



НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ

Does personality predict health? Non-cognitive skills, health behaviours, and longevity in Russia



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What are (non)-cognitive skills?



- **Cognitive skills, sometimes referred to as general intelligence (g), includes the capacity to “reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience” (Plomin, 1999);**
 - Traditionally measured with achievement and IQ tests;
 - Includes individual’s ability to read, write, and count (Green, 2010).
- **Non-cognitive skills are broadly defined as representing the “patterns of thought, feelings and behavior” (Borghans et al. 2008);**
 - Cannot be measured by IQ and achievements tests (Kautz et al., 2014);
 - In different areas of science can be referred to as personality traits or people skills;

Motivation



- **A growing interest in personality/non-cognitive skills in economics**
 - Part of human capital;
 - Long-term effects of non-cognitive skills on socio-economic outcomes (Heckman et al., 2006);
 - Related to education and may, at least partially, mediate the observed “education-health” gradient;
 - Partly formed by the social environment, remain responsive to external influences until late adolescence.
- **Certain personality traits may influence individual health and longevity**
 - Psychological factors cause many somatic diseases, including cardiovascular problems or the development of inflammatory processes (Hemingway, Marmot 1999);
 - Most evidence comes from psychological research with small samples and correlation analysis with no causation;
 - Not accounting for personality overestimates the effect of cognitive abilities and education on health.

Measuring personality



- **The Big Five (McCrae, John, 1992);**
 - **conscientiousness** (dutiful, disciplined, hard-working, following social norms)
 - **openness to experience** (creative, imaginative, intellectually curious)
 - **extraversion** (social, active, enthusiastic, adventurous)
 - **agreeableness** (friendly, considerate, kind, generous, trusting, helping)
 - **neuroticism** (impulsive, anxious, emotionally unstable)
 - Stability issues: the Big Five and locus of control, measured with short survey instruments, remain stable across one's working life. Cobb-Clark and Schurer (2012, 2011). Personality measured at the age of 30 can be considered as fixed (Terracciano et al. 2006).
- **Locus of control**
 - tendency to assign responsibility for life events either to third parties and circumstances (external locus of control) or to one's own behavior (internal locus of control)
- **Other measures may include leadership, self-esteem, preferences (e.g., risk aversion)**

The effect of personality on health



- Psychological literature consistently reports conscientiousness to be the most predictive personality trait for health-related outcomes (Friedman et al. 1995; Jokela et al. 2013; Kern and Friedman 2008);
- Neuroticism is generally associated with reduced health and higher mortality risks (Savelyev and Tan 2019). Neuroticism is correlated with worse health, especially when it is measured as a construct of psychosocial and subjective aspects (Friedman 2019);
- The main channels linking personality with longevity and other health outcomes may be health behaviours such as nutrition, sleep, smoking, and drinking alcohol (Heckman et al., 2006) or education;
- One third of the education-health gradient can be explained by non-cognitive skills (Carter et al. 2019).

Evidence from Russia



- **Limited research on the determinants of longevity and health**
 - A survival analysis suggests that excessive alcohol consumption and smoking were prominent health behaviours reducing longevity in the Russian population during the economic transition and early 2000's. (Denisova, 2010);
- **Substantial evidence of the effect of non-cognitive skills on socio-economic outcomes**
 - The probability of alcohol consumption and the amount of alcohol consumed are significantly affected by the Big Five. Moreover, non-cognitive skills may mediate the relationship between education and alcohol consumption (Rozhkova et al., 2023);
 - The Big Five and risk attitudes are demonstrated to significantly affect vaccination hesitancy and refusal during the COVID-19 pandemic (Roshchina et al. 2022);
 - Conscientiousness, openness to experience, internal locus of control, and emotional stability are positively correlated with individual intentions to pursue higher education and the probability to graduate with a university degree (Rozhkova and Roshchin 2021).

Data



- **The Russian Longitudinal Monitoring Survey - Higher School of Economics (RLMS-HSE)**

- Household representative survey (near 5,000 households and 10,000 individuals annually);
- Panel structure but sample attrition is present;
- Both males and females aged 17-100 and 18-65;
- From 2011 to 2021.

- **2011 – Locus of control**

- Self-evaluations on a scale of 1 to 4 on 7 questions are used to construct the internal locus of control as an average standardised with a mean of zero and a standard deviation of one within the sample;

- **2016 – The Big Five**

- Short Big Five inventory, consisting of 24 questions, used by the World Bank in STEP survey (Pierre et al., 2014);
- Self-evaluation on a scale from 1 to 4;
- 5 categories are constructed as average standardized with a mean of zero and a standard deviation of one within the sample;
- Extrapolating data for non-cognitive skills to consequent waves.

