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DISCUSSION PAPER SERIES

IZA DP No. 16300

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ABSTRACT

The Education-Health Gradient: Revisiting the Role of Socio-Emotional Skills

Is the education-health gradient inflated because both education and health are associated with unobserved socio-emotional skills? Revisiting the literature, we find that the gradient is reduced by 30-45% by fine-grained personality facets and Locus of Control. Traditional aggregated Big-Five scales, in contrast, have a much smaller and mostly insignificant contribution to the gradient. We decompose the gradient into its components with an order-invariant method, and use sibling-fixed effects to address that much of the observed education-health gradient reflects associations rather than causal relationships. There are education-health gradients even within sibling pairs; personality facets reduce these gradients by 30% or more. Our analyses use an extraordinarily large survey (N=28,261) linked to high-quality administrative registers with information on SES background and objective health outcomes.

JEL Classification: I14, I12, I24, I31

Keywords: inequality, Health-Education Gradient, personality, Big Five-2 Inventory, sibling fixed effects

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1 Introduction

More educated individuals live longer and healthier lives (Galama et al., 2018; Lleras-Muney, 2005; Lleras-Muney and Lichtenberg, 2014). Numerous studies have shown strong associations between education and mortality, (self-reported) health, obesity, and health behaviors (such as smoking, excessive drinking, or exercise). This inequality of health along the education spectrum, the *education-health gradient*, has been found in many countries and time periods (Case and Deaton, 2017; Chetty et al., 2016). Education is the measure of choice for socio-economic status (SES), as it predicts the onset of disease, whereas income and wealth do not after controlling for education (Smith, 2004).

Researchers disagree on whether education causally determines health. Lundborg et al. (2016), for example, attribute a large role to formal schooling based on twin studies, whereas Lleras-Muney (2022) summarizes the literature on policy-driven changes in education (from compulsory-schooling laws) as mixed: there are some positive effects in older cohorts and men, but mostly precisely estimated zero effects.

The main concern is that education could simply pick up other unobserved factors. Primary candidates for these omitted factors are cognitive and socio-emotional skills. While Cutler and Lleras-Muney (2010) doubted their explanatory potential, Conti and Hansman (2013) and more recently Savelyev (2020) demonstrate the opposite. For policy, it is very important to understand whether the gradient is really picking up effects of education, or rather of other skills that are simply correlated with education.

In this paper, we revisit the question of how much socio-emotional skills contribute to the education-health gradient. We use an extraordinarily large and representative survey with high-quality measures of socio-emotional skills that is linked to individual-level information on SES background, detailed health outcomes from high-quality administrative registers, as well as sibling identifiers (N=26,261).

We make four contributions to this debate: First, we demonstrate how the gradient clearly picks up the multi-dimensionality of human capital. Thus when allowing for inequality in socio-emotional skills — notably *disaggregated facets* of Big Five personality traits and locus of control — we clearly see that these are significant components of the gradient. Existing research only had access to the usual higher-order traits from shorter Big-Five inventories. Facet-level personality traits and locus of control greatly

reduce the gradient beyond what aggregated Big-Five measures of personality traits could achieve. In most health outcomes, they account for 30-45% of the gradient. We therefore conclude, in contrast to Cutler and Lleras-Muney (2010), that socio-emotional skills *do matter* for the education-health gradient. There is no independent reduction in the gradient from including economic preferences (risk and patience). Interestingly, we observe that there is a remaining role for income, even after controlling for personality and preferences, contrary to Smith (2004).

Our second contribution comes from the method we use to assess the importance of covariates. The method following Gelbach (2016) decomposes the gradient into its components of groups of covariates, and importantly, is robust to the order in which covariates are added. This improves upon the practice of adding covariate sets sequentially and observing reductions in the coefficient on education (a practice which is certainly standard in the literature, and employed by Cutler and Lleras-Muney, 2010 or Conti and Hansman, 2013).

Our third contribution is to go beyond simple overview measures of general health, or the catch-all longevity used in existing studies, and to instead analyze a wide range of objective diagnoses and health measures from registers as well as survey data on subjective health, mental health, and health behavior. We use our linked survey-register data to provide a rigorous and detailed documentation of the education-health gradient.

Finally, we address head-on the difficulty that much of the observed relationships between education and health are associations. To arrive at causal inferences is as desirable as it is problematic, because the associations may be driven by unobserved initial conditions determining both how many years of schooling an individual obtains and their adult health. Examples of common factors are genetic endowments, childhood environment, childhood health and cognitive ability. When these are not controlled for, the associations may overstate the true causal impact of education on health. We address the role of genetic endowments and childhood environment that are shared by siblings by exploiting a sibling-fixed effects set-up. This is feasible in our large survey, where siblings were over-sampled, resulting in over 9,000 respondents from sibling pairs or multiples. We find that there are education gradients in most health outcomes even within siblings; these gradients are still reduced by 30% or more from the inclusion of personality facets. Again, we would have concluded that there is no consistent role for

personality had we just used the aggregated Big Five traits instead of detailed facets.

How is it possible that the disaggregated facets contribute to explaining the education-health gradient, whereas the higher-order Big Five traits do not? We demonstrate that some facets belonging to the same trait have opposing associations with both education and health — this heterogeneity naturally disappears when only looking at how one overall trait correlates with education. Extraversion, for example, has a positive association with education overall. The three facets of Extraversion are Energy Level, Assertiveness, and Sociability. While the first two facets have positive associations with both education and health, Sociability has a negative association with education. Sociability as well as Assertiveness are *negatively* associated with health (self-rated overall health, hospitalizations, or obesity). These opposing forces at the facet level lead to a more mixed association of the trait Extraversion with health. Note also that a *single* facet of personality (here, Assertiveness) can be both positive for education and negative for health outcomes. This is reminiscent of results on externalizing behavior presented in Papageorge et al. (2019).

Our paper thus extends the current knowledge in several dimensions. Our unique data allows us to explore the health-education gradient across a wide array of health dimensions and health behaviors. We show that the gradient varies in size depending on the health outcome studied. Moreover, consistently with Lleras-Muney (2022), we document that there is considerable heterogeneity in the education gradient, which varies over age and gender. We explore trends in health and health behaviors over the lifecycle, showing that while the education gradient is more pronounced as people age for some health outcomes (e.g. the Charlson comorbidity index), the divergence in health outcomes is more striking in other health dimensions (e.g. poor self-reported health, BMI and some health behaviors). Interestingly, there are no clear age- or sex-patterns in the contribution of personality facets and locus of control to the reduction of the gradient.

