

Title: Cognitive health of middle-aged and older migrants: Russians in Estonia compared with Russians in Russia and Estonians

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1. Background

Studies on migrant health have most commonly found support for the so-called “healthy immigrant effect”, indicating that migrants’ health is better than that of the native population, and this contributes also to the population-level health and mortality outcomes. However, most of the health problems tend to emerge or cumulate at later ages, and thus the migration effect on health reverses as migrant populations age. Literature on this topic is inconclusive regarding the role of selection or age structure differences *vs.* the (dis)advantaged position of different population groups, partly because few countries have been able to study migrants reaching old age. Also, the migration effect might vary, depending on the health outcome observed.

This paper combines migration and health research. The main aim of the paper is to analyse cognitive functioning of middle-aged and older Russian origin population in Estonia and compare them with Estonians in Estonia and Russians in Russia. Such a design enables us to take into account possible selection effects, age structure differences as well as the role of (dis)advantage in later life health.

Europe has become one of the main immigration destinations (76 million people, Eurostat 2018) over the last decades. Migrants and their descendants form 18% of the European Union population. Of these migrants, 52 % are from outside Europe. With a 1.8 million migrant community, Russians constitute one of the largest foreign-origin groups (Eurostat 2018). Estonia is the third highest in Europe for the proportion of its foreign-born population and their descendants (33 %), and first for the share of the second generation foreign-origin population group (21.5 %) (Eurostat 2018). The majority of migrants and their descendants in the country are Russians. This confirms our motivation to concentrate on the Russian-origin population in Estonia and on Russians in Russia.

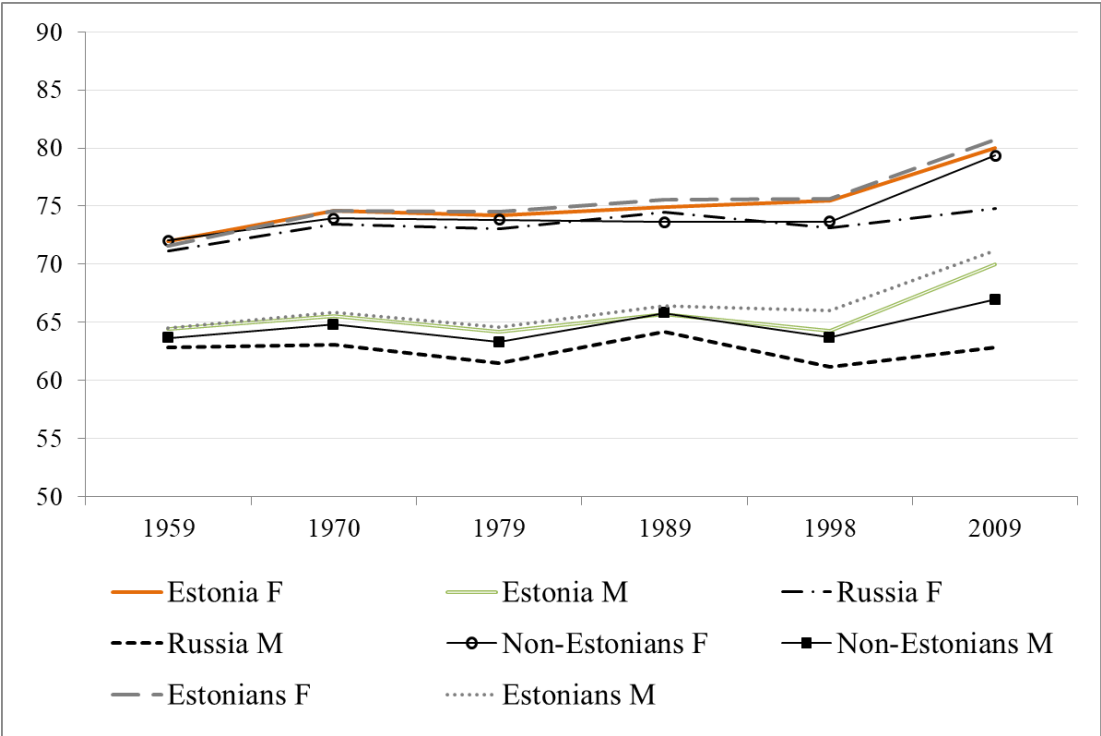
Cognitive functioning has been proposed as one of the indicators of the burden of ageing because of the increasing role of cognition in societies with the transformation of work and social life (Skirbekk et al., 2012). Eastern European countries have relatively low health outcomes in terms of life expectancy, physical health as well as self-reported health, however, cognitive health is still under-researched for this region. Given the relatively fast population ageing of the region, it is important to

understand the scope and health care implications for the potential dementia burden in these societies, and which population groups are affected most.

The currently middle-aged and older Russian population in Estonia has largely been formed by the migration waves of the post-World War II decades and of the 1980s. By the beginning of 1990s, the foreign born population in Estonia formed 26% in Estonia, being one of the highest in Europe. Among the 50+ population, the foreign-origin population constituted 33% by 2011 (Statistics Estonia 2011). Age distribution changed in particular after great migration waves in the 1950s and 1960s–70s as well as in the second half of 1980s. Therefore, in addition to the rapid increase of older population, the age structure of migrant population resulting from previous migration waves might have an impact on the developments in the society since the decline of immigration in the early 1990s.

1.1 Health and Mortality Developments

Life expectancy at birth reached 80 years for women and 70 years for men in Estonia by 2009 while it was 75 for women and 63 for men in Russia, with the latter group not having reached the highest 1989 level yet (Figure 1).



