Cohort Effects on Cognitive and Physical Functioning in Europe – Data from the Survey of Health, Ageing and Retirement in Europe (SHARE)

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Introduction

The consequences of an increase in life expectancy and postponement of mortality to higher ages have motivated researchers to focus their interest on whether the increase in life expectancy is associated with increasing number of years lived with or without disability to anticipate possible challenges in health care, social care or environmental planning. In the last decades, three conceptual frameworks concerning the ageing population were proposed.

The 'failure of success', a pessimistic perspective, suggested that the novelties in medical diagnostics and treatment as well as constantly improving health technologies would result in an increased proportion of persons with disabilities or chronic diseases in the growing elderly population [1, 2]. An opposing theory, the compression of morbidity or 'success of success', argued that the onset of chronic conditions and disability would be postponed to higher ages and consequently lower proportion of chronically diseased and disabled in the population [2]. The last theory advocated a dynamic equilibrium between prevalence of age-related diseases among the old people and their severity. i.e. the proportion of chronically diseased or disabled in the population would increase reflecting a decrease in mortality, but the chronic conditions would be less severe [3].

Many studies investigating these three conceptual frameworks have focussed on factors affecting health status in all age groups in a specific time period (i.e. a period perspective). However, our lives are lived in the cohort perspective and calculations based only on age and period may lead to erroneous conclusions, as the birth cohort may be an important factor for understanding trends in mortality and disease [4].

In our study, we hypothesize that younger elderly (adults aged 50 – 79 years) with a given health status who previously would have died of complications linked to their condition are now, due to improved health care, kept alive to ages of a higher selection pressure (i.e. age 80+) where they then die. In this scenario we would expect to observe compression of morbidity in the older elderly and failure of success in the younger elderly. To investigate whether deterioration of cognitive and physical functioning of younger cohorts have been faster or slower when compared to the recent cohorts, we model cohort effects in age-associated trajectories by including age-cohort interactions in the models.

Methods

We conducted a large cross-sectional analysis of 51,292 men and 62,007 women from 20 European countries who participated in SHARE - in Wave 1 (2004-2005), Wave 2 (2006-2007), Wave 4 (2011), Wave 5 (2013) or Wave 6 (2015).

In our study, we used a cognitive composite score (CCS) to evaluate cognitive functioning, and maximal grip strength, activities of daily living (ADL) and instrumental activities of daily living (IADL) to evaluate physical functioning of SHARE participants. We used linear models with the outcomes being CCS and maximal grip strength to examine age-associated cognitive and physical trajectories. In both models, we treated age as a random intercept. Logistic regression models were fitted to model the outcomes ADL and IADL. In all four models, we included the calibrated cross-sectional probability weights provided by SHARE [5]. We also controlled for age of the participants at the time of the survey, cohort groups, gender and European regions. Participants included in our study were born between the years 1900 and 1965. To model the cohort effect, we grouped the cohorts into 6 groups: 1900 – 1915, 1916 – 1925, 1926 – 1935, 1936 – 1945, 1946 – 1955 and 1956 – 1965. Similar with the previous studies, we pooled the European countries into four geographical regions based on welfare regimes: Northern Europe (Sweden, Denmark), Western Europe (Austria, Germany, the Netherlands, France, Switzerland, Belgium, Ireland, Luxembourg), Southern Europe (Spain, Italy, Greece, Portugal), and Eastern Europe (Czech Republic, Poland, Hungary, Slovenia, Estonia, Croatia)[6].

Results

Analysing the CCS outcome, we observed significant baseline cohort effects, as well as significant age x cohort interaction effects. Results show that all age x cohort interactions have negative coefficients suggesting that the earlier birth cohorts (1900 – 1915, 1916 – 1925, 1926 – 1935, 1936 – 1945) have significantly steeper age-associated cognitive declines compared to the most recent birth cohorts (1955 – 1965). The birth cohorts 1926 – 1935 (coefficient = - .26, $p < .0001$) have the steepest age-associated decline, followed by the birth cohorts 1900 – 1915 (coefficient = - .23, p = .04), birth cohort 1916 – 1925 (coefficient = - .23, p < .0001), birth cohorts 1936 – 1945 (coefficient = - .11, p = .02), and birth cohorts 1946 – 1955 (coefficient = 0.01, p = 0.91), respectively. Plotted cognitive composite score by age groups across birth cohorts is shown in Figure 1.

