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The impact of immigration on health, longevity and dependency of the elderly in the Spanish and European population

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Chapter 5

Scenarios for the impact of immigration on longevity and dependency of the elderly in the Spanish population

In recent decades, developed societies have witnessed remarkable gains in longevity. As more individuals experience longer lives, there are social and economical consequences to the larger society as growing numbers of older people experience extended periods of disability. Disabled individuals may need help and become dependent on others for activities of daily living (ADL). This phenomenon (the limitation of personal autonomy) is commonly known as dependency, because individuals need assistance from others to perform daily activities.

Spain ranks very high among developed nations in regards to life expectancy and very low in regards to birth rate (ONU, 2004). Longevity lead to higher prevalence dependency rates (Spillman and Lubitz, 2000), although only for the global dependency rates, not for specific dependency rates by age. As the proportion of working age individuals relative to retired-age individuals' decreases over time, combination with lower birth-rate, the financial solvency of the system will be cast in doubt. Additionally, both the incidence and prevalence of disability are highly associated with advancing age; thus as Spain experiences growing numbers of elderly, so to it will experience growing numbers of disabled and dependent people. Therefore Spain is expected to see rising dependency rates, as well as higher rates of disablement in the near future.

Simultaneously, with the increasing concern to provide protection tools that stop dependency in developed countries, Spain has been affected by a migration phenomenon with dimensions that could prevent the expected changes in demographic projections from taking place. The massive arrival of foreign residents who change their residence to Spain-municipally, raise different questions about which would be the consequences of incorporation of this new group of individuals, who compose about 15% of the Spanish population in some age groups.

Many of the immigrants are middle-aged individuals who may work for a few years, and then expect to depend on Spain's generous universal health care and social security systems. Incorporating immigrants into cost forecasts is complex, and has yet to be adequately investigated.

There are different demographic studies about the increment in life expectancy and the reduction of fertility and mortality for the Spanish population, but in too many cases migration fluxes are not considered (Delgado, 2000; Casado, 2001; Albarrán et al, 2002). In the last few years, in addition to changes in the population’s age-structure from native Spaniards, there are also strong influences on the population’s age-structure caused by immigration (Alonso et al., 2005; Izquierdo, 2007), and also exists a discussion about the correct assess of immigrants (Arango, 2004; Fernández, 2004; Garrido, 2004; Devolder et al.,2006).

The services provided for long-term care fell into public and private institutions; the population most impacted by dependency is the older population and moreover this population is among the lowest in income levels (Braña, 2004; López et al., 2005; Guillén et al., 2006). None of these studies considered the possible effect of recent immigrants on the Spanish population, so the existence of that group may alter costs. Geographic mobilization of the population may help to solve, in a favourable way, the pension payment pyramid system supporting older people. Thanks to their relocation, local areas can have additional active workers and taxpayers in the system. However, none of these studies mention the role of immigrants and their potential future profit to the welfare state (Stone, 2000; Abbring et al., 2003; Blake and Mayhew, 2004).

In this work we address a new methodology that allows us to delimit the impact on life expectancy and life expectancy with disability of the Spanish population, once immigrants' information is added. To assess the exact magnitude of this impact, would be necessary work with mortality and prevalence tables of this group, however, this is not possible because of insufficient statistical information about immigrants arrived in Spain.

First, the estimate of immigrant mortality rates is based on age and gender-specific rates from their countries of origin. There are arguments in favour of an opposite approach, to assume that immigrants adapt a lifestyle akin to their adoptive country and thus one might forecast using the same mortality rates as the corresponding native population. After all, we might suppose that the migrant's new life conditions changed their survival rates. For this reason, we test both hypotheses to determinate an average probability of dying for immigrant group as a function of the probability of dying from the countries that have the largest immigrant influence on Spain.

Second, in many cases the health related characteristics of the immigrant are unknown. Even if there was available data for immigrants by age, gender and country of origin (Estadística de Variaciones Residenciales, INE, 1999; Martí and Ródenas, 2004; Alonso et al., 2005), there is a paucity of data on which to base their social and health conditions (Martí and Ródenas, 2004; Ródenas and Martí, 2005; Carrasco-Garrido, et al., 2007). Without this information, it would be difficult to construct a distinct disability rate for the new group, immigrants. For this reason, we use different scenarios as a function of the group of origin disability rate.