Source: Katus & Puur 1992, Sakkeus 2007, Statistics Estonia 2021, Human Mortality Database 2021
Figure 1. Life expectancy at birth by gender in Estonia and Russia, 1959 – 2009

Life expectancy has mainly differed by gender in both countries; in Estonia the female advantage has been observed at least since the end of the 19th century (Jaadla et al., 2017). By 1970 life expectancy at birth was about 65.9 years for Estonian men and 64.8 years for non-Estonian men while it was 74.6

for Estonian women and 73.9 for non-Estonian women (Katus & Puur 1992, Sakkeus 2007). It remained almost the same or even stagnated (for men) during the following decades, especially a long-term stagnation was visible for non-Estonian male life expectancy which even in 2005 was far from reaching the level of the 1970s. Female life expectancy of non-Estonians has shown a slight increase after three decades, but in comparison with the Estonian women the growth was two times slower in the period up to mid-2000s (Sakkeus 2007). By the same time, there were no significant differences between the life expectancy of urban and rural population. However, Northeastern Estonia was distinguished among the five major regions for its lower life expectancy, due to lower life expectancy of immigrant population. By 2009, life expectancy of non-Estonian men was still the lowest at about 67 years, followed by Estonian men at 71.2 years, non-Estonian women at 79.4 and Estonian women at 80.7 (Statistics Estonia 2021).

Despite the increases in life expectancy, the number of healthy life years at birth in Eastern European countries is lower than in the rest of the region. In Estonia it has been constantly ranking among the lower positions with healthy life years at birth remaining slightly above 50 years, and with healthy life years at age 50 being between 10 and 15 years (Eurostat 2021). The main reason behind this is that about 30% of the adult population in Estonia report having everyday activity limitations (as of 2010). This increases in middle- and old age, being almost 70% among those aged 65 and above. Almost 40% of disabled older (65+) people report medium level activity limitations, the rest severe limitations. The latter group is more prevalent among women (30.9%) than men (24.7%). (Statistics Estonia 2021).

In general, in Estonia male mortality has been over twice higher than female mortality (Sakkeus & Karelson 2012). Also, non-Estonian male and female mortality rates exceeded the mortality rates of Estonians — a particularly great age-and-sex-specific difference was in the case of external causes of death. Differences in morbidity and causes of death patterns indicate to specific risk behaviour in case of migrant population, reflecting the low level of social cohesion of immigrant population in the country of residence. Therefore, mortality rate due to external causes can be considered as the main indicator for social cohesion of immigrant population. (Sakkeus 2007)

The most common causes of death among Estonians and non-Estonians have been generally the same – cardiovascular diseases, malignant neoplasms and external causes, but in case of non-Estonian men, after the three above-mentioned main causes, gastro-intestinal and respiratory diseases are followed by mortality caused by mental disorders (mostly due to psychoactive substance use) and infectious diseases. At the same time, in case of Estonian men, the two first mentioned diseases are followed by higher mortality caused by diseases of neural system and mental disorders. Ethnic differences indicated in the priority list of causes of death are even greater in case of women. The three major causes of death are followed by gastro-intestinal diseases in both ethnic groups. Estonian women also

die because of diseases of neural system, endocrine system and respiratory system, while non-Estonians die rather because of diseases of endocrine system, respiratory system and due to mental disorders. (Sakkeus 2007)

1.1.1 Cognitive Health

The proportion of 60+ people with dementia in Russia (4.9%) was lower than in Estonia (5.3%), remaining still below the OECD average in 2009 (OECD 2011). This feature may be associated with a lower life expectancy (in Russia and Estonia, not many older people survive up to their dementia) and insufficient disease detection due to attitudes (Shulman & Adams, 2002). However, it is expected that the dementia prevalence will increase to 17% in Russia and 26% in Estonia by 2050 (OECD 2019).

In general, cognitive functioning can measure different domains of cognition. Verbal fluency and verbal recall measure fluency and verbal memory, reflecting some types of cognitive ability domains (memory and semantic fluency), and as such do not cover the whole spectrum of cognitive functioning. It may be difficult to distinguish when cognitive impairment is a manifestation of dementia or serious clinical condition from when it is just one of age-related effects. Some studies use percentile-based thresholds to indicate cognitive impairment to reflect people who have a serious clinical condition (Brody et al., 2019).

Verbal fluency test assesses retrieval of information from semantic memory, being a measure of crystallised knowledge that is accumulated over a long time span. Verbal recall tests assess learning capacity, memory storage and memory retrieval, being measures of a temporary kind of or working memory. Therefore, different factors may influence these outcomes differently.

1.2 Social and Health Care Context

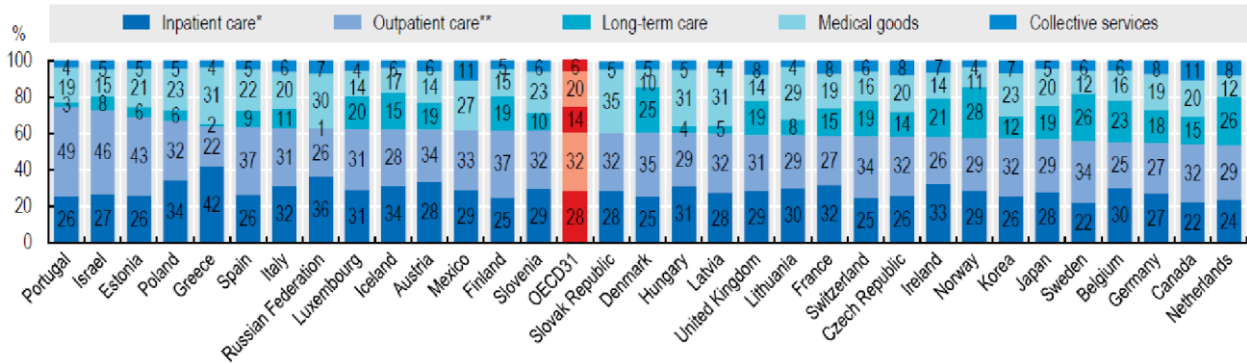
Although some studies attribute the ethnic gap in cognitive health and treatable life expectancy to inequalities in health behaviours, rather than inequalities in access to health care or the quality of health care in Estonia (Baburin et al., 2011), the structural differences in health care and long-term care can be a factor of the gap in life expectancy and detected prevalence of cognitive disorders (Jasilionis, et al., 2011). The health care systems of Estonia and Russia have a common socialist past with a focus on infectious diseases, poor technological equipment and insufficient training to work with chronic patients, including older people and age-related diseases. However, by early 2010, countries had managed to cope with these shortcomings to some extent. And Estonia, which launched a systemic reform of health care at the end of the 1990s (Jasilionis, et al., 2011), looks a little more prepared to protect the health of the elderly population. Countries' per capita health expenditures in

purchasing power parity varied slightly below the OECD average in 2009. In Russia, there was \$ 1,036 PPP per citizen. In Estonia, it was \$ 357 more (OECD 2011).