Similar to researchers before us, we use measures of personality traits or facets that are concurrent with health outcomes (as well as education). Therefore, health status, or health events, could change self-reports on personality traits. To what extent should one be concerned about reverse causality? Surprisingly, not too much. The reason is that researchers have *failed* to find significant systematic changes in personality traits in adults in reaction to health shocks (Cobb-Clark and Schurer, 2012; Cobb-Clark and

Schurer, 2013). There are also no systematic effects of most important life transitions or life events that we would consider here (Bleidorn et al., 2021; Damian et al., 2021; Specht et al., 2011). Cobb-Clark and Schurer (2012) conclude that "there is little evidence that economically meaningful, intra-individual personality change can be linked to the adverse employment, health, or family events that individuals experience."[1] Note also that while our measures of personality traits rely on self-reports, there is generally high congruence with other-rated and behaviors (Connelly and Ones, 2010; Connolly et al., 2007; Duckworth and Kern, 2011; Gosling et al., 2002; Jackson et al., 2010). A final note on personality change: While average personality evolves over a life time in typical maturation patterns (see Gensowski et al., 2021), this is not shaping our results as we control flexibly for age.

2 Data Description

The data for this project stems from a tailor-made online survey for which we invited a random sample of 121,390 individuals in Denmark. The survey provides information on self-assessed health and health behaviors, as well as detailed facet-level personality traits (details in Section 2.1); this data was merged to information from high-quality administrative registers to assess objective health markers via diagnoses and health care use (Section 2.2). The registers also identify family members, which is used to construct a sample of siblings (Section 2.3).

2.1 Survey Data

Survey Collection Statistics Denmark provided us with a random sample of individuals in Denmark in 2019, approximately representative of each cohort from 1944-2001. For the cohorts born 1956-1998, we also identified the siblings of all non-singleton individuals (more details on the sibling sample in the subsection below). The sample of 121,390 individuals aged 18 and older (of which there were 94,295 aged between 25 and 75), living in Denmark, was then contacted in May and August 2019 via a secure messaging system, "e-Boks", which is used for electronic official communication to all

[1] In a related study, García-Miralles and Gensowski (2023) find that personality traits of adolescents do not change much following a severe health shock to their parents. This is relevant because adolescence is a time of most change in personality, and an age at which parents are still expected to exert considerable influence.

citizens in Denmark. Details about the survey and survey collection can be found in Section S.1. The response rate including partial responses was 33.7% (N=41,373); 30% for complete responses. The survey assessed health behaviors, economic preferences and beliefs about the health production function, satisfaction with the public health system, and human capital in the form of socio-emotional skills and cognitive functioning.

Personality Traits The largest component of the survey was the Big Five personality inventory. We used the **BFI-2**, of which we implemented both the full 60-item version (Soto and John, 2017a) and an abbreviated 30-item instrument (Soto and John, 2017b) for different groups. See the full list of items in Tables S.1 and S.2. These instruments hierarchically assess the traits of Openness to Experience (called Open-Mindedness by the authors of the BFI-2), Conscientiousness, Extraversion, Agreeableness, and Emotional Stability (Negative Emotionality, also called Neuroticism), together with three sub-facets for each of these traits: Open-Mindedness facets of Intellectual Curiosity, Aesthetic Sensitivity, and Creative Imagination; Conscientiousness facets of Organization, Productiveness, and Responsibility; Extraversion facets of Sociability, Assertiveness, and Energy Level; Agreeableness facets of Compassion, Respectfulness, and Trust; and Negative Emotionality facets of Anxiety, Depression, and Emotional Volatility.

We account for age-specific variation and maturation patterns by regressing the traits on five-year age bins in all respondents, predicting the residuals, and standardizing these to have mean zero and standard deviation one in our sample, for ease of interpretation. See full distributions of facets and traits in Fig. S.1, and the pairwise correlations in Table S.3. Since the personality facets are derived from *subsets* of the items for a full higher-order trait, they are highly collinear with their corresponding trait. We therefore never include both Big Five traits and their facets in a regression, but treat them separately.

In addition to this personality inventory, we measured participants' **Locus of Control**, following the items used in the Australian HILDA (Cobb-Clark and Schurer, 2013, also see Caliendo et al., 2015; Cobb-Clark et al., 2014). We construct an index for "internal locus of control," which describes the extent to which individuals believe that their life's outcomes are due to their own efforts, rather than to external factors (e.g. luck). Similarly to the BFI-2 measures, respondents should agree/disagree on seven statements

such as "I have little control over the things that happen to me." or "What happens to me in the future mostly depends on me." – see the full list of items in Table S.4.

Economic Preferences were assessed with two questions: "Overall, how willing or unwilling are you to run a risk?" to measure risk preference, and "How willing are you to give up something that is beneficial to you today to benefit from it in the future?" for patience or time preference. Answers are on a scale from 1 (completely unwilling) to 10 (very willing). These items were validated experimentally with incentivized-choice experiments, where these items exhibited the highest predictive power (see details in Falk et al., 2016 or the summary in Falk et al., 2018). These short survey questions are good predictors of behaviors (Bonin et al., 2007; Dohmen and Falk, 2011; Jaeger et al., 2010) and have been widely used (for example Dohmen et al., 2010); they are for example part of the well-known German Socio-Economic Panel.

Self-assessed Health is measured with 4 questions given to all respondents: First, as an overall rating, we use "Would you say your health is... (excellent to bad)." We code an answer less than "good" as **bad self-reported health**. A second measure asks "For the past six months at least, to what extent have you been limited because of your health in activities people usually do? Think of grocery shopping, domestic work such as vacuuming, or climbing stairs." The third measure is BMI, computed from answers on weight and height, where a **BMI greater than 30** indicates obesity. In all questions, we follow the Danish wording in the Survey of Health Ageing and Retirement in Europe (SHARE). Note that while there is evidence for non-classical measurement error in BMI, notably a distinct age-gradient, there are no systematic associations with other socio-economic characteristics (Davillas and Jones, 2021).

Mental Health measures are obtained from the MHI-5 (a Danish translation of Berwick et al., 1991). This five-question screening detects mental illness (including depression, anxiety, affective disorders) exceptionally well. It performs comparable to longer instruments, such as the 18-item MHI, the 30-item version of the General Health Questionnaire (Berwick et al., 1991), and the longer Mental Health Component Summary, as Rivera-Riquelme et al. (2019) write. It detects mental health problems, based on questions such as "How much of the time, during the past month, have you felt so

down in the dumps that nothing could cheer you up?" (full list of items in Table S.5). A higher score means greater difficulties. Unsurprisingly, the MHI-5 scale is positively correlated with Negative Emotionality in our survey, especially the facet of Depression (r=.67).