Finally, this chapter is divided into four sections. The following section presents the database and the methodology used to calculate the probability of dying and disability rates for each group. Afterwards, results are shown and finally, the main conclusions are presented.

5.1 Data and methods

To study healthy life expectancy in Spain, and consider the growth of the immigrant population in the later years, three sources of statistical information are used. First, data is obtained from the *Survey on Disabilities, Handicaps and Health Status* (Encuesta sobre Discapacidades, Deficiencias y Estados de Salud, EDDES) (INE, 2005) to find the disability rates of the Spanish population in 1999. Second, data is taken from National Statistics Institute (INE) to learn the composition of the Spanish population. The statistical sources used from INE are Padrón municipal and Estadística de Variaciones Residenciales (EVR). Thirdly, to determinate the mortality rate for the immigrant population, data from the World Health Organization (WHO) is used.

Apart from national health surveys, it is possible to use the *Survey on Disabilities, Handicaps and Health Status*, (EDDES) to estimate the disability rates of the Spanish population. This survey was collected in 1999. The survey distinguishes different types of disabilities, and identifies the number of disabilities for each respondent, their severity level and their demographic characteristics. However, given the migratory flux produced since 1999 in Spain, the prevalence rates derived from this survey must be revised, or, at least, further supported by possible scenarios, as the final aim of this work. The percentage of foreign population in the EDDES (1999) is very low (1.26%), and does not allow comparisons between and extrapolations of behaviours of recently arrived individuals. Known the percentages of foreign population resident in Spain is not exempt of controversy (Alonso et al., 2005). The election of *Padrón* as a source for information about the immigrant population volume is problematic because it is over-estimated. The EVR data provides the annual flow of migrants inside and outside the country. The first measured flow is the intra-country movement of individuals across cities. The second flow is foreign emigration and immigration phenomenon. *Padrón municipal* is the administration's register based on an annual census collected by every city council in Spain on the first of January every year. Based on these data, files have been developed that to provide demographic and statistical information about the foreign population, by sex and gender. When EVR and *Padrón municipal* are compared, there are some discrepancies in official numbers that provide statistical information. In function of the methodological instructions of the INE, the EVR obtain their results about the census registration based on that source, INE. However, if we obtain the net migration flux as a difference between the outside immigration and emigration, the balance obtained is not equal as the difference between the estinates provided by *Padrón* and the vegetative balance produced during the year. These discrepancies are caused by methodological aspects and have already been summarized in several works (Alonso et al., 2005; INE, 2007).

Finally, the World Health Organization (WHO) is the most appropriate information source to obtain world-wide mortality data from, because it provides details of the population structure by age, and gender for a wide range of countries. Although similar data can be found in other statistical sources, such as the Human Mortality Database (HMD), they do not contain enough detail about the population above age 80 in the countries of interest. Eurostat, another inadequate statistical source, provides a variety of indicators but only for European countries.

With the mortality database provided by the World Health Organization (WHO), an adjusted probability of dying for the immigrant population, by sex and gender, is made. The WHO supplies a high level of age-specific detail at the older ages and provides information for a wide range of countries. This adjusted probability of dying is calculated based on a function of the relative frequency of the main countries of origin of the foreign resident population. Using the *Padrón municipal*, the following geographic areas and their integrated countries of reference are used: the European Union of 15 member states (which is the 21 percent of the foreign resident population), is represented by Germany and Great Britain (17 percent and the 19 percent of the immigrant population belongs to this area, respectively); the remaining European countries (about 15 percent of the foreign resident population) is represented by Bulgaria and Romania (about 16 percent and 55 percent of this area, respectively); Morocco represented the 19 percent of the population coming from Africa; the population coming from America established 40 percent of the total, and is represented by Argentina, Colombia and Ecuador (10 percent, 18 percent and 34 percent, respectively of the population coming from American), and finally, China which represents 5 percent of the foreign population of Asiatic origin.

We obtain the estimated probability of dying in the following way. First, we calculate the proportion of the number of immigrants from each country listed divided into the total number of immigrants from the respective geographic areas. After that, considering the relative weight of each geographic area in the foreign resident population, the average mortality rate for each country in the immigrant group with the new probability of dying is calculated. Finally, using the probability of dying from each country of origin (based on WHO data) we obtain the adjusted average for the probability of dying. A limitation of this methodology is that the mortality of the country of origin is higher than found in Spain, and that necessitates an explicit assumption: the immigrant population is assumed to be a random representation of the members of the origin population, and they are affected by the same mortality risk and average health status as found in their country of origin. I should be noted that immigrants can be selected among those who are in better socioeconomic situation, with higher levels of education and also better survival and health (for example, persons with worse health have less probability to emigrate than those who have better health conditions).