Unlike Russia, Estonia spent more on health care. In 2009, health care expenditures were 7% of GDP in Estonia and 5.4% in Russia (OECD 2011). Furthermore, the Estonian state was more generous in covering the expenses of the population for medical treatment. In Estonia, public spending was about 3/4 of the total health care expenditures, while in Russia, it was only about 2/3.

The difference between countries in terms of private health care spending has partially due to the difference in the conditions for providing drugs for outpatient treatment. In Estonia, patients receive reimbursement from the national health insurance fund from 50% to 90% of the cost of medicines prescribed by a doctor (Koppel et al., 2008). In Russia, only inpatients are eligible for free drug provision. Most outpatients purchase medication at their own expense. Benefits for full or partial payment for medicines are provided only to some categories: children, people suffering from certain diseases, and benefit categories of the population (Popovich et al., 2011). Sociological studies show that the reduced availability of free health care and drug therapy among the older population in Russia can refuse necessary assistance and trigger chronic diseases, including the development of cognitive impairments (Selezneva et al., 2020).

The share of out-of-pocket (OOP) payments confirm the above-mentioned patterns: it was around 20% in Estonia in the 2000s. Most of these costs were spent on pharmaceuticals or medication, but affected vulnerable population groups the most (Lai et al., 2013). Similarly to Estonia, the OOP share of expenditure grew in the 1990s, but then decreased in Russia, reaching almost 29% by 2009 (Popovich et al., 2011).



Source: OECD (2019)
Figure 2. Health expenditure by type of service, 2017¹ (or nearest year)

¹ Since there are no comparable data for Russia and Estonia for 2009, we present data for 2017. In 2009, the data on the structure of expenditures in Estonia differed insignificantly from those presented. In Russia in 2009, the distribution of types of spending on various types of assistance may be even more disproportionate than in 2017.

Estonia and Russia also differ in the abilities of their health care systems to deal with and prevent chronic diseases. With lower health spending (in absolute terms), Russia spends a lot on inpatient care (in relative terms) compared to Estonia and other OECD countries (Figure 2). At the same time, outpatient care costs, which accounts for most of the work to prevent chronic and age-associated diseases, and long-term care, are not high enough in Russia.

Ten years ago, both countries lacked an effective health care system for age-related diseases and long-term care. However, there are some reasons to believe that Estonia was more advanced in developing such assistance. The adoption of the Nursing Care Master Plan 2015 in 2001 launched the development of nursing care homes in the country. It led to a constant increase in the number of nursing beds until the standard of provision of 10 beds per 1000 citizens was achieved from the target group and the formation of home nursing and day home nursing. From 2001 to 2007, government spending on nursing care, both inpatient and home-based, increased. A law passed in 2007 and entered into force in 2008 gave family doctors the right to provide nursing care services, which should have further increased the supply of services. In the early 2000s, the chances of supportive therapy for dementia and depression, often provoking the first illness in the older population, increased in Estonia - during this period, the availability of psychiatrists to the population increased. The amount of assistance provided by family doctors for mental disorders increased (Koppel et al., 2008).

In Russia, assistance to patients with dementia was provided by the acute health sector, which did not meet the needs of patients. Older patients with disabilities, including cognitive disabilities, were offered nursing beds exclusively in inpatient medical institutions (Popovich et al., 2011). The massive development of outpatient geriatric care aimed at monitoring and caring for patients and providing them with some supportive therapy began in the country only in 2017. In the period from 2004 to 2009, the resources of geriatric centres and nursing homes and the number of citizens who received assistance in them did not change significantly, despite the apparent shortage of these services. Most older adults with self-care deficits (including those arising from mental disorders) received only care services in the shadow market (not always of good quality) or help from relatives. Mental health and mental health care was provided by poor quality services for people with severe mental disorders, not focused on a cure for these diseases, and did not receive any attention from the authorities (ibid.).

In an analysis of the changes in access to quality health care over 15 years in the Global Burden of Disease Study 2015, it becomes evident that over these years access to quality health care has significantly improved for Estonia compared to Russia (see tables on HAQ Index, Barber et al. 2017). The difference between the observed country and frontier HAQ Index values for Estonia in 1990 was 11.5 and in 2015 6.9, for Russia in 1990 19.8 and in 2015 16.4 (Barber et al. 2017, p.246)

2. Data and Methods

For our analysis purposes, we use data from two surveys aimed at studying individual ageing pathways - the SHARE (Survey of Health, Aging and Retirement in Europe) and the SAGE (The Study on Global Ageing and Adult Health) surveys. Both targeted people aged 50+, and included also partners of the main respondents. SHARE is a multidisciplinary study, and it is based on the U.S. Health and Retirement Study. SAGE is designed by the World Health Organization, and has a more health focus.

The first wave of the Estonian SHARE data was carried out in 2010-2011. The sample frame of SHARE Estonia was based on a population register which allowed drawing age-eligible target individuals from each household. Stratified sampling with simple random sampling of individuals within strata was used. Stratification was done by gender and year of birth. Within each gender-age stratum records are sorted by region to get better geographical allocation. Prior to fieldwork the sample was double-checked with the death registry to exclude any possible deaths that happened after sampling. Household response rate for Estonia was close to 60%. (Malter & Börsch-Supan 2013)

The SAGE Russian survey Wave 1 was carried out in 2007-2010. The national sample was constructed using data from two sources: the sample for the 2003 World Health Survey (WHS) and the 2002 population census. The aim of the sampling design was to obtain a nationally representative cohort of persons aged 50 years and older, with a smaller cohort of persons aged 18 to 49 for comparison. We use here data on people aged 50+. Total individual response rate was 71.8% for SAGE. (WHO 2014)

2.1. Variables

We looked at three cognitive function indicators - verbal fluency, immediate verbal recall and delayed verbal recall. Verbal fluency refers to the ability to produce as many words as possible in a one-minute time span. According to SHARE criteria, a score of less than 18 items represents impairment in word fluency (Börsh-Supan et al. 2005).