Health behaviors include questions about smoking, drinking, diet, exercise and sleep. We focus on **smoking** in the main text, which is measured with "Are you currently smoking?". More information on the other behaviors is given in Section S.1.

2.2 Administrative Register Data

The completed survey data was anonymized and merged to the administrative registers, through the unique personal identifier for all individuals in Denmark. The linked data was accessible in anonymized form through a secure server facilitated by Statistics Denmark. This link of survey and register data is essential to construct the gradient by education (obtained from registers) with objective measures of health and health care use at the individual level.

The combination of survey and administrative register data makes several contributions possible. First, the register data allows us to link respondents to their parents through the 2019-population register: this lets us construct a sample of siblings. Secondly, we observe detailed diagnoses, and can therefore measure health outcomes in an objective and nuanced way whereas much of other research is limited to longevity as the final measure of health, or self-reported general health. Thirdly, we are able to compare the socioeconomic background of individuals who completed the questionnaire with that of the entire sample of randomly selected potential respondents. This allows us to assess potential biases in responses due to non-random selection into answering the survey.

While we use **years of education** for the gradient regressions below, we begin the presentation of the results with descriptive graphs where we divide the sample into three **education groups**, based on the highest observed schooling in the registers up to 2018. "Low" education covers lower secondary education (compulsory schooling). 23% of the population are in this category. "Middle" education ranges from higher secondary to lower tertiary education (42% and 5%, combined 47%). Examples of short tertiary education are police officer, laboratory worker, financial economist, multimedia designer.

Finally, "high" education corresponds to a university degree, including Bachelor, Master, Doctoral and equivalent degrees (18%, 10% and 0.7%, a total of almost 30% of the population). We use the highest observed schooling categories to impute years of education in the cases where years were not given in the register (661 cases with full BFI facet responses in the age range of 25-75). The latest update to this register is from 2019.

Health outcomes rely on two register sources. First, we use the register on hospital admissions ("Landspatientregister"), which provides information on all inpatient and outpatient contacts in Danish hospitals with an ICD-10 diagnosis code linked to each visit, from 1998-2018. We first count **any in-patient or out-patient hospital contact**, excluding hospitalizations or visits that were for preventive care, screening, or pregnancy- or birth-related. The same register also provides a count of **nights hospitalized** associated with each diagnosis. We collapse the count across diagnoses in 2018. We further use this register to create a **Charlson Comorbidity Index**, which is a weighted index that predicts 1-year mortality on the basis of pre-existing conditions on comorbid conditions. We follow the updated weights developed by Quan et al. (2011), and the ICD-10 conversion for administrative data given in Quan et al. (2005).[2] Since the hospital register data only measure diagnoses when linked to an actual contact, and not whether someone has a condition, we collapse any diagnosis of illnesses in the past 20 years (1999-2018). Next, we use information on the number of contacts with the General Practitioner (GP). GPs provide primary health care, are organized in private clinics, and services rendered to patients are paid over the public health insurance scheme using predefined fees that are negotiated between the public health care system and the organization of general practitioners. Using register information on GP visits, we create a variable that sums up the **number of doctor visits** in 2018.[3]

Other covariates used are from the registers and are rather straightforward, such as gender. We use two **income measures**. Both are based on the year 2014, that means four years before we observe the health outcomes. The first measure is a continuous variable of personal disposable income, containing both labor income and income

[2]The comorbid conditions are myocardial infarct, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic pulmonary disease, connective tissue disease, ulcer disease, mild liver disease, diabetes (with/without organ damage), hemiplegia, moderate/severe renal disease, any tumor, leukemia, lymphoma, moderate/severe liver disease, metastatic solid tumor, AIDS/HIV.

[3]In Denmark, the General Practitioner (GP) or Primary Care Physician (PCP) takes care of primary care contacts of her patients and thus serves as a gate keeper into secondary health care.

transfers, and net of income taxes. Labor income includes salary income and income for self-employed. Income transfers include unemployment benefits, disability pension, pensions etc. The second measure is based on family income, which is derived from personal disposable income as just defined, among all household members, averaged with the OECD equivalency scales. Both variables are constructed by Statistics Denmark, and expressed in 10,000 Danish Kroner. We transform the family income measure, however, into quartiles within each 5-year age-group.

The final sample consists of all individuals who completed the BFI-2 instrument with at least one item for each facet, and who are between ages 25-75 in 2019. This ensures that educational attainment is completed and we do not include spurious association between health and education among the youngest. We furthermore condition on having non-missing information on completed education from the registers, and responding to the questions on patience and risk. The final sample size is 28,261.[4]

2.3 Sibling Sample

To identify siblings, we use all population registers from 1986-2019, and consider all persons as siblings who were registered as having the same mother (biological or adoptive). Note that we can only identify siblings in the civil registration system when they are currently living in Denmark and have information on their biological mother.[5]

In total, 69,749 individuals received an invitation to the survey together with at least one sibling. They were not informed specifically that their sibling would also be contacted. From the subset of *respondents* with at least one sibling invited (N=22,233), we also received responses from two or more siblings within the same family from 12,228 individuals. If we further restrict all respondents to be in the same age range as the

[4]Out of 41,373 respondents to the survey, 38,799 had complete BFI facet scales (39,158 have the five higher-order traits as we average over all available items, ignoring missings). Adding the availability of Locus of Control results in 37,847 respondents. The age restriction limits the sample to 31,391. These also have full education information. Of these, 28,692 responded to the questions on patience and risk, and a further 28,261 have information on personal and family income.

[5]The population registers stem from the national Central Person Register (CPR) which covers all individuals living in Denmark. This register links inidividuals to their parent and children. Links to parents are available for most individuals born after 1960, but information on parents and therefore also siblings may be lacking for the oldest participants in our study. The proportion of respondents in each 5-year age group for which the register data contains a parent identifier is above 90% for respondents younger than sixty (see Gensowski et al. (2021), Table 1). For most individuals, the number of siblings is consistent across years once the mothers are beyond child-bearing age. Yet the population register does not list Danes (or previous residents). For individuals who at any point are of a higher birth order than the number of siblings listed earlier, we replace their number of siblings as the maximum birth order.

