Healthy ageing in a comparative perspective

Reus Pons, Matias

Publication date:
2018

Citation for published version (APA):
Reus Pons, M. (2018). *Healthy ageing in a comparative perspective: A study of the health of older migrants and non-migrants across Europe.* [Groningen]: University of Groningen.

Chapter 4

Differences in the health transition patterns of older migrants and non-migrants in Europe (2004-2015)

Abstract: Most previous research on migrant health in Europe took a cross-sectional perspective, and did not focus on the older population. We analyse differences in health transitions between migrants and non-migrants, while specifically focusing on the older population in Europe. We applied multinomial logistic regression models to data on migrants and non-migrants aged 50 and older in 10 southern and western European countries (2004–2015). At older ages, western migrants and non-western female migrants had worse health at baseline than non-migrants. Both western and non-western migrants in Europe were at a higher risk than non-migrants of experiencing health deterioration as compared to maintaining good health. Western migrants and non-western female migrants were also less likely than non-migrants to have experienced an improvement in health as compared to remaining in poor health. However, non-western male migrants were more likely than non-migrants to have experienced an improvement in health as compared to remaining in poor health. Even after the inclusion of several covariates that are strongly associated with health outcomes and transitions, differences in the health transition patterns of older migrants and non-migrants remained largely unexplained. Our findings indicated that older migrants in Europe were more likely than older non-migrants to have experienced a deterioration in health over the study period. These results raise concerns about whether healthy ageing is as prevalent among migrants as among non-migrants in Europe. We recommend that policies designed to promote healthy ageing specifically address the health needs of the most disadvantaged population groups, including migrants.

Keywords: health transitions, migration, ageing, Europe

4.1   INTRODUCTION

As European societies become older and more diverse (Lanzieri, 2011), the study of the health of older migrants in Europe is becoming increasingly relevant. Having detailed knowledge of the differences in the health transition patterns of older migrants and non-migrants is crucial for assessing the future health care demands of a society that is becoming older and more culturally diverse (International Organization for Migration, 2009). Having such knowledge is also helpful for policymakers who are attempting to adapt their interventions to achieve health equity, which is one of the main pillars of European health care systems and policies (Nørredam & Krasnik, 2011).

Most of the previous research on health inequalities between (older) migrants and non-migrants in Europe took a cross-sectional perspective. These studies showed that although migrants tend to have a lower socio-economic status than non-migrants, they may actually live longer. This so-called 'migrant mortality paradox' has been observed across the life course, including at older ages (Carnein et al., 2014; Reus-Pons et al. 2016). However, previous research has also acknowledged that the number of years and the share of their remaining life expectancy older migrants in Europe can expect to live in good health are smaller than those of their non-migrant counterparts (Reus-Pons et al., 2017). Indeed, compared to older non-migrants, older migrants in Europe tend to have worse self-rated health, more chronic conditions, worse functioning, and higher rates of depression (Solé-Auró & Crimmins, 2008; Aichberger et al., 2010; Lanari & Bussini, 2012; Carnein et al., 2014; Reus-Pons et al., 2017). Longitudinal studies can provide a more complete picture than cross-sectional studies of how health and health inequalities evolve over the life course of individuals, and can provide valuable information about the causes of such inequalities.

Several studies have investigated the health differences between migrants and non-migrants in a longitudinal manner (Newbold, 2005; de Maio & Kemp, 2010; So & Quan, 2012; Kim et al., 2013; Gubernskaya, 2015; Reynolds et al., 2016; Garcia & Reyes, 2017). These studies have found that migrants, who often have a health advantage relative to non-migrants at arrival, tend to experience steeper rates of health decline with age and length of stay; thus, the health status of migrants tends to converge with that of non-migrants. However, only two of these previous studies looked specifically at the older population (Gubernskaya, 2015; Garcia & Reyes, 2017). A specific focus on the older population is essential for gaining a better understanding of healthy ageing in a multicultural context.

Healthy ageing may allow older individuals to maintain the ability to work, which is also a protective health factor, and may lead to a higher quality of life and the ability to live independently at advanced ages (Kristiansen et al., 2016).

Furthermore, all of the above-mentioned studies that examined how the health transitions of migrants and non-migrants differ focused on the United States or Canada. Whether these findings are also valid in a European context remains unclear. A majority of the older migrants who currently live in western Europe arrived before the early 1970s as labour migrants, or from neighbouring countries or former colonies (Lanzieri, 2011). We know from cross-sectional studies that many years after migration, older migrants in Europe tend to be disadvantaged relative to non-migrants in terms of self-rated health, chronic conditions, functioning, limitations, and depression (Solé-Auró & Crimmins, 2008; Aichberger et al., 2010; Lanari & Bussini, 2012; Carnein et al., 2014; Reus-Pons et al., 2017). Thus, older migrants in Europe appear to differ from older migrants in the United States or Canada, who have been shown to have an overall health advantage relative to non-migrants at baseline (Gubernskaya, 2015; Garcia & Reyes, 2017). On the one hand, this implies that in Europe, the migrant health advantage at the time of arrival disappears by the time migrants have reached age 50. On the other hand, if steeper rates of health decline among migrants in Europe were to continue as they age, health inequalities between the migrant and the non-migrant populations in Europe may be expected to increase with age.

To our knowledge, Lanari et al. (2015) were the first to describe how the health transition patterns of older migrants and non-migrants in Europe differ. Specifically, they looked at the extent to which these two groups maintained good health and experienced health recovery. However, their paper was mostly cross-sectional, and they did not attempt to explain the differences in the health transition patterns of older migrants and non-migrants based on their demographic, socio-economic, or lifestyle-related characteristics.

Moreover, most previous studies on the differences in the health transition pattern of older migrants and non-migrants did not distinguish between migrants according to their place of origin (Garcia & Reyes, 2017); or they focused on very specific origin groups, such as Hispanic (Gubernskaya, 2015) or eastern European (Lanari et al., 2015). However, it appears likely that the specific origin of migrants influence the ways in which the health transition patterns of migrants differ from those of non-migrants. For example, the health status of migrants at the time of arrival is determined by previous conditions in their country of origin

(Razum & Twardella, 2002). In addition, based on their origin, specific minority groups may suffer more from discrimination than other groups of migrants (de Maio & Kemp, 2010).

The aim of the present longitudinal study is to analyse the differences in the health transition patterns of older migrant and non-migrant populations in Europe, and to illustrate how a range of individual health determinants contribute to these differences in health transition patterns. In our analysis, we distinguish between migrants who came from western and non-western countries.

We used longitudinal data from the Survey of Health, Ageing and Retirement in Europe (SHARE) from 2004 to 2015. SHARE gathers demographic, socio-economic, and health data on individuals aged 50 and older (Börsch-Supan et al., 2013). We applied multinomial logistic regression models of experiencing a deterioration in health among individuals in good self-rated health, and of expe-riencing an improvement in health among individuals in poor self-rated health, separately by sex, in which migrant status was the main explanatory variable.

4.2 THEORIES AND HYPOTHESES

Comparisons of migrant health outcomes and the changes in these outcomes over time with those of non-migrants may follow one of six different patterns (de Maio, 2010). These patterns can be identified by examining the intersection of health at the time of arrival and changes in health over time. At the time of arrival, migrants' health may either be better or worse than that of non-migrants. Over time, the health of migrants may deteriorate at a faster, similar, or slower pace than that of non-migrants.

The existing scientific research on this issue overwhelmingly shows that at the time of arrival, migrants have a health advantage over non-migrants, as they have better self-rated health outcomes and fewer chronic conditions (e.g., de Maio, 2010). The mortality and health advantages of migrants at the time of arrival have mainly been attributed to 'positive health selection', as the people who migrate tend to be healthy (Razum et al., 1998; Abraído-Lanza et al., 1999; Deboosere & Gadeyne, 2005); and to the tendency of migrants to – at least initially – engage in better health-related behaviours than non-migrants, including following a healthier diet and being less likely to smoke and drink (Abraído-Lanza et al., 2005). The 'migrant health transition' theory (Razum & Twardella, 2002) might

also help explain migrants' relative health advantage after moving to a country with a generally healthier population. According to this theory, migrants – and especially those arriving from less developed countries – benefit from improved social and living conditions and better health care services immediately after migration, which might lead to a decline in the prevalence of infectious diseases and maternal conditions among these migrants shortly after their arrival.