Immediate and delayed verbal recall are tested by presenting ten words successively, after which the respondent is given the opportunity to recall as many words as possible. In SAGE this was repeated three times to saturate the learning curve while in SHARE this was repeated two times. After about 10 minutes, delayed recall and recognition were tested. In SHARE the question was repeated after having asked several other questions in between (approximately also after 10 minutes). According to SHARE criteria, a score of 4 or less represents impairment in verbal learning and recall (Börsch-Supan et al. 2005).

The measurement of verbal recall (or immediate recall) is most similar in both Estonian and Russian survey. The measurement of delayed recall measurement was slightly different – in the SHARE survey a different list of words was asked to be repeated two times, while in the SAGE survey the same list was asked to be repeated three times. While it seems that the fluency test was similar in both surveys, the outcomes are twice lower for SAGE, indicating to differences in measurement. Therefore, we will use a 25%-percentile-based threshold to have comparable impairment indicators for fluency between both countries, following some examples (Brody et al. 2019).

We distinguish migrant groups by self-reported ethnicity as this is comparable in both surveys - we include Estonians in Estonia, Russians in Estonia and Russians in Russia. Russians in Estonia include both first and second generation foreign-origin groups. Control variables include age (at interview), gender in models for total population, marital status (married or partnered/ separated or divorced/ widowed/ never married), total years spent in education, residence area (urban-rural), employment status (in employment/retired/ at home, ill, other), evaluation of the current financial situation, ownership status of dwelling, self-rated health ((very)bad/ fair/ (very) good), depressiveness, smoking and alcohol consumption, BMI, satisfaction with personal relations, trust in people, receipt of care/ help, mother's education (highest completed), father's education (highest completed). The comparison of questions and response options that have differed in the surveys of the two countries and how they have been transformed for the use of the current analysis are presented in Table 1.

3. Results

Descriptive statistics of the three population groups are presented in Table 2. Despite Russians in Estonia having a mean age (66.5) that remains between the other groups' mean age, immediate and delayed recall averages are lowest for this group (immediate recall 5.0 for women and 4.6 for men; delayed recall 3.5 for women and 3.0 for men). Mean fluency outcomes are remarkably lower for Russians in Russia, possibly indicating to measurement differences, therefore we do not compare these, however, the mean fluency is still lower among Russians in Estonia than Estonians in Estonia. While the differences in means between men and women are significant for most outcomes among both Estonians and Russians in Estonia, there are no significant gender differences in outcomes in Russia, possibly due to slightly larger gender gap in life expectancy.

Due to some measurement differences, looking at the proportion of impaired people might give a better overview from a comparative perspective. Among both women and men, Russians in Estonia have the largest proportion of people with impaired verbal learning and recall. Among Russians in Estonia, 24.5% of women and 20.6% of men have impaired verbal learning, 53.7% of women and 48.3% of have impaired verbal recall. In verbal learning, 16.8% of Estonian men in Estonia and 13.3%

of Russian men in Russia have impairment while 12% of Estonian women and 13% of Russian women in Russia have impairment. In verbal recall impairment, both Estonian men (47.3%) and women (39.7%) follow Russians in Estonia while the prevalence is lowest for Russians in Russia (26.2% and 25.7%, respectively). Also, 29.8% of Russian men in Estonia and 30.1% of Russian women in Estonia have impaired fluency followed by 24.2% Russian men in Russia and 22.5% Russian women in Russia.

3.1 Immediate Recall

Finally adjusted binary logistic regression models for verbal learning (immediate recall) show that Russians in Estonia have the highest odds of impaired verbal learning – 1.6 times higher than that of Russian men in Russia, and 1.5 times higher than that of Russian women in Russia (Table 3). However, the difference was slightly bigger compared to Estonians in Estonia – 1.6 times higher than for Estonian men in Estonia, and 1.8 times higher than for Estonian women.

For men, differences in impairment between Estonians and Russians in Estonia are most explained by health (self-rated health, depression), social relations (trust, satisfaction with relations, receipt of care), and parental education. Differences in impairment between Russians in Estonia and in Russia are most explained by economic (economic situation, dwelling ownership), health, social relations and parental education.

Significant differences in impairment among men remain by age, employment status, years of education, self-rated health, depression, BMI and receipt of care in finally adjusted models.

Among women, differences in impairment between Estonians and Russians in Estonia are most explained by socio-economic (employment status, years of education, economic situation, dwelling ownership) and health variables. Differences in impairment between Russians in Estonia and in Russia are most explained by health behaviour (alcohol, tobacco consumption, BMI and parental education).

Significant differences in impairment among women remain by age, employment status, years of education, dwelling ownership, self-rated health, alcohol consumption, and satisfaction with relations in finally adjusted models.

Running separate models by groups, some differences in associated variables emerge, although age remains significant for all as well as years of education remains significant almost for all, except for men in Russia (results not presented). Among Russians in Estonia, interestingly, differences in impairment are significantly higher for men and women living in rural areas than in urban areas (OR 2.65, CI 1.22-5.80 for women, and OR 2.29, CI 1.06 – 4.93 for men).

Interaction models with the group indicator and residence area point out that Russians in Estonia living in rural areas have twice the odds of impairment compared to Russians living in Estonian urban areas (Table 3). However, the differences in impairment are significantly lower among urban and rural dwellers of both Estonians in Estonia and Russians in Russia compared to Russians in urban Estonia.

Interacting the group indicator with receipt of care results in the disappearance of differences in impairment almost between all groups, among men. Russian men living in Estonia who have received care indicate higher odds of impairment, but it is not significantly different from those men who have not received care. However, the fact that those who have receive care also have higher impairment indicates to them being already more in need of personal help. Among men the impairment does not differ from impairment of Estonian men not received care and not from the impairment of Russian men who have as well as have not received care. Only Estonian men who have not received care show significantly lower odds of impairment than Russian men in Estonia who have not received care.