Table 1: Descriptive Statistics

	Full Sample		Sibling Subsample	
	Mean	Std.Dev	Mean	Std.Dev
Years of education	14.18	(2.60)	14.28	(2.45)
Number of Siblings by age 17/next earliest	2.83	(1.25)	3.07	(1.16)
Female	0.54	(0.50)	0.55	(0.50)
Age	53.02	(13.3)	46.93	(10.8)
Immigrant/Descendant	0.05	(0.22)	0.02	(0.15)
Deceased by 2020	0.01	(0.071)	0.00	(0.048)
Any in/out-patient hospitalization	0.50	(0.50)	0.46	(0.50)
Nights Hospitalized	1.56	(3.94)	1.36	(3.68)
Number GP visits	8.46	(8.40)	7.72	(8.06)
CCI	0.40	(1.66)	0.26	(1.32)
Bad Health	0.19	(0.39)	0.18	(0.39)
BMI>30	0.19	(0.39)	0.20	(0.40)
Smoker	0.14	(0.35)	0.15	(0.36)
O: Intellectual Curiosity	−0.00	(1.00)	0.00	(0.99)
O: Aesthetic Sensitivity	0.00	(1.00)	−0.01	(1.00)
O: Creative Imagination	0.00	(1.00)	−0.01	(1.00)
C: Organization	−0.00	(1.00)	−0.01	(1.02)
C: Productiveness	−0.00	(0.99)	−0.01	(1.00)
C: Responsibility	−0.00	(1.00)	0.00	(0.99)
E: Sociability	0.00	(1.00)	0.00	(1.01)
E: Assertiveness	0.00	(1.00)	0.01	(1.00)
E: Energy Level	0.00	(1.00)	0.01	(1.01)
A: Compassion	0.00	(1.00)	0.00	(0.99)
A: Respectfulness	−0.00	(1.00)	−0.00	(0.98)
A: Trust	−0.00	(1.00)	0.01	(1.00)
N: Anxiety	0.00	(1.00)	−0.01	(1.01)
N: Depression	−0.00	(0.99)	−0.00	(1.02)
N: Emotional Volatility	−0.00	(1.00)	−0.02	(1.01)
Locus of control (internal)	−0.00	(1.00)	0.02	(1.00)
Risk aversion(-)	6.12	(2.02)	6.27	(1.97)
Patience	6.37	(2.03)	6.52	(2.00)
Fam. Income Q1 (Bottom)	0.13	(0.34)	0.15	(0.36)
Fam. Income Q2	0.20	(0.40)	0.19	(0.39)
Fam. Income Q3	0.28	(0.45)	0.29	(0.45)
Fam. Income Q4 (Top)	0.39	(0.49)	0.37	(0.48)
Disposable Income	26.75	(28.9)	27.20	(30.9)
Observations	28,261		18,032	

Note: Showing descriptive statistics for the main sample of analysis (respondents in the Full Sample) and the subsample of siblings where at least two from a family responded (Sibling Subsample). See the sample restrictions on page 11. The BFIS-2 personality traits are abbreviated as O-Openness, C-Conscientiousness, E-Extraversion, A-Agreeableness, N-Negative Emotionality/Emotional Stability. Hospitalizations and nights hospitalized exclude preventive care, screening, and perinatal visits.

main sample (25-75) and have full covariate sets, we obtain a sibling sample N = 9,023, from 4,062 families (73% of responses are from 2-sibling respondent pairs, 22% are from 3 responses per family). The respondents' personality traits and facets are summarized in Table 1, by sibling status.

About half of individual differences in personality traits is considered heritable (Bouchard and Loehlin, 2001; Krueger et al., 2008; Tellegen et al., 1988; Yamagata et al., 2006). Heritability is decreasing across the life span (Kandler et al., 2020). However, one might be concerned whether there is meaningful variation in personality traits among siblings. There is—when computing differences in traits in sibling pairs, they are almost as widely distributed as when computing differences between perfect strangers (see Fig. S.2). We therefore consider within-family personality differences to be a meaningful and promising source of variation in personality.

3 Results

Before analyzing how much of the education-health gradient is accounted for by differences in personality traits, we establish the gradient in terms of multiple health outcomes.

3.1 What is the education-health gradient in Denmark today?

We begin by using the detailed medical diagnoses from the hospital data to establish the extent of the association between medical diagnoses and education. As is well known, the educational attainment varies significantly by cohort. We therefore document probabilities of individual diagnoses by education *and age* in Fig. 1, which plots non-parametric associations, from kernel-weighted local polynomial regressions of the probability of diagnosis on age, by education groups. We highlight a selected group of diagnosis codes that stand in for generally observed patterns. Many illnesses have an increasing baseline probability of being diagnosed with age (older individuals more likely to be ill), and where an education gap opens up at mid-age and widens until age 75, while possibly shrinking again in the very oldest. This is exemplified in panel A — illnesses as wide ranging as lung cancer, bronchitis, atherosclerosis, and heart attacks. Panel B of Fig. 1 shows examples where a diagnosis is quite prevalent at all ages instead of being limited to older patients, and where the gradient is largest in the youngest individuals. These

are broken arms or slipped discs. Finally, panel C shows that some illnesses have no education gradient (such as tumors in the lymphatic system, or malignant tumors of the intestine), even though their baseline probability increases with age.