At the same time, migrants seem to experience steeper rates of health decline than non-migrants with age and the passage of time, and this effect seems to be triggered a few years after arrival (Kim et al., 2013; Goldman et al., 2014; Gubernskaya, 2015; Garcia & Reyes, 2017). The steeper health decline of migrants with age is explained by the 'cumulative disadvantage' theory (Angel et al., 2001; Dannefer, 2003), which postulates that migrants suffer negative effects from having a lower socio-economic position throughout their life course, including detrimental effects on their health. Indeed, migrants often suffer from material deprivation, poor working conditions, social isolation, and limited access to services (Gushulak et al., 2010). Furthermore, migrants may have an even larger health burden if they fail to fulfil their socio-economic aspirations, and especially if they perceive that their social position in the destination country is lower than the position they would have achieved if they had not migrated (Alcántara et al., 2014).

At older ages and many years after migration, migrants in Europe tend to be in poorer general health than non-migrants (Solé-Auró & Crimmins, 2008; Aichberger et al., 2010; Lanari & Bussini, 2012; Carnein et al., 2014; Reus-Pons et al., 2017). This difference is important, as existing studies on older migrants' health transition patterns outside of Europe (Gubernskaya, 2015; Garcia & Reyes, 2017) have shown that older migrants' health at baseline is better than that of non-migrants. While steeper rates of health decline among older migrants lead to a decrease in migrant health inequalities in the United States and Canada, and thus to a convergence in health between migrants and non-migrants, steeper rates of health decline among older migrants in Europe could lead to an increase in the migrant health disadvantage, and thus to a divergence in migrant health inequalities with age. Indeed, steeper rates of health decline among older migrants could be expected according to the cumulative disadvantage theory. Furthermore, the rates of health decline among older migrants are not expected to converge to those of non-migrants, since socio-economic disparities in health do not seem to disappear until advanced ages (House et al., 2005), and selection in the form of premature mortality among the relatively unhealthy migrant population is unlikely due to the overall migrant mortality advantage (Razum et al., 1998; Wallace &

Kulu, 2015), which seems to be maintained even at older ages (Reus-Pons et al., 2016).

The migrants' context of origin plays an important role in, for instance, determining the baseline health status of migrants via the physical, socio-economic, and political environment (Razum & Twardella, 2002); and in culturally shaping health-related behaviours (Abraido-Lanza et al., 2005; Deboosere and Gadeyne, 2005). Most western migrants are from European countries, and are therefore subject to more favourable immigration policies (European Commission, 2015) and to more favourable attitudes towards migrants (Schneider, 2008). It therefore seems reasonable to assume that non-western migrants are more prone to social and legal disadvantages throughout their life course. This could explain why non-western migrants tend to have poorer health than both western migrants and non-migrants (Lindström et al., 2001; Reus-Pons et al., 2017). The context of origin may also play a role in health transitions at older ages, since specific diseases that develop later in life, such as stomach cancer, are associated with deprivation during childhood (Razum & Twardella, 2002).

Therefore, we hypothesise that:

Older migrants in Europe, especially those of non-western origin, are more likely to experience health deterioration than older non-migrants (H1);

and that:

Older migrants in Europe, especially those of non-western origin, are less likely to experience health improvement than older non-migrants (H2).

Additionally, we take into account the role of a range of individual-level factors in explaining differences in health transitions between older migrants and non-migrants, including marital status, socio-economic position (education, job status), and different variables reflecting health-related behaviours (BMI, smoking, physical activity). Being married or partnered is associated with better health outcomes (Carr & Springer, 2010). Poor socio-economic status is strongly associated with both poor physical and poor mental health outcomes (Nazroo, 2003; Kunst et al., 2005; Mackenbach et al., 2008). While job status captures current socio-economic status, level of education also partially reflects socio-economic position during childhood and youth (Bhopal et al., 2002). Health-related characteristics and behaviours, especially BMI, exercise, and smoking, are all strongly

Chapter 4

associated with poor health outcomes (WHO, 2003). We also control for age to adjust for possible differences in the age structures of the migrant and non-migrant populations; for country and wave to adjust for contextual differences across space and time; and for length of residence in the country of destination to account for differences therein.

4.3   DATA AND METHODS

4.3.1   *Data source*

Our study population consisted of individuals aged 50 and older who participated in the Survey of Health, Ageing and Retirement in Europe (SHARE). Since 2004, SHARE has been collecting panel data on the health status, the socio-economic status, and the social networks of older individuals in European countries and in Israel (Börsch-Supan et al., 2013). For our analysis, we selected data only from countries in western and southern Europe: Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden, and Switzerland. We excluded eastern European countries because they have very different migration histories than western European countries, with most continuing to experience more emigration than immigration (Castles et al., 2014). We used data from waves 1 (2004–2005), 2 (2006–2007), 4 (2011–2012), 5 (2013), and 6 (2015) (Börsch-Supan, 2017a; 2017b; 2017c; 2017d; 2017 e). At each wave, refreshment samples were drawn to increase the sample size and to compensate for panel attrition (Börsch-Supan et al., 2013). We included respondents in wave 1 and in the successive refreshment samples for whom health data were available for at least two waves.

Our analytical sample consisted of 66,660 respondents aged 50 and older who contributed 127,136 person-wave observations (as defined below). Of these observations, 116,537 were of non-migrants; 7,854 were of western migrants; and 2,745 were of non-western migrants.

4.3.2 DEPENDENT VARIABLE

We defined health transitions based on each individual's health status at baseline and follow-up. We used self-rated health as a subjective measure of each respondent's overall health status. Answers to the question: *Would you say your health*

is…? were dichotomised in the conventional manner (e.g. Newbold, 2005): i.e., as indicating good (excellent, very good, or good) or poor (fair or poor) health.

We converted the data into a person-wave format, allowing as many person-wave observations (health status at baseline combined with health status at follow-up) as possible per respondent. In order to minimise the number of observations ending in loss to follow-up, we included observations from non-consecutive waves when health information was missing in intermediate waves. We took into account the differences in the time of exposure in different transitions by including the pairs of waves as a control variable (see below).

We classified the person-wave observations into six categories according to the individual's health status at baseline and follow-up. Respondents who experienced no transition were placed in one of the first two categories: namely, maintaining good health and remaining in poor health. Respondents who experienced a transition were placed in one of the other four categories: namely, health deterioration (good to poor health); health improvement (poor to good health); good health to either death or loss to follow-up; and poor health to either death or loss to follow-up. Unfortunately, the data did not allow us to differentiate transitions leading to death from those leading to loss to follow-up.

4.3.3 INDEPENDENT VARIABLES

We defined migrants, our main independent variable, as those respondents who were not born in their current country of residence. We then distinguished between migrants who came from a western or a non-western country (Lindström et al., 2001; Hosper et al., 2007; Arnold et al., 2010; Vandenheede et al., 2015; Reus-Pons et al., 2017). Following the definitions used by Statistics Netherlands (CBS, 2017), we defined western migrants as those born in Europe (except Turkey), North America, Oceania, Japan, or Indonesia.

All of the covariates, except for an indicator for the pair of waves to which the observation pertained, were measured at the initial wave of each observation (baseline): age, country of residence and length of residence in that country, marital status, socio-economic status (education, job status), and health-related behaviours (BMI, smoking, physical activity). Age was recoded into five-year age groups up to 85+. Length of residence (up to 10 years, and 10 years or longer) was derived from the year of migration and the year when the interview took

place. We coded marital status into four categories: married (consisting of the categories 'married and living together with spouse', and 'registered partnership'), separated (consisting of the categories 'married and living separated from spouse', and 'divorced'), single ('never married'), and widowed. Highest level of education ISCED 1997 codes were recoded into four categories: primary education or lower (ISCED codes 0 and 1), secondary education (codes 2 and 3), higher education (codes 4, 5, and 6), and other (consisting of the categories 'still in education', and 'other'). Current job status was recoded into four categories: retired, economically active ('employed' or 'self-employed'), unemployed or economically inactive ('unemployed', 'permanently sick or disabled', or 'homemaker'), and other. We used the original BMI coding: underweight (< 18.5), normal weight (18.5–24.9), overweight (25–29.9), and obese (> 30). We also maintained the dichotomous coding for ever having smoked (yes/no), and the four categories indicating how frequently the respondent engaged in either vigorous or moderate activities: more than once a week, once a week, one to three times a month, and hardly ever or never. In SHARE, vigorous activities are defined as sports, heavy housework, and physically demanding jobs; while moderate activities include less demanding forms of exercise such as gardening, cleaning the car, or going for a walk.

4.3.4 METHOD

We first show some descriptive results. We performed two-sided tests to assess whether the differences in the background characteristics and the health status at baseline between older (western and non-western) migrants and non-migrants were statistically significant.

