

Factors associated with incidence of depressiveness among the middle-aged and older Estonian population

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Abstract

Objective: Relatively scant research among older Estonian population describes factors associated with the incidence of depressive symptoms. This study identifies factors associated with the incidence of depressiveness among middle-aged and older Estonians over 2- and 4-year periods.

Method: In this cross-sectional analysis, logistic regression models are used to identify the factors associated with the incidence of depressiveness over 2- and 4-year periods. The data were drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2011–2015 which included Estonian population aged 53 years and older in 2013. After excluding those younger than 53 years, not interviewed 2 years later, those with depressive symptoms at baseline in 2013, and missing values for depressiveness or other variables, our analytical sample comprised 2513 people.

Results: Among those who were not depressive in 2013, 21.9% became depressive within 2 years; 16.1% of non-depressive individuals since 2011 became depressive by 2015. No age differences in incidence remained in adjusted models. Women have almost 50% higher odds of becoming depressive. A previous history of depressiveness and the presence of everyday activity limitations were important factors increasing the incidence of depression.

Discussion: Changes related to the individual's unique ageing experience are important explanatory factors related to the likelihood of developing depressive symptoms, rather than age itself. To diminish the incidence of depressive symptoms among older Estonian population, public health interventions should attempt to address factors which complicate existing health problems and facilitate continued independence and community involvement, both of which contribute to overall satisfaction with life.

Keywords

Depressive symptoms, ageing, Estonia, EURO-D, SHARE

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Background

An increasingly ageing population places the topic of the mental health of older adults high on the research agenda. The psychological, emotional, and physical symptoms of depressiveness strongly influence an individual's well-being and functioning. The condition has various levels of severity, chronicity, and recurrence. It can be related to other illnesses and can have a debilitating effect on an individual's work and social life.^{1,2} The prevalence of depression in Estonia is one of the highest in Europe at 5.9%.³ Depression is more prevalent among youth and older people, and the rate increases with age in Estonia as in other countries.^{2,4}

Depressiveness is more prevalent in Estonia than in other European countries and is estimated to affect 6%–9.7% of

Estonian middle-aged and older adults, with levels as high as 37%–51% among the eldest.^{3,5} The 2-year incidence of depressive symptoms is near 12% for the Estonian population aged 65+ years.⁶ We analyse the factors associated with the incidence of depressiveness over a 2- and a 4-year period among middle-aged and older Estonians. This

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approach provides insight into the risk factors for developing symptoms. With one exception,⁶ an analysis of the incidence of depressiveness by means of a large-scale population-based survey of older people in Estonia has not been undertaken.

Besides youth, depressiveness is more prevalent at older ages, reaching 51% among the oldest.^{2,5} Early onset depression is likely to recur in later age due to lack of treatment or comorbidities that render antidepressants less effective over time.⁷ Age differences in depression in Estonia have previously been linked to socio-economic, demographic, and health factors.^{2,8}

The prevalence and incidence of depressiveness is typically twice as high among women as among men.^{2,5,6,9–11} The least risk of depressiveness for both genders has been associated with favourable socio-economic position and partnership status; however, lower educational achievement is more predictive of depression in women than in men among adult Europeans, possibly because women are more dependent on education to achieve socio-economic success.¹¹

Social support protects individuals from depressiveness by means of different mechanisms. For that reason, partnered individuals report lower levels of depression than those who are widowed, separated, or divorced.^{2,9,12} The death of a spouse is more likely to cause depression among men than among women.¹¹ Remaining socially active through participation in various organisations safeguards mental health by providing emotional support, promoting self-efficacy, and warding off loneliness and thoughts of one's own mortality.^{2,13,14}

The risk of depressiveness tends to be greater among those with less education; achieving more than a primary level of education appears to lessen the incidence of depressive symptoms among older adults.¹⁵ This may be related to one's employment situation, lower household income, or a disparity between care requirements and financial resources.

Evidence of the role of income and income inequality in depression is mixed. The lifetime prevalence of depression is higher in higher-income countries.⁹ Social deprivation has a stronger influence on depression than income inequality among the older population in some localities;¹⁶ no difference between urban and rural areas in depressiveness has been identified in Estonia.¹⁷

The presence of chronic diseases and functional limitations is associated with a greater incidence of depressiveness.^{6,11,18–20} Older people with no activity limitations enjoy higher levels of independence, life satisfaction, and are more active.¹⁹ Greater satisfaction with life is correspondingly associated with developing fewer everyday activity limitations and avoiding depression in later life.²⁰

A higher level of physical activity is related to fewer depressive symptoms among older adults (65+ years) over a 2-year period, while it is possible that among the younger segment of older adults (50–64 years), an impairment in independence or physical activity may lead to depressiveness.²¹ Current alcohol use is associated with fewer depressive

symptoms among older people, compared with abstainers.²² The reasons include lower social networking and participation levels among abstainers, other related health problems, and previous heavy consumption of alcohol.^{22,23} Smokers are more likely than non-smokers to experience depression.²³

Internet and computer use decrease depression by reducing loneliness and social isolation.^{24,25} A relatively low proportion of Estonians aged 55+ years report using the Internet; older working men have lower computer skills due to a lack of learning opportunities.²⁶ Taking part in various social, leisure, and cognitive activities may benefit mental health, but these are the least common pastimes among Estonians aged 65+ years; solitary activities such as reading are more popular.²⁶

Research aim

The main purpose of this research is to understand the factors related to the onset (i.e. incidence) of depressive symptoms in middle and old age in Estonia.