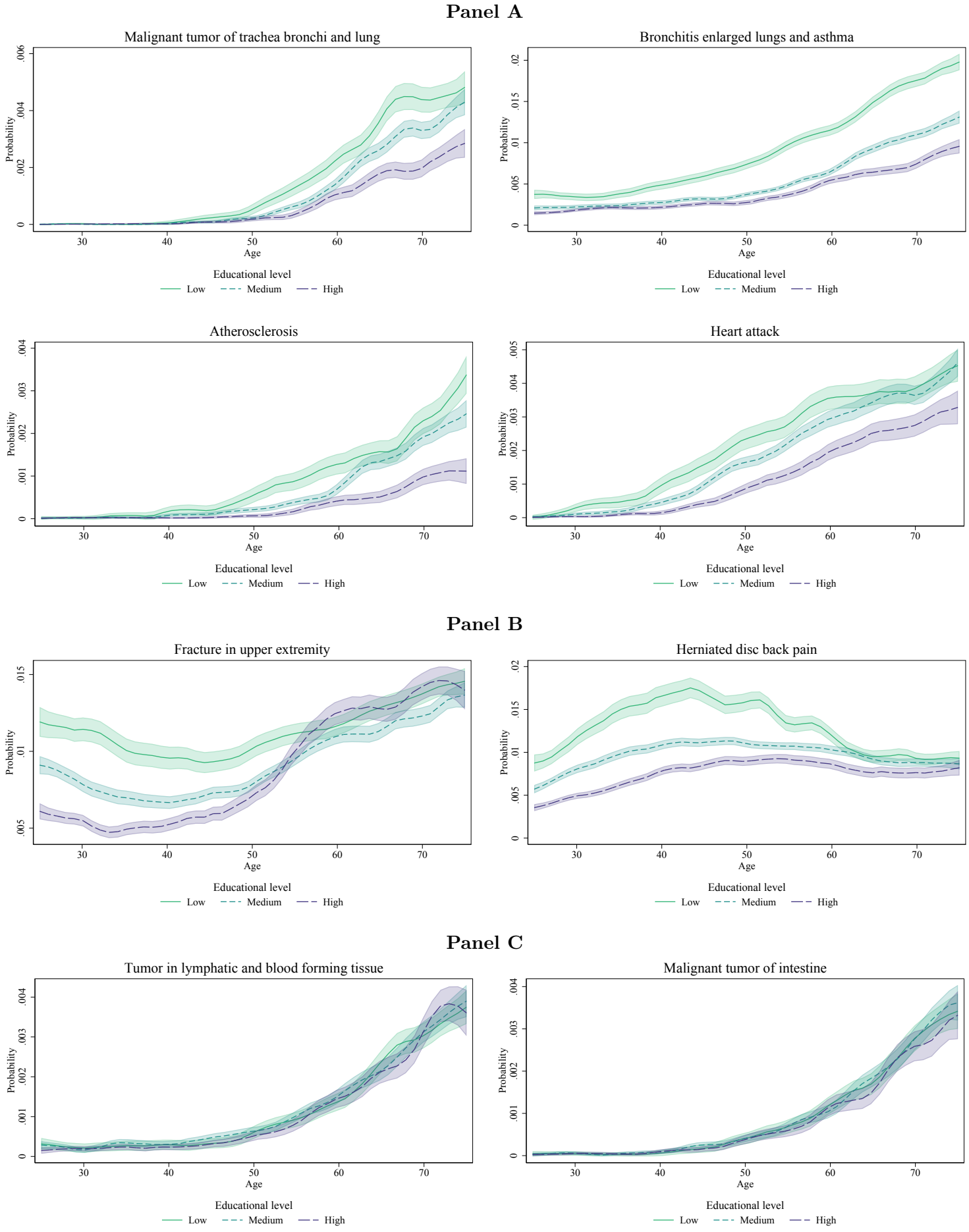
We repeated this exercise for all 100 ICD-10 codes. While fascinating and certainly useful to understand the origin of the education-health gradient, these 100 diagnoses are unwieldy to work with. Therefore, we fall back to aggregate administrative characteristics and the CCI as a summary measure that has been extensively used in the literature.

Figure 2 depicts those summary measures. There is a clear gradient in ever being hospitalized throughout the last year, and in the number of doctor visits. The gradient is somewhat decreasing with age for these two measures, as it is for the count of different ICD-10 codes registered in 2018. In contrast, expected 10-year mortality from the Charlson Comorbidity Index (CCI) is increasing with age and the gap between individuals with the highest and lowest educational achievement also increases. The figure also demonstrates that the survey response was not gravely selected on health outcomes, as the gradients look entirely comparable between the population (left column, panel a) and in the survey sample only (right column, panel b).

From the survey, we observe that there is a significant gradient in having poor self-reported health (Fig. 3). Obesity, indicated by a BMI exceeding 30, as well as smoking, display significant education gradients throughout life, although the gradient is reduced with age. The same holds for mental health: Individuals with lower educational attainment are at greater risk for low mental health than those with higher education, especially in early adulthood. By age 65, the gradient has almost disappeared. Clearly, there is value added in complementing objective diagnoses of illnesses with these evaluations of individual and continuous markers of health.[6]

[6]Additional gradients are presented in Appendix Fig. S.3. There are gradients in healthy eating and sleeping, but not in physical activity (all risk factors for obesity). Binge drinking does not have a gradient, and frequent drinking has a small reverse gradient that emerges with age.