Among women, the impairment of Russians in Estonia who have not received care is not significantly different from the impairment of Russians in Estonia who have received care as well as from Russians in Russia who have received care. Other groups (Estonian women who have and have not received care as well as Russian women who have not received care) have significantly lower impairment than Russian women who have not received care.

3.2 Delayed Recall

Also for delayed recall, Russians in Estonia have the highest odds of being impaired (1.4 times higher than for Estonian men, but 4 times higher than for Russian men in Russia; 1.3 times higher than for Estonian women, but 2.9 higher than for Russian women in Russia) . The difference between Russians in Estonia and Russia is now much greater, perhaps indicating to somewhat different measurement procedures of this indicator in the two surveys. Although impairment odds for delayed recall are more similar between Estonians and Russians in Estonia than was the case in immediate recall, differences still remain significant.

Among men and women, only demographic variables reduce differences in impairment between Estonians and Russians in Estonia while other variables increase the differences again. Most variables reduce differences in impairment between Russians in Estonia and in Russia, except for parental education among women.

Interaction terms indicate that Russians living in rural Estonia have higher odds of impairment in delayed recall, but they do not differ significantly from Russians living in urban Estonia. All other groups have significantly lower impairment, but the odds are lower among urban than rural dwellers among Estonians as well as Russians in Russia.

Interaction terms with care receipt indicate that Russians in Estonia who received care have higher impairment odds than Russians in Estonia who did not receive care, but they do not differ significantly. Also, Estonian men that received care do not differ significantly in impairment from Russian men that did not receive care in Estonia. All other groups have significantly lower odds of impairment in delayed recall with most groups having beneficial effects in case of not receiving care, except for Estonian women.

This was the only cognitive function outcome where for the 65+ population, differences in impairment disappeared between Estonians and Russians in Estonia after controlling for paternal education, among both men and women.

3.3 Fluency

Also for fluency, Russians in Estonia have the highest odds of being impaired, followed by Russians in Russia among men, while among women they are followed by Estonians. Russian men in Estonia have 1.8 times higher odds of impairment than Estonian men, and 1.5 times higher odds than Russian men in Russia, and the significance level is weaker for Russian men in Russia. Among women, the odds are higher for Russians in Estonia by 1.6 times than for Estonians, but they do not differ from Russian women in Russia.

Among men, demographic and social relations' factors reduce the differences in impairment between Estonians and Russians in Estonia the most, followed by employment status, education and parental education while all included factors reduce differences between Russians in Estonia and in Russia. Among women, no factors reduce the differences in impairment between Estonians and Russians in Estonia while most included factors reduce the differences compared with Russians in Russia.

Interaction terms with the residence area indicate that Russian men and women in rural Estonia have higher odds of impairment in fluency, but they do not differ significantly from urban Russians in Estonia. Most of the other groups have significantly lower odds of impairment than Russians living in urban Estonia, except for Russian men living in rural Russia.

Interactions with care receipt show that Russian men and women in Estonia who have received care had significantly higher odds of impairment than Russians in Estonia who did not receive care.

Estonian men and women who received care and Russian men in Russia who did not receive care were not significantly different in their odds of impairment compared to the reference group.

4. Conclusions

As cognitive functioning becomes an increasingly important aspect of health in ageing societies, it is important to identify its main risk factors and groups. Since working memory is a temporary type of memory that starts to show deficiencies more easily than in the case of crystallised knowledge, it can be used as an indicator that predicts Alzheimer's dementia onset. Therefore, based on immediate recall or verbal learning measure we can conclude that the minimum share of middle-aged and older people at risk of impairment is around 20-25% among the foreign-origin population in Estonia while it is almost twice lower for Estonians and Russians in Russia.

Contrary to expectations of the healthy migrant effect, our analysis finds that migrant origin population groups in Estonia have the highest risk of cognitive health impairment – and the risk remains higher in case of all three cognitive functioning outcomes observed in this study, after adjusting for all variables. Our analysis has provided a good study case because unlike some other settings, it has been possible to take into account that migrants have aged similarly or even faster than the native population, affecting also health and social outcomes at the population level.

Although more women than men are cognitively impaired among Estonians and Russians in Russia, being in line with other international findings, the impairment proportion is higher among Russian men than women in Estonia. However, after taking into account the different variables, the risk of impairment remains significantly higher also among Russian women than men living in Estonia. Therefore, higher life expectancy among women means also that the experience of cognitive impairment firstly impacts them, irrespective of the group belonging.

Demographic indicators as well as years spent in education explain and reduce most of the differences in impairment between Russians in Estonia and other groups, at least for immediate recall and verbal fluency. While demographic indicators such as age, residence area and marital status reduce the differences in impairment more between Russians in Estonia and Estonians, years spent in education reduce the differences more between Russians in Estonia and in Russia, indicating to somewhat different explanations of differences between the groups and countries. However the differences in impairment do not disappear nor become insignificant. On the contrary, in case of immediate and delayed recall (for men and women) as well as fluency (for men), most of the other indicators such as health behaviour factors or those covering social relations (measuring overall social cohesion) even slightly increase the differences in impairment again. Only among the older population – those aged 65+ - parental education explained away differences in delayed recall between Russians and Estonians

in Estonia, suggesting that intergenerational sources have a somewhat differential impact on some domains of later life cognitive outcomes between these groups. However, for other cognition domains this effect did not emerge. Therefore, in general, the variables included in the current analysis do not explain away group differences in cognitive health impairment sufficiently, and further explanations should be sought in future analysis.

The fact that Russian men and women living in rural Estonia have higher odds of cognitive impairment than their counterparts living in urban areas but also compared to all other groups indicates to possible problems with health and social care services in the relevant areas. Since these areas have in general taken longer time to develop social and care services and infrastructure addressing the contemporary challenges, it is possible that these regions are also not prepared to address cognitive functioning issues of the foreign-origin population. Possibly, attitude change related to people with dementia has been slower among these areas and groups. More likely though, the finding reflects the generally low proportion of Russian migrants that have settled in rural areas – around 6-8% - and the numbers of rural dwellers is quite low in the sample. Therefore, the findings may reflect sample size differences instead of substantial conclusions.