Methods

Data and sample

The Survey of Health, Ageing and Retirement in Europe (SHARE) is a longitudinal pan-European study of the population aged 50 years and above. Respondents are interviewed every 2 years in Estonia. A refresher sample of 50–52-year-olds is added every other wave. Respondents are selected based on a probability sample of people aged 50+ years residing in Estonia according to the population register. Interviews were conducted by means of computer-assisted personal interviewing (CAPI). Respondents were informed of the purpose of the survey and asked for written consent to participate.

We use SHARE data mainly from waves conducted in 2013 and 2015, Version 7.0.0. As no 50–52-year-olds were added in Wave 5, individuals aged 53 years (in 2013) and older are analysed to avoid under-representation of younger people. We include those in their fifties in order to capture a broader range of the life course prior to reaching old age. Methodological information about the survey can be read in previous publications.^{27,28}

A total of 5752 respondents were included in Wave 5 in Estonia. After excluding those of unsuitable ages ($n=128$), not interviewed in Wave 6 ($n=1134$), with depressive symptoms in Wave 5 ($n=1521$), missing values for depressiveness in Wave 5 ($n=178$), or missing values for different variables ($n=278$) including depressiveness in Waves 4 and 6, an analytical sample of 2513 people remained (Figure 1).

Measurement of depressiveness

The focus of this article is on those who are experiencing depressiveness according to a screening test based on self-reported symptoms. Individuals are considered depressive if

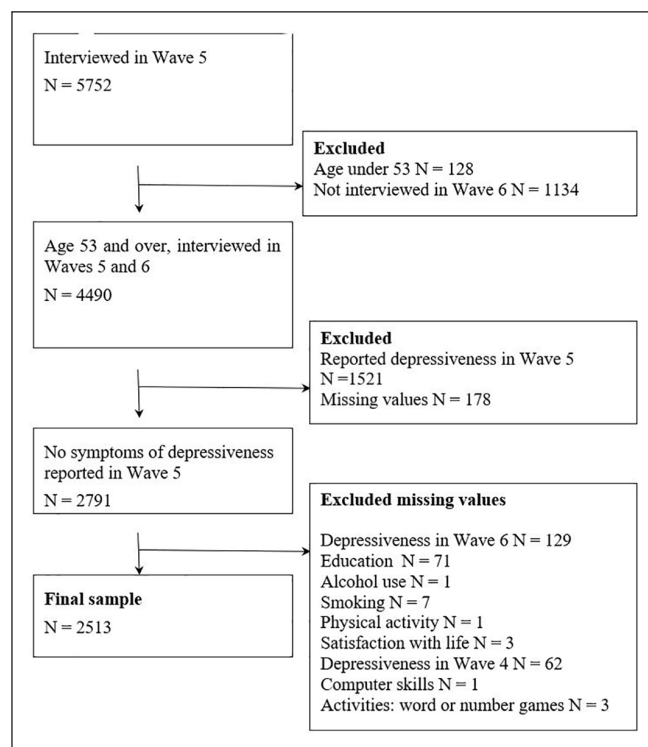


Figure 1. Analytical sample selection.

they have experienced three or more symptoms during the last 4 weeks. Relying on a survey of self-reported estimates rather than on a formal medical diagnosis gives some idea of the number of people experiencing this condition, including mild or low-level chronic depressive symptoms.

Depressiveness was assessed according to a discrete EURO-D measure that captures self-reported depressive symptoms such as pessimism, guilt, suicidal thoughts, irritation, sleep disturbances, changes in interests, appetite, fatigue, concentration, and enjoyment. EURO-D has been developed based on multiple scales and instruments specifically for comparing later-life depressiveness in European countries. It has been validated for the 50+ years population and separately for those aged 65+ years in various countries, including neighbouring Finland, but not in Eastern Europe.^{29,30} The EURO-D scale includes 12 binary variables with a value of 0 or 1. The sum of the values of the binary variables produces a score that indicates the level of depressiveness. The baseline score for depressiveness has been determined to be three and above (EURO-D ≥ 4).³⁰ Cronbach's alpha shows relatively high internal reliability of the EURO-D scale for Estonia: 0.8399 for Wave 4, 0.7585 in case of Wave 5, and 0.7532 for Wave 6.

Socio-demographic and health variables

Most of the independent variables are self-reported and were included at the baseline (2013). The socio-demographic variables include a continuous age variable, gender (male–female),

marital status (married/cohabiting, never married, divorced, widowed), and whether one received practical or personal help from others within or outside of the household during the last year (yes or no).

The socio-economic variables include level of education (basic, secondary, and tertiary based on the International Standard Classification of Education (ISCED) classification), employment status (retired, employed, other), and income. Household income was divided by the number of members of the household in order to calculate individual average income, and categorised according to the minimum and average salaries in Estonia at the time of the survey in 2013 (0–319, 320–929, 930+ euros).

