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Genus

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How does origin affect migrant mortality advantage in Spain?

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Abstract

In high-income countries, migrants tend to have lower mortality compared with natives. It is necessary to understand such a phenomenon, known as "the migrant mortality paradox", to design better social policies aimed at migrants. This paper aims to study the impact of the region of birth on the differences in migrant mortality advantage in Spain using data for the period 2002–2019. To do so, we estimated death rates by origin for ages 30–90 years, smoothed the crude curves using B-splines and compared the resulting temporary life expectancy. Results show a large mortality advantage for Asian and Latin American migrants (both men and women) over the Spanish native population. African males also have significant advantages, followed by North American males. African and North American females and European males and females show an overall disadvantage. Women benefit from a lower mortality advantage over their native counterparts, compared with male migrants from the same origin. In conclusion, the relatively higher advantage of migrants from low-income countries compared with migrants from industrialised countries is more likely due to differences in selection processes. The same appears to apply to the difference between men and women migrants; migrant men may be subject to more severe selection procedures compared with their accompanying women. Alternatively, women may encounter more discrimination than men during the migration process, particularly those from Africa.

Keywords: Migrants, Mortality advantage, Region of birth, Spain

Introduction

Assessing population health and tracking its variation over time and space has always been a primary preoccupation of policymakers (Curtis, 2004; Stiefel et al., 2010). Mortality indicators can be very informative as indices of population health status (Leon, 2011), because a high death risk is often associated with poor health conditions. However, despite their relevance in describing health status, global mortality indicators may also hide important disparities between the different subgroups of the population—–for instance, to ethnicity or socio-economic status (Vaupel et al., 2011). Using such indicators to monitor national health programmes can be misleading, especially for health programmes intended for a specific subgroup with markedly different characteristics than the national population (Luy et al., 2019). The more heterogeneous the population, the more group-specific indices are required.

One of the main drivers of population heterogeneity is international migration. European populations are more diverse than ever before when it comes to country of birth, religion, ethnicity or other socio-demographic characteristics, due to high migration flows in recent decades. For instance, the proportion of foreign-born residents in EU countries has increased to 13% in 2022, and 15.5% in Spain (EuroStat, 2023). Examining mortality differences between migrants and native populations is particularly useful for public health and social security authorities dedicated to tailoring social policies for immigrants.

In high-income countries, migrants tend to have lower mortality compared with natives, a phenomenon which is known as "the migrant mortality advantage". This is the case for Hispanics in the US (Abraído-Lanza et al., 1999), Turks in Germany (Razum et al., 1998), Moroccans in France (Khlat & Courbage, 1996), Greeks and Italians in Australia (Kouris-Blazos, 2002; Stanaway et al., 2019) and many others (Razum, 2008; Reus-Pons et al., 2016; Shor & Roelfs, 2021; Wallace & Kulu, 2014; Wallace & Wilson, 2022). An abundance of research has been carried out in search of an explanation, and numerous hypotheses have been presented, including the healthy migration effect, the salmon bias, cultural effects and data artefacts (Davies et al., 2011; Guillot et al., 2018; Helgesson et al., 2019; Turra & Elo, 2008; Wallace et al., 2019; Wallace & Wilson, 2022; Zufferey, 2016). According to the first two hypotheses, migrants are among the healthiest and wealthiest people in their home country, and those who are likely to stay in the host country have more favourable health and living conditions (Fuller-Thomson et al., 2015; Helgesson et al., 2019; Rechel et al., 2013; Syse et al., 2016; Zufferey, 2016). Those in poorer health and living conditions, on the other hand, are less likely to migrate and more likely to return (Turra & Elo, 2008) and die in their country of origin (Davies et al., 2011).

The cultural effect hypothesis suggests that migrants have a healthier lifestyle and living habits than natives (Zufferey, 2016), which can be attributed to religion and social customs. But, the longer migrants stay in the host country, the more their behaviour resembles that of the local population. As a result, cultural effects on migrant mortality advantage have a decreasing impact with age (Guillot et al., 2018), or more precisely, with the length of stay (Wallace et al., 2019). Finally, data artefacts are typically generated by an inconsistency between death records and the underlying population exposure. Due to their high mobility, some migrants can die elsewhere despite being counted in the exposure population of the destination country (Syse et al., 2016).

To have a better understanding of the migrant mortality advantage, further aspects of the phenomenon must be examined, such as a comparison of different migration origins and an analysis of additional destination countries. Unfortunately, the number of countries with data on population and mortality by region of birth is limited. Most of the European studies which consider the effect of the country/region of birth on the migrant mortality advantage focus on Nordic countries (Elstad et al., 2015; Gadd et al., 2006; Juarez et al., 2018; Norredam et al., 2012; Oksuzyan et al., 2019; Syse el al., 2016, 2018; Wallace, 2022), the UK (Wallace & Wilson, 2022), France (Boulogne et al., 2012) and

Germany (Razum et al., 1998; Ronellenfitsch et al., 2006), whereas Southern European countries received little attention, an issue we address in this paper.

Spain is an interesting case for studying mortality differences based on migration background. According to WHO (2020), Spain ranked fourth country in the world in terms of life expectancy in 2019. According to official estimates, trends over the last two decades show significant increases in life expectancy at birth of almost three years in the 2000s, but a more moderate increase of less than a year in the 2010s. Historically, Spain has long been an emigration country, but in the past three to four decades, it has shifted to an immigration country. The migrant population is mostly composed of young, low-skilled adults (Biffl & Martin, 2020). In the 1980s and 1990s, migration to Spain increased, particularly from Latin America, Eastern Europe and North Africa. In the first decade of this century, migration continued to increase rapidly until the economic crisis of 2008. A subsequent wave of migrants, mostly from Latin American countries, took place in 2013–2019. Despite being less well-known, it is highly relevant in terms of absolute numbers (Domingo & Bayona-i-Carrasco, 2024). These notable immigration flows are reflected in the size of the foreign-born population in Spain, as nearly 20% of the 30–69-aged population are migrants, which contrasts with much lower numbers for the population aged 70 and over (around 5%) in 2022 (INE, 2023).