Additionally, Russians in Estonia that have received some sort of care from others have higher fluency impairment risk than those who have not received care. In general, care receipt is more prevalent among people who already have some health issues, therefore it is possible that those older people have other detrimental factors causing the worsening of cognitive health. This is why similar effects – people with care receipt having higher impairment risks than those without – can be observed for some other groups as well. However, it might also mean that the help received has not been adequate or matching the needs while guaranteeing also the autonomy of the older person. As most of the care has so far, at least during the observation period, been given by other close relatives in both countries due to lack of good quality official services and investments, such help might not correspond to the actual needs of people, and thus affecting also the development of cognitive functioning in old age negatively. Also, other cognitive functioning outcomes with care receipt show significantly higher impairment than Estonians or Russians in Russia, but mostly only among women which might reflect the fact that women live longer, but they have to do so with more limitations, including those set by cognitive health.

Similarly to restructuring the health and social care systems to correspond infectious or cardiovascular diseases in earlier times, it is now time for increasing national investments and attention to address and prevent cognitive health challenges. This includes also addressing the general attitudes of people regarding those with dementia and other mental illnesses.

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Table 1. Construction of variables in the analysis based on questions from SAGE and SHARE

Topic	SHARE	Response options	SAGE	Response options	Variable in analysis
Financial situation	Thinking of your household's total monthly income, would you say that your household is able to make ends meet?	1. With great difficulty, 2. With some difficulty, 3. Fairly easily, 4. Easily	Would you say your household's financial situation is...?	Very good / Good / Moderate / Bad / Very bad	1. Have difficulty (incl SHARE: "With great difficulty" and SAGE: "Bad/ Very bad"); 0. OK
Smoking	Do you smoke at the present time?	Yes/ No	Do you currently use (smoke, sniff or chew) any tobacco products such as cigarettes, cigars, pipes, chewing tobacco or snuff?	Yes/ No	1. Current smoker; 0. Not a current smoker
Alcohol drinking	During the last 3 months, how often did you drink any alcoholic beverages, like beer, cider, wine, spirits or cocktails?	Daily or almost every day , Five or six days a week , Three or four days a week , Once or twice a week , Once or twice a month, Less than once a month, Not at all in the last 3 months	In the last 12 months, how frequently [on how many days] on average have you had at least one alcoholic drink?	No days, < 1 per month , 1-3 days per month, 1-4 days per week, 5+ days per week	1. Never (incl. SAGE: "No Days"; SHARE "Not at all..."); 2. Sometimes (SAGE: "< 1 per month", "1-3 days per month"; SHARE: "Once or twice a month", "Less than once a month"), 3. Often (SAGE/ SHARE: 1+ a week)
Depression	In the last month, have you been sad or depressed?	Yes/ No	During the last 12 months, have you had a period lasting several days when you felt sad, empty or depressed?	Yes/ No	1. Depressive caseness (SAGE: Yes for all three questions; SHARE: Yes for three issues), 0. No depressiveness
	What are your hopes for the future?	1. Any hopes mentioned 2. No hopes mentioned	During the last 12 months, have you had a period lasting several days when you lost interest in most things you usually enjoy such as personal relationships, work or hobbies/recreation?	Yes/ No	
	In the last month, have you felt that you would rather be dead?	1. Any mention of suicidal feelings or wishing to be dead 2. No such feelings	During the last 12 months, have you had a period lasting several days when you have been feeling your energy decreased or that you are tired all the time?	Yes/ No	
	Do you tend to blame yourself or feel guilty about anything?	1. Obvious excessive guilt or self-blame 2. No such feelings 3. Mentions guilt or self-blame, but it is unclear if these constitute obvious or excessive guilt or self-blame			
	Have you had trouble sleeping recently?	1. Trouble with sleep or recent change in pattern 2. No trouble sleeping			

	In the last month, what is your interest in things?			1. Less interest than usual mentioned 2. No mention of loss of interest 3. Non-specific or uncodeable response	
	Have you been irritable recently?			Yes/ No	
	What has your appetite been like?			1. Diminution in desire for food 2. No diminution in desire for food 3. Non-specific or uncodeable response	
	In the last month, have you had too little energy to do the things you wanted to do?			Yes/ No	
	How is your concentration? For example, can you concentrate on a television programme, film or radio programme?			1. Difficulty in concentrating on entertainment 2. No such difficulty mentioned	
	What have you enjoyed doing recently?			1. Fails to mention any enjoyable activity 2. Mentions ANY enjoyment from activity	
	In the last month, have you cried at all?			Yes/ No	
Trust	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? Not looking at card 35 anymore, please tell me on a scale from 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted.	Scale 0 ... 10	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	1. Can be trusted 2. Can't be too careful	1. Low/ No trust (SAGE: 2; SHARE: 0...4), 2. Trust in people (SAGE: 1; SHARE: 5...10)
Satisfaction with social relations	Overall, how satisfied are you with the relationships we have just talked about? Please answer on a scale from 0 to 10 where 0 means completely dissatisfied and 10 means completely satisfied.	Scale 0 ... 10	How satisfied are you with your personal relationships?	1. Very satisfied, 2. Satisfied, 3. Neither satisfied nor dissatisfied, 4. Dissatisfied, 5. Very dissatisfied	1. Dissatisfied (SAGE: 4/5; SHARE: 0/4), 2. Neutral (SAGE: 3; SHARE: 5/6), 3. Satisfied (SAGE: 1/2; SHARE: 7/10)

Receipt of care	Thinking about the last twelve months has any family member from outside the household, any friend or neighbour given you [or/or/or/or] [your/your/your/your] [husband/wife/partner/partner] personal care or practical household help?	Yes/ No	In the last 12 months, has anyone in the household received any financial or in-kind support from your family (children, siblings or parents) and relatives (other kin) who do not live with you?	Yes/ No	1. Has received care (Yes on any of the questions), 0. Has not received care (No on any of the questions)
	Is there any other family member from outside the household, friend or neighbour who has given you [or/or /or/or] [your/your/your/your] [husband/wife/partner/partner] personal care or practical household help?	Yes/ No			
	And is there someone living in this household who has helped you regularly during the last twelve months with personal care, such as washing, getting out of bed, or dressing?	Yes/ No			
	IWER: By regularly we mean daily or almost daily during at least three months. We do not want to capture help during short-term sickness.				