The health and well-being variables included everyday activity limitations based on the validated Global Activity Limitation Instrument (GALI) measure (severe/moderate limitations were grouped together),³¹ life satisfaction (on a continuous scale of 0–10), and the Wave 4 depressiveness score (on a continuous scale of 0–10, based on EURO-D) to adjust for recurrent depressive symptoms. Moderate physical activity was categorised as ‘more than once a week’, ‘1–4 times a month’, or ‘almost never or never’. Frequency of alcohol consumption was divided into ‘5–7 days a week’, ‘1–2 times a month – 4 days a week’, ‘less than once a month’, or ‘did not consume alcohol in the last 3 months’. Smoking was classified as: ‘never smoked’, ‘former smoker’, or ‘current smoker’.

Analytical strategy

Chi-square and analysis of variance (ANOVA) tests were used to estimate statistically significant differences in the distribution of different variables by level of depressiveness. Binomial logistic regression models were estimated to calculate associations between incidence of depressiveness from Wave 5 to Wave 6, and baseline socio-demographic, economic and health factors. Only respondents with no reported depressiveness in Wave 5 were included in the analysis because we were interested in factors associated with new onset of depressiveness, and to make use of the panel design of the data set. The variables were added to the models one at a time, enabling the effect of each added variable on the previous models to be identified. All analyses were conducted using the Stata IC software version 14.

Other variables – country of birth, area of residence, partnership status, size of household, number of children, social network characteristics, number of chronic diseases, frequency of vigorous physical activity, participation in various activities, as well as change in status over time – were also tested. As they did not affect the outcome, results are presented without these iterations in the modelling.

Descriptive and statistical models were run for weighted as well as unweighted samples. Since the results did not differ by including one or both partners in the analysis, or between the weighted and unweighted models, only the unweighted results for both partners were included in the

analytical sample. As depressiveness reported in Wave 4 was most strongly associated with the incidence of depressiveness, we conducted a second analysis based on individuals who did not report symptoms of depressiveness in Wave 4 ($n=1851$) or Wave 5.

Results

The characteristics of the sample population by outcome are presented in Table 1: 21.9% of the middle-aged and older Estonian population who had no symptoms of depressiveness in 2013 developed symptoms. This proportion applied to both the unweighted and weighted samples (The incidence was slightly higher (22.8%) for the period between the previous waves (2011–2013). A quarter of the 65+ years population who initially reported no symptoms became depressed by 2013, and 22.8% by 2015. These findings are almost twice as high as those reported by Conde-Sala et al.⁶ for Estonia.). In addition, 16% of those with no symptoms of depressiveness in Wave 4 (2011) developed symptoms by 2015 (Table 4 in Appendix 1).

The univariate models show that with each year of age, the 2-year incidence of depressiveness increases by 2% among older adults (95% confidence interval (CI) 1.01–1.03, Table 2). Significant age differences mainly disappeared after accounting for everyday activity limitations and computer skills, whereas including previous depressiveness made age stratification statistically significant once again. Finally, each additional year of age was associated with a 1% increase in the incidence of depressiveness, but this did not reach the level of significance.

Women had 48% higher odds of becoming depressed compared to men (AOR (Adjusted Odds Ratio (Model 2 in Table 2))=1.48, 95% CI 1.15–1.90). Gender differences in becoming depressive by Wave 6 were smallest after adjusting for previous depressiveness, although playing word and number games, and level of computer skills, also reduced some of the gender difference. Those with only a basic education exhibited the highest odds of experiencing depressiveness compared with highly educated people, but no statistically significant differences remained in the adjusted models. Furthermore, no differences remained for marital status or for receiving practical or personal assistance.

Differences between the categories of employment status with regard to the incidence of depressiveness disappeared after adjusting for computer skills and playing word or number games. The inverse association between income level and becoming depressive reversed after controlling for socio-economic and mental health status such that those with the highest income were found to have a 22% higher incidence of depressiveness compared to other groups (AOR=0.82, 95% CI 0.55–1.23, AOR=0.82, 95% CI 0.63–1.06).

Adjusting for socio-demographic and health factors, especially previous depressiveness, reduced the impact of

activity limitations with respect to becoming depressive, but people with limitations still showed significantly higher odds of developing depressive symptoms (AOR=1.41, 95% CI 1.13–1.75). Regarding health behaviour factors, those who engaged in moderate physical activity only once a week or less exhibited the highest and most significant incidence of depressiveness compared with those who were active more often (AOR=1.39, 95% CI 1.03–1.87). A higher level of satisfaction with life and better computer skills both protected against becoming depressive by Wave 6.

As reported depressiveness in Wave 4 was one of the most important factors explaining differences in the 2-year incidence of depressiveness, we ran a second set of models with only those who did not report depressiveness in Wave 4 or Wave 5 ($n=1851$, Table 3). Again, there were no significant age differences in incidence (AOR=1.97, 95% CI 0.95–1.20) after adjusting for everyday activity limitations. Subsequent inclusion of life satisfaction in the model removed any statistical significance for the influence of activity limitations on later depressiveness (AOR=1.28, 95% CI 0.98–1.69).