The estimation of the probability of dying for five-year age interval distributions and gender of the foreign resident population is shown in Table 5.1. If one wants to consider, for further analysis, these probabilities as the ones for the foreign group resident in Spain, the following hypotheses have to be considered. First, suppose that the map of the origin countries of the immigrant group is stable. Second, suppose that the probability of dying obtained with the corresponding probabilities of the origin countries does not change for the different health conditions of these individuals in Spain. This hypothesis is difficult to justify, because it is expected that individuals from non-developed countries have experienced an improvement in their quality of life, and also in their health expectancy. For this reason, the adjusted average probability of dying has to be considered as a maximum.

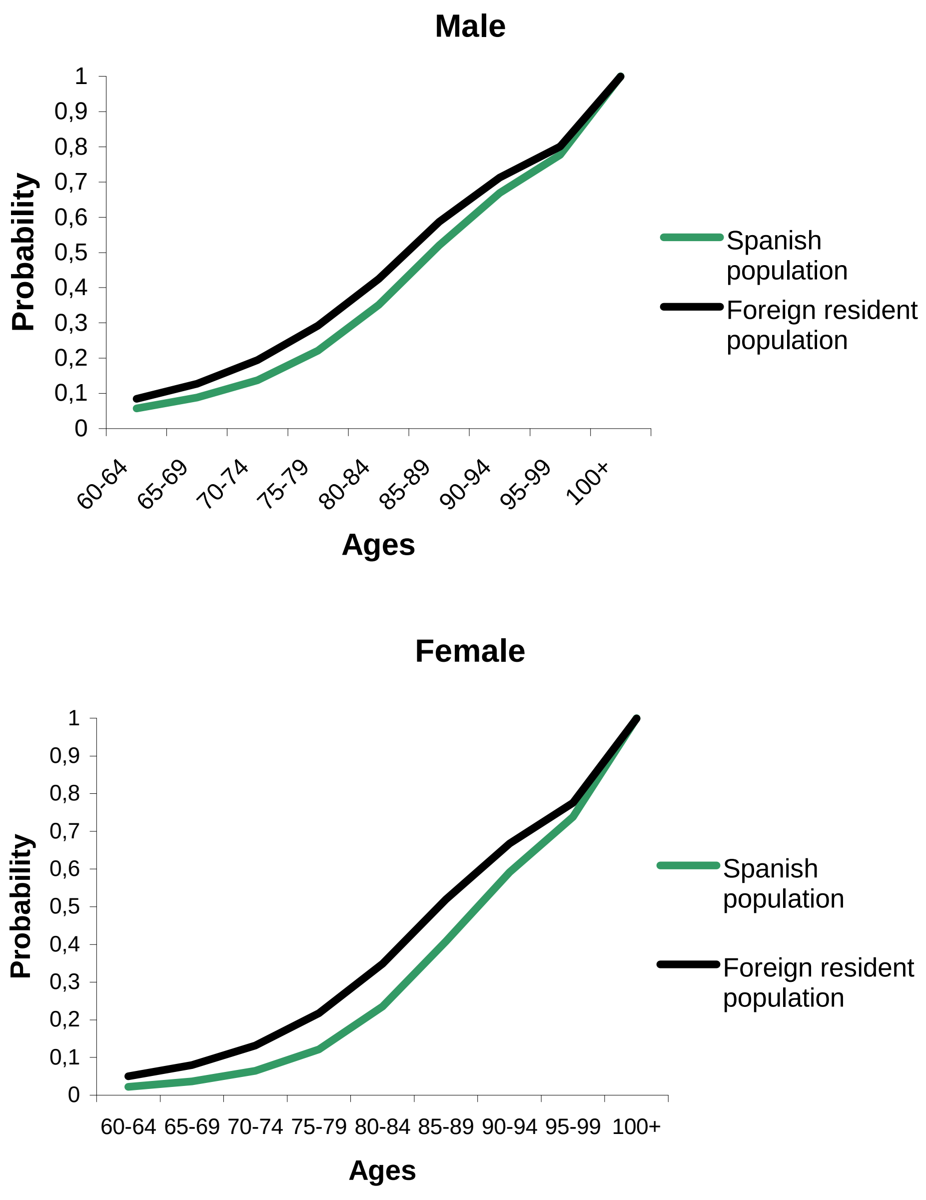
Table 5.1: Adjusted probability of dying of foreign Spanish resident population by sex and age groups, 2005