Despite the significant number of migrants in Spain, research on their differential mortality compared with natives is mostly focused on specific Spanish regions. In line with findings from other European countries, migrants in Spain tend to have lower mortality than natives (Gimeno-Feliu et al., 2019; Moncho et al., 2014; Regidor et al., 2008; Rodrigues-Sanz et al., 2019). Yet only the study from Moncho et al. is a population-level study for all of Spain (Moncho et al., 2014). In that study, data for the period 1999–2008 are used to compute age-standardised mortality rates by sex for migrants from different world regions and sub-regions. The results showed that migrants exhibited significant reductions in mortality during the study period. Immigrant men from Eastern, Southern and Northern Europe, and Africa started with higher mortality rates (compared with Spaniards) but ended with a significant mortality advantage. At the end of the observation period, migrants from all areas of origin were shown to have a mortality advantage compared with natives. For women, despite African and all European migrants having started with a disadvantage compared with the natives (Asians and Latin Americans started with an advantage), only African women ended with a higher mortality rate compared with native Spanish women (Moncho et al., 2014).

In this paper, we aim to analyse how the different groups of migrants in Spain compare to the Spanish native population in terms of mortality and bring further understanding of the migrant mortality advantage and its recent evolution in Spain by region of birth and sex. Using contemporary data for the period 2002–2019, we estimate death rates by five-year age groups and sex for the different origin groups and in different periods. This is followed by analyses and comparisons of mortality levels and trends over time and age. Here, the term "origin" is used to represent the country/region of birth, independently of the nationality or ethnicity.

Data and method

Data

To estimate death rates by age, sex and origin, two types of data must be available: death counts and population exposures by age, sex and country/region of birth. For this paper, the population data were retrieved from the Spanish National Institute of Statistics (INE) for the 2002–2019 period, and it contains the mid-year resident population of Spain.[1] Individual-level mortality data[2] were obtained from the same source, and are detailed by age, sex and country of birth. For our analysis, countries of birth were grouped into world sub-regions, including Africa (AFR), Asia (ASIA), the European Union minus Spain (EU-SP), the Rest of Europe (RoEU), North America (NAM), Latin America and the Caribbean (LAC), Oceania (OCE) and Spain (SP). Oceania was excluded from the analysis due to the very low population exposure.[3]

As a part of mortality data collection, the INE includes questions about the country of birth and the nationality at birth. The questionnaire was updated in 2009. In its previous version, migrants and native-born people were distinguished by a question on the "province of birth", with the people born aboard identified with the code "66". Before 2009, the municipality of birth for Spaniards and the country of birth for migrants were recorded as a single, three-digit variable. The new form asks where the deceased individual was born. If the response is Spain, additional questions regarding the province and municipality of birth are asked. If the answer is elsewhere, a question about the country of birth is asked. Even though the new questionnaire improved the separation of migrants and natives in the mortality database, the proportion of migrants' deaths with missing information about their country of birth increased after 2009. Prior to 2009, this proportion was small—around 0.1%—but climbed to around 3.8% (3.7–5.8% in men and 2.4–4.9% in women) between 2009 and 2019. A closer look at the data shows that after 2009, information on the country of birth was not reported for dead migrants from countries with low representation in Spain. Some small nations are missing from the new dataset, including Liechtenstein, Luxembourg, Malta, Benin, Cape Verde, the Bahamas, Belize, Mongolia and Malaysia.

To estimate the missing information on the country/region of birth after 2009, we created a list of countries that were reported in the dataset in the first period but not in the second. The deaths among migrants from these countries during the first period were grouped by global sub-region. The estimated distribution was assumed to remain constant after 2009, and it was used to spread the numbers of deaths with missing countries of birth over the world sub-regions.

Method/analytical approach

Based on the distributions of deaths and population exposure, we estimated death rates by five-year age intervals, sex and region of birth. We defined four time periods: 2002–2005, 2006–2009, 2010–2014 and 2015–2019. Although data were available from 2002

[1] https://www.ine.es/jaxiT3/Tabla.htm?t=56937

[2] https://www.ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736177008&menu=resultados&idp=1254735573002#!tabs-1254736195450

[3] Refer to Appendix 1 for the list of countries by region.

to 2022, our analysis focused on the years 2002 to 2019. COVID-19 has increased mortality in Spain and is likely to affect significantly the migrants-to-natives comparison (which is the purpose of this article). Therefore, we believe that the effect of COVID-19 on migrant mortality advantage should be examined in a separate paper.

Estimating death rates by age involves dividing the deaths observed at age x by the corresponding population at risk. The regularity of the curves of death rates by age is strongly proportional to the size of the population at risk. Therefore, estimating death rates by five-year age intervals rather than single ages and considering multi-year periods rather than single observation years will help increase the population at risk and the regularity of the resulting mortality curves, particularly for the small-sized migrant groups.

The death rate corresponding to the five-year age interval [x, x + n), noted ${}_nM_x^{s,o}$, with x, s and o referring to age, sex and origin (region of birth), respectively, is estimated using the following relationship:

$$ {}_nM_x^{s,o} = \frac{d_{x,x+n}^{s,o}}{{}_nL_x{}^{s,o}}, $$

with $d_{x,x+n}^{s,o}$ denoting the number of deaths observed in the age interval [x, x + n) among the population of sex s and origin o and ${}_nL_x^{s,o}$ being the corresponding exposure to death risk. This latter is the number of person-years spent by the population under study during the observation period within a given age interval.

The estimated death rates by age groups were smoothed using B-splines, using the R-package "splines (v.4.4.2)", separately for men and women, for the seven regions of origin and for the four time periods considered; 2002–2005, 2006–2009, 2010–2014 and 2015–2019.

