

Supplementary Materials. Healthy Ageing Phenotypes and Four-Year Health Outcomes: Findings from a Prospective Cohort Study

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Supplementary Table 1. Biomedical Phenotype (HA-B). This phenotype, based on Rowe and Kahn's model [9], follows the operationalization by McLaughlin et al. [30], as adapted by Hank [29] to the SHARE dataset. A participant is classified as meeting HA-B criteria if all three dimensions are satisfied.

<i>DIMENSION 1 Low probability of illness and disability (A + B)</i>
A. NO Diseases
No self-reported diagnosis: Diabetes, Heart disease, chronic lung disease, Cancer; Stroke, Depression (Euro-D $\geq$ 4)
B. NO DISABILITY
No limitation in basic activities of daily living (ADL): walking indoors, dressing, bathing, eating, getting in/out of bed, and toileting
<i>DIMENSION 2 Maintenance of high physical and cognitive function (C + D)</i>
C. High Cognition total score above mean on 4 cognitive tests (max score 29):
• Orientation (max score 4) • Immediate Memory recall (max score 10) • Delayed Memory recall (max score 10) • Mathematical calculation (max score 5)
D. High Physical Functioning: 1 or No Limitation in physical function:
Walking 100 m, Climbing one floor, Climbing several floors, Squatting, pushing large objects, lifting >5 kg
<i>DIMENSION 3 Actively involved in society (E + F)</i>
E. Social Participation (minimum 1 out of 3):
• Paid work in the last month • Volunteer last month • Caregiving for grandchildren in the last year
F. Social Support (minimum 1 of 3):
• Living with a partner • Engaging in sports in the last month

Supplementary Table 2. Biopsychosocial Phenotype (HA-BPS). This phenotype reflects the WHO's multidimensional definition of HA, encompassing physical, mental, and social well-being. A participant is classified as meeting HA-BPS criteria if all three dimensions are satisfied:

<i>DIMENSION 1 Physical Well-being (A + B)</i>	
A. NO Fragility (SHARE-FI scale) (Pre-Fragile or Non-Fragile)	
B. Cognitive Function (if it meets the Orientation and Cognitive Test Criteria)	
· Orientation: give 4 correct orientation answers (day, week, day, month, year) · Cognitive test criteria: scoring above the age-adjusted 10th percentile in at least three of four cognitive tests (immediate memory, delayed memory, mathematical calculation, verbal fluency).	
<i>DIMENSION 2 Mental Well-being (C + D)</i>	
C. Self-reported life satisfaction: rated 7 or higher on a 0–10 scale	
D. Non-Depression: absence depressive symptoms (≤ 3 on EURO-D scale)	
<i>DIMENSION 3 Social Welfare (E + F)</i>	
E. Social Participation 1 of the 3 criteria (work, volunteering, social activities)	
1. Paid Work 2. Babysitting grandchildren 3. Social Activities: to do 1 or more social activities (sports, education, religion, politics, volunteering) with a satisfaction score of 7 or higher in the activity performed.	
F. Social support to have family support (1) OR social network (2)	
	1. Family support
	1.1 If they have children or a partner (required cohabitation or proximity (< 5 km) to children and a low loneliness score)
	Objective criterion a) 1.1 Live with the partner b) 1.2 Live with children or < 5 Km away c) 1.3 Weekly contact with children
	Subjective Loneliness (Revised UCLA Loneliness Scale): Feeling at all or little alone (R-UCLA < 5)
	1.2 Have no children, no partner: Solitude Scale (R-UCLA < 5)
2. Social network: They have given or received financial or domestic help	

Supplementary Table 3. STROBE Checklist

STROBE Item	Recommendation	Location in Article
Title and Abstract		
1. Title	Indicate study design in title or abstract	Title and Abstract
2. Abstract	Provide informative and balanced summary of methods and findings	Abstract section
Introduction		
3. Background/rationale	Explain scientific background and rationale	Introduction
4. Objectives	State specific objectives and hypotheses	Introduction
Methods		
5. Study design	Present key elements of study design early	Methods (2.1)
6. Setting	Describe setting, locations, and relevant dates	Methods (2.1)
7. Participants	Eligibility criteria, sources and methods of selection	Methods (2.1)
8. Variables	Define all outcomes, exposures, predictors, confounders, effect modifiers	Methods (2.2)
9. Data sources/measurement	Sources of data and details of measurement methods	Methods (2.2)
10. Bias	Describe efforts to address potential bias	Methods (2.2, 2.3)
11. Study size	Explain how study size was arrived at	Methods (2.1)
12. Quantitative variables	Explain handling of quantitative variables	Methods (2.2, 2.3)
13. Statistical methods	Describe statistical methods including confounding control, subgroup analyses, sensitivity analyses	Methods (2.3)
Results		
14. Participants	Numbers at each stage of study, reasons for non-participation, flow diagram	Results (3.1), Figure 1
15. Descriptive data	Characteristics of participants, exposures, confounders	Results (3.1), Table 1
16. Outcome data	Outcome events or summary measures	Results (3.2 - 3.4), Tables and Figures
17. Main results	Unadjusted and adjusted estimates with precision	Results (3.2 - 3.4), Tables 2 and Figures
18. Other analyses	Additional analyses (subgroups, interactions, sensitivity)	Results (3.2 - 3.4)
Discussion		
19. Key results	Summarize key results with reference to objectives	Discussion
20. Limitations	Discuss limitations and potential sources of bias	Discussion
21. Interpretation	Provide cautious overall interpretation considering objectives, limitations, and other evidence	Discussion
22. Generalisability	Discuss generalisability of results	Discussion
Other information		
23. Funding	Describe sources of funding and role of funders	Acknowledgments
24. Conflicts of interest	Declare conflicts of interest	Acknowledgments
25. Ethics	Ethical approval and consent process	Methods (2.1)