However, the odds of developing depressiveness among women remained almost 50% higher than men. Controlling for alcohol consumption reduced the significance of gender differences, but adjusting for computer skills and playing word and number games restored the gender difference. In the final model, the following factors retained a statistically significant role in predicting new onset of depressiveness by 2015: women, individuals of both genders who engage in moderate physical activity once a week or less, have lower life satisfaction, poorer Internet and computer skills, or do not play word or number games.

Our analytical approach was thorough. We also reviewed separate models for men and women to explore the role of different risk factors (not shown). Four-year incidence of depressiveness was significantly higher among highly educated women (AOR=0.54, 95% CI 0.30–0.97 for those with basic education), while having everyday activity limitations was associated with twice the odds of depressiveness among men (AOR=1.99, 95% CI 1.24–3.18). For both genders, not playing word or number games was significantly associated with depressiveness (AOR=1.71, 95% CI 1.10–2.65 for men; AOR=1.77, 95% CI 1.24–2.53 for women). Among women, lower life satisfaction (AOR=0.85, 95% CI 0.77–0.93) and poorer computer skills (AOR=0.82, CI 95% 0.68–0.98) were also significantly associated with depressiveness.

Discussion

We assessed the incidence of depressiveness among middle-aged and older Estonians (53+ years) between 2013 and 2015, and also between 2011 and 2015. We used a longitudinal survey to analyse the factors associated with becoming depressed over a 2- and 4-year period among individuals who had initially reported not being depressed. This approach enabled us to better identify the potential factors associated

Table 1. Descriptive statistics of the incidence of depressiveness among the Estonian middle-aged and older population by socio-demographic, socio-economic, health, and behavioural characteristics of those who did not report depressiveness in Wave 5 (SHARE, $n=2513$).

| Characteristics | Depressiveness in Wave 6 | | | | Total | p-value |
|--|--------------------------|-------|-----------------|-------|-------|---------|
| | No | SE | Yes | SE | | |
| | mean/number (%) | | mean/number (%) | | | |
| Age in Wave 5 | | | | | | |
| Age (53–95 years) | 66.60 | 0.20 | 68.02 | 0.41 | 2513 | <0.001 |
| Gender | | | | | | |
| Male | 842 (82.6) | | 178 (17.5) | | 1020 | <0.001 |
| Female | 1121 (75.1) | | 372 (24.9) | | 1493 | |
| Education | | | | | | |
| Higher | 530 (81.8) | | 118 (18.2) | | 648 | 0.005 |
| Secondary | 989 (78.1) | | 277 (21.9) | | 1266 | |
| Basic | 444 (74.1) | | 155 (25.9) | | 599 | |
| Marital status | | | | | | |
| Married | 1266 (79.3) | | 330 (20.7) | | 1596 | 0.164 |
| Never married | 158 (78.6) | | 43 (21.4) | | 201 | |
| Divorced | 223 (76.4) | | 69 (23.6) | | 292 | |
| Widowed | 316 (74.5) | | 108 (25.5) | | 424 | |
| Receiving assistance in Wave 5 | | | | | | |
| Yes | 215 (73.9) | | 76 (26.1) | | 291 | 0.004 |
| No | 1420 (77.6) | | 411 (22.5) | | 1831 | |
| N/A | 328 (83.9) | | 63 (16.1) | | 391 | |
| Employment status in Wave 5 | | | | | | |
| Employed | 731 (82.5) | | 155 (17.5) | | 886 | <0.001 |
| Unemployed | 118 (70.7) | | 49 (29.3) | | 167 | |
| Retired | 1114 (76.3) | | 346 (23.7) | | 1460 | |
| Income in Wave 5 (2013) | | | | | | |
| 930+ | 615 (80.7) | | 147 (19.3) | | 762 | 0.008 |
| 320–929 | 1139 (78.0) | | 321 (22.0) | | 1460 | |
| 0–319 | 209 (71.8) | | 82 (28.2) | | 291 | |
| Activity limitations in Wave 5 | | | | | | |
| No | 1051 (84.0) | | 200 (16.0) | | 1251 | <0.001 |
| Yes | 912 (72.3) | | 350 (27.7) | | 1262 | |
| Smoking in Wave 5 | | | | | | |
| Current smoker | 346 (80.1) | | 86 (19.9) | | 432 | 0.270 |
| Former smoker | 553 (79.2) | | 145 (20.8) | | 698 | |
| Never smoked | 1064 (76.9) | | 319 (23.1) | | 1383 | |
| Alcohol use in Wave 5 | | | | | | |
| Did not use in last 3 months | 692 (72.6) | | 261 (27.4) | | 953 | <0.001 |
| Five to seven times a week | 69 (78.4) | | 19 (21.6) | | 88 | <0.001 |
| One to two times a month–four times a week | 769 (84.1) | | 145 (15.9) | | 914 | |
| Less than once a month | 433 (77.6) | | 125 (22.4) | | 558 | |
| Physical activity in Wave 5 moderate | | | | | | |
| >Once a week | 1501 (80.0) | | 376 (20.0) | | 1877 | 0.002 |
| Once a week | 229 (72.0) | | 89 (28.0) | | 318 | |
| One to three times a month | 96 (73.3) | | 35 (26.7) | | 131 | |
| Almost never | 137 (73.3) | | 50 (26.7) | | 187 | |
| Satisfaction with life | | | | | | |
| Satisfaction level (0–10) | 6.788 | 0.042 | 6.086 | 0.081 | 2513 | <0.001 |
| Depressiveness in Wave 4 | | | | | | |
| Depressiveness (0–10) | 2.170 | 0.039 | 3.391 | 0.081 | 2513 | <0.001 |
| Computer skills in Wave 5 | | | | | | |
| Skill level (1–6) | 2.563 | 0.030 | 2.211 | 0.055 | 2513 | <0.001 |
| Activities: word or number games in Wave 5 | | | | | | |
| Selected | 1108 (81.6) | | 250 (18.4) | | 1358 | <0.001 |
| Not selected | 855 (74.0) | | 300 (26.0) | | 1155 | |

SE: standard error; N/A: not available.

