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**Hotspots of centenarians in the Netherlands**

Introduction

In line with the rise of life expectancy and longevity in the Netherlands since the mid-nineteenth century, exceptional longevity has strongly increased as well in more recent years. In the period 2000-2025 the number of centenarians in the Netherlands more than doubled from 1,098 to 2,583. Around the world, various areas even have been identified as so-called ‘blue zones’: areas where significantly higher proportions of centenarians were born than elsewhere. These areas are assumed to be found in limited and homogenous geographically and/or historically isolated areas where the population shares the same (traditional) lifestyle and environment (Poulain et al., 2013). Can similar hotspot areas with relatively large numbers of centenarians also be found in the Netherlands?

Data and methods

We compiled a unique database of all centenarians, 7,074 men and 29,144 women, born in the Netherlands in the period 1812-1923 and who died between 1912 and 2023 or were still alive in 2024 in the Netherlands. Data on centenarians born in the period 1812-1894 were primarily collected from digitized death certificates, the National Register of Deceased Persons, and a Statistics Netherlands database of deceased centenarians. The data were supplemented with data from death announcements in newspapers, prayer cards, and digital records of cemeteries. The death data were thoroughly validated by linking to the birth records of the deceased. For the period from 1995 onwards, we added Statistics Netherlands data based on the Dutch electronic official Personal Records Database (Basis Registratie Personen), which includes everyone born before January 1st, 1924 and aged 100 or above, who had died in the period 1995-2023 or who was still alive on January 1st, 2024. Due to missing follow-up of Dutch emigrants, our centenarian database is not covering Dutch emigrants who have become centenarians abroad.

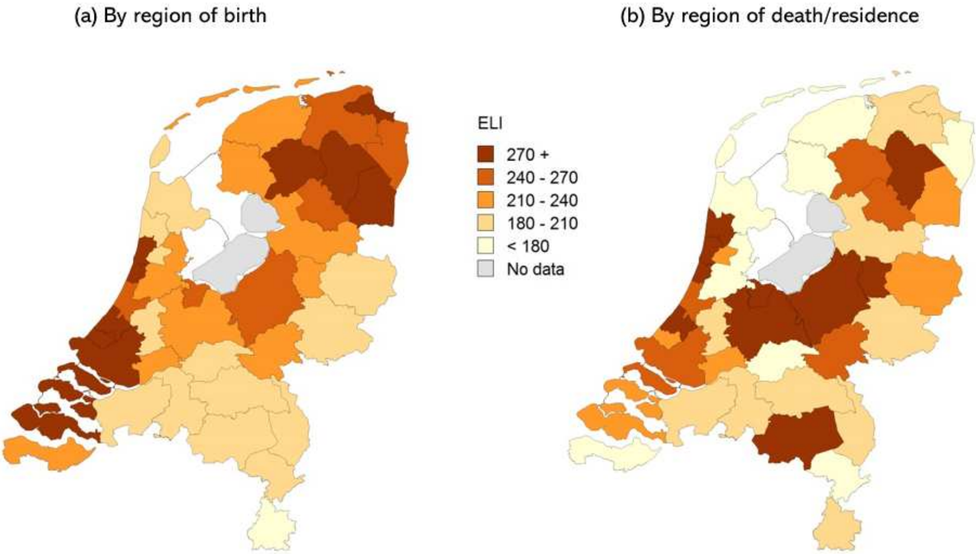
We calculated the extreme longevity index (ELI) of persons reaching age 100 for the whole country and for all 40 NUTS-3 regions separately. In line with Poulain et al. the extreme longevity index is defined as the proportion of all persons who became centenarians among those born alive from the same birth cohort. We also examined the effect of lifetime migration on the regional pattern of centenarians by comparing the ELI based on the region of birth with the ELI based on the region of death or region of residence if still alive.

## Results

The ELI for centenarians strongly increased over time, from 13 centenarians per 100,000 births for birth cohorts 1812-1849 to 480 per 100,000 births for the most recent birth cohorts 1890-1923. The ELI levels and ELI increase for women were much higher than for men: for women from 16 per 100,000 in birth cohorts 1812-1849 to 813 per 100,000 in birth cohorts 1890-1923 versus for men from 10 per 100,000 in birth cohorts 1812-1849 to 164 per 100,000 in birth cohorts 1890-1923. For men the ELI increase temporarily stagnated due to an increase in male mortality risks caused by the smoking epidemic from the beginning of the 1950s until the middle of the 1970s. The overall average in all birth cohorts 1812-1923 for men and women together is 227 centenarians per 100,000 births.

The relative numbers of centenarians per 100,000 births in all birth cohorts 1812-1923 by region of birth show a spatial concentration of high ELI values in the historically more isolated rural northeast and (insular) rural southwest, but also in the urbanized southwest of the country with the cities of Rotterdam and The Hague (Figure a). Low ELI values are concentrated in the southeast and east as well as in the northwest of the country. The effect of life-time migration appears to be considerable, especially for the peripheral rural regions in the north and the southwest (Figure b). These regions lost substantial numbers of centenarians due to migration, in line with the general pattern of internal migration flows within the Netherlands, but likely strengthened by selection effects due to migrants in general being more healthy than non-migrants.

Figure: Extreme longevity index (ELI) for centenarians* by NUTS-3 region of birth and region of death/ residence, cohorts born in the Netherlands 1812-1923




* Number of centenarians per 100,000 births.
Sources: NIDI Centenarians database (cohorts 1812-1894), Statistics Netherlands (cohorts 1895-1923).

## Conclusion

The Netherlands show substantial regional differences in proportions of centenarians. Identifying hotspots of extreme longevity is complicated by life-time migration. To resolve which phases of life and environments where people spent their life are most important for extreme longevity, a long-term historical perspective and nation-wide approach is needed to extend the information on regions of birth and death with information on migration of individuals over the full life course.

Dear Aart, based on the maps above, being born in Schiedam and living in Baarn indicate to be quite favourable conditions and circumstances to enjoy a well-deserved retirement for a very long time!

## References

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