Due to low population exposure and missing data below age 30 years in some migrant groups, we decided to exclude this age interval from consideration in our analysis. On the other hand, population and death numbers are not detailed by age beyond 90 years. As a result, only the age interval of 30 to 90 years was considered.

We analysed the age pattern of the crude death rates for the different regions of birth, and—using the native Spanish population as a reference—observed how the mortality gap evolves over age, time, sex and region of birth. To further the comparative analysis, we looked at the mortality ratios by age between the different origin groups and the native Spanish population.

Based on the smoothed death rates, mortality ratios were calculated between each migrant group and the native Spanish population. The visual inspection of the age pattern of mortality ratios allowed us to analyse which migrant groups display the largest mortality advantage or disadvantage compared with native Spanish, and to determine how the comparative mortality changes by sex, age group and time period.

To ease the comparative analysis, we used the temporary life expectancy between ages 30 and 90 as a single indicator to compare the mortality levels between the native Spanish population and the migrants by sex and origin. The concept of temporary life expectancy was first introduced by Arriaga (1984) to analyse mortality at specific age intervals. In other words, mortality rates outside the defined age range are not taken into account. Like life expectancy, temporary life expectancy provides a summary indicator of mortality that does not depend on the age structure of the population (Arriaga, 1984; Heuvline, 2023). Temporary life expectancy between ages x and x + n has a maximum of n years, which corresponds to no deaths in the considered age interval. We estimated the gap between Spain and each region of origin in terms of temporary life expectancy between 30 and 90 years, as well as the 95% confidence intervals, for men and women, and for the four periods considered for the analysis. The confidence intervals around the estimated temporary life expectancy were calculated based on the 95% confidence intervals around the smoothed death rates, considering a normal distribution of errors between the crude and the smoothed rates. Hence, a more regular age pattern of death rates will result in narrower confidence intervals.

Results

The total population exposure in our study reached 170 million person-years in the 2002–2005 period and increased to 233 million in 2015–2019 (Appendix 2). Meanwhile, the proportion of natives decreased slightly, from 92% to 87%. The dominant group of migrants in terms of exposure is Latin Americans, with a proportion that increased from 3.2% to 4.6% in men, and from 3.6% to 5.9% in women from 2002–2005 to 2015–2019. The proportion of migrants from the other EU countries (which stands as the second main migrant group in Spain) increased from around 2.5% to 4% during the same period, with high similarity by gender. Africans come behind with a proportion of 1.9% and 1% in 2002–2005 and of 2.9% and 1.8% in 2015–2019 for men and women, respectively.[4]

On the other hand, the total number of deaths observed by period increased from around 1.5 million in 2002–2005 and 2006–2009 to 1.96 million in 2010–2014 and 2.1 million in 2015–2019. The share of migrants in total deaths was 3.6% in 2002–2005, 3.9% in 2006–2009, 4.0% in 2010–2014 and 4.6% in 2015–2019.[5]

The available data allowed us to estimate death rates by sex and five-year age intervals for the different origin groups and periods (Fig. 1). One can easily distinguish two groups based on regions of origin in terms of how they compare to the native Spanish population in terms of mortality. The first group is composed of migrants from other European countries, either from EU or non-EU countries, together with North Americans, which are more likely to display a disadvantage compared with the native Spanish population. The second group is composed of migrants from less-developed world regions, i.e. Asia, Latin America and Africa, who are more likely to display an advantage compared with the native Spanish population.

Figure 1 shows that the mortality gap between natives and migrants is wider in men than in women. This implies (as very likely) a higher mortality advantage. Asian and Latin American male migrants display a clear advantage over their native Spanish counterparts in all studied age groups and the four time periods. The curve representing African males' mortality rates is closer to that of Spanish natives, especially in the 2002–2005 period, with lower mortality rates at ages below 55 years and higher rates at ages

[4] Refer to Appendix 3 for a detailed distribution of the different subpopulations by origin, sex, age group and timeperiod.

[5] Refer to Appendix 4 for a detailed distribution of deaths by origin, sex, age group and time period.

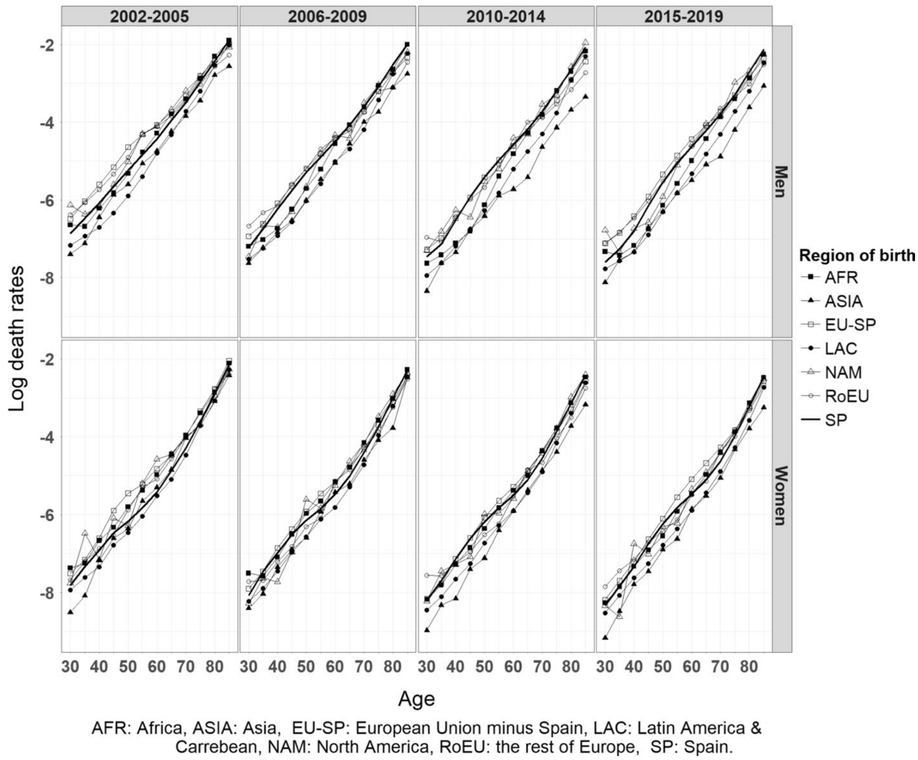

Fig. 1 The log death rates by five-year age intervals, sex, origin and period

60 and older, compared with Spaniards. The gap between the two curves tends to widen over time, especially at younger ages, in favour of African males.