Method



- **Three approaches are employed:**
 - 1) Multinomial model for the association between non-cognitive skills and self-assessed health;
 - 2) Probit models for the association between non-cognitive skills and health behaviours (drinking, smoking, physical activity);
 - 3) Survival models for the association between non-cognitive skills and longevity.

Method – 1: non-cognitive skills and self-assessed health



- Self-assessed health is widely used in the research context as a valid predictor of the actual mortality (Idler and Benyamini 1997)
- Multinomial logit model:

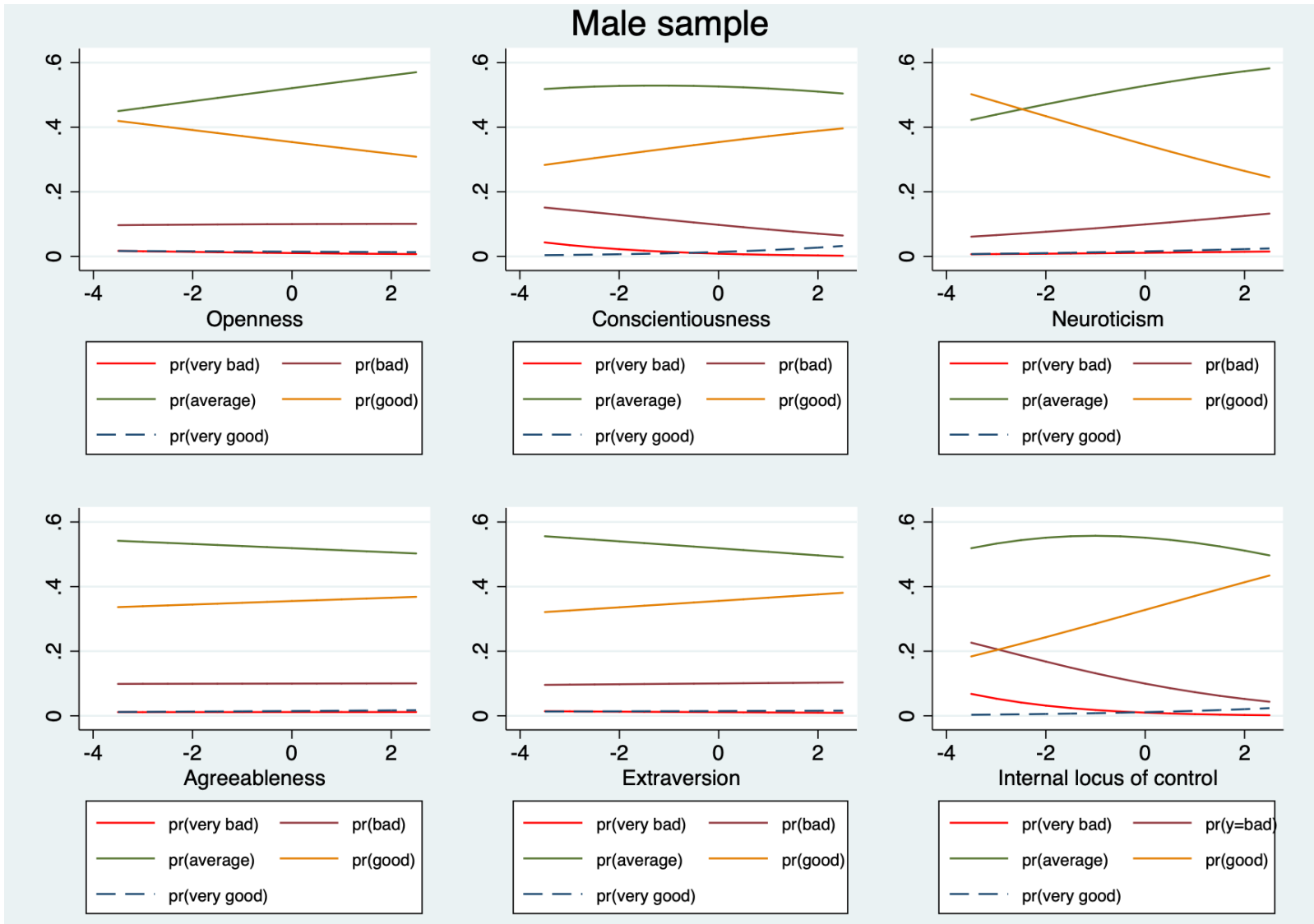
$$\Pr(Y_i = k|X_i; \beta) = \frac{\exp(X_i' \beta_k)}{\sum_{j=1}^5 \exp(X_i' \beta_j)} \text{ for } k = 1 \dots 5 \quad (1)$$