Table 2. Descriptive results for different population groups aged 50+, SHARE Estonia 2010- 2011 and SAGE Russia 2007-2010

	Estonian ethnicity (SHARE)				Russian ethnicity (SHARE)				Russian ethnicity in Russia (SAGE)			
	Women (N=2811)		Men (1946)		Women (N=1029)		Men (N=657)		Women (N=1974)		Men (N=1005)	
	Mean (CI)		Mean (CI)		Mean (CI)		Mean (CI)		Mean (CI)		Mean (CI)	
Verbal fluency (no of animals)	22.2 (21.9 - 22.5)		21.7 (21.3 - 22.0)		20.2 (19.8 - 20.7)		19.8 (19.2 - 20.4)		12.1 (11.3 - 12.4)		12.1 (11.7 - 12.5)	
Immediate recall (10 words)	5.4 (5.4 - 5.5)		5.0 (4.9 - 5.1)		5.0 (4.9 - 5.1)		4.6 (4.4 - 4.8)		5.3 (5.2 - 5.3)		5.3 (5.2 - 5.4)	
Delayed recall (10 words)	3.8 (3.7 - 3.9)		3.4 (3.3 - 3.5)		3.5 (3.3 - 3.6)		3.0 (2.8- 3.2)		4.9 (4.8 - 5.0)		4.8 (4.7 - 5.0)	
	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %
Age (mean)		67.5 (67.2 - 68.0)		66.3 (65.9 - 66.7)		66.9 (66.3 - 67.5)		65.8 (65.0 - 66.5)		66.1 (65.7 - 66.6)		64.1 (63.5 - 64.7)
Years of education (mean)		11.6 (11.5 - 11.8)		11.5 (11.3 - 11.6)		11.2 (11.0 - 11.4)		11.4 (11.2 - 11.7)		11.0 (10.9 - 11.2)		11.4 (11.1 - 11.6)
Urban-Rural NA (%)	181	6,4	115	5,9	56	5,4	31	4,7	0		0	
Urban (%)	1611	57,3	1044	53,7	910	88,4	568	86,5	1649	83,5	797	79,3
Rural (%)	1019	36,3	787	40,4	63	6,1	58	8,83	325	16,5	208	20,7
Married/partnered (%)	1425	50,7	1441	74,1	560	54,4	548	83,4	847	43,0	784	78
Separated/ divorced (%)	416	14,8	214	11,0	161	15,7	63	9,6	193	9,8	71	7,1
Widowed (%)	729	25,9	113	5,8	265	25,8	28	4,3	867	44,0	132	13,1
Never married (%)	241	8,6	178	9,2	43	4,2	18	2,7	63	3,2	18	1,8
In employment (%)	1040	37,0	833	42,8	339	32,9	274	41,7	575	29,1	400	39,8
Retired (%)	1599	56,9	959	49,3	627	60,9	346	52,7	1190	60,3	471	46,9
Other (%)	167	5,9	154	7,9	62	6,0	35	5,3	196	9,9	132	13,1
Household size (mean)		1.97 (1.93 - 2.01)		2.24 (2.19 - 2.28)		1.93 (1.88 - 1.99)		2.23 (2.17 - 2.29)		2.1 (2.04 - 2.14)		2.38 (2.31 - 2.45)
Living alone	896	31,9	247	12,7	315	30,6	76	5,6	710	36,0	162	16,1
Partner in household	1623	57,7	1643	84,4	594	57,7	563	85,7	847	42,9	784	78,0

Good economic situation (%)	2570	91,4	1820	93,5	787	76,5	578	88,0	1316	66,7	3149	87,3
Own dwelling (%)	1798	64,0	940	48,3	707	68,7	295	44,9	1794	90,9	916	91,1
Self-rated health: (very) bad (%)	744	26,5	565	29,0	357	34,7	182	27,7	629	31,9	236	23,5
Self-rated health: medium (%)	1281	45,6	859	44,1	502	48,8	316	48,1	1155	58,5	583	58,0
Self-rated health: (very) good (%)	782	27,8	517	26,6	170	16,5	158	24,1	188	9,5	183	18,2
Depressed (%)	1198	42,6	559	28,7	542	52,7	214	32,6	947	48,0	324	32,2
BMI: DK/NA/R	80	2,9	42	2,2	34	3,3	8	1,2	55	2,8	35	3,5
BMI: <18.5	36	1,3	11	0,6	8	0,8	6	0,9	29	1,5	14	1,4
BMI: 18.5 - 22.9	404	14,4	255	13,1	122	11,9	96	14,6	169	8,6	120	11,9
BMI: 23.0 - 24.9	442	15,7	384	19,7	115	11,2	125	19,0	216	10,9	168	16,7
BMI: 25.0 - 29.9	1027	36,5	786	40,4	389	37,8	277	42,2	730	37,0	467	46,5
BMI: 30.0 - 24.9	569	20,2	337	17,3	223	21,7	104	15,8	477	24,2	149	14,8
BMI: 35.0 +	253	9,0	131	6,7	138	13,4	41	6,2	298	15,1	52	5,2
Current smoker (%)	354	12,6	587	30,2	126	12,2	214	32,6	101	5,1	433	43,1
Alcohol drinking: DK/ NA / R (%)	10	0,4	2	0,1	3	0,3	6	0,9	548	27,8	94	9,4
Alcohol: Never (%)	1348	48,0	522	26,8	518	50,3	194	29,5	371	18,8	143	14,2
Alcohol: Sometimes (%)	1232	43,8	678	34,8	464	45,1	276	42,0	1021	51,7	602	59,9
Alcohol: Often (%)	221	7,9	744	38,2	44	4,3	181	27,6	34	1,7	166	16,5
Satisfaction with relations: DK/NA/R (%)	59	2,1	78	4,0	22	2,1	39	5,9	25	1,3	17	1,7
Satisfaction with relations: dissatisfied (%)	28	1,0	39	2,0	25	2,4	6	0,9	126	6,4	41	4,1
Satisfaction with relations: neutral/medium (%)	142	5,1	138	7,1	52	5,1	46	7,0	293	14,8	112	11,1
Satisfaction with relations: satisfied (%)	2581	91,8	1,691	86,9	930	90,4	566	86,2	1510	76,5	831	82,7