The curve representing the death rates of North American migrants displays a similar age pattern and time trend globally as those representing African males' mortality, but with a smaller advantage over their native Spanish counterparts.

On the opposite side, male migrants from the other EU countries and the rest of Europe display a net disadvantage compared with their native Spanish counterparts at most age groups during the four observed periods.

Figure 2 displays the mortality ratios by five-year age interval and sex of the different migrant origin groups compared with their native Spanish counterparts during the study periods. This allowed us to visualise the extent of the mortality gap between migrants and natives, and—more importantly—how it changes with age.

Figure 2 emphasises the importance of Asian and Latin American male migrants' relative advantage over Spanish natives as compared with other migrant groups. In addition to being more prominent, the Asians' advantage tends generally to expand with age, whereas the Latin Americans' advantage declines. On the other hand, African male migrants have an advantage more generally, particularly in recent periods, while some age groups have a disadvantage at other times. North American male migrants follow a similar age pattern compared with their African counterparts, but with a significantly smaller advantage. European male migrants in Spain, both EU and non-EU, have a significant disadvantage at young ages, which tends to decrease with age or even turn into an advantage at older ages.

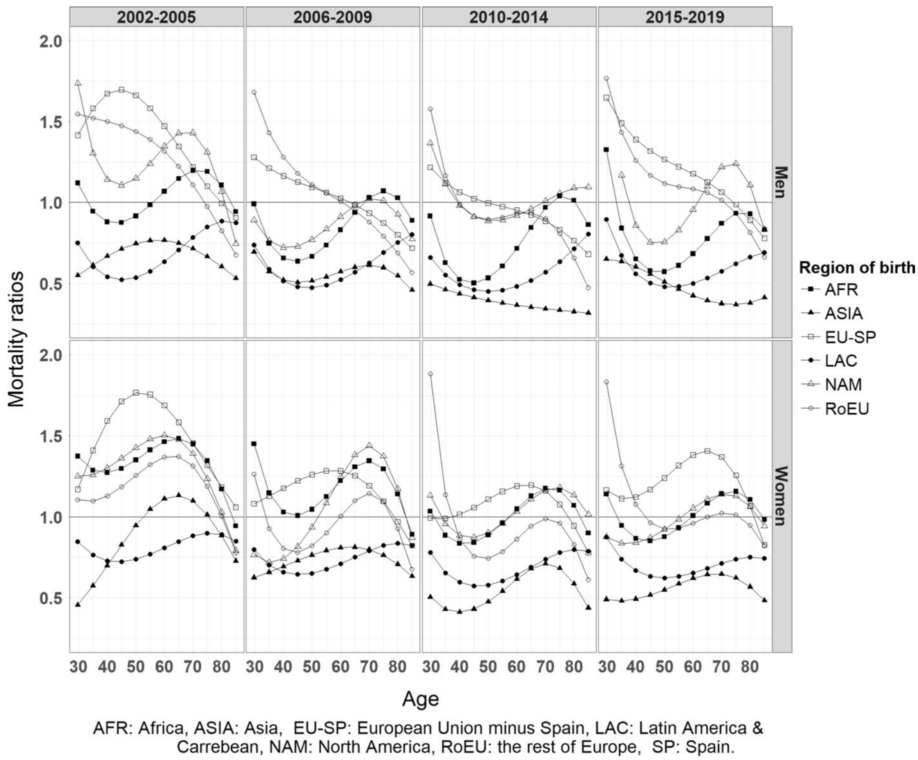

Fig. 2 The ratio of the fitted death rates between the various origin groups and the native Spanish population by five-year age intervals, sex and period

For female migrants, Asians and Latin Americans enjoyed greater advantages than other migrant groups, but to a lesser extent than their same-origin male counterparts. Migrants from the rest of the EU had a more significant net disadvantage in the first period, with middle-aged groups being the most disadvantaged and older groups having slight advantages over their native Spanish counterparts from 2006 to 2019. During the 2002–2005 period, their non-EU counterparts had a net disadvantage relative to their native Spanish counterparts, which declined significantly in the 2006–2009 period, with advantages and disadvantages alternating over age. During the 2010–2019 period, there was a modest advantage to individuals aged 40–45 and older, while younger age groups had a large disadvantage. Unlike men, migrant women from Africa and North America had a similar age pattern and advantage/disadvantage levels throughout the study period. In 2002–2005, they both started with a significant disadvantage at young ages, which expanded over age and began to decline at age 65, ending with a slight advantage at old age (i.e. 80 years and older). During the following periods, the two groups shared an approximately similar mortality ratio age pattern but with a decreasing level of disadvantage.