Supplementary Table 4. Comparison between individuals included in the analysis and those lost to follow-up in wave 7

	Included in the analysis	Lost to follow-up in wave 7
N	15,122	5,131
Gender – Male (n, %)	6,914 (45.72)	2,388 (46.54)
Age (mean, SD)	73.18 (6.25)	73.66 (6.62)
65-74	9,515 (62.92)	3,083 (60.09)
75+	5,607 (37.08)	2,048 (39.91)
Material deprivation (yes) (n, %)	7,329 (48.47)	2,201 (42.9)

Supplementary Table 5. Odds ratio estimates with 95% confidence intervals for binomial outcomes

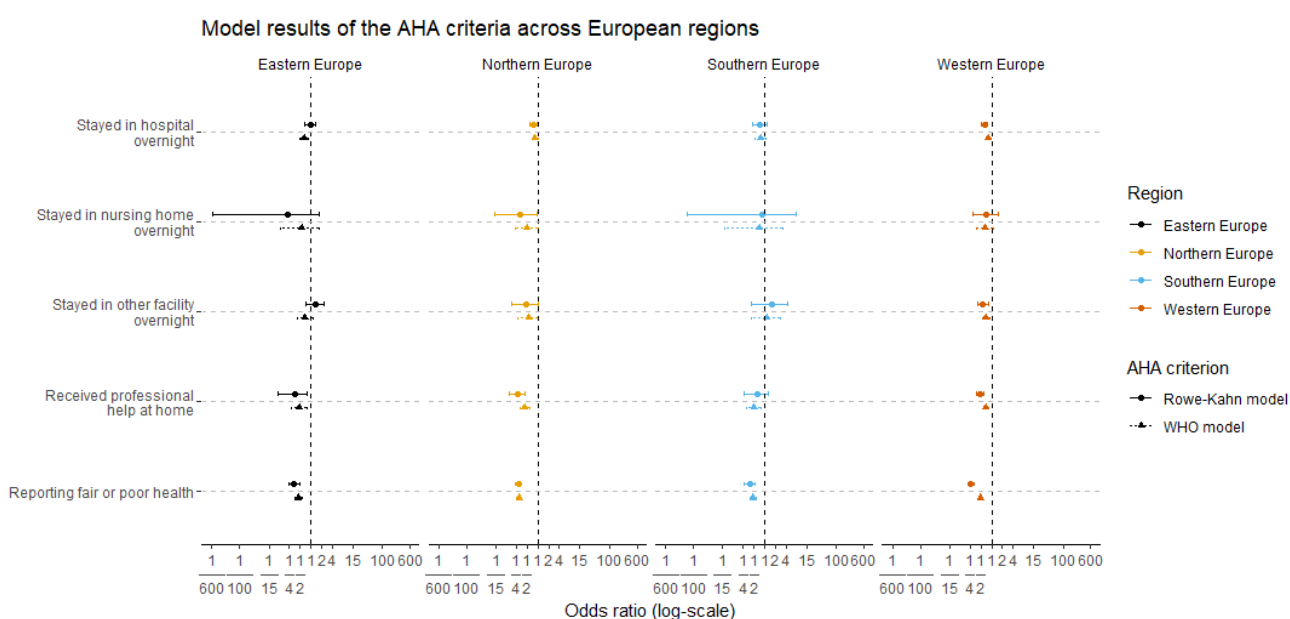
Outcome	HA phenotype	Non-adjusted models	Adjusted by gender, age and material deprivation	Adjusted by gender, age, material deprivation and country
Stayed in hospital overnight	Rowe-Kahn	0.68 (0.60, 0.76)*	0.73 (0.64, 0.82)*	0.71 (0.62, 0.80)*
	WHO	0.81 (0.74, 0.88)*	0.84 (0.76, 0.92)*	0.79 (0.71, 0.87)*
Stayed in nursing home overnight	Rowe-Kahn	0.21 (0.10, 0.41)*	0.46 (0.20, 0.89)*	0.40 (0.18, 0.78)*
	WHO	0.41 (0.27, 0.59)*	0.65 (0.43, 0.96)*	0.56 (0.36, 0.82)*
Stayed in other facility overnight	Rowe-Kahn	0.63 (0.49, 0.82)*	0.68 (0.52, 0.89)*	0.68 (0.51, 0.88)*
	WHO	0.70 (0.57, 0.84)*	0.73 (0.60, 0.89)*	0.69 (0.56, 0.84)*
Received professional help at home	Rowe-Kahn	0.29 (0.24, 0.36)*	0.45 (0.36, 0.55)*	0.43 (0.34, 0.53)*
	WHO	0.49 (0.43, 0.55)*	0.64 (0.56, 0.73)*	0.59 (0.51, 0.68)*
Reporting fair or poor health	Rowe-Kahn	0.23 (0.21, 0.26)*	0.30 (0.27, 0.33)*	0.30 (0.27, 0.34)*
	WHO	0.32 (0.30, 0.35)*	0.41 (0.38, 0.44)*	0.45 (0.42, 0.49)*