We applied multinomial logistic regression models separately by sex. We ran separate models for those transitions starting in good health, and for those transitions starting in poor health, since the possible health transitions were restricted by the health status at baseline. Transitions leading to death or loss to follow-up were modelled as a competing risk. We estimated robust standard errors (Huber, 1967; White, 1980) to take into account the fact that the same respondent may be observed several times (transition or no transition). In model 1, we included migrant origin (non-migrant, western migrant, or non-western migrant) and controlled for age, country of residence, and wave. In model 2, we additionally controlled for each respondent's length of residence in the country, marital status, highest level of education attained, current job status, BMI, having ever smoked, and frequency of engaging in vigorous and moderate activities.

4.4 RESULTS

4.4.1 Descriptive findings

Table 4.1 shows the absolute and the relative distributions of the person-wave observations according to the individuals' characteristics at baseline by migrant origin. Compared to the non-migrants, the proportion of males was lower among western migrants, but higher among non-western migrants. While the age profiles of western migrants were similar to those of non-migrants, non-western migrants tended to be younger. The vast majority of migrants had been living in the current country of residence for more than 10 years. Compared to non-migrants, all migrants were more likely to be separated, non-western migrants were less likely to be widowed, and western migrants were less likely to married or single. While larger shares of both

<div style="position: absolute; right: 0;">Chapter 4</div>

Table 4.1. Number of person-wave observations and their distribution according to individual characteristics at baseline by migrant origin (2004-2015)

	Non-migrants		Western migrants		Non-western migrants	
	N	%	N	%	N	%
Sex						
Male	53,353	45.8	**3,376**	**43.0**	**1,373**	**50.0**
Female	63,184	54.2	**4,478**	**57.0**	**1,372**	**50.0**
Age (years)						
50-54	24,258	20.8	1,628	20.7	**1,014**	**36.9**
55-59	22,012	18.9	**1,382**	**17.6**	**589**	**21.5**
60-64	20,125	17.3	1,373	17.5	436	15.9
65-69	16,994	14.6	**1,230**	**15.7**	**317**	**11.5**
70-74	13,860	11.9	948	12.1	**186**	**6.8**
75-79	10,070	8.6	676	8.6	**116**	**4.2**
80-84	5,875	5.0	423	5.4	**61**	**2.2**
85+	3,343	2.9	194	2.5	**26**	**0.9**
Length of residence (years)						
0-9	0	0.0	453	5.8	**188**	**6.9**
10+	116,537	100.0	7,383	94.2	**2,552**	**93.1**
Marital status						
Married	85,089	73.1	**5,498**	**70.0**	1,950	71.1
Separated	10,092	8.7	**914**	**11.6**	**390**	**14.2**
Single	7,010	6.0	**410**	**5.2**	159	5.8
Widowed	14,285	12.3	1,031	13.1	**245**	**8.9**

Table 4.1. (continued)

	Non-migrants		Western migrants		Non-western migrants	
	N	%	N	%	N	%
Education						
Primary or lower	32,385	27.8	**1,400**	**17.8**	**879**	**32.2**
Secondary	55,767	47.9	**3,584**	**45.7**	**983**	**36.0**
Higher	27,773	23.8	**2,697**	**34.4**	**796**	**29.2**
Other	536	0.5	**165**	**2.1**	**72**	**2.6**
Job status						
Retired	54,888	47.4	3,769	48.3	**769**	**28.3**
Active	37,019	31.9	2,485	31.9	**1,051**	**38.6**
Unemployed or inactive	22,472	19.4	1,449	18.6	**841**	**30.9**
Other	1,537	1.3	97	1.2	**60**	**2.2**
BMI						
Underweight	1,365	1.2	**126**	**1.6**	34	1.3
Normal weight	45,393	39.8	3,002	38.9	1,108	41.4
Overweight	47,382	41.6	3,281	42.5	**1,024**	**38.3**
Obese	19,807	17.4	1,302	16.9	509	19.0
Ever smoked						
No	60,766	52.3	4,027	51.5	**1,558**	**57.0**
Yes	55,433	47.7	3,790	48.5	**1,175**	**43.0**
Vigorous activities						
More than once a week	43,078	37.1	2,928	37.5	**859**	**31.5**
Once a week	15,866	13.7	1,059	13.6	**308**	**11.3**
One to three times a month	9,538	8.2	**551**	**7.1**	**189**	**6.9**
Hardly ever, or never	47,700	41.1	3,276	41.9	**1,375**	**50.3**
Moderate activities						
More than once a week	83,372	71.8	**5,729**	**73.3**	1,758	64.3
Once a week	14,959	12.9	962	12.3	**429**	**15.7**
One to three times a month	5,806	5.0	365	4.7	144	5.3
Hardly ever, or never	12,053	10.4	759	9.7	**403**	**14.7**

Source: Own calculations based on SHARE data (2004-2015)

Bold: The proportion is statistically significantly different from that of non-migrants ($p < 0.05$), except for length of residence (difference between western and non-western migrants)

western and non-western migrants were highly educated than of non-migrants, the share of non-western migrants with primary education or lower was larger than that of non-migrants. In line with their younger age structure, non-western migrants were less likely than non-migrants to be retired, and were more likely to be economically active, unemployed, or economically inactive; whereas the job status profile of western migrants was very similar to that of non-migrants. Non-western migrants were less likely than both non-migrants and western migrants to report frequently engaging in vigorous and moderate activities. However, in terms of smoking and BMI, non-western migrants had a slightly healthier profile, as the shares of these migrants who had smoked or were overweight were smaller than those of both non-migrants and western migrants. Nevertheless, it is important to note that among females only, the proportion who were obese was statistically significantly higher among non-western migrants (22.1%), than among non-migrants (17.7%) and western migrants (16.8%; results not shown in Table 4.1).

Table 4.2 shows the counts and the proportions of the different categories of the person-wave observations according to health by sex and migrant origin. At baseline, western migrants and non-western female migrants had worse health outcomes than non-migrants, while the health of non-western male migrants did not statistically differ from that of non-migrants. Migrants, especially those of non-western origin, were more likely to have made transitions leading to death or loss to follow-up, and less likely to have experienced no transition (stable good health, stable poor health) than their non-migrant counterparts. The shares of transitions resulting in a deterioration in health did not seem to differ between migrants and non-migrants, whereas the shares of transitions resulting in an improvement in health were lower among western migrants than among non-migrants. These patterns were present among both males and females.

4.4.2   Health deterioration

Table 4.3 shows the risk of experiencing a deterioration in health as compared to experiencing stable good health on the logit scale, by sex. The complete results, including the effects of country and wave, and the models showing the risk of experiencing transitions leading to death or loss to follow-up, are shown in the supplement at the end of this chapter (Tables 4.S.1 and 4.S.2).

In line with our first hypothesis, we found that at older ages, both western and non-western migrants faced a higher risk than non-migrants of experiencing a deterioration in health as compared to maintaining good health. These patterns were found among both males and females, although the differences in the risk

Table 4.2. Categories of person-wave observations according to self-rated health at baseline and follow-up by sex and migrant origin (2004-2015)

Males	Non-migrants		Western migrants		Non-western migrants	
	N	%	N	%	N	%
TOTAL: good health (baseline)	37,241	69.8	**2,257**	**66.9**	939	68.4
Stable good health	23,541	63.2	**1,322**	**58.6**	**518**	**55.2**
Health deterioration	4,933	13.2	306	13.6	122	13.0
Good health to death/loss to follow-up	8,767	23.5	**629**	**27.9**	**299**	**31.8**
TOTAL: poor health (baseline)	16,112	30.2	**1,119**	**33.1**	434	31.6
Stable poor health	7,573	47.0	**476**	**42.5**	**157**	**36.2**
Health improvement	3,288	20.4	**191**	**17.1**	91	21.0
Poor health to death/loss to follow-up	5,251	32.6	**452**	**40.4**	**186**	**42.9**

Females	Non-migrants		Western migrants		Non-western migrants	
	N	%	N	%	N	%
TOTAL: good health (baseline)	41,424	65.6	**2,754**	**61.5**	856	62.4
Stable good health	25,887	62.5	**1,632**	**59.3**	**482**	**56.3**
Health deterioration	6,016	14.5	390	14.2	116	13.6
Good health to death/loss to follow-up	9,521	23.0	**732**	**26.6**	**258**	**30.1**
TOTAL: poor health (baseline)	21,760	34.4	**1,724**	**38.5**	**516**	**37.6**
Stable poor health	11,338	52.1	871	50.5	**234**	**45.3**
Health improvement	4,293	19.7	**270**	**15.7**	84	16.3
Poor health to death/loss to follow-up	6,129	28.2	**583**	**33.8**	198	38.4

Source: Own calculations based on SHARE data (2004-2015)

Bold: The proportion is statistically significantly different from that of non-migrants ($p < 0.05$)

of health deterioration among non-western female migrants and female non-migrants were not statistically significant. However, we had also expected this association to be stronger for non-western migrants than for western migrants. While the size of the effect on the risk of health deterioration was larger among non-western migrants, the risk of experiencing health deterioration rather than maintaining good health was not statistically significantly different between western and non-western migrants. The differences between older migrants and non-migrants in the likelihood of experiencing a deterioration in health were robust to the inclusion of a wide variety of covariates that are strongly associated with health outcomes and transitions (socio-economic status, health-related behaviours, marital status).

