Regional mortality inequalities in the Netherlands and the role of internal migration

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Maximilian Frentz-Göllnitz[a,b], Adrien Remund[a], Ernst van der Hoeven[a,c], Carel Harmsen[c], Gabriele Doblhammer[b,d], Fanny Janssen[e,a]

[a] Population Research Centre, Faculty of Spatial Sciences, University of Groningen, Groningen, The Netherlands.
[b] Institute of Sociology and Demography, University of Rostock, Rostock, Germany.
[c] Statistics Netherlands, The Hague, The Netherlands.
[d] German Center for Neurodegenerative Diseases, Bonn, Germany.
[e] Netherlands Interdisciplinary Demographic Institute - KNAW/University of Groningen, The Hague, The Netherlands.

Introduction

Life expectancy has gone through a secular increase in most high-income countries. However, national life expectancies are an average and do not reflect underlying inequalities in mortality. Regional mortality inequalities are large and tend to be increasing within high-income countries (van Raalte et al., 2020). Regional mortality, and thus regional life expectancy, reflects the overall health in an area or region (Kibele & Janssen, 2013). Knowing about regional mortality differences could influence the allocation of health budgets (Janssen et al., 2016) and prevent the unequal distribution of resources or opportunities (van Raalte et al., 2020).

It is well-documented in the European literature on international migrant health that many migrant groups have lower general mortality (also known as *Migrant Mortality Advantage* (Ikram et al., 2016)) but poorer self-reported health (Nielsen & Krasnik, 2010) than non-migrants in host regions. Research on residential mobility has focused on younger ages and showed that, overall, migration before adulthood has a negative effect on children's health outcomes (Simsek et al., 2021). The picture is less clear at the internal migration level, while a study from the Netherlands found that movers have a lower life expectancy than stayers, which was linked to excess mortality from chronic conditions at old age (Frentz-Göllnitz et al., manuscript in preparation).

However, evidence on how the relationship between internal migration and health varies by region is inconclusive due to substantial heterogeneity of individual and contextual factors. In addition, it is unclear to what extent movements across regions are contributing to such regional health differences.

Research question: What is the contribution of internal migration on regional inequalities in life expectancy across the Netherlands?

Background

At the sub-national level, many studies have shown that migration is selective on health (Boyle, 2004). However, the direction of the relationship between moving and health outcomes varies by factors such as age, observed outcome, and region.

Overall, positive effects of internal moves on general physical health were found for Germany (Holz, 2022) and Italy (Atella et al., 2019). In contrast, there is mixed evidence on mortality, with a study from Italy and Germany showing a positive effect (Luy & Caselli, 2007), while a study from the Netherlands revealed a negative effect (Frentz-Göllnitz et al., manuscript in preparation); yet another a study from Sweden observed no difference between movers and stayers, but instead an unhealthy remigration effect (Andersson & Drefahl, 2017).

Moves during childhood are generally linked to poorer health outcomes (Simsek et al., 2021) such as mental health problems in the short term (Jelleyman & Spencer, 2008) and longer term (Mok et al., 2016), indicating that childhood moves are linked to adverse circumstances in the life course.

On the other hand, migration of elderly people is often related to unfavourable health conditions (Bentham, 1998; Boyle, 2004). Litwak and Longino (1987) identify three stages of moving for retirees. The first move is made around retiring age and when the migrants are in relatively good health (i.e. an amenity move (Zhang et al., 2013)). The second move is made when people's health starts to decline and chronic diseases trouble the older people in everyday tasks such as grocery shopping (Litwak & Longino, 1987). Assistance might therefore be needed and family and friends can offer these, resulting in moves towards family and friends (Zhang et al., 2013). The third move is then made towards nursing homes and other institutions when the informal help from family and friends is no longer sufficient (Litwak & Longino, 1987; Zhang et al., 2013). Kibele and Janssen (2013) indeed observed that people of old age nearing death move more frequently than those with a longer remaining lifespan. This effect was also found at neighbourhood level in Amsterdam by Jonker et al. (2013), where neighbourhoods with a nursing home had lower life expectancies than neighbourhoods without a nursing home.