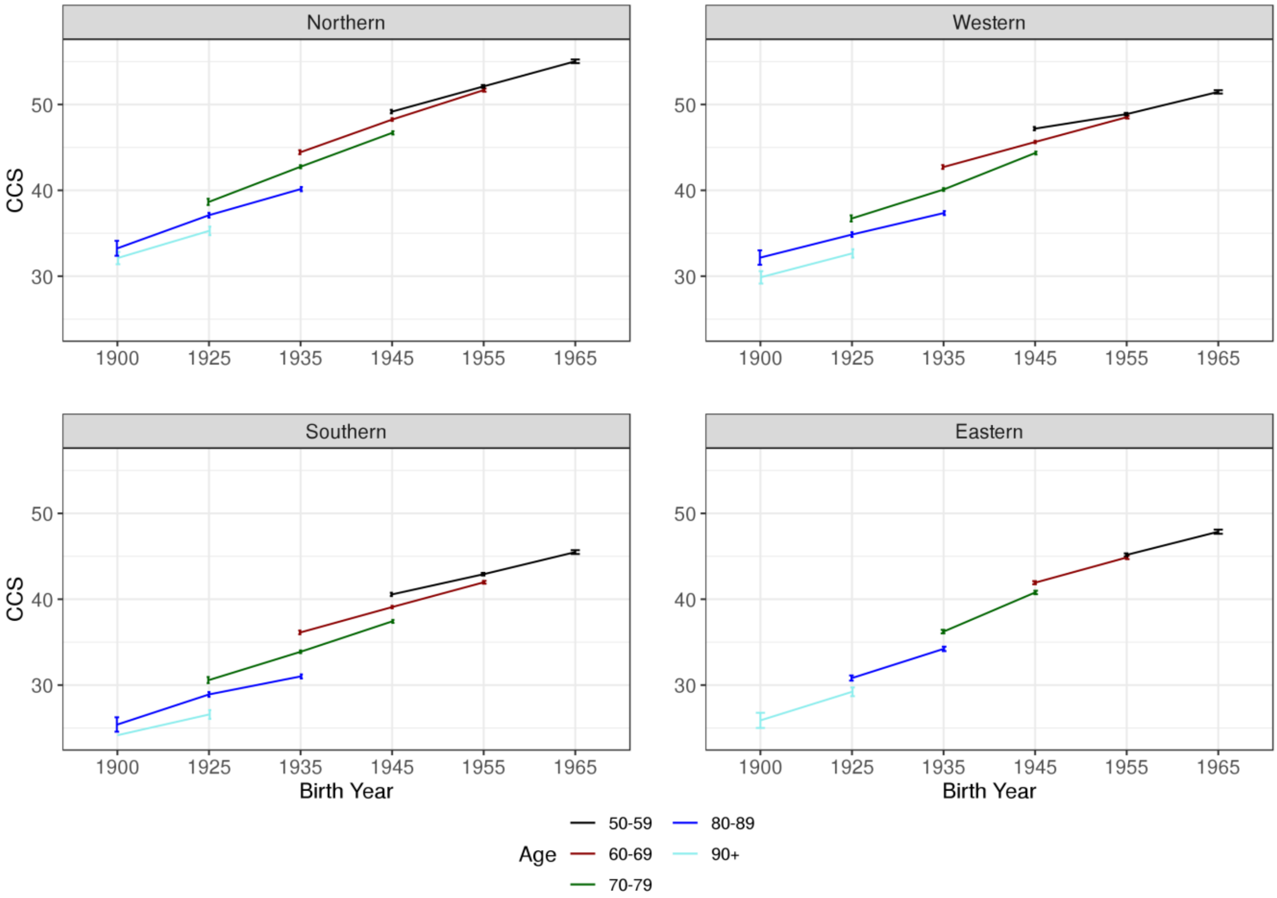

Fig. 1

Estimated cognitive composite scores with 95% confidence intervals based on the coefficients obtained from the mixed-effects model by age groups across birth cohorts for each European region separately.

The results also showed a significant region effect with Northern Europe having significantly higher cognitive composite score (coefficient = 5.48, p < .0001), followed by Western Europe (coefficient = 3.02, p < .0001) compared to the reference region, Eastern Europe. Cognitive composite score measured in Southern Europe was significantly lower (coefficient = -1.00, p < .0001) than in Eastern Europe.

Significant cohort effects and age x cohort interaction effects were also observed for grip strength as outcome. Significantly steeper age-associated physical decline linked to a decrease in grip strength score was observed for the birth cohorts 1900 – 1915 (coefficient = -.30, p = 0.02), 1916 - 1925 (coefficient = - .20, p < .0001), birth cohorts 1926 – 1935 (coefficient = - .26, p < .0001), birth cohort 1936 – 1945 (coefficient = - .19, p < .0001), and birth cohorts 1946 – 1955 (coefficient = - .17, p < .0001) compared to the most recent birth cohorts 1956 – 1965.

Significantly higher grip strength scores were found in Northern Europe (coefficient = 1.87, p < .0001) and Western Europe (coefficient = .95, p < .0001) when compared to the reference region, Eastern Europe. Significantly lower scores were found in Southern Europe (coefficient = -2.49, p <.0001) compared to Eastern Europe.

Our findings were somewhat replicated when analysing ADL and IADL, however, without consistent statistical significance.

Preliminary conclusion

Cohort effects in age-associated trajectories were observed in all examined domains, mostly with consistent differences between the earlier born cohorts (1900 – 1955) and the most recent cohorts (1956 – 1965) included in our study. However, only the domains of cognitive composite score and maximal grip strength showed consistent significant differences between the most recent cohort group (1956 – 1965) and other five cohort groups. A less steep trajectory of cognitive and physical decline observed among the later born cohorts, compared to the earlier born cohorts, could suggest that the onset of disability and age-related diseases is postponed to higher ages. Our findings, hence, do not support our initial hypothesis of morbidity expansion, but they support the 'success of success' theory, with more individuals living longer in better health.

References

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