Table 4.3. Effects on the logit scale (b) and standard error (SE) of experiencing self-rated health deterioration as compared to stable good health, by sex (2004-2015)

	Males				Females			
	Model 1		Model 2		Model 1		Model 2	
Log pseudolikelihood	-33580		-33179		-37090		-36587	
Pseudo R^2	0.0640		0.0752		0.0715		0.0841	
	b	SE	b	SE	b	SE	b	SE
Origin: non-migrants (ref)								
Western migrants	0.21***	0.07	0.21***	0.07	0.16**	0.06	0.22***	0.07
Non-western migrants	0.31***	0.11	0.25**	0.11	0.18	0.12	0.19	0.12
Age: 50-54 (ref)								
55-59	0.20***	0.05	0.12**	0.06	0.16***	0.05	0.05	0.05
60-64	0.39***	0.05	0.18***	0.06	0.35***	0.05	0.10*	0.06
65-69	0.61***	0.06	0.33***	0.08	0.71***	0.05	0.34***	0.06
70-74	0.96***	0.06	0.65***	0.08	0.99***	0.05	0.58***	0.07
75-79	1.15***	0.07	0.79***	0.09	1.30***	0.06	0.84***	0.07
80-84	1.36***	0.08	0.97***	0.10	1.55***	0.08	1.05***	0.09
85+	1.63***	0.12	1.19***	0.14	1.75***	0.10	1.17***	0.12
Length of residence: 10+ years (ref)								
0-9 years			0.08	0.24			-0.37	0.25
Marital status: married (ref)								
Separated			0.05	0.06			0.15***	0.05
Single			0.15**	0.07			0.18***	0.07
Widowed			0.00	0.07			-0.01	0.05
Highest education: secondary education (ref)								
Primary education or lower			0.27***	0.04			0.40***	0.04
Higher education			-0.38***	0.04			-0.29***	0.04
Other			0.04	0.22			-0.05	0.21
Current job status: retired (ref)								
Active			-0.30***	0.06			-0.35***	0.05
Unemployed or inactive			0.35***	0.08			0.04	0.04
Other			-0.24	0.17			-0.13	0.14
BMI: normal weight (ref)								
Underweight			0.99***	0.32			0.24**	0.12
Overweight			0.13***	0.04			0.29***	0.03
Obese			0.46***	0.05			0.59***	0.04
Ever smoked: no (ref)								
Yes			0.13***	0.03			0.13***	0.03

Chapter 4

Table 4.3. (continued)

	Males				Females			
	Model 1		Model 2		Model 1		Model 2	
Log pseudolikelihood	-33580		-33179		-37090		-36587	
Pseudo R^2	0.0640		0.0752		0.0715		0.0841	
	b	SE	b	SE	b	SE	b	SE
Vigorous activities: more than once a week (ref)								
Once a week			0.09*	0.05			-0.02	0.05
One to three times a month			0.12**	0.06			0.04	0.06
Hardly ever, or never			0.34***	0.04			0.24***	0.04
Moderate activities: more than once a week (ref)								
Once a week			0.04	0.05			0.15***	0.05
One to three times a month			0.30***	0.07			0.24***	0.07
Hardly ever, or never			0.23***	0.07			0.35***	0.06

Source: Own calculations based on SHARE data (2004-2015)
In all models, country and wave are controlled for. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The effects of all of the covariates were in the expected direction. The risk of health deterioration increased with age. Respondents who were single or separated had a higher likelihood of experiencing health deterioration than their married counterparts. As expected, lower socio-economic status and risky health-related behaviours were associated with a greater likelihood of experiencing transitions leading to worse health outcomes. The risk of health deterioration decreased with increasing levels of education. Respondents who were economically active were less likely than those who were retired to have experienced health deterioration. In contrast, being unemployed or economically inactive was associated with a higher risk of health deterioration, especially among males. Being underweight, overweight, or obese; having ever smoked; and exercising less frequently were all factors that substantially increased the risk of transitioning from good to poor health.

4.4.3   Health improvement

Table 4.4 shows the risk of experiencing an improvement in health as compared to remaining in poor health, by sex. As expected according to our second hypothesis, older western migrants and older non-western female migrants were less likely than non-migrants to have experienced an improvement in health compared to remaining in poor health; however, this difference was statistically significant for western female migrants only. Contrary to our expectations, non-

Table 4.4. Effects on the logit scale (b) and standard error (SE) of experiencing self-rated health improvement as compared to stable poor health, by sex (2004-2015)

	Males				Females			
	Model 1		Model 2		Model 1		Model 2	
Log pseudolikelihood	-16996		-16732		-21876		-21567	
Pseudo R²	0.0550		0.0697		0.0553		0.0687	
	b	**SE**	**b**	**SE**	**b**	**SE**	**b**	**SE**
Origin: non-migrants (ref)								
Western migrants	-0.06	0.10	-0.02	0.10	-0.30***	0.08	-0.29***	0.08
Non-western migrants	0.20	0.15	0.36**	0.15	-0.17	0.14	-0.02	0.14
Age: 50-54 (ref)								
55-59	0.04	0.08	0.16**	0.08	-0.10	0.06	0.00	0.07
60-64	0.06	0.07	0.31***	0.08	-0.27***	0.07	-0.10	0.07
65-69	-0.09	0.08	0.22**	0.10	-0.34***	0.07	-0.14*	0.08
70-74	-0.36***	0.08	-0.02	0.11	-0.56***	0.07	-0.32***	0.08
75-79	-0.66***	0.09	-0.26**	0.12	-0.62***	0.07	-0.31***	0.09
80-84	-0.56***	0.11	-0.13	0.13	-0.83***	0.09	-0.46***	0.11
85+	-0.86***	0.17	-0.34*	0.19	-0.60***	0.12	-0.15	0.13
Length of residence: 10+ years (ref)								
0-9 years			0.11	0.39			0.35	0.33
Marital status: married (ref)								
Separated			-0.20**	0.09			-0.12*	0.07
Single			-0.21**	0.09			-0.15*	0.09
Widowed			0.08	0.10			-0.04	0.05
Highest education: secondary education (ref)								
Primary education or lower			-0.25***	0.06			-0.18***	0.05
Higher education			0.06	0.06			0.07	0.06
Other			-0.32	0.28			-0.38	0.31
Current job status: retired (ref)								
Active			0.50***	0.08			0.37***	0.07
Unemployed or inactive			-0.12	0.09			-0.10**	0.05
Other			-0.04	0.22			-0.12	0.16
BMI: normal weight (ref)								
Underweight			-0.28	0.32			-0.49***	0.15
Overweight			-0.03	0.05			-0.09**	0.05
Obese			-0.20***	0.06			-0.42***	0.05

Chapter 4

Table 4.4. (continued)

	Males				Females			
	Model 1		Model 2		Model 1		Model 2	
Log pseudolikelihood	-16996		-16732		-21876		-21567	
Pseudo R²	0.0550		0.0697		0.0553		0.0687	
	b	SE	b	SE	b	SE	b	SE
Ever smoked: no (ref)								
Yes			-0.13***	0.05			-0.06	0.04
Vigorous activities: more than once a week (ref)								
Once a week			0.14*	0.08			0.11	0.07
One to three times a month			-0.05	0.09			0.15*	0.08
Hardly ever, or never			-0.28***	0.06			-0.15***	0.05
Moderate activities: more than once a week (ref)								
Once a week			-0.20***	0.07			-0.08	0.06
One to three times a month			-0.08	0.09			-0.23***	0.08
Hardly ever, or never			-0.49***	0.07			-0.54***	0.06

Source: Own calculations based on SHARE data (2004-2015)

In all models, country and wave are controlled for. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

western male migrants were more likely than their non-migrant counterparts to have experienced an improvement in health, although this difference was not statistically significant. Therefore, our second hypothesis seems to be supported among western migrants and non-western female migrants, but not necessarily in non-western male migrants The effects on the risk of experiencing an improvement in health among older migrants and non-migrants remained in the same direction after all of the covariates had been included.