Trust in people: DK/NA/R (%)	52	1,9	78	4,0	23	2,2	41	6,2	19	1,0	10	1,0
Trust in people: no/ low trust (%)	382	13,6	276	14,2	113	11,0	104	15,8	569	28,8	321	31,9
Trust in people: (high) trust (%)	2377	84,6	1,592	81,8	893	86,8	512	77,9	1,368	69,3	670	66,7
Receipt of care: DK/NA/R (%)	313	11,1	390	20,0	85	8,3	138	21,0	19	1,0	9	0,9
Receipt of care: no (%)	1824	64,9	1,234	63,4	717	69,7	421	64,1	1,53	77,5	846	84,2
Receipt of care: yes (%)	674	24,0	322	16,6	227	22,1	98	14,9	423	21,4	148	14,7
Education of mother: DK/NA/Other (%)	481	17,1	440	22,6	263	25,6	64	6,4	96	4,9	695	19,3
Education of mother: basic (%)	1768	62,9	1112	57,1	569	55,3	529	52,6	1064	53,9	1984	55,0
Education of mother: (post)secondary (%)	482	17,2	336	17,3	171	16,6	370	36,8	716	36,3	811	22,5
Education of mother: higher (%)	80	2,9	58	3,0	26	2,5	42	4,2	98	5,0	118	3,3
Education of father: DK/NA/Other (%)	662	23,6	540	27,8	340	33,0	108	10,8	1236	21,3	877	24,3
Education of father: basic (%)	1577	56,1	999	51,3	442	43,0	419	41,7	2,85	49,0	1692	46,9
Education of father: (post)secondary (%)	459	16,3	317	16,3	188	18,3	409	40,7	1427	24,5	844	23,4
Education of father: higher (%)	113	4,0	90	4,6	59	5,7	69	6,9	301	5,2	195	5,4

Table 3. Results from regular and interaction models for three cognitive function outcomes

		IMMEDIATE RECALL		DELAYED RECALL		FLUENCY	
		MEN	WOMEN	MEN	WOMEN	MEN	WOMEN
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
	Russians in EE	1	1	1	1	1	1
	Estonians in EE	0.640 (0.491 - 0.834)	0.557 (0.438 - 0.709)	0.726 (0.586 - 0.898)	0.778 (0.652 - 0.929)	0.550 (0.433 - 0.698)	0.625 (0.513 - 0.761)
	Russians in RU	0.671 (0.473 - 0.951)	0.698 (0.520 - 0.936)	0.248 (0.188 - 0.326)	0.350 (0.281 - 0.434)	0.686 (0.513 - 0.917)	0.569 (0.451 - 0.719)
INTERACTION: AREA	Russians in EE - Urban	1	1	1	1	1	1
	Russians in EE - Rural	2.145 (1.054 - 4.366)	2.210 (1.088 - 4.489)	1.392 (0.757 - 2.561)	1.493 (0.821 - 2.714)	1.332 (0.687 - 2.582)	1.000 (0.516 - 1.938)
	Estonians in EE - Urban	0.697 (0.520 - 0.934)	0.598 (0.460 - 0.776)	0.752 (0.594 - 0.952)	0.812 (0.670 - 0.983)	0.599 (0.460 - 0.779)	0.638 (0.516 - 0.789)
	Estonians in EE - Rural	0.632 (0.461 - 0.867)	0.622 (0.468 - 0.826)	0.696 (0.541 - 0.895)	0.776 (0.628 - 0.959)	0.519 (0.390 - 0.690)	0.448 (0.351 - 0.571)
	Russians in RU - Urban	0.679 (0.469 - 0.983)	0.732 (0.544 - 0.985)	0.272 (0.203 - 0.365)	0.371 (0.295 - 0.465)	0.667 (0.488 - 0.913)	0.580 (0.455 - 0.740)
	Russians in RU - Rural	0.533 (0.305 - 0.931)	0.599 (0.376 - 0.956)	0.194 (0.126 - 0.298)	0.310 (0.218 - 0.440)	0.835 (0.549 - 1.272)	0.339 (0.273 - 0.584)
INTERACTION: CARE RECEIPT	Russians in EE - Not received	1	1	1	1	1	1
	Russians in EE - Received	1.592 (0.913 - 2.779)	0.904 (0.605 - 1.351)	1.248 (0.726 - 2.147)	0.847 (0.593 - 1.210)	2.152 (1.282 - 3.612)	1.681 (1.179 - 2.398)
	Estonians in EE - Not received	0.673 (0.481 - 0.941)	0.524 (0.392 - 0.701)	0.727 (0.561 - 0.941)	0.744 (0.604 - 0.916)	0.595 (0.446 - 0.798)	0.638 (0.503 - 0.808)
	Estonians in EE - Received	0.934 (0.619 - 1.408)	0.514 (0.368 - 0.719)	0.770 (0.542 - 1.092)	0.705 (0.546 - 0.910)	0.974 (0.676 - 1.403)	0.943 (0.717 - 1.239)
	Russians in RU - Not received	0.727 (0.490 - 1.078)	0.604 (0.436 - 0.837)	0.244 (0.179 - 0.333)	0.310 (0.243 - 0.397)	0.860 (0.620 - 1.191)	0.681 (0.523 - 0.886)
	Russians in RU - Received	0.577 (0.321 - 1.037)	0.707 (0.474 - 1.052)	0.281 (0.177 - 0.447)	0.389 (0.286 - 0.530)	0.544 (0.326 - 0.908)	0.576 (0.412 - 0.806)