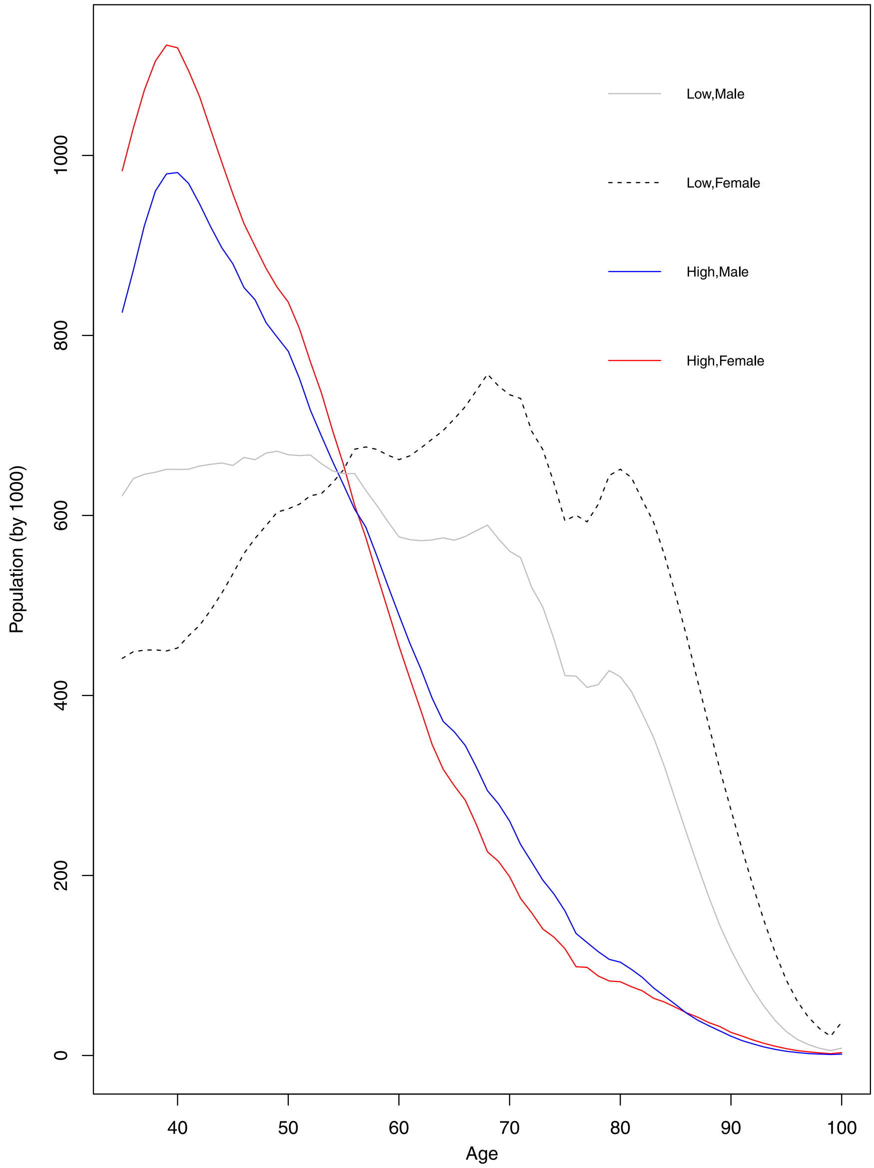

FIGURE A3 Population exposures (by thousands) by age, sex and educational attainment in Spain, 2014–2018. *Source*: Authors' calculations based on Instituto Nacional de Estadística

See Tables A1-A4.

TABLE A1 Distribution of population exposures by sex and educational attainment in Spanish autonomous communities 2014–2018