Table 2. Multivariate logistic regression of associations between incidence of depressiveness and socio-demographic, socio-economic, health, and behavioural characteristics of those who did not report depressiveness in Wave 5 ($n=2153$).

| Variables | Model 1 ^a (95% CI) | Model 2 ^b (95% CI) |
|--|-------------------------------|-------------------------------|
| Age in Wave 5 | | |
| Age (53–95 years) | 1.02 (1.01–1.03)** | 1.01 (1.00–1.03) |
| Gender | | |
| Male | 1 | 1 |
| Female | 1.57 (1.30–1.90)*** | 1.48 (1.15–1.90)** |
| Education | | |
| Higher | 1 | 1 |
| Secondary | 1.26 (0.99–1.60) | 0.99 (0.76–1.30) |
| Basic | 1.57 (1.20–2.06)** | 0.93 (0.67–1.30) |
| Marital status | | |
| Married | 1 | 1 |
| Never married | 1.04 (0.73–1.50) | 0.81 (0.53–1.22) |
| Divorced | 1.19 (0.88–1.60) | 0.98 (0.69–1.38) |
| Widowed | 1.31 (1.02–1.69)* | 0.83 (0.61–1.15) |
| Receiving assistance in Wave 5 | | |
| Yes | 1 | 1 |
| No | 0.82 (0.61–1.09) | 0.96 (0.69–1.34) |
| N/A | 0.54 (0.37–0.79)** | 0.96 (0.61–1.49) |
| Employment status in Wave 5 | | |
| Employed | 1 | 1 |
| Unemployed | 1.96 (1.34–2.86)** | 1.45 (0.95–2.21) |
| Retired | 1.46 (1.18–1.82)** | 0.87 (0.64–1.20) |
| Income in Wave 5 (2013) | | |
| 930+ | 1 | 1 |
| 320–929 | 1.18 (0.94–1.48) | 0.82 (0.55–1.23) |
| 0–319 | 1.64 (1.20–2.25)** | 0.82 (0.63–1.06) |
| Activity limitations in Wave 5 | | |
| No | 1 | 1 |
| Yes | 2.02 (1.66–2.45)*** | 1.41 (1.13–1.75)** |
| Smoking in Wave 5 | | |
| Current smoker | 1 | 1 |
| Former smoker | 1.05 (0.78–1.43) | 1.15 (0.82–1.61) |
| Never smoked | 1.21 (0.92–1.59) | 1.08 (0.78–1.52) |
| Alcohol use in Wave 5 | | |
| Did not use in last 3 months | 1 | 1 |
| Five to seven times a week | 0.73 (0.43–1.23) | 1.05 (0.57–1.94) |
| One to two times a month–four times a week | 0.50 (0.40–0.63)*** | 0.75 (0.57–0.99)* |
| Physical activity in Wave 5 moderate | | |
| >Once a week | 1 | 1 |
| Once a week | 1.55 (1.18–2.03)** | 1.39 (1.03–1.87)** |
| One to three times a month | 1.46 (0.97–2.18) | 1.00 (0.65–1.56) |
| Almost never | 1.46 (1.03–2.05)* | 0.81 (0.54–1.23) |
| Satisfaction with life | | |
| Satisfaction level (0–10) | 0.82 (0.78–0.86)*** | 0.87 (0.82–0.92)*** |
| Depressiveness in Wave 4 | | |
| Depressiveness (0–10) | 1.43 (1.36–1.51)*** | 1.37 (1.29–1.45)*** |
| Computer skills in Wave 5 | | |
| Skill level (1–6) | 0.81 (0.75–0.87)*** | 0.88 (0.79–0.98)* |
| Activities: word or number games in Wave 5 | | |
| Selected | 1 | 1 |
| Not selected | 1.56 (1.29–1.88)*** | 1.48 (1.19–1.83)*** |

CI: confidence interval; N/A: not available.