Supplementary Table 6. Linear regression coefficients with 95% confidence intervals

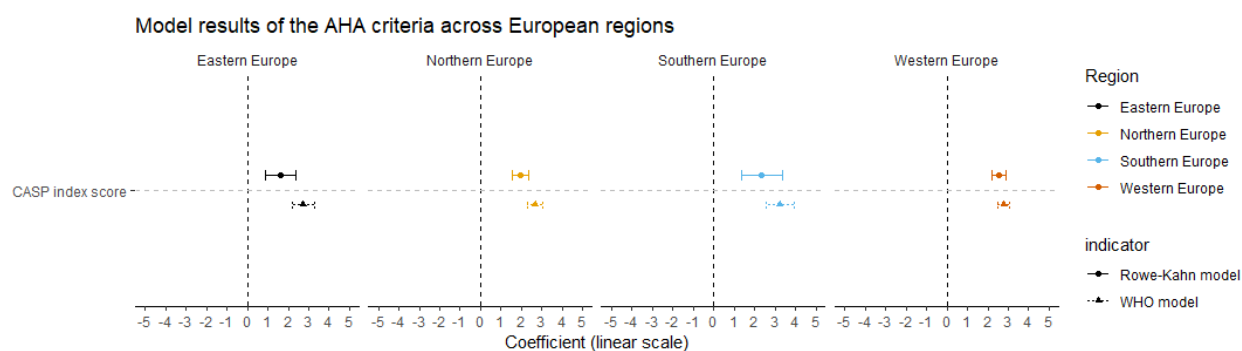
Outcome	HA phenotype	Non-adjusted models	Adjusted by gender, age and material deprivation	Adjusted by gender, age, material deprivation and country
CASP index score	Rowe-Kahn	3.92 (3.66, 4.18)*	2.68 (2.42, 2.94)*	2.22 (1.97, 2.47)*
	WHO	4.45 (4.24, 4.65)*	3.33 (3.13, 3.54)*	2.82 (2.62, 3.02)*

Supplementary Table 7. Hazard ratio estimates with 95% confidence intervals for survival models