- Y is the dependent variable taking value k from 1 to 5, which reflects five possible health states from “very bad” to “very good” health
- Standard errors clustered on the individual level
- **Controls:** age, education, marital status, presence of children, number of family members, type of settlement, employment status, year of observation, the Big Five or locus of control
- **Additional specification:** health behaviours (smoking, alcohol consumption, physical activity)
- Separate regressions for male and female sample

Results-1: non-cognitive skills and self-assessed health



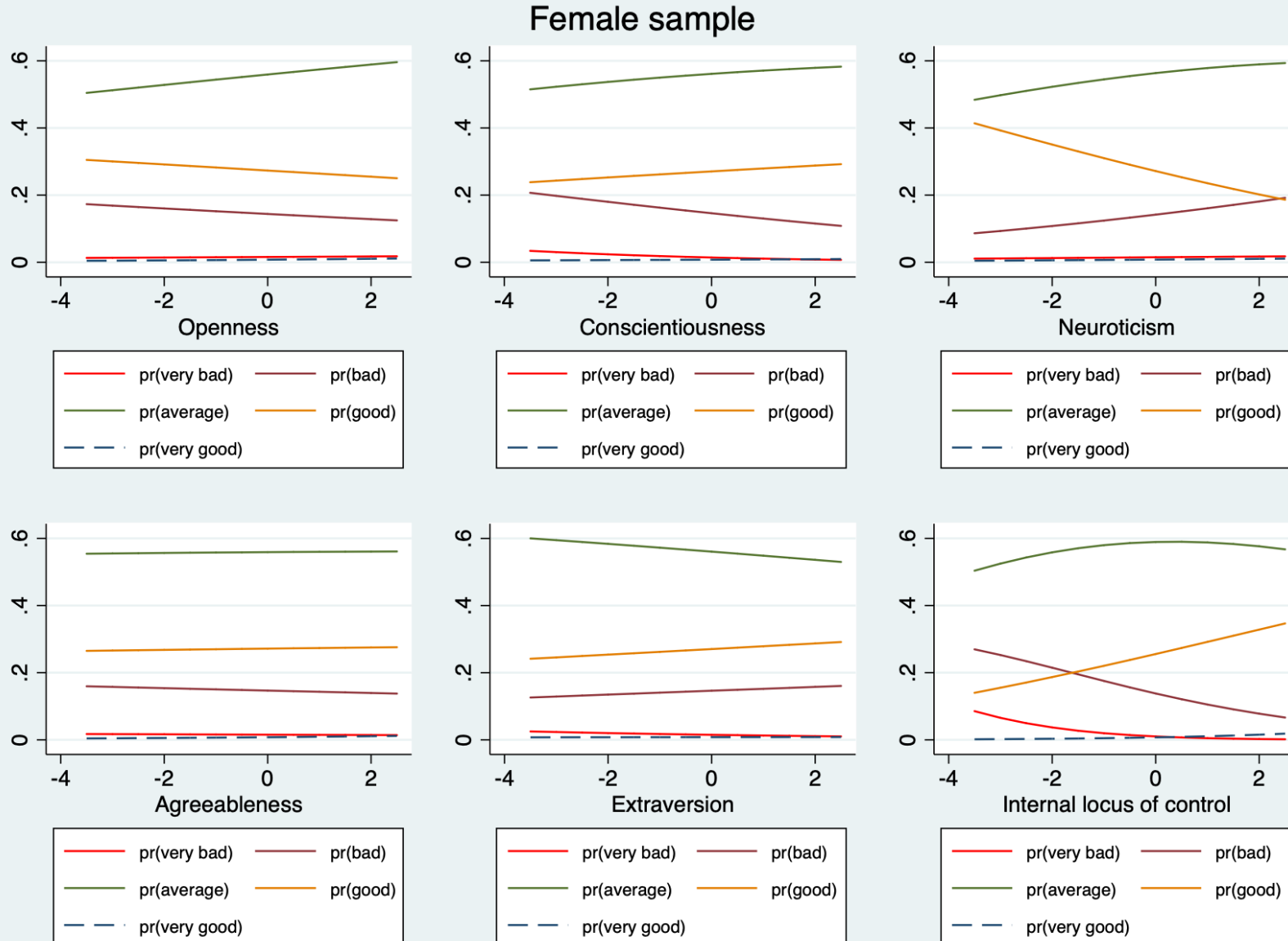
The relationship between self-assessed health and personality, marginal effects