Autonomous community	Sex	Low education	High education	Autonomous community	Sex	Low education	High education
Andalusia	Female	6,445,472	3,968,366	Valencian Community	Female	3,828,733	2,614,802
	Male	5,845,334	3,879,646		Male	3,553,056	2,487,877
Aragón	Female	969,632	798,273	Extremadura	Female	921,506	474,049
	Male	855,882	814,719		Male	879,383	445,165
Asturias	Female	868,292	713,754	Galicia	Female	2,418,500	1,545,269
	Male	689,646	688,085		Male	2,079,526	1,438,246
Balearic Islands	Female	740,665	652,364	Madrid	Female	3,777,202	4,743,290
	Male	727,641	633,220		Male	2,932,183	4,491,890
Canary Islands	Female	1,512,654	1,179,128	Murcia	Female	1,059,735	675,234
	Male	1,478,159	1,132,293		Male	1,022,953	666,089
Cantabria	Female	426,083	389,916	Navarra	Female	419,610	407,107
	Male	364,494	377,865		Male	383,265	403,021
Castile and León	Female	1,976,932	1,485,780	Basque Country	Female	1,487,264	1,569,084
	Male	1,837,312	1,425,567		Male	1,122,746	1,622,858
Castile- La Mancha	Female	1,651,764	894,128	La Rioja	Female	223,429	191,833
	Male	1,609,617	882,271		Male	209,509	184,595
Catalonia	Female	5,041,236	4,646,264	Ceuta and Melilla	Female	53,134	33,372
	Male	4,396,655	4,498,358		Male	49,693	39,826
				Spain	Female	33,873,823	27,011,262
					Male	30,037,054	26,111,591

Source: Authors' calculations based on Instituto Nacional de Estadística.

TABLE A2 Life expectancy at age 35 and above by sex and educational attainment in Spanish autonomous communities

Autonomous community	Males		Difference	Females		Difference	Difference by sex	
	LE	HE	HE – LE	LE	HE	HE – LE	LE	HE
Andalusia	43.92	46.60	2.68	49.49	51.08	1.59	5.57	4.48
Aragon	45.08	47.07	1.99	51.05	52.13	1.08	5.97	5.06
Asturias	43.38	46.73	3.35	50.03	51.95	1.92	6.65	5.22
Balearic Islands	44.94	47.84	2.90	50.34	51.84	1.50	5.40	4.00
Canary Islands	44.49	47.44	2.95	49.56	51.74	2.18	5.07	4.30
Cantabria	44.41	47.03	2.62	50.98	51.99	1.01	6.57	4.96
Castile and León	45.68	48.25	2.57	51.45	52.83	1.38	5.77	4.58
Castile-La Mancha	45.65	47.47	1.82	50.97	52.16	1.19	5.32	4.69
Catalonia	45.12	47.74	2.62	50.94	52.55	1.61	5.82	4.81
Valencia	44.80	46.83	2.03	50.12	51.54	1.42	5.32	4.71
Extremadura	44.53	46.69	2.16	50.30	51.98	1.68	5.77	5.29
Galicia	44.38	47.40	3.02	50.93	52.28	1.35	6.55	4.88
Madrid	45.99	48.42	2.43	51.72	52.87	1.15	5.73	4.45
Murcia	45.05	46.80	1.75	50.17	51.22	1.05	5.12	4.42
Navarra	45.77	47.90	2.13	51.51	52.36	0.85	5.74	4.46
Basque Country	44.53	47.43	2.90	51.00	52.31	1.31	6.47	4.88
La Rioja	45.77	47.42	1.65	51.53	52.48	0.95	5.76	5.06
Ceuta and Melilla	42.96	46.28	3.32	48.05	52.40	4.35	5.09	6.12
Spain	44.85	47.50	2.65	50.62	52.21	1.59	5.77	4.71
Standard deviation	0.81	0.58	0.23	0.89	0.48	0.41	−0.08	0.10

Abbreviations: LE, low education; HE, high education.

Source: Authors' calculations based on Instituto Nacional de Estadística.

TABLE A3 Life disparity at age 35 and above by sex and educational attainment in Spanish autonomous communities