Figure 1: Examples of Education-Health Gradients by Age

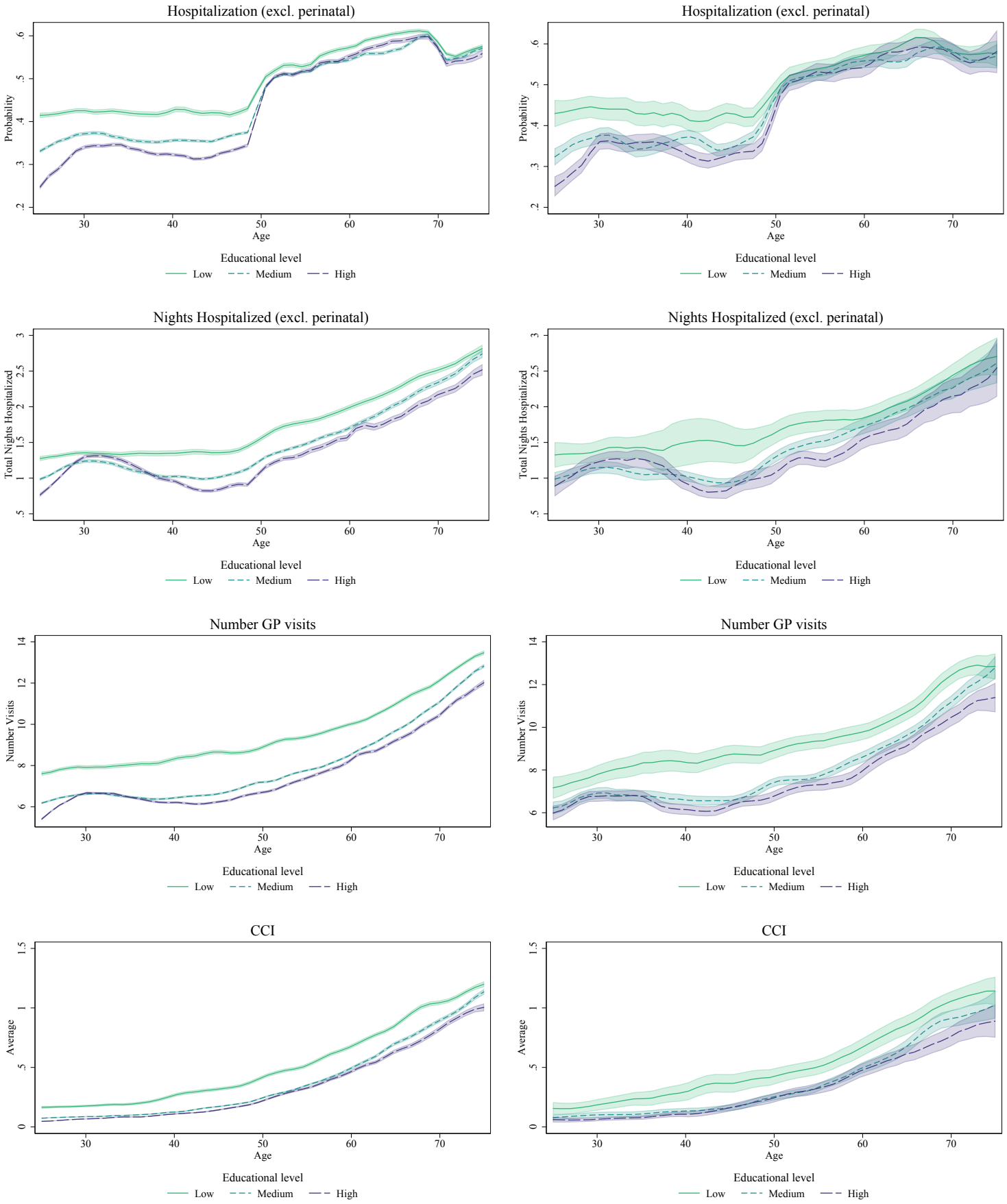


Note: Non-parametric estimates from kernel-weighted local polynomial regressions of probabilities of individual diagnoses on age by education (with associated 95% confidence bands), not adjusting for any other characteristics. "Low" education = lower secondary education (compulsory schooling), "medium" = higher secondary and lower tertiary, "high" = university education. Diagnoses are observed any time in 2018. Sample: All residents aged 25-75 in the Danish population register of 2019.

Figure 2: Gradient in Hospitalizations and Number of Doctor Visits

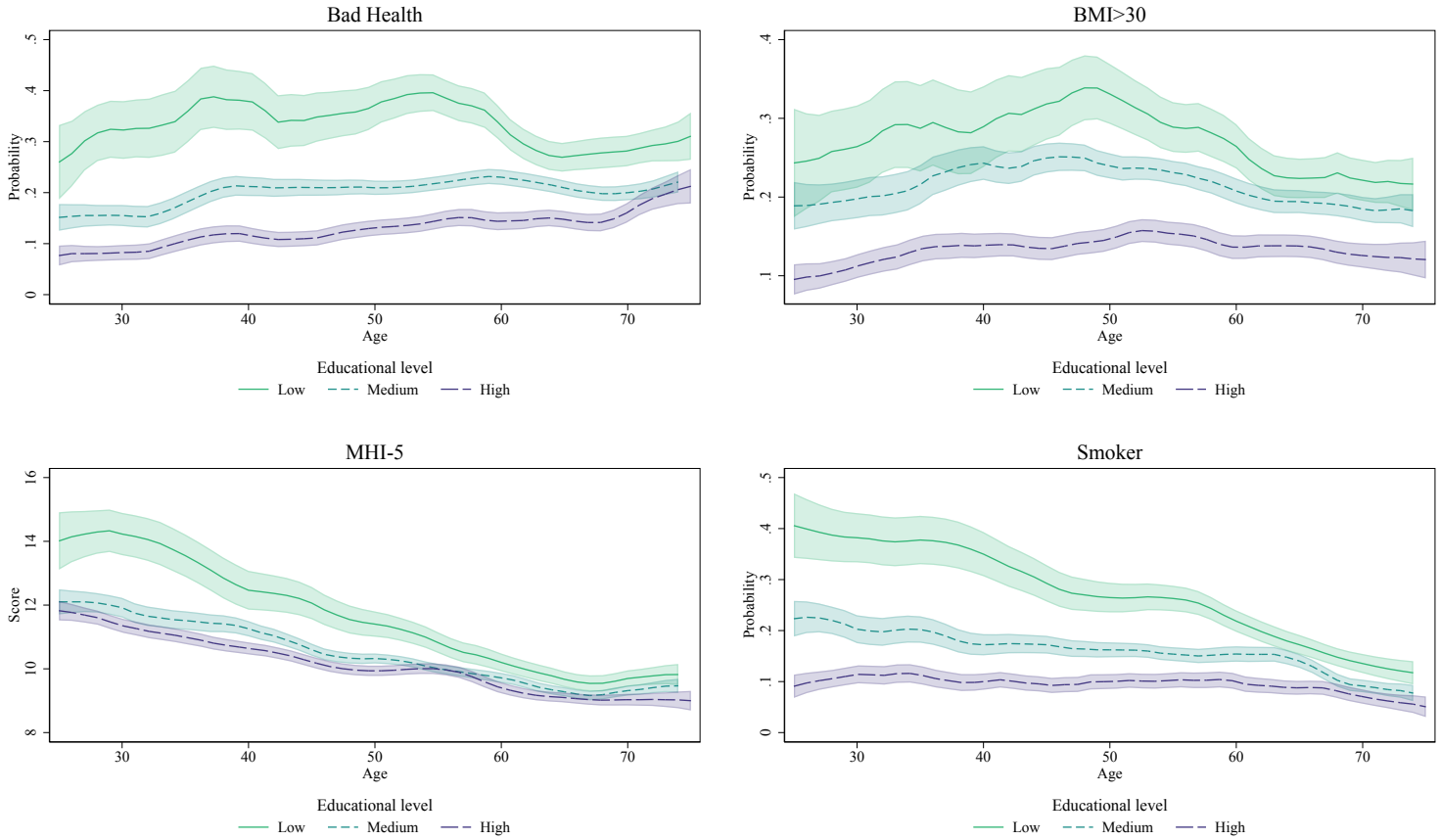
(a) Full Sample

(b) Survey Sample



Note: Non-parametric estimates from kernel-weighted local polynomial regressions of probabilities of individual diagnoses on age by education (with associated 95% confidence bands), not adjusting for any other characteristics. See notes to Fig. 1. Outcomes are probabilities of ever being hospitalized (including outpatient) in 2018 and the total number of nights at a hospital in 2018 (both excluding pregnancy/childbirth-related visits), the annual number of visits at the general practitioner (GP), and the Charlson Comorbidity Index (CCI, based on diagnoses in the last 20 years). Sample: Population aged 25-75 in 2018.