- **Beneficial association between health and conscientiousness, both before and after controlling for habits**
 - Positive association with conscientiousness, internal locus of control, negative with neuroticism;
 - The size of the effect is only slightly reduced after controlling for habits;
 - The other Big Five categories demonstrate fewer stable results and are less consistent across genders

Results-1: non-cognitive skills and self-assessed health

The relationship between self-assessed health and personality, marginal effects



- **Positive association between health self-assessment and education only on female sample**
 - Higher education implies a higher probability of good health (approximately 2 pp) before and after controlling for habits and a reduced probability of bad (approximately 3 pp) and very bad health (approximately 1 pp).
- **Clear association between self-assessed health and health habits in both genders**
 - The most pronounced effects arise between alcohol consumption and self-assessed health

Method – 2: non-cognitive skills and health behaviours



- **Logit models:**

$$\Pr(Y_i = 1|X_i; \beta) = \frac{1}{1 + \exp^{-X_i' \beta}}$$

- Y is the dependent variable (smoking, alcohol consumption, or physical activity)
 - **Smoking** is assessed with the following question: “Are you a smoker?”;
 - **Drinking** measures any alcohol consumption, including moderate, and is assessed with the following question: “Do you consume alcoholic beverages, including beer?”;
 - **Physical activity** is assessed with the following question: “During the past 12 months did you take part, at least 12 times, in some type of physical activities?”, with the list of activities including running, swimming, exercising in a gym, walking, cycling, aerobics, shaping, yoga, playing basketball, volleyball, badminton, tennis, boxing, martial arts, or others.
- Standard errors clustered on the individual level;
- **Controls:** age, education, marital status, presence of children, number of family members, type of settlement, employment status, year of observation, the Big Five or locus of control.

Results-2: non-cognitive skills and health behaviours



	Male sample			Female sample		
	Physical activity	Smoking	Drinking	Physical activity	Smoking	Drinking
Openness	0.0335***	-0.00754	0.00539	0.0505***	0.00566	0.0192***
	(0.00540)	(0.00832)	(0.00672)	(0.00481)	(0.00488)	(0.00605)
Conscientiousness	0.00513	-0.0297***	-0.0204***	-0.000459	-0.00535	-0.00458
	(0.00551)	(0.00842)	(0.00714)	(0.00472)	(0.00498)	(0.00603)
Extraversion	0.00832*	-0.00160	0.0169***	0.00456	0.0196***	0.0230***
	(0.00475)	(0.00749)	(0.00588)	(0.00412)	(0.00429)	(0.00525)
Agreeableness	0.00531	0.00195	-0.0116*	-0.00603	-0.00574	-0.00285
	(0.00525)	(0.00801)	(0.00659)	(0.00428)	(0.00456)	(0.00565)
Neuroticism	-0.00726	0.0239***	0.00374	-0.00664	0.00910**	0.0135***
	(0.00466)	(0.00738)	(0.00612)	(0.00411)	(0.00421)	(0.00522)
Higher education	0.139***	-0.217***	0.0369***	0.136***	-0.116***	0.0414***
	(0.0107)	(0.0169)	(0.0142)	(0.00942)	(0.0102)	(0.0122)
College	0.0455***	-0.0856***	0.00453	0.0445***	-0.0499***	0.0166
	(0.0118)	(0.0168)	(0.0143)	(0.00957)	(0.00851)	(0.0112)
N of observations	20,344	20,332	20,229	32,626	32,605	32,482
N of clusters	4,306	4,306	4,303	6,629	6,629	6,627

- **Physical activity**
 - Openness to experience + for both males and females;
 - Extraversion + only for the male sample.
- **Smoking**
 - Conscientiousness - in the male sample ;
 - Extraversion + in the female sample;
 - Neuroticism + in both samples;
- **Alcohol**
 - Conscientiousness – for males;
 - Agreeableness – for males;
 - Extraversion + in both genders.