Figure 3 provides a comparison of the different migrant origin groups in terms of overall mortality advantage over the native Spanish population. Based on the temporary life expectancy between the ages of 30 and 90, migrants from Asia and Latin America had the largest mortality advantage over the native Spanish population during the four investigated periods for both men and women. African men benefit

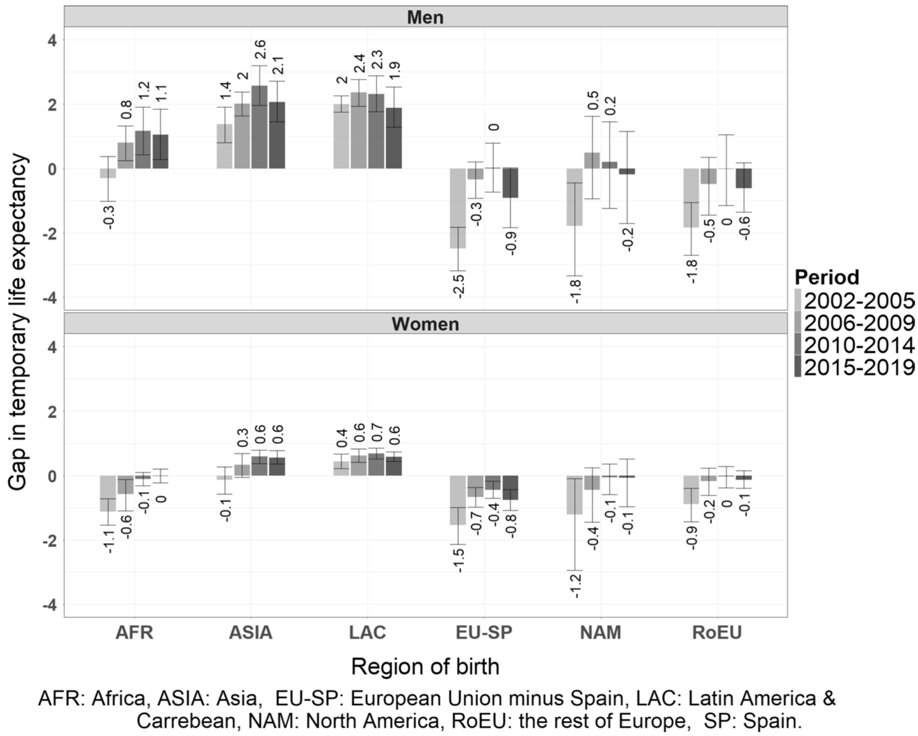

Fig. 3 The gap in temporary life expectancy between 30 and 90 years, by sex, origin and period compared with the native Spanish population

from a relatively lesser advantage, while their female counterparts are more likely to display a disadvantage or a non-advantage compared with native Spanish women. North Americans display similar outcomes for women, while men show a much lower advantage compared with their African counterparts. On the other hand, European migrants display a tiny disadvantage compared with native Spanish men and women.

When we examined the evolution of the mortality advantage––measured by the gap in temporary life expectancy––of the various migrant groups over the four analysed periods for African males, Asians and Latin Americans migrants, we observed a rising advantage up to 2006–2009 or 2010–2014, followed by a small decline thereafter. Asian males had a longer temporary life expectancy of 1.4 years compared with their Spanish counterparts between 2002 and 2005. This grew to roughly 2.6 years in 2010–2014 and then declined to 2.1 years in the last period. Similarly, Latin Americans had an advantage of 2–2.4 years from 2002–2005 to 2010–2014, which declined to 1.9 years during the 2015–2019 period. African male migrants, on the other hand, improved from a modest disadvantage of nearly -0.3 years in 2002–2005 into a significant advantage of 0.8 years in 2006–2009 and of nearly 1.2 years in 2010–2014, before decreasing slightly to 1.1 years in the last period. North American men's gap first improved from -1.8 years in 2002–2005 to around 0.5 in 2006–2009 and then decreased to 0.2 in 2010–2014 and -0.2 years in 2015–2019. Male European migrants in Spain have always had a mortality disadvantage compared with the Spanish native population over the observation period. In 2002–2005, this difference was greater than -1.8 years in temporary life expectancy. The gap was zero in 2010–2014 for both

EU and non-EU male migrants, and it decreased to -0.9 and -0.6 years in 2015–2019 for EU and non-EU migrants, respectively.

The lead of Asians and Latin Americans was reaffirmed in women, but to a lesser extent. Asian women began with a 0.1-year disadvantage in the first period, which increased to an advantage of roughly 0.6 years in the 2010–2019 period. Their Latin American peers began with a 0.4-year advantage in 2002–2005, which grew to nearly 0.6–0.7 years in the subsequent periods. African women had a 1.1-year disadvantage compared with native Spanish women in the first period, which turned into almost no advantage in 2010–2019. North American women improved from a 1.2-year disadvantage in the first period to a 0.4-year disadvantage in 2006–2009, followed by almost no advantage in the 2010–2019 period. Female migrants from other EU countries had a deficit of almost 1.5 year in the first period, but this was reduced to 0.4–0.8-year deficit in the 2006–2019 period. Their non-EU counterparts began with a 0.9-year disadvantage in the first period, which decreased to nearly 0 in the subsequent periods.

Discussion

Three eye-catching findings have arisen from this study. Firstly, the analysis of migrant mortality advantage in Spain displays different outcomes by origin and sex. In this sense, some migrant groups, including African males and Asian and Latin American of both sexes, display a significant advantage over their native counterparts. North American males display generally a very slight advantage, while the remaining migrant groups—including Europeans and females from Africa and North America—were more likely to display a disadvantage or no advantage. Secondly, very often women have a lesser migrant advantage over Spanish natives compared with men. Thirdly, the time evolution of migrant advantage in temporary life expectancy displays a common pattern over the various migrant groups analysed in this study. The advantage of migrants over natives showed an increase from the 2002–2005 period to 2010–2014, or only to 2006–2009, before narrowing slightly in the most recent years. This is the case for all migrant groups except female migrants from Africa, who showed a continual—but slowing—decrease in life expectancy disadvantage compared with native Spanish women over time.

Our results can be compared with a previous study by Moncho et al. (2014), who assessed differences in age-standardised mortality rates by origin in Spain among all adult ages in 1999–2008. Our contribution adds to this previous paper in several ways. Firstly, our analysis considers a longer time interval (i.e. 2002–2019) compared with the previous research paper, which makes the time evolution analysis and comparison more significant. Fortuitously, the fact that the period 2002–2008 was common between the two studies facilitated results comparison. Secondly, this paper's focus on the age interval between 30 and 90 years helps prevent our results from being affected by the low population exposure at very young ages and the use of old-age mortality extrapolation methods. Thirdly, we used the temporary life expectancy as a summary mortality indicator for all comparisons, after the estimated death rates by five-year age intervals were smoothed using B-splines to reduce statistical fluctuations in the mortality age pattern of the different population groups. Temporary life expectancy, as a summary mortality indicator, is not affected by changes and differences in population age structure, while the standardised mortality rate is very affected by the population age structure chosen as a standard. Fourthly, the first study (Moncho et al., 2014) considered four European groups of migrants: Eastern, Western, Northern and Southern, while our study considered Europeans as "EU" and "non-EU".