Considering the size of the Netherlands, migrations from one side of the country to the other side are common. Migrants often experience lower mortality than stayers/natives, a phenomenon known in the literature as *Migrant Mortality Advantage*. As a result, migration patterns could have an impact on the regional mortality differentials. Many studies regarding life expectancy disparities have focused on cross-country comparisons (Omran, 1998; Gerry et al., 2018; Jasilionis et al, 2011). Whereas sub-national patterns are covered less in this field of research, their usefulness has been acknowledged (Vallin & Meslé, 2005), as they reflect persisting geographical pattern going back decades (Janssen et al., 2016). National averages might hide variation across sub-regions (Kibele et al., 2015), and could therefore potentially be misleading.

Studies have shown that subregional differences in life expectancy are associated to differences in individual and contextual socio-economic conditions. A study from England and Wales (Woods et al., 2005) found that material deprivation is the main driver for regional differences in life expectancy at birth (e0), while a study from Spain (Dobis et al., 2020) showed that regions with a higher life expectancy at age 35 also have a larger share of the population with high education. In Lithuania, regions with higher e0 were those with a higher level of male urban and educated population, as well as larger share of male and female married population (Kalediene & Petrauskiene, 2000).

Data and Methods

We studied the total population of the Netherlands for the period 2015-2019. The 40 NUTS-3 regions, also known as COROP were used to divide the national territory. The COROP regions are based on the nodal principle, for which commuter flows form a central urban node, and the regions are roughly equal in area, but not necessarily in population size.

Individual mortality and population data were accessed through Statistics Netherlands (Statistics Netherlands, 2016). Demographic data in the Netherlands are maintained through a population register ('Basisregistratie Personen'), which includes personal information on events such as marriage, citizenship, death and data on place of residence and changes therein. Since 1980, the Netherlands has consistently scored well on the Vital Statistics Performance Index with scores of ≥0.85, placing them in the highest category in terms of data quality (Mikkelsen et al., 2015).

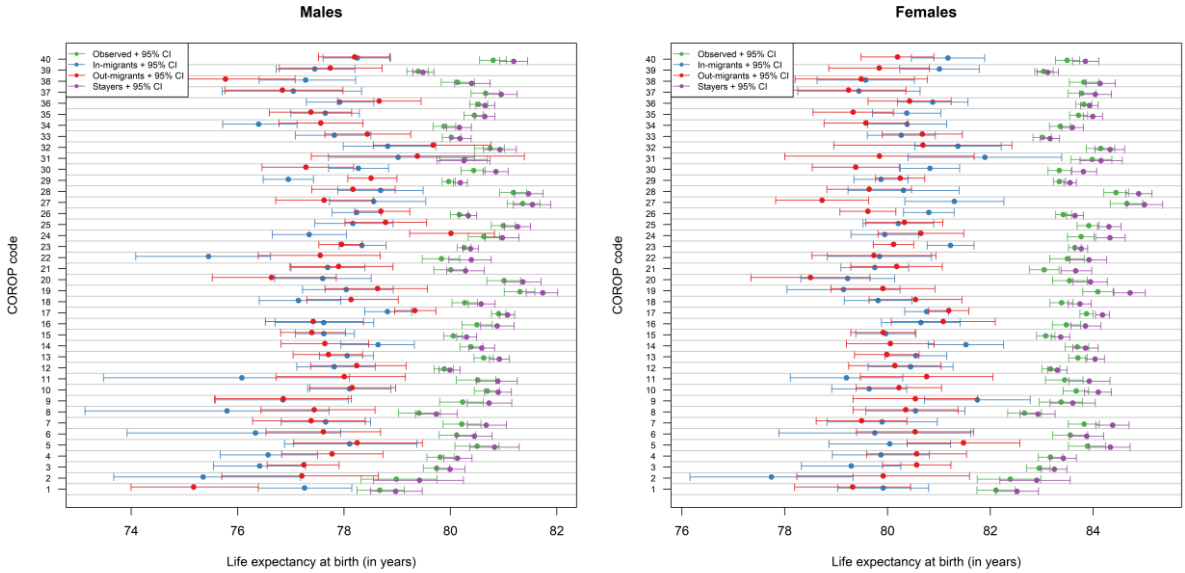
In this study, an internal migrant was defined as somebody who lived in a different COROP region 10 years before. By considering only those who move between COROP regions for a long period as internal migrants, we filter out short moves and residential mobility, which are subject to specific forces (Darlington-Pollock & Peters, 2020; Mulder & Malmberg, 2014).