^aUnadjusted.^bAdjusted for all factors.* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3. Multivariate associations between incidence of depressiveness and socio-demographic, socio-economic, health, and behavioural characteristics of those who did not report depressiveness in Waves 4 and 5 (SHARE, $n = 1851$).

| Variables | Model 1 ^a (95% CI) | Model 2 ^b (95% CI) |
|--|-------------------------------|-------------------------------|
| Age in Wave 5 | | |
| Age (53–95 years) | 1.03 (1.01–1.04)*** | 1.07 (0.95–1.20) |
| Gender | | |
| Male | | |
| Female | 1.35 (1.05–1.73)** | 1.49 (1.08–2.05)* |
| Education | | |
| Higher | | |
| Secondary | 1.04 (0.77–1.41) | 0.77 (0.51–1.16) |
| Basic | 1.41 (1.00–1.99)* | 0.78 (0.56–1.09) |
| Marital status | | |
| Married | | |
| Never married | 1.20 (0.75–1.91) | 1.02 (0.62–1.69) |
| Divorced | 1.12 (0.75–1.68) | 1.05 (0.67–1.65) |
| Widowed | 1.34 (0.96–1.86) | 1.00 (0.67–1.48) |
| Receiving assistance in Wave 5 | | |
| Yes | | |
| No | 0.83 (0.57–1.22) | 1.01 (0.67–1.52) |
| N/A | 0.57 (0.35–0.94)* | 0.92 (0.51–1.54) |
| Employment status in Wave 5 | | |
| Employed | | |
| Unemployed | 1.84 (1.11–3.06)* | 1.43 (0.83–2.48) |
| Retired | 1.59 (1.19–2.11)** | 0.94 (0.63–1.39) |
| Income in Wave 5 (2013) | | |
| 930+ | | |
| 320–929 | 1.26 (0.94–1.68) | 0.87 (0.62–1.21) |
| 0–319 | 1.49 (0.97–2.30) | 0.72 (0.43–1.22) |
| Activity limitations in Wave 5 | | |
| No | | |
| Yes | 1.65 (1.29–2.11)*** | 1.28 (0.98–1.69) |
| Smoking in Wave 5 | | |
| Current smoker | | |
| Former smoker | 1.02 (0.69–1.51) | 1.05 (0.69–1.61) |
| Never smoked | 1.19 (0.83–1.70) | 0.93 (0.61–1.42) |
| Alcohol use in Wave 5 | | |
| Five to seven times a week | | |
| One to two times a month–four times a week | 0.53 (0.27–1.04) | 0.52 (0.26–1.02) |
| Less than once a month | 0.99 (0.50–1.96) | 0.79 (0.39–1.61) |
| Did not use in last 3 months | 1.13 (0.58–2.18) | 0.82 (0.40–1.65) |
| Physical activity in Wave 5 moderate | | |
| >Once a week | | |
| Once a week | 1.69 (1.20–2.38)** | 1.49 (1.04–2.13)** |
| One to three times a month | 1.09 (0.59–2.00) | 0.84 (0.44–1.58) |
| Almost never | 1.27 (0.76–2.10) | 0.91 (0.54–1.55) |
| Satisfaction with life | | |
| Satisfaction level (0–10) | 0.85 (0.80–0.91)*** | 0.87 (0.81–0.93)*** |
| Computer skills in Wave 5 | | |
| Skill level (1–6) | 0.77 (0.70–0.86)*** | 0.83 (0.72–0.96)** |
| Activities: word or number games in Wave 5 | | |
| Selected | | |
| Not selected | 1.77 (1.38–2.27)*** | 1.70 (1.29–2.30)*** |
| R2 | | 0.0595 |

CI: confidence interval; N/A: not available.

^aUnadjusted.^bAdjusted for all variables.* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

with developing symptoms of depressiveness, especially in the context of ageing and in a country with a relatively high proportion of middle-aged and older people who had previously reported experiencing depressiveness. Analyses of mental health based on large-scale population surveys have rarely been undertaken, especially in an Eastern European setting.

We found that 22% of middle-aged and older Estonians became depressive over the 2-year period and 16% became depressive over 4 years. Relative to other findings, the Estonian outcomes are high.^{5,20,32} In line with Western countries,¹⁰ women had double the odds of becoming depressive over the 2-year and 4-year periods.

A score indicating depressiveness in Wave 4 was one of the most important factors for reducing or eliminating differences in the incidence of depressiveness between men and women. Other important explanatory factors were basic and higher levels of education, those with and without everyday activity limitations, income groups, and whether or not the person was receiving assistance. Adding previous depressiveness to the model also made age once again a statistically important factor, after being overpowered by the influence of health and health behaviour. Upon incorporating those with no incidence of depressiveness over the 4-year period into our analysis, no significant difference in incidence of depressiveness by age remained, as everyday activity limitations explained any residual variations.

Our results suggest that everyday activity limitations are strongly related to depressiveness over time. The existence of limitations can cause depressiveness, leading to recurring or even chronic depressiveness, especially in cases of increasing functional limitations. When depressiveness leads to developing some everyday activity limitations, a cycle of depressiveness may ensue. Our findings indicate that such limitations also affect life satisfaction. The causal mechanisms could be identified by analysing a longer panel. However, since controlling for differences in everyday activity limitations eliminated differences in the incidence of depressiveness between people of various ages, we are inclined to interpret the findings in the context of disability – the symptoms of depressiveness in middle and old age may have developed due to obstacles created by activity limitations.^{20,32} Early prevention and treatment of specific illnesses might help to prevent or alleviate depressiveness later. Removing barriers that prohibit those with everyday activity limitations from fully participating in the life of the community might yield positive results, including increased satisfaction with life, which tends to be especially important for women. Men with everyday activity limitations are one of the vulnerable groups, with double the odds of becoming depressed over the 4-year period relative to men without such impairments.