As in the case of health deterioration, the effect of all covariates on health improvement was in the expected direction. The likelihood of health improvement decreased with age. Single and separated respondents were less likely to have experienced an improvement in health than their married counterparts. The risk of health improvement was lower among those with primary education or lower than among those with secondary education. Respondents who were economically active were more likely than those who were retired to have experienced an improvement in health, while the opposite was the case among respondents who were unemployed or economically inactive. Being underweight, overweight, or

obese; having ever smoked; and exercising less frequently were associated with a reduced likelihood of recovery.

4.5 DISCUSSION AND CONCLUSION

We applied multinomial regression models to longitudinal data on self-rated health derived from the Survey of Health, Ageing and Retirement in Europe (2004–2015) to examine differences in the health transition patterns of migrants and non-migrants aged 50 and older in 10 southern and western European countries. We found that at older ages, western migrants and non-western female migrants had worse health at baseline than non-migrants. We also found that compared to non-migrants, both western and non-western migrants were at a higher risk of experiencing a deterioration in health as compared to maintaining good health. Western migrants and non-western female migrants were also less likely than non-migrants to have experienced an improvement in health as compared to remaining in poor health. In contrast, non-western male migrants were more likely than their non-migrant counterparts to have experienced an improvement in health as compared to remaining in poor health. Even after the inclusion of several covariates that are strongly associated with health outcomes and transitions, the differences in the health transition patterns of older migrants and non-migrants remained largely unexplained.

4.5.1 Interpretation of the results

Our results mostly validate our hypotheses: i.e., *older migrants in Europe are more likely to experience health deterioration than older non-migrants* (H1), and *older migrants in Europe are less likely to experience health improvement than older non-migrants* (H2). The results are in line with the steeper rates of health decline of migrants with age postulated by the 'cumulative disadvantage' theory (Angel et al., 2001). In contrast with previous findings on differences in health transitions between older migrants and non-migrants outside of Europe (Gubernskaya, 2015; Garcia & Reyes, 2017), older migrants in Europe have been shown to have a health disadvantage at baseline relative to non-migrants (Solé-Auró & Crimmins, 2008; Aichberger et al., 2010; Lanari & Bussini, 2012; Carnein et al., 2014; Reus-Pons et al., 2017). Our descriptive findings also point in this direction, at least among western migrants and non-western female migrants. Furthermore, and in line with the results of previous studies conducted outside of Europe, our findings largely support the idea that migrants in Europe experience faster health deterioration with age than non-migrants. These findings raise concerns about

Chapter 4

whether healthy aging is as prevalent among migrants as among non-migrants in Europe, and may also be related to evidence indicating that the health inequality gap between older migrants and non-migrants in certain European countries has increased between 2001 and 2011 (Reus-Pons et al., 2017).

However, contrary to expectations, we also found that non-western male migrants were more likely to have experienced an improvement in health than their non-migrant counterparts. We do not believe that cultural differences in reporting one's own health played a major role in determining this unexpected result. Seo et al. (2014) showed that variations in self-rated health response patterns differ not according to migrant origin, but according to the responding language. SHARE questionnaires are provided in the national languages only, which helps to reduce the potential variability in the response patterns of migrants and non-migrants within each country. Regardless of their general social and economic disadvantages over the life course, the tendency of non-western migrants to suffer more often than their western counterparts from specific diseases and conditions could explain this finding. For instance, previous research has shown that migrants are more likely than non-migrants to suffer from infectious diseases, occupational injuries, and mental diseases such as anxiety and depression (Gushulak et al., 2010; Rechel et al., 2013; Deboosere & Gadeyne, 2005; Kunst et al., 2011). Compared to the majority of non-communicable diseases, infectious diseases and occupational injuries tend to be acute and are more likely to lead to either death or recovery (Anthamatten & Hazen, 2011). Mental health is strongly associated with social support, especially from spouses and children (Li et al., 2014; Ahn et al., 2017). Because family norms and bonds tend to be stronger among non-western migrants (de Valk & Schans, 2008), these migrants might have a higher likelihood of recovery from certain mental diseases than western migrants. Nevertheless, older non-western female migrants do not seem to share this advantage, as their likelihood of health improvement was lower than that of their non-migrant counterparts. We found that non-western female migrants were more likely to be obese than their non-migrant counterparts (see also Deboosere & Gadeyne, 2005; Vandenheede & Deboosere, 2009). Over the life course, cumulative risky health behaviours such as being obese could eventually take their toll, and may therefore offset the higher likelihood of recovery by negatively affecting the incidence rates of, for instance, cardiovascular diseases or diabetes (Razum & Twardella, 2002; Vandenheede & Deboosere, 2009). The results of a recent study by Reus-Pons et al. (2016) seem to suggest that this is the case: while older non-western female migrants in Belgium were found to have a cardiovascular mortality disadvantage

relative to their non-migrant counterparts, no such disadvantage was found among male migrants.

4.5.2   Evaluation of data and methods

Perhaps the most important limitation of the data is that SHARE is not designed to adequately subsample the migrant subpopulation. According to Eurostat data for 2011, migrants represented 12.6% of the population in the 10 countries studied; whereas migrants only contributed 8.3% of the person-wave observations in our data. Because the migrant sample sizes were small, we were unable to classify migrants beyond a broad western versus non-western typology. Furthermore, the data for all of the countries were pooled together. Although we controlled for the effect of country of residence in order to broadly consider the spatial, social, and institutional context, the impact of this context could well be dissimilar for migrants and non-migrants. For instance, variation across countries in integration policies or public attitudes towards migrants are likely to affect migrants in particular, and may have contributed to the sizes of the health differences between migrants and non-migrants. The small migrant sample sizes for each country did not allow us to analyse these potential contextual effects, which, in addition to the individual-level covariates included in this study, could help explain the inequalities in the health transition patterns of older migrants and non-migrants. Future research should aim to investigate the extent to which specific countries of origin and specific countries of residence influence the differences in the health transition patterns of migrants and non-migrants.

Another important methodological limitation is related to the fact that we had a maximum of four person-wave observations per respondent. Many of the respondents first entered the survey in the refreshment samples, and not all of the respondents in the first wave made it to the final wave owing to death or loss to follow-up. Because the number of transitions observed per individual was relatively small, we were unable to analyse longer health trajectories. Considerably more effort should be devoted to gathering comparative longitudinal migrant health data across Europe.

Finally, due to data restrictions, we were unable to distinguish transitions leading to death from those leading to loss to follow-up. The respondents in SHARE are traced and followed if they relocate within the country, and their mortality is recorded via end-of-life interviews with a proxy respondent, who could be a family or household member, a neighbour, or another person socially related to the deceased (Börsch-Supan et al., 2013). Solé-Auró et al. (2015) compared the mortality

Chapter 4

rates in SHARE with those from the Human Mortality Database, and concluded that SHARE underestimates mortality. Furthermore, migrants are more likely to migrate abroad, and preliminary data exploration (results not shown) indicated that migrants were more likely to have experienced transitions that led to loss to follow-up. Although these transitions were modelled as a competing risk, the results of this part of the analysis are not very informative. We know from previous studies that despite having a lower socio-economic status, migrants often have lower overall mortality rates than non-migrants; a phenomenon known as the 'migrant mortality paradox' (Razum et al., 1998; Abraído-Lanza et al., 1999; Wallace & Kulu, 2015). We also know that at older ages, migrants maintain this overall mortality advantage in certain European countries (Carnein et al., 2014; Reus-Pons et al., 2016). Given that older migrants may have a mortality advantage over older non-migrants in Europe – or at least in certain European countries – the relevance of our findings could be challenged by arguing that mortality could be understood as the worst possible health outcome. More precisely, it is possible to ask whether the relative health disadvantage of migrants would remain if they had a mortality advantage. While we agree that our findings would have been more complete if we had clearly distinguished transitions leading to death, we argue that general health also matters, and has a clear impact on people's quality of life (Uitenbroek & Verhoeff, 2002). Thus, we believe our findings have implications relevant to health-related policies and health care provision.

4.6   OVERALL CONCLUSION

Despite these limitations, our study is the first to analyse the differences in the health transition patterns of older migrants and non-migrants in a European context. Our results show that older migrants in Europe were in worse health than older non-migrants at baseline; and that they were also more likely to have experienced a deterioration in health, and – albeit depending on the migrant's origin - less likely to have experienced an improvement in health. These findings could indicate that the health inequality gap between migrants and non-migrants is increasing with age. Our results also show that the differences in the health transition patterns of migrants and non-migrants remained largely unexplained even after a range of socio-economic indicators and health-related behaviours had been included.