Age	Males	Females
<1	0.02078	0.01704
1-4	0.00315	0.00261
5-9	0.00235	0.00166
10-14	0.00226	0.00164
15-19	0.00550	0.00273
20-24	0.00885	0.00323
25-29	0.00927	0.00344
30-34	0.01043	0.00446
35-39	0.01222	0.00622
40-44	0.01722	0.00937
45-49	0.02553	0.01431
50-54	0.03810	0.02152
55-59	0.05609	0.03293
60-64	0.08457	0.05027
65-69	0.12744	0.07974
70-74	0.19505	0.13167
75-79	0.29170	0.21755
80-84	0.42507	0.34892
85-89	0.58730	0.51977
90-94	0.71280	0.66781
95-99	0.80042	0.77593
100+	0.99883	0.99883

Source: World Health Organization (WHO, 2005) and own elaboration.

In figure 5.1, the adjusted mortality for the foreign resident population is compared to the mortality of the Spanish population, based on WHO data. Differences are substantial and higher for women. It is expected that, in the long term, the curves will converge. In a medium term, the recent immigration (most of them about their 30 years old) can improve on the rate of their country of origin as a consequence of a better quality of life and also with the assistance received in Spain (Carrasco-Garrido et al., 2007). Moreover, as noted earlier, immigrants are a sample positively

Figure 5.1: Probability of dying, 2005



Source: World Health Organization (WHO, 2005) and own elaboration.

selected of their countries of origin, either in health or survival.

Finally, the method employed here to analyze the longevity of the population by state of health and compare this longevity to different countries is the Sullivan's method. With this method it is possible to separate life expectancy into two parts, healthy life expectancy and non-healthy life expectancy and it allows for the capturing of mortality and morbidity in a single indicator. Moreover this measure can be used to examine whether healthy life expectancy grows at the same pace as life expectancy (Sullivan, 1971; Molla et al., 2001; Imai and Soneji, 2007).

5.1.1 Estimation of health expectancy

It is considered a multiple-states model with three states: active, disabled and dead (Haberman and Pitacco, 1999; Preston et al., 2001). It is possible to traverse between active and disabled states, but the dead state is an absorbing state and it is not possible to experience further transition.

Once a population is made up of two groups (in this case, native and foreign-born residents), it is possible to calculate life expectancy and life expectancy with disability for each group, separately, if there is enough demographic information (Jansà and García, 2004).

We suppose a population (G_1) is composed of different individuals. The likelihood that one person in the population G_1 with age x died between the ages x and $x+1$ is denoted by $q_x^{G_1}$. The disability rate for person G_1 with age x is $t_x^{G_1}$. Finally, $LE_x^{G_1}$ is the life expectancy for a person with age x in the population G_1. For the initial population, G_1, we suppose stationarity and we assume the following demographic conditions: probability of dying is constant along the way, but it is not the same for each age, the number of births added in the population is the same and the net migration is zero in all age stages.

We use Sullivan's method (1971) to calculate the healthy life expectancy that we denote by $HLE_x^{G_1}$ for each person of population G_1. This method presents some difficulties because it supposes the population is homogenous, the calculated likelihoods are stationary and it is not possible to do more than one transition in each period between states. However, this method is used by international health officials due to the fact that with only the probability of dying at different ages and an estimation of disability for every age.

As we noted earlier, we calculate the healthy life expectancy for population G_1 by Sullivan's method (1971):

$$HLE_x^{G_1} = \frac{\sum_{y=x}^{w}\left(1-t_y^{G_1}\right)L_y^{G_1}}{l_x^{G_1}} \tag{1}$$

where $L_y^{G_1} = \dfrac{l_y^{G_1}+l_{y+1}^{G_1}}{2}$, $l_x^{G_1} = l_{x-1}^{G_1} - l_{x-1}^{G_1}q_{x-1}^{G_1}$ and w is the oldest age. Moreover $l_0^{G_1}$ can be an initial fictitious value.