Results-2: non-cognitive skills and health behaviours



	Male sample			Female sample		
	Physical activity	Smoking	Drinking	Physical activity	Smoking	Drinking
Internal locus of control	0.0211***	-0.0420***	0.00304	0.0275***	-0.00647	0.0320***
	(0.00418)	(0.00691)	(0.00552)	(0.00340)	(0.00422)	(0.00470)
Higher education	0.149***	-0.224***	0.0319**	0.141***	-0.109***	0.0368***
	(0.00907)	(0.0156)	(0.0129)	(0.00747)	(0.00974)	(0.0105)
College	0.0523***	-0.0865***	0.00566	0.0497***	-0.0433***	0.0255***
	(0.00969)	(0.0157)	(0.0129)	(0.00760)	(0.00832)	(0.00957)
N of observations	33,946	33,936	33,740	56,146	56,111	55,884
N of clusters	5,196	5,196	5,195	7,969	7,969	7,967

- **Physical activity**
 - Internal locus of control **+** for both males and females;
- **Smoking**
 - Internal locus of control **-** for male sample
- **Alcohol**
 - Internal locus of control **+** for females

Method – 3: non-cognitive skills and longevity



- As an ultimate solution for the issue of reversed causality, we use mortality data and duration analysis design
- Non-parametric Cox model with standard errors clustered on the regional level:

$$\lambda(t, X, \beta, \lambda_0) = \phi(X, \beta)\lambda_0(t)$$

- where λ is the expected hazard at time t , λ_0 is the base hazard, corresponding to $\phi(\cdot)=1$, $\phi(X, \beta) = \exp(X' \beta)$;
- **Controls**: age, education, marital status, presence of children, number of family members, type of settlement, employment status, year of observation, the Big Five or locus of control
- **Additional specification**: health behaviours (smoking, alcohol consumption, physical activity)
- Separate regressions for male and female sample
- From 2012 to 2021 there were a reported 1,749 all-cause deaths among survey participants

Results-3: Determinants of mortality, total adult sample, non-parametric Cox regression results, hazard ratios, RRR



	Male sample				Female sample			
Openness	0.971	0.969			0.866*	0.853*		
	(0.0686)	(0.0675)			(0.0703)	(0.0702)		
Conscientiousness	0.797***	0.780***			0.880*	0.870**		
	(0.0637)	(0.0629)			(0.0592)	(0.0587)		
Extraversion	1.065	1.073			1.030	1.031		
	(0.0907)	(0.0927)			(0.0566)	(0.0576)		
Agreeableness	1.039	1.034			1.076	1.073		
	(0.0696)	(0.0669)			(0.0854)	(0.0851)		
Neuroticism	1.121*	1.130*			1.007	1.012		
	(0.0726)	(0.0767)			(0.0842)	(0.0854)		
Internal locus of control			0.887**	0.874***			0.903*	0.888**
			(0.0473)	(0.0426)			(0.0530)	(0.0529)
Higher education	0.778	0.683**	0.697***	0.601***	0.808	0.732*	0.728*	0.681**
	(0.139)	(0.122)	(0.0970)	(0.0888)	(0.137)	(0.137)	(0.137)	(0.126)
College	0.849	0.804	0.877	0.835	0.940	0.915	0.924	0.908
	(0.153)	(0.141)	(0.0987)	(0.0944)	(0.194)	(0.186)	(0.125)	(0.124)
Physical	0.759		0.758		0.386***		0.565***	
	(0.151)		(0.143)		(0.0973)		(0.118)	
Smoke	1.610***		1.876***		1.767*		2.534***	
	(0.206)		(0.192)		(0.526)		(0.590)	
Drink	0.810		0.722***		0.957		0.982	
	(0.109)		(0.0685)		(0.157)		(0.138)	
N of observations	19,178	19,298	32,069	32,272	30,890	31,045	53,121	53,398
N of subjects	4,282	4,285	5,168	5,169	6,594	6,597	7,926	7,929
N of failures	266	268	527	531	266	266	460	461

Conclusions and discussion



- **Non-cognitive skills are predictive of self-assessed health in both men and women**
 - Higher conscientiousness and emotional stability from the Big Five demonstrate a consistent positive association with better health, which is in line with most of the existing empirical literature, both in the field of psychology (e.g., Friedman et al. 1995) and partly in economics (e.g., Savelyev and Tan 2019);
 - The other Big Five categories demonstrate fewer stable results and are less consistent across genders;
 - Internal locus of control is associated with better self-assessed health in both genders.
- **Non-cognitive skills are relevant for both subjective and objective measures of health**
 - Conscientiousness and internal locus of control consistently reduce the risks of mortality in both genders;
 - While the positive effect of conscientiousness is well-known in literature (Savelyev 2022; Chapman et al. 2011), less evidence exists for locus of control.
- **Only a small part of the observed effect of non-cognitive skills is transmitted via health behaviour**
- **Promoting such non-cognitive skills as conscientiousness, internal locus of control, and emotional stability as a part of early socialisation during the initial stages of education may positively affect health and longevity in the long run.**



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Thank you!
Any questions?

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