Differences between our findings and those of Moncho et al. (2014) are most likely due to differences in the methodology used. Our results confirm some of the results obtained by Moncho et al. (2014), but contradict others. For instance, the African women's disadvantage is observed in both studies; however, our study shows that it returns to a very slight advantage (or no advantage) after 2009. In addition, the advantage of Asian and Latin American migrants (men and women) is confirmed in both studies, as well as that of male African migrants. The big difference made apparent by the comparison concerns the North American and European migrant groups. While Moncho et al. (2014) showed a persistent advantage for North American male migrants in the period 2003–2008 and a move from an advantage to a disadvantage for their female counterparts, our results reveal a change from a disadvantage in 2002–2005 to a slight advantage in 2006–2009 for men, and a persistent but decreasing disadvantage for women. European migrants displayed little advantage compared with the Spaniards during the 2003–2008 period, according to Moncho et al. (2014), except for the South European group in 2003–2005. In our study, all European migrants are shown to have a disadvantage (however, slight or insignificant) compared with Spaniards throughout the 2002–2019 period.

Overall, and despite a few differences, our findings are consistent with the literature on migrant mortality advantage. The difference between the mortality outcomes for migrants from low- and high-income countries to Western Europe has already been highlighted in previous research (Mourits & Puschmann, 2023) and is more likely due to differences in migration selection procedures. Indeed, migrants from low-income countries may face stricter immigration procedures than migrants from high-income countries. Consequently, migrants from less-developed countries are usually the most skilled and healthiest in their home countries, whereas those from developed countries are not necessarily the healthiest individuals from their populations (Shor & Roelfs, 2021). Similar findings were observed among European migrants in the United States in the early twentieth century (Bakhtyari, 2022). This rule is not a standard; however, and some exceptions can be found, especially when we consider forced migration and migration from old colonies, neither of which is always highly selective. In the case of our study, it seems that the ease of mobility throughout Europe, and between North America and Europe, allows for less healthy migration into Spain from the rest of Europe and North America, which is known as negative selectivity. This—together with the fact that working migrants in general are more at risk of death in the workplace than natives despite having better health conditions (Lau et al., 2024)—may explain the mortality disadvantage observed among European and North American migrants in Spain. In light of this, the mortality advantage reported among migrants from less-developed countries *should* be more significant if migrants engage as often in risky activities as natives do and suffer no discrimination. The implications of occupational conditions on the differential mortality between natives and migrants, however, must be further studied before being confirmed.

An explanation of our results requires a focus on gender, such as the relatively larger mortality advantage of men compared with women, and the significant gender-based difference in mortality advantages among migrants from Africa. Several papers have considered gender-based differences in migrant mortality advantage, including the frequently lower female advantage relative to their male counterparts (Oksuzyan et al., 2019). This can be explained by the migration procedures being more selective for men compared with women in terms of general health (Mourits & Puschmann, 2023), and by the fact that women often migrate to accompany their husbands or family members (Heuveline, 2023). Other authors postulate that the discrimination against women before, during and after migration partly accounts for the lower female health advantage (Trappolini & Giudici, 2021). The absence of an advantage for African women migrants may be somewhat surprising at first, but it is in line with recent research, which shows a moderate advantage for male migrants from Sub-Saharan Africa against a no advantage for their female counterparts in Belgium (Bircan et al., 2023).

Despite the valuable conclusions of our analysis, some limitations must be considered when interpreting the results. Firstly, due to data limitations, we could not account for the length of stay, whereas this is thought to be an important factor in migrants' health. Previous research has shown evidence of migrants acculturation the longer they stay in the host country (Zufferey, 2016). Migrants tend to be healthier than natives upon arrival, however, with time they tend to converge with natives in terms of lifestyle, health, and mortality outcomes. Secondly, considering the reasons for migration and the socio-economic level of migrants would have provided a deeper understanding of the differences between the various origins, and between men and women in terms of mortality outcomes as migrants. Thirdly, the grouping of countries of origin into regions might hide some heterogeneity of mortality outcomes when compared with natives. Lastly, comparing changes in the causes-of-death structure between natives and migrants by origin would have provided further explanation of the observed differences in mortality indicators between different population groups. All these limitations may be addressed in future research.

Conclusion

With the increasing international migration, it is essential to understand how migrants compare to natives in terms of health and mortality in order to adopt better social and preventive health programmes. In this paper, we studied mortality differences in Spain between the native population and migrants by region of birth, including Africa, EU countries, non-EU countries, Latin America, North America and Asia. Data from 2002 to 2019 were used to estimate death rates and temporary life expectancy at age 30 to 90 years, and we used it as a summary mortality indicator to compare the different origin groups. The choice of this age interval aimed to offset the effects of low population size at very young ages and using old-age mortality extrapolation methods.