We obtain the non-healthy life expectancy at age x ($NHLE_x$) with the following relation $NHLE_x^{G_1} = LE_x^{G_1} - HLE_x^{G_1}$, or we use an expression similar to (1) but using $t_y^{G_1}$ instead of $1-t_y^{G_1}$ for calculating the total number of years in disability.

We suppose that a new group of population (G_2) is added at the previous population G_1 in the same condition and the resulting population, the union of G_1 and G_2, are stationary, as well.

The likelihood that one person in the population G_2 with age x died between the ages x and $x+1$ is denoted by $q_x^{G_2}$. Therefore, the following relationships stay the same (the exclusion of the superscript means the global population; this is the union of both groups):

$$l_x = l_x^{G_1} + l_x^{G_2}, \qquad x = 0,\dots,w.$$

If we have details about the disability rates for the population G_2, we denote this by $t_x^{G_2}$, it is possible to calculate the healthy life expectancy of the global group, using the expression:

$$HLE_x = \frac{\sum_{y=x}^{w}\left[\left(1-t_y^{G_1}\right)L_y^{G_1} + \left(1-t_y^{G_2}\right)L_y^{G_2}\right]}{l_x}$$

$L_y^{G_2}$ is defined similarly to $L_x^{G_2}$. As is expected, previous expression can be reduced to only one group if the probability of dying and the disability rates are the same for each subpopulation. When the same mortality rates are supposed for each subpopulation, a close expression that relates healthy life expectancy in disability for the subpopulations and for the whole group is obtained (Bermúdez et al., 2007).

5.1.2 Life expectancy, Sullivan's Method

The methodology noted earlier allows us to estimate the non-healthy life expectancy ($NHLE_x$) and the healthy life expectancy (HLE_x) of the Spanish population in terms of the existence of immigrants. For that, we may select an initial percentage of population as the immigrant group (G_2). According to the previous results, the percentage of the immigrant population is as much as 15% of the population for some age groups. However, taking into consideration that the approximation of Sullivan's Method proposes a percentage that is fixed for all ages; aiming to show a series of results, we establish two values for the percentage of immigrants: 10% and 20%.

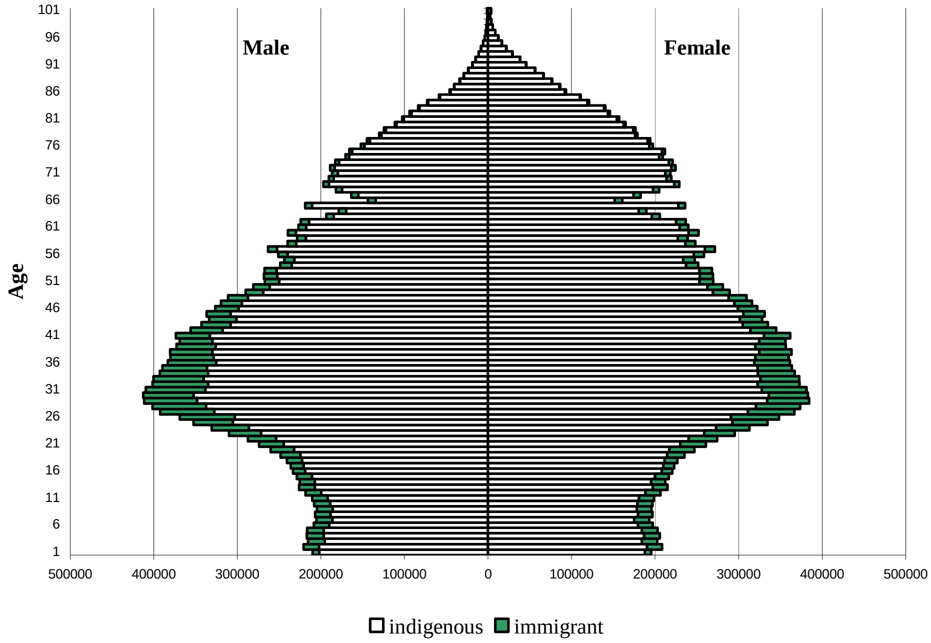
For each percentage of immigrants, we calculate a first scenario and we suppose that disability rate in the immigrant group (G_2) is total. This involves a maximum in the possible impact on the non-healthy life expectancy, because it supposes that all the individuals of the new group have been directly incorporated into the disability group. The second scenario suppose that the disability rate in G_2 is null for all ages. Then, immigrant group increases the number of total individuals but reduces the disability rate of the global population. This means a minimum impact on non-healthy life expectancy which can be observed in the global population. In the third scenario, the group G_2 has the same disability rate as the group G_1 for all ages. For this last group, the disability rate provided by EDDES (Ayuso et al., 2007) survey is used. In summary, the statistical work is developed in three scenarios: a) all foreign residents have disability; b) none of them have disability; and c) the disability rate is similar to the Spanish population.