The data containing individual characteristics were aggregated for each year into 5-year age groups (0, 1-4, 5-9, …, 85+), and ultimately combined to create life tables by internal migrant status and sex in the 40 COROP (NUTS-3) regions for the period 2015-2019. This is useful to take out randomness since some regions have low numbers of mortality (e.g. Delfzijl en Omgeving with 571 yearly deaths on average). In the computation of the life tables, values for ${}_{n}a_{x}$ were taken from the national population in 2015, as found in the Human Mortality Database, except for the age categories 0 and 1-4, were the method of Coale and Demeny (1983) was used. Confidence intervals (CIs) (Andreev & Shkolnikov, 2010) were used to test differences between the sub-populations.

To assess the contribution of internal migration on regional e0 gaps, we compared 5 different subpopulations: the observed population, a counter-factual 'no-migration' scenario where every person is taken back to their place of residence 10 years prior, stayers, in- and out-migrants. People who were not born in 2005-2009 were considered stayers, and those who previously did not reside in the Netherlands were placed into a fictional region. However, to avoid biases due to these specifications, mortality rates from the total population were used for the first 2 age categories for all regions.

Results

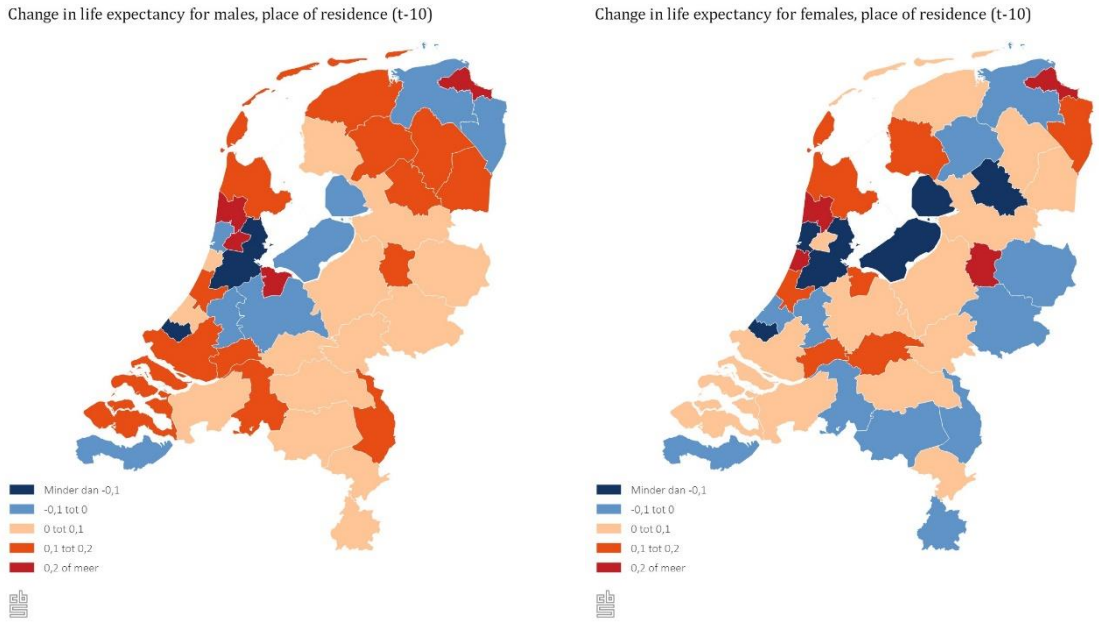
Figure 1: Life expectancy of the observed population, in-migrants, out-migrants and stayers in the 40 regions of the Netherlands, 2015-2019, by sex (own calculations based on Statistics Netherlands data)