Although employment status and income produced differences in the incidence of depressiveness between those with tertiary and secondary education, previous depressiveness

eliminated the differences between tertiary and basic education, leaving no significant differences in the 2-year incidence by education. The fact that women with basic education exhibited significantly lower odds of depressiveness over the 4-year period compared with highly educated women is probably a statistical artefact as the number of highly educated depressive women is small ($n=18$).

Recurring depression is likely in middle and old age in Estonia as elsewhere.⁷ However, better computer skills and playing word or number games function as coping mechanisms, as they reduced age differences to insignificant levels, confirming similar findings elsewhere.^{24,25} Possessing a higher level of such skills and being involved in these types of activities decreased the odds of depressiveness over both observation periods. However, lower computer skills were significantly associated with depressiveness only for women over the 4-year period. Computer skills might reflect the existence of social, material, and cognitive resources; playing word and number games might be an indication of an individual's cognitive resources. The distribution of such resources varies and counteracts developing depressiveness in later life in different ways.

Several conclusions can be drawn. First, the emergence of symptoms of depressiveness among middle-aged and older Estonians is more closely related to physical and mental health, and to cognitive activities, than to differences in demographic or socio-economic structures and characteristics. These findings confirm earlier results for middle-aged and older Estonians.^{5,6} Therefore, an accumulation of life events, trajectories, or health situations that have affected women and men differently are linked to the onset of depressiveness in old age.

We confirmed that age alone is not a risk factor for developing symptoms of depressiveness;³³ however, differences in health and cognitive resources among people of diverse ages are associated with variation in the risk of becoming depressive in middle and old age. This could be related to difficulties coping with changing circumstances linked to ageing, and deficiencies in the services provided for people experiencing such changes. These can include developing physical health limitations, losing close friends or family members, and experiencing changes in social roles and skills. A lack of computer skills, which have become increasingly important, may intensify the social and physical barriers encountered by those with activity limitations, effectively isolating them.

From the public health perspective, our findings highlight the need to monitor middle-aged and older people with a history of previous depression or everyday activity limitations, while being mindful of gender differences. A helpful approach to mental health in old age has been proposed in the geriatric psychiatry literature,³⁴ which emphasises paying attention to how individuals are adjusting to the life changes that accompany old age in addition to symptoms of depressiveness. All parties – health professionals as well as

informal networks – have a responsibility to find a balance between dignity, autonomy, capabilities, and degree of dependence for older people.

Limitations and strengths

The current results should be interpreted as associations rather than causes. The primary age of onset of symptoms of depressiveness tends to be much earlier than 50 years,⁹ so it is likely that we have not fully identified the effects of all possible earlier life and health situations on depressiveness in older age.

The incidence of depressiveness is relatively high according to our findings. EURO-D should be validated for Estonia to evaluate the appropriateness of the measure. Twice the incidence of depressiveness was found among the 65+ years population compared with an earlier analysis.⁶ The authors used a similar sample and indicator to estimate the incidence of depressiveness in several European countries, including Estonia, and found a 13.2% incidence of depressiveness among Europeans aged 65+ years between 2013 and 2015. The exact numerator and denominator for calculating the incidence in Estonia have not been specified by Conde-Sala et al.⁶ In their study, the total Estonian sample (aged 65+ years) included 2393 people; however, it is not clear how many were included in the calculation of incidence. If we separate our sample into those aged 53–64 years and those aged 65+ years, the former group is comprised of 1430 individuals, and the latter 1083. This may explain the difference in incidence outcomes. Different sample selection procedures affect the comparability of the findings. Due to using existing SHARE data with its established sampling procedure, no sample size calculation/power analysis was conducted.

Selection bias might have resulted from the presence of more or fewer depressive individuals in our analytical sample. The proportion of the institutional population is relatively low in Estonia,³⁵ and was not specifically sampled. The incidence of depression is generally higher among an institutionalised population,³⁴ and our results might have differed had more people in this vulnerable position been included. Those in institutional settings could have higher unmet psychological needs with the potential to cause various forms of mental distress, such as depression.³⁴

The sample from a large population-level survey of middle-aged and older people enabled an in-depth analysis of different factors associated with the emergence of symptoms of depressiveness. The lack of differences in results between the weighted and unweighted samples suggests that the results are representative of the population aged 53+ years in Estonia. The SHARE Estonia survey has a sufficiently large sample without an upper age limit, while in other cases, individuals in the 80+ years age group have not been included, or the analysis focussed only on the 65+ years population. Respondents aged 80+ years ($n=232$) have been well represented in our study. A panel survey design

allowed us to study the incidence of depressiveness and related factors over a 2-year observation period, including symptoms of depressiveness reported 4 years earlier.

Conclusion

This study highlights the importance of examining symptoms of depressiveness among middle-aged and older people by identifying the factors associated with their incidence, especially those related to age and gender, although these differences were moderated by other factors. We find indications that precipitating life events may influence the likelihood of becoming depressive in middle and old age, especially with respect to the development of everyday activity limitations among men. Another important finding relates to the protective role of cognitive resources and activities in the incidence of depressiveness. These findings contribute to the development of public health interventions which are sufficient to address the dynamics of depressiveness over time in Estonia; however, further potential factors should be studied.