5.2 Results

5.2.1 Composition of the Spanish population

Figure 5.2 shows the age pyramid of the Spanish population for the year 2005, for immigrant and native populations. The estimation of the number of Spanish individuals and immigrants is from the Padrón municipal database from 1999 through 2006. 1999 is used as the base year for the study. The Spanish population is provided distinguishing between immigrant population and the native population. Information about the immigrant population is used to find the cumulative population. It is supposed that immigrants could exit the population due to both emigration and death. In Figure 5.2 it is observed that a high proportion of the immigrant group is around 30 years of age. For this reason, the Spanish age-pyramid shows a bulge in the center of the age-range. Second, for the population between 7 and 21 years of age, the percentage of the immigrant population is lower than for the population around 30 years old.

Figure 5.2: Age pyramid of the Spanish population, 2005



Source: Padrón municipal, INE, 1999-2005.

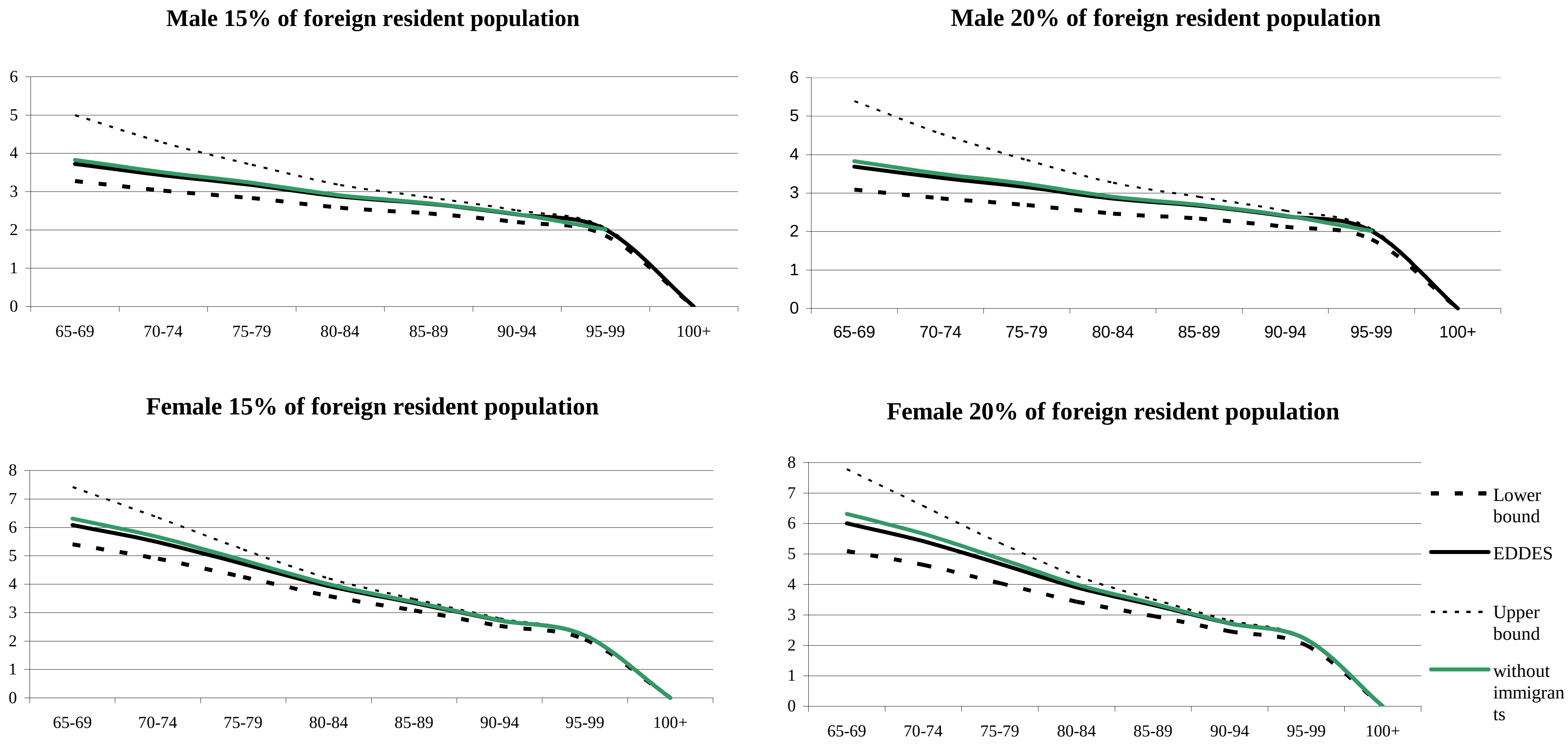
5.2.2 Healthy and non-healthy life expectancy of the Spanish population