Figure 3: Gradient in Self-Reported Health and Behaviors



Note: Non-parametric estimates from kernel-weighted local polynomial regressions of probabilities of individual diagnoses on age by education level (with associated 95% confidence bands), not adjusting for any other characteristics. See notes to Fig. 1. Outcomes are Bad health: Indicator for self-reported health being "tolerable" or "bad"; BMI>30 indicates obesity; MHI-5 is a score in self-reported indicators of mental health following the MHI-5 classification (see Table S.5). Sample: Survey respondents age 25-75.

3.2 Personality in the Education-Health Gradient

Personality traits and their facets are significantly **associated with years of education**, as demonstrated by Table 2. In all personality traits, there are facets that have the opposite association with attainment as the higher-level trait. This is a first indication of the importance of accounting for facets in the education-health gradient, instead of only higher-order traits.

Openness to Experience is strongly positively associated with education, as one standard deviation of difference in this facet is associated with over half a year of more schooling, and is further confirmed by the fact that Intellectual Curiosity has the largest association of the facets. This corresponds to the well-known positive correlation between IQ and Openness (von Stumm et al., 2011). The trait-level association hides, however, that Creative Imagination has a *negative* association with years of education. In our sample, Conscientiousness has a negative association with years of education. This is unexpected given the literature (see, for example MacCann et al., 2015; Poropat, 2009), but it has been found previously for this data in Gensowski et al. (2021), also for men and women separately. Column (2) of Table 2 suggests that facets of conscientiousness work in opposite directions, such that the facets Organization and Productiveness have negative associations with education, whereas Responsibility is positively correlated with education.

Extraversion has an overall positive association with educational attainment of around a quarter of a standard deviation, while the facet of Sociability has a significant negative association. Agreeableness overall shows a small negative association with years of schooling, that is made up of a strong negative association of Trust with attainment, a negative (but smaller) association of Compassion, and a *positive* association of Respectfulness with attainment. For Emotional Stability, we find moderate positive associations - or negative ones of Anxiety and Emotional Volatility, against a positive association of Depression with educational attainment (controlling for all other facets and covariates simultaneously).

Having an internal locus of control is also strongly positively associated with attainment. Willingness to take risks and patience have a moderately positive role.

Table 2: Association of Characteristics with Years of Education

	(1)	(2)	(3)	(4)
Openness	0.389***	0.404***		
	(0.0160)	(0.0151)		
O: Intellectual Curiosity			0.378***	0.354***
			(0.0169)	(0.0160)
O: Aesthetic Sensitivity			0.248***	0.236***
			(0.0164)	(0.0154)
O: Creative Imagination			−0.139***	−0.0761***
			(0.0173)	(0.0164)
Conscientiousness	−0.125***	−0.166***		
	(0.0170)	(0.0160)		
C: Organization			−0.129***	−0.142***
			(0.0175)	(0.0164)
C: Productiveness			−0.0838***	−0.0847***
			(0.0189)	(0.0177)
C: Responsibility			0.00714	−0.00915
			(0.0178)	(0.0168)
Extraversion	0.0747***	0.0358**		
	(0.0180)	(0.0173)		
E: Sociability			−0.0600***	−0.0584***
			(0.0173)	(0.0164)
E: Assertiveness			0.175***	0.139***
			(0.0175)	(0.0166)
E: Energy Level			0.193***	0.123***
			(0.0187)	(0.0177)
Agreeableness	−0.0423**	0.00223		
	(0.0172)	(0.0162)		
A: Compassion			−0.0539***	−0.0275
			(0.0186)	(0.0175)
A: Respectfulness			0.0716***	0.0577***
			(0.0189)	(0.0178)
A: Trust			−0.0961***	−0.0468***
			(0.0176)	(0.0166)
Neuroticism	−0.0570***	−0.0447**		
	(0.0192)	(0.0180)		
N: Anxiety			−0.0959***	−0.0920***
			(0.0201)	(0.0190)
N: Depression			0.151***	0.133***
			(0.0218)	(0.0205)
N: Emotional Volatility			−0.100***	−0.0742***
			(0.0189)	(0.0178)
Locus of control (internal)	0.341***	0.198***	0.321***	0.187***
	(0.0191)	(0.0181)	(0.0192)	(0.0183)
Risk aversion(-)		−0.0683***		−0.0544***
		(0.00811)		(0.00815)
Patience		0.0483***		0.0407***
		(0.00774)		(0.00768)
Female	−0.0316	0.0112	−0.0201	0.0258
	(0.0331)	(0.0313)	(0.0332)	(0.0315)
Age	0.00613***	−0.0131***	0.00637***	−0.0124***
	(0.00114)	(0.00114)	(0.00113)	(0.00113)
Immigrant/Descendant	−0.0759	0.276***	−0.00828	0.329***
	(0.0706)	(0.0665)	(0.0700)	(0.0661)
Fam. Income Q2		0.799***		0.820***
		(0.0515)		(0.0511)
Fam. Income Q3		1.619***		1.633***
		(0.0493)		(0.0489)
Fam. Income Q4 (Top)		2.300***		2.269***
		(0.0501)		(0.0497)
Disposable Income		0.00949***		0.00892***
		(0.000520)		(0.000517)
Constant	13.88***	13.21***	13.86***	13.15***
	(0.0663)	(0.0933)	(0.0656)	(0.0927)
Observations	28,261	28,261	28,261	28,261

Note: Coefficients from regressions of years of education, standard errors in parentheses. Omitted income category is the lowest quartile. Note that number of siblings is defined at age 17 or the next earliest observed age. P-values * < .10,** < .05,*** < .01. See the correlations among the personality traits and facets in Table S.3.

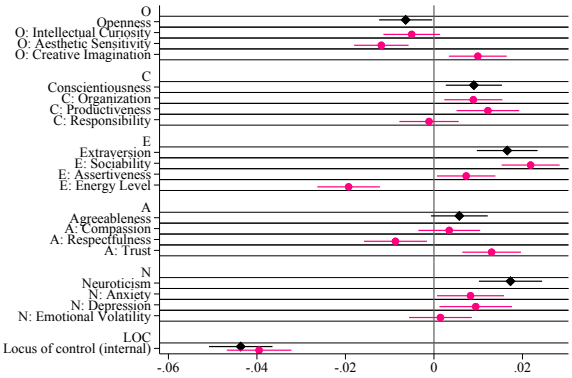
Personality is also significantly associated with **health outcomes and health behaviors**. Figure 4 regresses outcomes and behaviors on traits and demographics (as well as income), but not conditioning on education.Bad self-rated health is more prevalent among individuals with lower Conscientiousness, Extraversion, and Emotional Stability, and lower Openness and Agreeableness (see details in Fig. 4). Conscientiousness and Extraversion are traits that are often found to be highly predictive of labor market outcomes even over long time spans (Gensowski, 2018; George et al., 2011). The facets driving those positive associations are Organization (C) and Energy Level (E). In the cases of Conscientiousness and Neuroticism, the aggregate trait is the most highly individually associated. The facets with the largest positive association (meaning worse health outcomes) are Depression (N), and Creative Imagination (O).