Author contributions

G.O. and L.A. conducted the statistical analysis. G.O. and K.L. reviewed and contributed to the manuscript. L.A. wrote the paper. Dolores Talp Lindsay and Allison Krug edited the language of the manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Until July 2011, the Survey of Health, Ageing and Retirement in Europe (SHARE) was reviewed and approved by the Ethics Committee of the University of Mannheim. Since then, the Ethics Council of the Max Planck Society for the Advancement of Science (MPG) is responsible for ethical reviews and the approval of the study. More information can be found on the SHARE website (no ethics approval number is included there): <http://www.share-project.org/faqs/3-methodology.html>. No ethical approval was needed for conducting the analysis for our article.

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Informed consent

Written informed consent was obtained from all subjects before the study.

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Data availability

Data are distributed by SHARE-ERIC (Survey of Health, Ageing and Retirement in Europe – European Research Infrastructure Consortium) to registered users through the SHARE Research Data Centre (<http://share-project.org/>).

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Appendix I

Table 4. Incidence of depressiveness among the Estonian middle-aged and older population by socio-demographic, socio-economic, health, and behavioural characteristics of those who did not report depressiveness in Waves 4 and 5 (SHARE, $n = 1851$).

| Characteristics | Depressiveness in Wave 6 | | | SE | Total | p-value |
|--|--------------------------|-------|---------------------|-------|-------|---------|
| | No | SE | Yes | | | |
| | mean/ number (%) | | mean/ number (%) | | | |
| Age in Wave 5 | | | | | | |
| Age (53–95 years) | 66.58 | 0.22 | 68.87 | 0.41 | 1851 | <0.001 |
| Gender | | | | | | |
| Male | 710 (86.2) | | 114 (13.8) | | 824 | 0.020 |
| Female | 844 (82.2) | | 183 (17.8) | | 1027 | |
| Education | | | | | | |
| Higher | 333 (80.4) | | 81 (19.6) | | 414 | 0.083 |
| Secondary | 785 (84.8) | | 141 (15.2) | | 926 | |
| Basic | 436 (85.3) | | 75 (14.7) | | 511 | |
| Marital status | | | | | | |
| Married | 1024 (85) | | 181 (15) | | 1205 | 0.347 |
| Never married | 118 (82.5) | | 25 (17.5) | | 143 | |
| Divorced | 171 (83.4) | | 34 (16.6) | | 205 | |
| Widowed | 241 (80.9) | | 57 (19.1) | | 298 | |
| Receiving assistance in Wave 5 | | | | | | |
| Yes | 164 (80.8) | | 39 (19.2) | | 203 | 0.063 |
| No | 1112 (83.5) | | 220 (16.5) | | 1332 | |
| N/A | 278 (88) | | 38 (12) | | 316 | |
| Employment status in Wave 5 | | | | | | |
| Employed | 868 (82) | | 191 (18) | | 1059 | 0.002 |
| Unemployed | 592 (87.8) | | 82 (12.2) | | 674 | |
| Retired | 94 (79.7) | | 24 (20.3) | | 118 | |
| Income in Wave 5 (2013) | | | | | | |
| 930+ | 507 (86.2) | | 81 (13.8) | | 192 | 0.130 |
| 320–929 | 892 (83.3) | | 179 (16.7) | | 1071 | |
| 0–319 | 155 (80.7) | | 37 (19.3) | | 588 | |
| Activity limitations in Wave 5 | | | | | | |
| No | 873 (87) | | 130 (13) | | 1003 | <0.001 |
| Yes | 681 (80.3) | | 167 (19.7) | | 848 | |
| Smoking in Wave 5 | | | | | | |
| Current smoker | 272 (85.3) | | 47 (14.7) | | 319 | 0.459 |
| Former smoker | 443 (85) | | 78 (15) | | 521 | |
| Never smoked | 839 (83) | | 172 (17) | | 1011 | |
| Alcohol use in Wave 5 | | | | | | |
| Did not use in last 3 months | 53 (81.5) | | 12 (18.5) | | 65 | <0.001 |
| Five to seven times a week | 655 (89.2) | | 79 (10.8) | | 734 | |
| One to two times a month–four times a week | 329 (81.6) | | 74 (18.4) | | 403 | |
| Less than once a month | 517 (79.7) | | 132 (20.3) | | 649 | |
| Physical activity in Wave 5 | | | | | | |
| Moderate | | | | | | |
| >Once a week | 1210 (85.2) | | 210 (14.8) | | 1420 | 0.020 |
| Once a week | 184 (77.3) | | 54 (22.7) | | 238 | |
| One to three times a month | 69 (84.2) | | 13 (15.8) | | 82 | |
| Almost never | 91 (82) | | 20 (18) | | 111 | |
| Satisfaction with life | | | | | | |
| Satisfaction level (0–10) | 6.881 | 0.047 | 6.323 | 0.111 | 1851 | <0.001 |
| Computer skills in Wave 5 | | | | | | |
| Skill level (1–6) | 2.595 | 0.034 | 2.168 | 0.074 | 1851 | <0.001 |
| Activities: word or number games in Wave 5 | | | | | | |
| Selected | 890 (79.7) | | 128 (20.3) | | 833 | <0.001 |
| Not selected | 664 (87.4) | | 169 (12.6) | | 1018 | |

SE: standard error; N/A: not available.