Our results confirm the existence of migrant mortality advantage in Spain for migrants from low and medium-income world regions, with Asians and Latin Americans of both sexes—together with African men—as the groups who benefit most from the mortality advantage. North American men come after, with a very slight advantage, while European migrants (either EU or non-EU) and African and North American women are more likely to display a disadvantage or a no advantage. These results support the migration selection effect hypothesis, which emphasises that the severe selection towards migrants from less-developed countries makes healthy people more likely to migrate into Spain or to high-income countries in general. On the other hand, the selection is less severe when it comes to people from developed countries who are not necessarily the healthiest of their origin country's population. This, however, does not conflict with the healthy behaviour and data artefacts hypotheses. Additionally, the results show a globally lower advantage for women from different origins compared with their male counterparts, which necessitates a closer inspection of the reasons for migration. Globally, it appears that women frequently migrate to accompany their husbands; hence, men face more selective migration procedures than their accompanying women. Such a statement requires additional inquiry before it can be confirmed, especially since some previous papers (e.g. Kawar, 2004; Trappolini & Giudici, 2021) assumed that women––especially those from Africa––might face more discrimination than their male counterparts before, during and after immigration. Another aspect of the comparison between migrants and natives is the fact that longer life expectancy does not necessarily mean better overall health conditions. It is necessary to investigate further whether migrant mortality advantage is accompanied by a health advantage.

Appendix 1

See Table 1.

Table 1 List of countries by region

European Union	The Rest of Europe	Africa	Latin America & Caribbean	North America	Asia	Oceania
Austria	Albania	Angola	*Central America & Caribbean*	Canada	Afghanistan	Australia
Belgium	Iceland	Algeria	Antigua and Barbuda	United States of America	Saudi Arabia	Fiji
Bulgaria	Liechtenstein	Benin	Bahamas	Mexico	Bahrain	New Zealand
Cyprus	Monaco	Botswana	Barbados	Saint Pierre and Miquelon	Bangladesh	Papua New Guinea
Denmark	Norway	Burkina Faso	Belize	Greenland	Myanmar	Solomon Islands
Spain	Andorra	Burundi	Costa Rica	Other countries or territories in North America	China	Samoa
Finland	United Kingdom	Cape Verde	Cuba	h	United Arab Emirates	Tonga
France	San Marino	Cameroon	Dominica		Philippines	Vanuatu
Greece	Holy See	Comoros	El Salvador		India	Micronesia
Hungary	Swiss	Congo	Grenada		Indonesia	Tuvalu
Ireland	Ukraine	Ivory Coast	Guatemala		Iraq	Cook Islands
Italy	Moldova	Djibouti	Haiti		Iran	Kiribati
Luxembourg	Belarus	Egypt	Honduras		Israel	Nauru
malt	Georgia	Ethiopia	Jamaica		Japan	Palau
Netherlands	Bosnia and Herzegovina	Gabon	Nicaragua		Jordan	East Timor
Poland	Armenia	Gambia	Panama		Cambodia	French Polynesia
Portugal	Russia	Ghana	St. Vincent and the Grenadines		Kuwait	Norfolk Island
Germany	Macedonia	Guinea	Dominican Republic		Laos	Niue
Romania	Serbia	Guinea-Bissau	Trinidad and Tobago		Lebanon	Pitcairn Islands
Sweden	Montenegro	Equatorial Guinea	St. Lucia		Malaysia	Tokelau
Latvia	Guernsey	Kenya	St. Kitts and Nevis		Maldives	New Caledonia
Estonia	Svalbard and Jan Mayen	Lesotho	Cayman Islands		Mongolia	Wallis and Fortuna
Lithuania	Faroe Islands	Liberia	Turks and Caicos Islands		Nepal	American Samoa
Czech Republic	Isle of Man	Libya	United States Virgin Islands		Oman	Other countries or territories in Oceania
Slovak Republic	Gibraltar	Madagascar	Guadeloupe		Pakistan	
Croatia	Channel Islands	Malawi	Bermuda		Qatar	
Slovenia	sweater	Mali	Saint Martin (French part)		Korea	
Other countries or territories of the European Union	Aland Islands	Morocco	Martinique		North Korea	
	Other countries or territories in the rest of Europe	Mauricio	Montserrat		Singapore	
	Other countries or territories in Europe	Mauritania	Anguilla		Syria	
		Mozambique	San Bartolome		Sri Lanka	
		Namibia	Puerto Rico		Thailand	
		Niger	Aruba		Türkiye	
		Nigeria	Netherlands Antilles		Vietnam	
		Central African Republic	British Virgin Islands		Taiwan	
		South Africa	Curacao		Brunei	
		Rwanda	Saint Martin (Dutch part)		Marshall Islands	
		Sao Tome and Principe	Bonaire, Sint Eustatius and Saba		Yemen	
		Senegal	Other countries or territories of the Caribbean and Central America		Azerbaijan	
		Seychelles	***South America***		Kazakhstan	
		Sierra Leone	Argentina		Kyrgyzstan	
		Somalia	Bolivia		Tajikistan	
		Sudan	Brazil		Turkmenistan	
		Swaziland	Colombia		Uzbekistan	
		Tanzania	Chile		Bhutan	
		Chad	Ecuador		Palestine	
		Togo	Guyana		Hong Kong	
		Tunisia	Paraguay		Guam	
		Uganda	Peru		Macau	
		Democratic Republic of Congo	Suriname		Northern Mariana Islands	
		Zambia	Uruguay		Other countries or territories in Asia	
		Zimbabwe	Venezuela			
		Eritrea	French Guiana			
		South Sudan	Malvinas Islands			
		Saint Helena	Other countries or territories in South America			
		Meeting	Other countries or territories of America			
		Mayotte				
		Occidental Sahara				
		Other countries or territories in Africa				

Appendix 2

See Table 2.

Table 2 Total population exposure by period, sex and origin

Origin	2002–2005	2006–2009	2010–2014	2015–2019
(a) Men				
Spain	76,379,231	78,061,746	99,423,406	99,353,271
Latin America & Caribbean	2,678,747	4,086,474	5,168,967	5,288,314
European Union minus Spain	2,226,301	4,051,276	5,299,098	4,622,385
Africa	1,618,935	2,495,656	3,248,403	3,269,028
Asia	387,023	690,533	1,013,167	1,105,924
Rest of Europe	337,805	480,376	626,286	679,403
North America	51,568	51,568	94,913	117,653
Oceania	11,111	13,667	17,562	19,283
Total	83,699,863	89,954,167	114,898,609	114,455,261
(b) Women				
Spain	79,631,475	81,073,570	102,894,980	102,780,501
Latin America & Caribbean	3,145,263	4,830,144	6,532,520	7,056,525
European Union minus Spain	2,102,162	3,659,715	5,026,977	4,645,413
Africa	860,950	1,323,569	1,989,916	2,177,877
Asia	266,214	475,048	806,574	957,020
Rest of Europe	360,420	539,888	784,249	903,959
North America	60,455	64,605	80,090	117,466
Oceania	10,390	12,668	16,216	17,474
Total	86,441,676	91,993,096	118,163,613	118,669,840

Appendix 3

See Fig. 4.