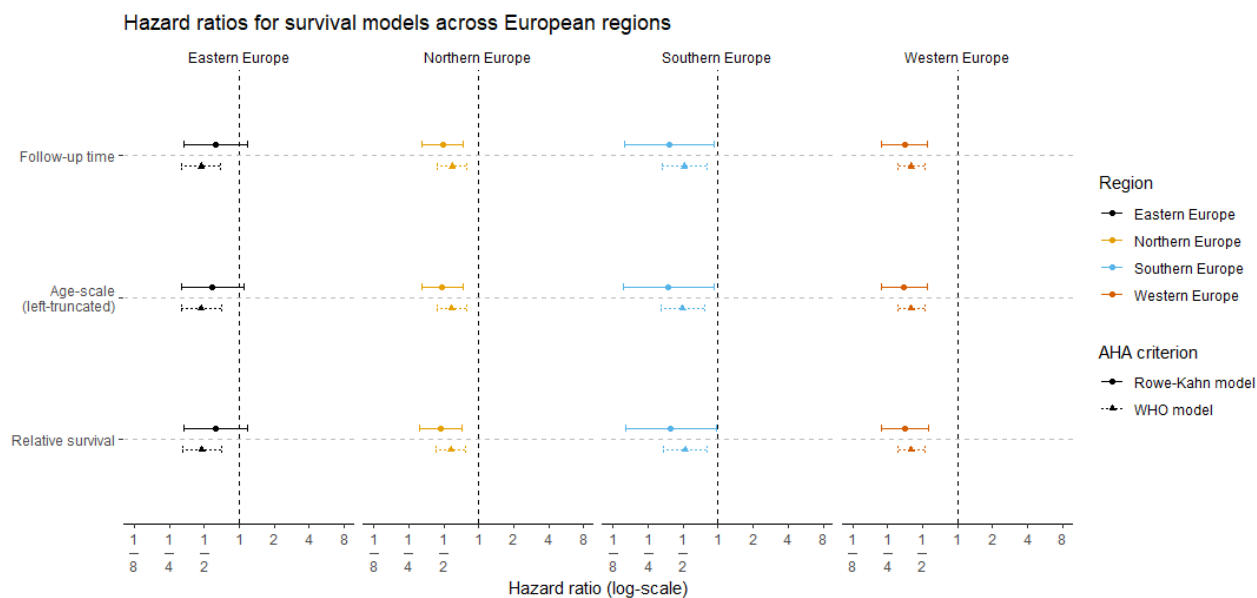
Outcome	HA phenotype	Non-adjusted models	Adjusted by gender, age and material deprivation	Adjusted by gender, age, material deprivation and country
Survival - Follow-up time	Rowe-Kahn	0.24 (0.19, 0.32)*	0.42 (0.32, 0.55)*	0.44 (0.34, 0.57)*
	WHO	0.34 (0.29, 0.39)*	0.47 (0.40, 0.55)*	0.48 (0.41, 0.56)*
Survival - Age-scale (left-truncated)	Rowe-Kahn	0.39 (0.30, 0.51)*	0.42 (0.32, 0.54)*	0.43 (0.33, 0.56)*
	WHO	0.47 (0.40, 0.54)*	0.47 (0.40, 0.55)*	0.48 (0.41, 0.56)*
Survival - Relative survival	Rowe-Kahn	0.36 (0.28, 0.46)*	0.41 (0.32, 0.53)*	0.44 (0.34, 0.57)*
	WHO	0.42 (0.36, 0.49)*	0.46 (0.39, 0.54)*	0.48 (0.41, 0.56)*



Supplementary Figure 1. Binomial model results for healthcare use and quality of life, stratified by European regions (Eastern Europe: Czech Republic and Slovenia; Northern Europe: Sweden, Finland and Estonia; Southern Europe: Spain and Italy; Western Europe: Austria, Germany, Switzerland, France and Belgium). Models were adjusted by age, sex, material deprivation and country.



Supplementary Figure 2. Linear model results for quality of life, stratified by European regions (Eastern Europe: Czech Republic and Slovenia; Northern Europe: Sweden, Finland and Estonia; Southern Europe: Spain and Italy; Western Europe: Austria, Germany, Switzerland, France and Belgium). Models were adjusted by age, sex, material deprivation and country.



Supplementary Figure 3. Hazard ratios for survival models, stratified by European regions (Eastern Europe: Czech Republic and Slovenia; Northern Europe: Sweden, Finland and Estonia; Southern Europe: Spain and Italy; Western Europe: Austria, Germany, Switzerland, France and Belgium). Models were adjusted by age, sex, material deprivation and country.

Supplementary Table 8. Multinomial model for number of visits to a healthcare professional last year, stratified by European regions (Eastern Europe: Czech Republic and Slovenia; Northern Europe: Sweden, Finland and Estonia; Southern Europe: Spain and Italy; Western Europe: Austria, Germany, Switzerland, France and Belgium). Models were adjusted by age, sex, material deprivation and country.

	HA-B phenotype	HA-BPS phenotype
N of doctor visits – Eastern Europe		
0	Reference	Reference
1-3	0.79 (0.41-1.52)	1.07 (0.65-1.77)
4-6	0.6 (0.31-1.16)	0.82 (0.49-1.35)
7+	0.54 (0.28-1.05)	0.81 (0.49-1.34)
N of doctor visits – Northern Europe		
0	Reference	Reference
1-3	1 (0.77-1.29)	1.22 (0.95-1.58)
4-6	0.61 (0.45-0.81)*	1.1 (0.84-1.45)
7+	0.52 (0.38-0.7)*	0.8 (0.61-1.06)
N of doctor visits – Southern Europe		
0	Reference	Reference
1-3	0.92 (0.5-1.69)	0.8 (0.51-1.26)
4-6	0.82 (0.44-1.53)	0.81 (0.51-1.27)
7+	0.55 (0.3-1.02)	0.71 (0.46-1.1)
N of doctor visits – Western Europe		
0	Reference	Reference
1-3	0.77 (0.58-1.03)	1.17 (0.89-1.54)
4-6	0.54 (0.4-0.72)*	1.06 (0.81-1.39)
7+	0.35 (0.26-0.47)*	0.85 (0.65-1.12)