During the period 2015-2019, the national life expectancy at birth (e0) was 80.31 years for males and 83.52 years for females. Overall, the range in e0 across the 40 COROP regions was 2.69 years for males and 2.55 years for females. The regions with the highest e0 were clustered in the western urban regions like 'Delft en Westland' (CR 27) (highest e0 for both sexes with 81.36 males; 84.66 females) and 'Oost-Zuid-Holland' (CR 28). The lowest e0 were clustered in the border regions like the northern rural 'Oost-Groningen' (CR 1) (lowest e0 for both sexes with 78.67 males; 82.11 females) and 'Delfzijl en Omgeving' (CR 2) (Figure 1).

Comparing the sub-groups showed that internal migrants have a lower e0 than stayers for both males (-2.75 years) and females (-3.37 years), and this was true for all 40 regions. Moreover, even in small regions, the 95% CIs did not overlap. The largest gap in e0 between in-migrants and stayers was found in eastern sub-urban/rural region 'Zuidwest-Overijssel' (CR19) with 5.57 years for females and in the western urban/sub-urban region 'Agglomeratie Leiden en Bollenstreek' (CR22) with 4.94 years for males. The largest gap between out-migrants and stayers was found in western urban/sub-urban region 'Delft en Westland' (CR27) with 6.27 years for females and in the eastern sub-urban/rural region 'Twente' (CR20) with 4.73 years for males. This pattern was present even in the regions that seem attractive for migrants (e.g. 'Groot-Amsterdam' (CR 23)).

Figure 2: Change in life expectancy by comparing observed vs. hypothetical 'no-migration' scenario in the 40 regions of the Netherlands, 2015-2019, by sex (own calculations based on Statistics Netherlands data)



Despite these strong differences between internal migrants and stayers, it appeared that internal migrants represent a too small fraction of the total population to profoundly influence regional mortality differentials. Indeed, artificially placing migrants back to their region of origin yielded a difference in regional e0 of -0.2 to 0.3 years compared to the observed figures, and most regions only showed a change of -0.1 to 0.1. Even for a region such as Utrecht, where the net-migration is high, the scenario with no migrants did not produce a notably different result than for the total population. In fact, comparing these figures to the range of the observed regional mortality differentials led to the conclusion that internal migrations account for only about 10% of the differences (Figure 2). We plan further analyses to better estimate to weight of in- and out-migration on the 'no-migration' scenario.

Additional analyses revealed that age-specific mortality rates for internal migrants are higher than for stayers at almost all ages and both sexes. An exception were the ages 20 to 34, where migrants show lower rates. With increasing age, migrants' disadvantage tended to get stronger and the CIs narrower (Figure 3, Appendix). These results were duplicated while filtering out everyone living in an institutional care home, in order to check if the negative selection of internal migrants could be due to the specific location of care homes. Although overall mortality rates were much lower for all sub-groups, the proportion to one another was very similar except for age 70-79, where the gap between stayers and migrants was more narrow.

Conclusion

Our study shows that there are marked inequalities in e0 across Dutch regions. Internal migrants in the Netherlands have a lower e0 than stayers in all regions and for both sexes, while the magnitude of this differential varies by region. However, most likely due to the limited proportion of internal migrants in the total population, the contribution of these selection effects of the regional difference in e0 is much smaller than other contextual effects, such as the socioeconomic composition or the

prevalence of health behaviours, in the construction of regional mortality differentials in the Netherlands.

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Appendix

Figure 3: Age-specific mortality risk ratios of movers and stayers in the Netherlands, 2015-2019, by sex. Reference=1.0 (own calculations based on Statistics Netherlands data)