Autonomous community	Males LE	Males HE	Difference HE − LE	Females LE	Females HE	Difference HE − LE	Difference by sex LE	Difference by sex HE
Andalusia	10.18	9.15	−1.03	8.32	7.75	−0.57	−1.86	−1.40
Aragon	10.11	9.14	−0.97	8.23	7.73	−0.50	−1.88	−1.41
Asturias	10.63	9.27	−1.36	8.66	7.68	−0.98	−1.97	−1.59
Balearic Islands	9.98	9.22	−0.76	8.22	7.70	−0.52	−1.76	−1.52
Canary Islands	10.55	9.49	−1.06	8.89	8.02	−0.87	−1.66	−1.47
Cantabria	10.28	9.12	−1.16	8.30	7.70	−0.60	−1.98	−1.42
Castile and León	10.15	8.84	−1.31	8.32	7.50	−0.82	−1.83	−1.34
Castile-La Mancha	9.86	8.77	−1.09	7.92	7.36	−0.56	−1.94	−1.41
Catalonia	10.01	9.05	−0.96	8.22	7.68	−0.54	−1.79	−1.37
Valencia	10.14	9.27	−0.87	8.29	7.79	−0.50	−1.85	−1.48
Extremadura	10.14	8.97	−1.17	8.12	7.58	−0.54	−2.02	−1.39
Galicia	10.73	9.37	−1.36	8.34	7.73	−0.61	−2.39	−1.64
Madrid	9.95	8.99	−0.96	8.15	7.75	−0.40	−1.80	−1.24
Murcia	9.83	8.89	−0.94	7.96	7.43	−0.53	−1.87	−1.46
Navarra	9.71	8.88	−0.83	8.11	7.54	−0.57	−1.60	−1.34
Basque Country	10.25	9.08	−1.17	8.43	7.78	−0.65	−1.82	−1.30
La Rioja	9.95	8.76	−1.19	8.13	7.19	−0.94	−1.82	−1.57
Ceuta and Melilla	10.62	9.40	−1.22	8.97	8.10	−0.87	−1.65	−1.30
Spain	10.18	9.13	−1.05	8.31	7.75	−0.56	−1.87	−1.38
Standard deviation	0.29	0.21	−0.08	0.27	0.21	−0.06	−0.02	0.00

Abbreviations: LE, low education; HE, high education.
Source: Authors' calculations based on Instituto Nacional de Estadística.

TABLE A4 Lifetable entropy between ages 35 and above by sex and educational attainment in Spanish autonomous communities

Autonomous community	Males		Difference	Females		Difference	Difference by sex	
	LE	HE	HE – LE	LE	HE	HE – LE	LE	HE
Andalusia	0.232	0.196	−0.036	0.168	0.152	−0.016	−0.064	−0.044
Aragon	0.224	0.194	−0.030	0.161	0.148	−0.013	−0.063	−0.046
Asturias	0.245	0.198	−0.047	0.173	0.148	−0.025	−0.072	−0.050
Balearic Islands	0.222	0.193	−0.029	0.163	0.149	−0.014	−0.059	−0.044
Canary Islands	0.237	0.200	−0.037	0.179	0.155	−0.024	−0.058	−0.045
Cantabria	0.232	0.194	−0.038	0.163	0.148	−0.015	−0.069	−0.046
Castile and León	0.222	0.183	−0.039	0.162	0.142	−0.020	−0.060	−0.041
Castile-La Mancha	0.216	0.185	−0.031	0.155	0.141	−0.014	−0.061	−0.044
Catalonia	0.222	0.189	−0.033	0.161	0.146	−0.015	−0.061	−0.043
Valencia	0.226	0.198	−0.028	0.165	0.151	−0.014	−0.061	−0.047
Extremadura	0.228	0.192	−0.036	0.161	0.146	−0.015	−0.067	−0.046
Galicia	0.242	0.198	−0.044	0.164	0.148	−0.016	−0.078	−0.050
Madrid	0.216	0.186	−0.030	0.158	0.147	−0.011	−0.058	−0.039
Murcia	0.218	0.190	−0.028	0.159	0.145	−0.014	−0.059	−0.045
Navarra	0.212	0.185	−0.027	0.158	0.144	−0.014	−0.054	−0.041
Basque Country	0.230	0.192	−0.038	0.165	0.149	−0.016	−0.065	−0.043
La Rioja	0.217	0.185	−0.032	0.158	0.137	−0.021	−0.059	−0.048
Ceuta and Melilla	0.247	0.203	−0.044	0.187	0.154	−0.033	−0.060	−0.049
Spain	0.227	0.192	−0.035	0.164	0.148	−0.016	−0.063	−0.044
Standard deviation	0.010	0.006	−0.004	0.008	0.004	−0.004	0.002	−0.002

Abbreviations: LE, low education; HE, high education.

Source: Authors' calculations based on Instituto Nacional de Estadística.