Our results raise concerns whether healthy aging is as prevalent among migrants as among non-migrants in Europe, and suggest that general policies aimed at

improving health among the older population – such as policies that promote healthier lifestyles, or broader socio-economic policies that seek to tackle socio-economic inequalities – might not be effective in reducing health inequalities between migrants and non-migrants. We recommend that policies designed to promote healthy ageing also be formulated to specifically address the health needs of the most disadvantaged population groups, including migrants.

Future research should investigate the role of specific diseases and conditions, and the extent to which the context in the country of origin and in the country of residence explain the differences in health and in health transition patterns among older migrants and non-migrants. The findings of these studies may, for example, be used to help formulate healthy ageing policies that target specific diseases and conditions that affect migrants in particular; to design more inclusive integration policies; or to create campaigns to promote more favourable public attitudes towards migrants.

Chapter 4

REFERENCE LIST

Abraído-Lanza AF, Chao MT, Flórez KR (2005). Do healthy behaviors decline with greater acculturation?: implications for the Latino mortality paradox. *Social Science & Medicine* 61(6):1243-1255.

Abraído-Lanza AF, Dohrenwend BP, Ng-Mak DS, Turner JB (1999). The Latino mortality paradox: a test of the "salmon bias" and healthy migrant hypotheses. *American Journal of Public Health* 89(10):1543-1548.

Aichberger MC, Schouler-Ocak M, Mundt A, Busch MA, Nickels E, Heimann HM, Ströhle A, Reischies FM, Heinz A, Rapp MA (2010). Depression in middle-aged and older first generation migrants in Europe: results from the survey of health, ageing and retirement in Europe (SHARE). *European Psychiatry* 25(8):468-475.

Ahn S, Kim S, Zhang H (2017). Changes in depressive symptoms among older adults with multiple chronic conditions: role of positive and negative social support. *International Journal of Environmental Research and Public Health* 14(1):16.

Alcántara C, Chen C, Alegría M (2014). Do post-migration perceptions of social mobility matter for Latino immigrant health? *Social Science & Medicine* 101:94-106.

Angel JL, Buckley CJ, Sakamoto A (2001). Duration or disadvantage? Exploring nativity, ethnicity, and health in midlife. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 56(5):S275-S284.

Anthamatten P, Hazen H (2011). *An introduction to the geography of health.* Abingdon (Oxford): Routledge: 36.

Arnold M, Razum O, Coebergh JW (2010). Cancer risk diversity in non-western migrants to Europe: an overview of the literature. *European Journal of Cancer* 46:2647-2659.

Bhopal R, Hayes L, White M, Unwin N, Harland J, Ayis S, Alberti G (2002). Ethnic and socio-economic inequalities in coronary heart disease, diabetes and risk factors in Europeans and south Asians. *Journal of Public Health Medicine* 24(2):95-105.

Börsch-Supan A, Brandt M, Hunkler C, Kneip T, Korbmacher J, Malter F, Schaan B, Stuck S, Zuber S, on behalf of the SHARE Central Coordination Team (2013). Data resource profile: the survey of health, ageing and retirement in Europe (SHARE). *International Journal of Epidemiology* 42(4):992-1001.

Börsch-Supan A (2017a). Survey of health, ageing and retirement in Europe (SHARE) wave 1. Release version: 6.0.0. SHARE-ERIC. Dataset. doi: 10.6103/SHARE.w1.600.

Börsch-Supan A (2017b). Survey of health, ageing and retirement in Europe (SHARE) wave 2. Release version: 6.0.0. SHARE-ERIC. Dataset. doi: 10.6103/SHARE.w2.600.

Börsch-Supan A (2017c). Survey of health, ageing and retirement in Europe (SHARE) wave 4. Release version: 6.0.0. SHARE-ERIC. Dataset. doi: 10.6103/SHARE.w4.600.

Börsch-Supan A (2017d). Survey of health, ageing and retirement in Europe (SHARE) wave 5. Release version: 6.0.0. SHARE-ERIC. Dataset. doi: 10.6103/SHARE.w5.600.

Börsch-Supan A (2017e). Survey of health, ageing and retirement in Europe (SHARE) wave 6. Release version: 6.0.0. SHARE-ERIC. Dataset. doi: 10.6103/SHARE.w6.600.

Carnein M, Milewski N, Doblhammer G, Nusselder WJ (2014). Health inequalities of immigrants: patterns and determinants of health expectancies of Turkish migrants living in Germany. In: Doblhammer G. (ed.). *Health among the elderly in Germany: new evidence on disease, disability and care need.* Leverkusen: Barbara Budrich: 157-190.

Carr D, Springer KW (2010). Advances in families and health research in the 21st century. *Journal of Marriage and Family* 72:743-761.

Castles S, de Haas H, Miller MJ (2014). *The age of migration*. Basingstoke: Palgrave Macmillan.

CBS (2017). Definition of western background (in Dutch only). Available online at: https://www.cbs.nl/nl-nl/onze-diensten/methoden/begrippen?tab=w#id=westerse-allochtoon. Last accessed 2 June 2017.

Dannefer D (2003). Cumulative advantage/disadvantage and the life course: cross-fertilizing age and social science theory. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 58(6): S327-S337.

Deboosere P, Gadeyne S (2005). Adult migrant mortality advantage in Belgium: evidence using census and register data. *Population (English Edition)* 60(5):655-698.

De Maio FG (2010). Immigration as pathogenic: a systematic review of the health of immigrants to Canada. *International Journal for Equity in Health* 9:27.

De Maio FG, Kemp E (2010). The deterioration of health status among immigrants to Canada. *Global Public Health* 5(5):462-478.

De Valk HAG, Schans D (2008). They ought to do this for their parents: perceptions of filial obligations among immigrant and Dutch older people. *Ageing & Society* 28(1):49-66.

European Commission (2015). Definition of EU citizen. Available online at: http://ec.europa.eu/justice/citizen/. Last accessed 1 June 2017.

Garcia MA, Reyes AM (2017). Physical functioning and disability trajectories by age of migration among Mexican elders in the United States. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*; doi.org/10.1093/geronb/gbw167.

Goldman N, Pebley AR, Creighton MJ, Teruel GM, Rubalcava LN, Chung C (2014). The consequences of migration to the United States for short-term changes in the health of Mexican immigrants. *Demography* 51:1159-1173.

Gubernskaya Z (2015). Age at migration and self-rated health trajectories after age 50: understanding the older immigrant health paradox. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 70(2):279-290.

Gushulak B, Pace P, Weekers J (2010). Migration and health of migrants. In: Koller T. (ed.). *Poverty and social exclusion in the WHO European region: health systems respond*. Copenhagen: WHO Regional Office for Europe: 257-281.

Hosper K, Nierkens V, Nicolaou M, Stronks K (2007). Behavioural risk factors in two generations of non-Western migrants: do trends converge towards the host population? *European Journal of Epidemiology* 22(3):163-172.

House JS, Lantz PM, Herd P (2005). Continuity and change in the social stratification of aging and health over the life course: evidence from a nationally representative longitudinal study from 1986 to 2001/2002 (Americans' changing lives study). *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 60(Special Issue 2):S15-S26.

Huber PJ (1967).The behavior of maximum likelihood estimates under nonstandard conditions. In: *Proceedings of the fifth Berkeley symposium on mathematical statistics and probability*. Berkeley: University of California Press: vol.1:221–233.

International Organization for Migration (2009). *Migrant health: Better health for all in Europe*. Geneva: International Organisation for Migration.

Chapter 4

Kristiansen M, Razum O, Tezcan-Güntekin H, Krasnik A (2016). Aging and health among migrants in a European perspective. *Public Health Reviews* 37:20.

Kim I-H, Carrasco C, Muntaner C, McKenzie K, Noh S (2013). Ethnicity and postmigration health trajectory in new immigrants to Canada. *American Journal of Public Health* 103(4):96-104.

Kunst AE, Bos V, Lahelma E, Bartley M, Lissau I, Regidor E, Mielck A, Cardano M, Dalstra JA, Geurts JJ, Helmert U, Lennartsson C, Ramm J, Spadea T, Stronegger WJ, Mackenbach JP (2005). Trends in socioeconomic inequalities in self-assessed health in 10 European countries. *International Journal of Epidemiology* 34(2):295-305.