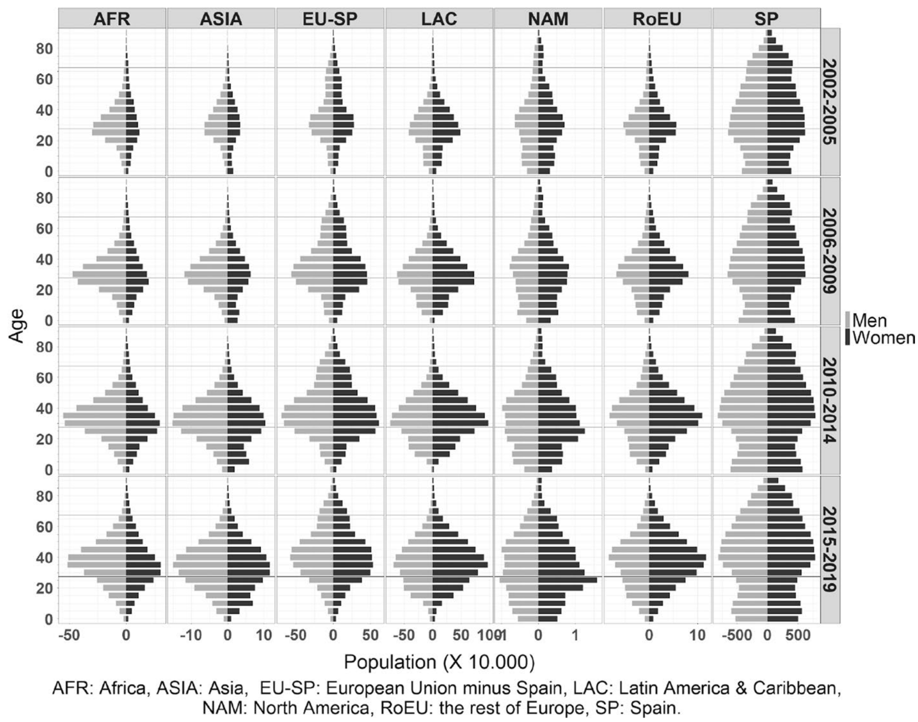

Fig. 4 The Distribution of Population Exposure by Age, Sex, Origin and Period

Appendix 4

See Fig. 5.

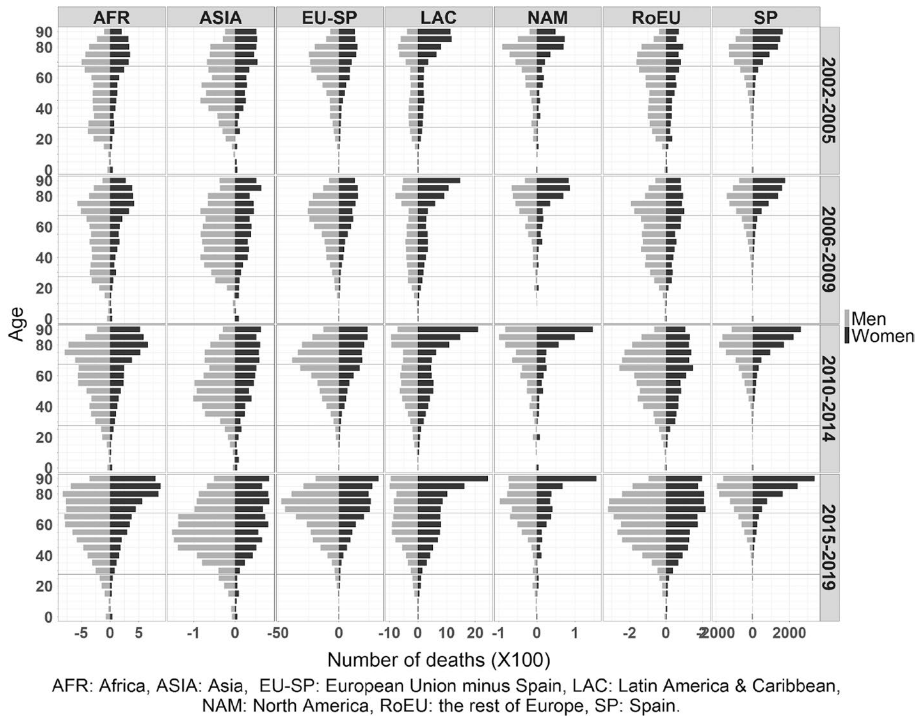

Fig. 5 The Distribution of Deaths by Age, Sex, Origin and Period

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Author contributions
FF contributed to research design, data treatment, data analytics, results interpretation, writing first draft and writing final version. STL contributed to research design, data collection, results interpretation, reading and revising the first draft. IP contributed to results interpretation and revising the first draft. All authors approved the final version to be submitted.

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Availability of data and materials
The population data were retrieved from the website of the Spanish National Institute of Statistics (INE) for the 2002–2019 period, and it contains the mid-year resident population of Spain, by sex, age and country of birth. These data are available at https://www.ine.es/jaxiT3/Tabla.htm?t=56937. Individual-level mortality data were obtained from the same source, and are detailed by age, sex and country of birth. These data are available at https://www.ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736177008&menu=resultados&idp=1254735573002-1254736195450

Declarations

Competing interests
None.

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