Each panel in figure 5.3 shows the non-healthy life expectancy of the Spanish population above age 65 based on the three different scenarios as described above separated by gender and percentage of immigrants. Specifically, the two scenarios noted earlier, when a null disability rate is supposed for the foreign resident group (*lower bound*) and total (*upper bound*) are shown. A third scenario that uses the same disability rate as the EDDES for the immigrant and non-immigrant population is also shown.

Figure 5.3 indicates that, first, the initial proportion of individuals of the second group (immigrants) out of the total population has an impact on non-healthy life expectancy, because there is a variation in the curves. Second, looking at differences by gender, non-healthy life expectancy is always higher for females, who remain alive longer with disabilities, so the impact of a higher proportion of foreign resident population is lower.

The scenarios proposed let us observe the limited repercussions that the behavioural hypotheses about foreign residents have on non-healthy life expectancy, even for the extreme scenarios. If we focus on the proportion of 15% for the new group, in which their disability rate is unknown, we observe that in the worst-case scenario (when immigrants have a total disability rate), and for the 65 year-old group, the maximum difference between the non-healthy life expectancy is more than two years for males and more than three years for females. These results indicate a longer non-healthy life expectancy than the scenario when the disability rate for the foreign residents is equal to the population who do not immigrate (Lagares-Serrano and Mora-Arias, 2006).

Figure 5.3: Non-healthy life expectancy by gender, 2005



Source: World Health Organization (WHO, 2005) and own elaboration.

5.3 Discussion

The debate about the immigration phenomenon in the Spanish population and its social, economic and health consequences has led governments and researchers to show interest in its effects.

Policymakers in Spain have developed a framework for protection against disability called the Libro Blanco de la Dependencia (MTAS, 2005). This publication guides the development of the social protection system to ensure autonomy for disabled persons and fill the voids in existing regulations and planning for public assistance. This publication was based on a definition of dependency introduced by the European Council in 1998 and accepted for different economic and social agents: 'Dependency is the state of individuals that, for reasons linked in to the lack or loss the physical autonomy, psychic or intellectual, may need help or assistance for activities of daily living'.

After the law of dependence was passed by the Spanish Government in 2006, it is expected to introduce a national dependency health system which has to complete the "fourth pillar" of the welfare state. With the growth of the foreign resident population, Spain also has to attend to the main dependency coverage that this group may need. For this reason, if we try to estimate the cost of dependency in the near future for the Spanish population, participation of the foreign residents and a precise estimate of the increment (or decrease) in the costs respect to those who have talking nowadays, have to be considered.

To evaluate the healthy and non-healthy life expectancy for the foreign resident population, it is necessary to use mortality tables and disability rates of these individuals, but this is not possible because there is not enough statistical information about the individuals arriving in Spain. In this work, with the main objective of defining the impact that incorporation of this group of foreign residents in healthy and non-healthy life expectancy has on the Spanish population, extreme scenarios are considered for mortality and disability rates of this group.

The results obtained, based on more pessimistic suppositions, establish an extreme and also a difficult level to reach. In spite of that, it has been shown that for the most negative extreme scenarios, the impact of immigrants on healthy life expectancy is very low. As a result, the incorporation of the foreign resident population in the Spanish population has not caused a substantial increment in the cost of the health care sysrem, not even those costs associated to dependency.