Kunst AE, Stronks K, Agyemang C (2011). Non-communicable diseases. In: Rechel B, Mladovsky P, Devillé W, Rijks B, Petrova-Benedict R, McKee M. (eds.). *Migration and health in the European Union*. Berkshire: Open University Press: 101-120.

Lanari D, Bussini O (2012). International migration and health inequalities in later life. *Ageing & Society* 32(6): 935-962.

Lanari D, Bussini O, Minelli L (2015). Self-perceived health among eastern European immigrants over 50 living in western Europe. *International Journal of Public Health* 60:21–31.

Lanzieri G (2011). *Fewer, older and multicultural?: projections of the EU populations by foreign/national background*. Luxemburg: Eurostat.

Li H, Ji Y, Chen T (2014). The roles of different sources of social support on emotional well-being among Chinese elderly. *PLOS One* 9(3):e90051.

Lindström M, Sundquist J, Östergren PO (2001). Ethnic differences in self reported health in Malmö in southern Sweden. *Journal of Epidemiology and Community Health* 55:97-103.

Mackenbach JP, Stirbu I, Roskam AR, Schaap MM, Menvielle G, Leinsalu M, Kunst AE (2008). Socioeconomic inequalities in health in 22 European countries. *The New England Journal of Medicine* 358(23):2468-2481.

Nazroo JY (2003). The structuring of ethnic inequalities in health: economic position, racial discrimination, and racism. *American Journal of Public Health* 93(2):277-284.

Newbold KB (2005). Self-rated health within the Canadian immigrant population: risk and the healthy immigrant effect. *Social Science & Medicine* 60:1359-1370.

Nørredam M, Krasnik A (2011). Migrants' access to health services. In: Rechel B, Mladovsky P, Devillé W, Rijks B, Petrova-Benedict R, McKee M (eds.). *Migration and health in the European Union*. Berkshire: Open University Press: 67-80.

Razum O, Zeeb H, Akgün HS, Yilmaz S (1998). Low overall mortality of Turkish residents in Germany persists and extends into a second generation: merely a healthy migrant effect? *Tropical Medicine & International Health* 3(4):297-303.

Razum O, Twardella D (2002). Time travel with Oliver Twist–towards an explanation for a paradoxically low mortality among recent immigrants. *Tropical Medicine & International Health* 7(1):4-10.

Rechel B, Mladovsky P, Ingleby D, Mackenbach JP, McKee M (2013). Migration and health in an increasingly diverse Europe. *Lancet* 381:1235-1245.

Reus-Pons M, Kibele EUB, Janssen F (2017). Differences in healthy life expectancy between older migrants and non-migrants in three European countries over time. *International Journal of Public Health* 62(5): 531–540.

Reus-Pons M, Vandenheede H, Janssen F, Kibele EUB (2016). Differences in mortality between groups of older migrants and older non-migrants in Belgium, 2001-09. *European Journal of Public Health* 26(6): 992-1000.

Reynolds MM, Chernenko A, Read JG (2016). Region of origin diversity in immigrant health: moving beyond the Mexican case. *Social Science & Medicine* 166:102-109.

Schneider SL (2008). Anti-immigrant attitudes in Europe: outgroup size and perceived ethnic threat. *European Sociological Review* 24(1):53-67.

Seo S, Chung S, Shumway M (2014). How good is "very good"? Translation effect in the racial/ethnic variation in self-rated health status. *Quality of Life Research* 23:593–600.

So L, Quan H (2012). Coming to Canada: the difference in health trajectories between immigrants and native-born residents. *International Journal of Public Health* 57:893-904.

Solé-Auró A, Crimmins EM (2008). Health of immigrants in European countries. *International Migration Review* 42(4):861-876.

Solé-Auró A, Michaud P-C, Hurd M, Crimmins E (2015). Disease incidence and mortality among older Americans and Europeans. *Demography* 52:593-611.

Uitenbroek DG, Verhoeff AP (2002). Life expectancy and mortality differences between migrant groups living in Amsterdam, the Netherlands. *Social Science & Medicine* 54:1379-1388.

Vandenheede H, Deboosere P (2009). Type 2 diabetes in Belgians of Turkish and Moroccan origin. *Archives of Public Health* 67:62-87.

Vandenheede H, Willaert D, de Grande H, Simoens S, Vanroelen C (2015). Mortality in adult immigrants in the 2000s in Belgium: a test of the 'healthy-migrant' and the 'migration-as-rapid-health-transition' hypotheses. *Tropical Medicine & International Health* 20(12):1832-1845.

Wallace M, Kulu H (2015). Mortality among immigrants in England and Wales by major causes of death, 1971-2012: a longitudinal analysis of register-based data. *Social Science & Medicine* 147:209-221.

White H (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica* 48(4):817–838.

WHO (2003). *Joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases.* Geneva: WHO. Technical report series 916.

Chapter 4

SUPPLEMENT CHAPTER 4

Table 4.S.1. Odds ratios of experiencing a health transition as compared to maintaining good health, by sex (2004–2015)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-33580	-33179	-37090	-36587
Pseudo R^2	0.0640	0.0752	0.0715	0.0841
Odds ratios of transitioning from good to poor health				
Origin: non-migrants (ref)				
Western migrants	1.23***	1.24***	1.17**	1.25***
Non-western migrants	1.36***	1.29**	1.20	1.21
Age: 50-54 (ref)				
55-59	1.22***	1.13**	1.17***	1.05
60-64	1.48***	1.20***	1.43***	1.10*
65-69	1.85***	1.39***	2.03***	1.41***
70-74	2.61***	1.91***	2.69***	1.79***
75-79	3.15***	2.21***	3.67***	2.31***
80-84	3.91***	2.65***	4.73***	2.85***
85+	5.08***	3.28***	5.75***	3.22***
Country: Austria (ref)				
Germany	1.24***	1.39***	1.10	1.27***
Sweden	0.88*	0.90	0.84***	0.93
Netherlands	1.01	1.05	0.85**	0.88
Spain	1.53***	1.16*	1.67***	1.29***
Italy	1.60***	1.30***	1.72***	1.35***
France	1.12	0.98	1.03	0.94
Denmark	0.64***	0.69***	0.55***	0.63***
Switzerland	0.50***	0.55***	0.40***	0.43***
Belgium	0.76***	0.69***	0.75***	0.72***
Pair of waves: 12 (ref)				
14	1.56***	1.61***	1.40***	1.40***
15	2.30***	2.57***	1.40*	1.40*
16	1.91**	1.82*	1.75*	1.82*
24	1.13**	1.18***	1.06	1.08*
25	1.55***	1.60***	1.66***	1.79***
26	2.21***	2.24***	1.86***	1.99***
45	0.84***	0.89**	0.80***	0.85***
46	1.28**	1.35**	1.19	1.26**
56	0.82***	0.88***	0.75***	0.81***

Table 4.S.1. (continued)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-33580	-33179	-37090	-36587
Pseudo R^2	0.0640	0.0752	0.0715	0.0841
Length of residence: 10+ years (ref)				
0-9 years		1.09		0.69
Marital status: married (ref)				
Separated		1.05		1.16***
Single		1.17**		1.20***
Widowed		1.00		0.99
Highest education: secondary education (ref)				
Primary education or lower		1.31***		1.49***
Higher education		0.68***		0.75***
Other		1.04		0.95
Current job status: retired (ref)				
Active		0.74***		0.71***
Unemployed or inactive		1.42***		1.04
Other		0.79		0.88
BMI: normal weight (ref)				
Underweight		2.69***		1.27**
Overweight		1.14***		1.34***
Obese		1.58***		1.80***
Ever smoked: no (ref)				
Yes		1.14***		1.13***
Vigorous activities: more than once a week (ref)				
Once a week		1.10*		0.98
One to three times a month		1.13**		1.05
Hardly ever, or never		1.40***		1.27***
Moderate activities: more than once a week (ref)				
Once a week		1.04		1.16***
One to three times a month		1.35***		1.27***
Hardly ever, or never		1.26***		1.42***
Odds ratios of transitioning from good health to death or loss to follow-up				
Origin: non-migrants (ref)				
Western migrants	1.37***	1.35***	1.34***	1.35***
Non-western migrants	1.63***	1.57***	1.59***	1.57***

Table 4.S.1. (continued)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-33580	-33179	-37090	-36587
Pseudo R^2	0.0640	0.0752	0.0715	0.0841
Age: 50-54 (ref)				
55-59	0.91**	0.90**	0.94*	0.92**
60-64	0.90**	0.90**	0.96	0.92**
65-69	0.90**	0.88**	1.04	0.98
70-74	1.08	1.06	1.16***	1.07
75-79	1.30***	1.25***	1.53***	1.39***
80-84	1.82***	1.70***	2.19***	1.91***
85+	2.77***	2.51***	3.79***	3.17***
Country: Austria (ref)				
Germany	1.40***	1.46***	1.46***	1.52***
Sweden	0.79***	0.80***	0.80***	0.83***
Netherlands	3.53***	3.57***	3.41***	3.42***
Spain	0.84***	0.75***	0.85**	0.76***
Italy	1.01	0.90	1.10	0.95
France	1.16**	1.11*	1.08	1.02
Denmark	0.61***	0.62***	0.56***	0.60***
Switzerland	0.64***	0.65***	0.58***	0.57***
Belgium	0.79***	0.77***	0.76***	0.75***
Pair of waves: 12 (ref)				
14	-	-	-	-
15	-	-	-	-
16	-	-	-	-
24	1.26***	1.29***	1.21***	1.23***
25	-	-	-	-
26	-	-	-	-
45	0.73***	0.75***	0.71***	0.73***
46	-	-	-	-
56	1.33***	1.37***	1.32***	1.37***
Length of residence: 10+ years (ref)				
0-9 years		1.49**		1.32*
Marital status: married (ref)				
Separated		1.01		0.98
Single		1.05		1.02
Widowed		0.90*		0.89***

Table 4.S.1. (continued)

	Males		Females	
	Model 1	**Model 2**	**Model 1**	**Model 2**
Log pseudolikelihood	**-33580**	**-33179**	**-37090**	**-36587**
Pseudo R^2	**0.0640**	**0.0752**	**0.0715**	**0.0841**
Highest education: secondary education (ref)				
Primary education or lower		1.06		1.15***
Higher education		0.79***		0.78***
Other		0.86		1.15
Current job status: retired (ref)				
Active		0.99		0.94
Unemployed or inactive		1.11		1.01
Other		0.79**		0.82*
BMI: normal weight (ref)				
Underweight		2.20***		1.14
Overweight		0.99		0.94**
Obese		1.01		0.95
Ever smoked: no (ref)				
Yes		1.09***		1.08***
Vigorous activities: more than once a week (ref)				
Once a week		1.04		1.01
One to three times a month		1.04		1.08
Hardly ever, or never		1.14***		1.10***
Moderate activities: more than once a week (ref)				
Once a week		1.06		1.11***
One to three times a month		1.35***		1.26***
Hardly ever, or never		1.39***		1.42***

Source: Own calculations based on SHARE data (2004-2015)

In all models, country and wave are controlled for. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 4

Table 4.S.2. Odds ratios of experiencing a health transition as compared to remaining in poor health, by sex (2004-2015)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-16996	-16732	-21876	-21567
Pseudo R^2	0.0550	0.0697	0.0553	0.0687
Odds ratios of transitioning from poor to good health				
Origin: non-migrants (ref)				
Western migrants	0.94	0.99	0.74***	0.75***
Non-western migrants	1.23	1.44**	0.85	0.98
Age: 50-54 (ref)				
55-59	1.04	1.17**	0.90	1.00
60-64	1.06	1.36***	0.76***	0.91
65-69	0.91	1.25**	0.71***	0.87*
70-74	0.69***	0.98	0.57***	0.73***
75-79	0.52***	0.77**	0.54***	0.74***
80-84	0.57***	0.88	0.44***	0.63***
85+	0.42***	0.71*	0.55***	0.86
Country: Austria (ref)				
Germany	0.73***	0.62***	0.75***	0.64***
Sweden	1.34***	1.21*	0.97	0.84*
Netherlands	1.05	0.94	0.89	0.85
Spain	1.13	1.32***	0.81***	0.93
Italy	0.97	1.07	0.67***	0.75***
France	0.87	0.90	0.77***	0.77***
Denmark	1.05	0.98	0.91	0.83*
Switzerland	1.31**	1.20	1.31**	1.17
Belgium	1.07	1.14	0.98	1.03
Pair of waves: 12 (ref)				
14	1.15	1.15	1.03	1.00
15	1.24	1.29	1.84***	1.71**
16	0.66	0.60	1.13	0.88
24	1.14*	1.06	1.19***	1.13*
25	1.55***	1.43**	1.28*	1.19
26	1.01	0.93	1.66**	1.47
45	1.10	1.02	1.10*	1.02
46	1.26	1.18	1.16	1.08
56	1.16**	1.06	1.09	1.00

Table 4.S.2. (continued)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-16996	-16732	-21876	-21567
Pseudo R^2	0.0550	0.0697	0.0553	0.0687
Length of residence: 10+ years (ref)				
0-9 years		1.11		1.42
Marital status: married (ref)				
Separated		0.82**		0.89*
Single		0.81**		0.86*
Widowed		1.08		0.96
Highest education: secondary education (ref)				
Primary education or lower		0.78***		0.83***
Higher education		1.06		1.07
Other		0.73		0.68
Current job status: retired (ref)				
Active		1.64***		1.45***
Unemployed or inactive		0.88		0.90**
Other		0.96		0.89
BMI: normal weight (ref)				
Underweight		0.75		0.61***
Overweight		0.97		0.91**
Obese		0.82***		0.66***
Ever smoked: no (ref)				
Yes		0.88***		0.94
Vigorous activities: more than once a week (ref)				
Once a week		1.15*		1.11
One to three times a month		0.95		1.16*
Hardly ever, or never		0.76***		0.86***
Moderate activities: more than once a week (ref)				
Once a week		0.82***		0.93
One to three times a month		0.92		0.80***
Hardly ever, or never		0.61***		0.58***
Odds ratios of transitioning from poor health to death or loss to follow-up				
Origin: non-migrants (ref)				
Western migrants	1.34***	1.35***	1.12*	1.10
Non-western migrants	1.78***	1.74***	1.63***	1.57***

Table 4.S.2. (continued)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-16996	-16732	-21876	-21567
Pseudo R^2	0.0550	0.0697	0.0553	0.0687
Age: 50-54 (ref)				
55-59	1.12	1.16**	0.80***	0.85**
60-64	1.24***	1.36***	0.95	1.06
65-69	1.25***	1.45***	1.00	1.14*
70-74	1.39***	1.60***	1.10	1.23***
75-79	1.73***	1.93***	1.27***	1.37***
80-84	2.46***	2.63***	1.79***	1.84***
85+	3.81***	3.97***	3.21***	3.07***
Country: Austria (ref)				
Germany	1.23**	1.24***	1.30***	1.31***
Sweden	1.30***	1.31***	0.86*	0.88
Netherlands	3.70***	3.67***	3.24***	3.17***
Spain	0.77***	0.77***	0.56***	0.55***
Italy	0.93	0.89	0.75***	0.71***
France	1.14	1.14	0.96	0.94
Denmark	1.02	0.99	0.88	0.87
Switzerland	1.08	1.05	0.83*	0.82*
Belgium	1.14	1.12	0.86**	0.84**
Pair of waves: 12 (ref)				
14	-	-	-	-
15	-	-	-	-
16	-	-	-	-
24	1.36***	1.38***	1.38***	1.40***
25	-	-	-	-
26	-	-	-	-
45	0.76***	0.77***	0.77***	0.79***
46	-	-	-	-
56	1.09	1.11*	1.22***	1.24***
Length of residence: 10+ years (ref)				
0-9 years		0.99		2.12***
Marital status: married (ref)				
Separated		1.04		0.93
Single		0.93		1.14*

Table 4.S.2. (continued)

	Males		Females	
	Model 1	Model 2	Model 1	Model 2
Log pseudolikelihood	-16996	-16732	-21876	-21567
Pseudo R^2	0.0550	0.0697	0.0553	0.0687
Widowed		0.94		1.01
Highest education: secondary education (ref)				
Primary education or lower		0.95		0.98
Higher education		0.91*		0.92
Other		1.25		0.85
Current job status: retired (ref)				
Active		1.24***		1.24***
Unemployed or inactive		1.07		1.07
Other		0.77		1.01
BMI: normal weight (ref)				
Underweight		1.59**		1.17
Overweight		0.88***		0.87***
Obese		0.75***		0.73***
Ever smoked: no (ref)				
Yes		1.05		1.04
Vigorous activities: more than once a week (ref)				
Once a week		1.03		1.02
One to three times a month		1.02		1.02
Hardly ever, or never		1.07		1.02
Moderate activities: more than once a week (ref)				
Once a week		1.02		1.14**
One to three times a month		1.19**		0.99
Hardly ever, or never		1.26***		1.29***

Source: Own calculations based on SHARE data (2004-2015)

In all models, country and wave are controlled for. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 4