Conscientiousness has been described in the literature as the most important factor for health as well, but the role of facets has not been thoroughly explored. In our data, Conscientiousness decreases inpatient hospital contacts and hospitalization lengths, and while Responsibility has a negative association with the number of diagnoses and the CCI, Organization has positive associations. Conscientiousness has been found to reduce a range of behaviors that are detrimental to health, including the use of tobacco and alcohol, risky sexual behavior and driving, and unhealthy eating and physical inactivity (see the meta-analysis in Bogg and Roberts, 2004). Early-childhood conscientiousness is negatively associated with substance abuse (Moffitt et al., 2011). More conscientious individuals follow diet and exercise regimens better (Hilliard et al., 2014).

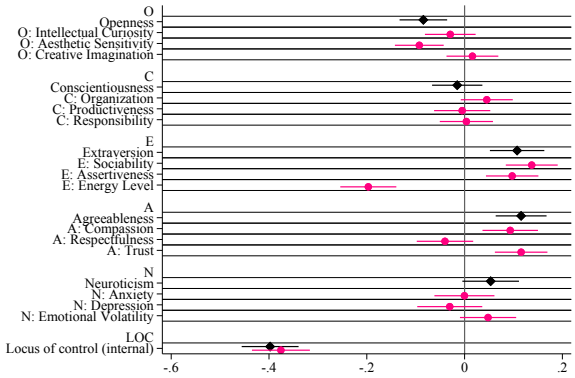
Extraversion has a mixed relationship with health: it is associated both with smoking and heavy drinking, but also better mental health (Hampson et al., 2007; Kern et al., 2014; Savelyev and Tan, 2019). The same pattern is observed in this study: Extraversion has an overall positive association with negative health outcomes, but this is driven purely by Sociability, and to a lesser degree Assertiveness. They outweigh the very positive association of Energy Level with positive health outcomes and behaviors (see, for example, the association with hospitalization lengths, panel b) of Fig. 4, or being obese, panel f). A popular theory is that Sociability is associated with more gregarious behavior that also includes activities that are detrimental to health, such as drinking and smoking. Indeed they are positively associated with smoking and drinking, especially heavy drinking (see Appendix Fig. S.4).

Figure 4: Coefficients on Personality Traits and Facets, Regressions of Health Outcomes

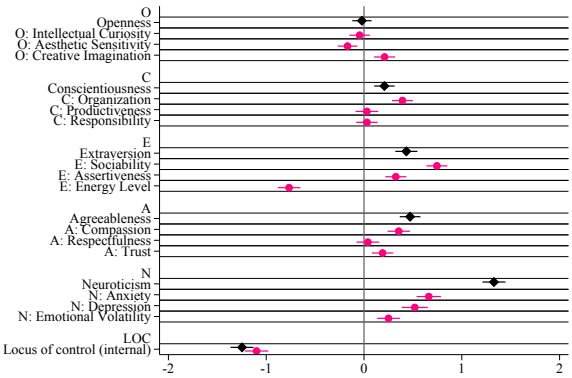
(a) Any in/out-patient hospital contact



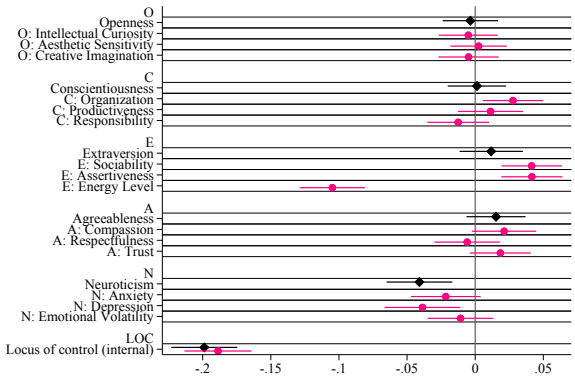
(b) Hospitalization length, if any



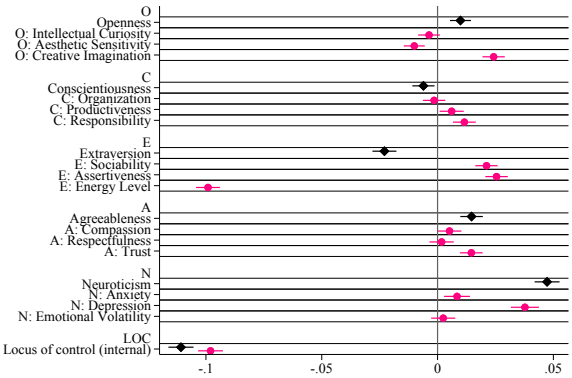
(c) Number of doctor visits



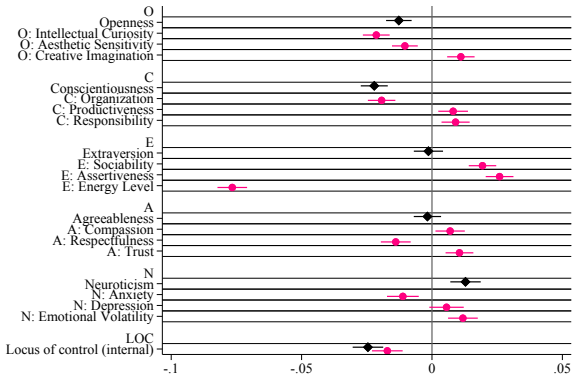
(d) Charlson Comorbidity Index



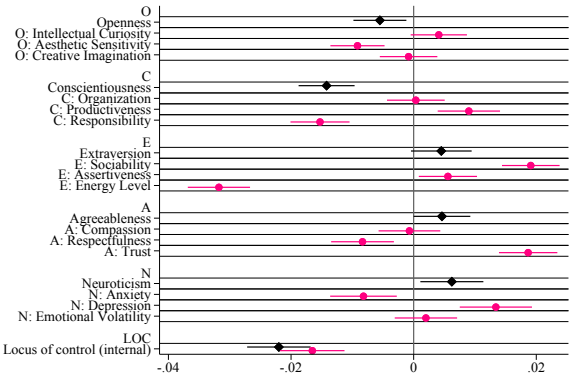
(e) Bad self-rated health



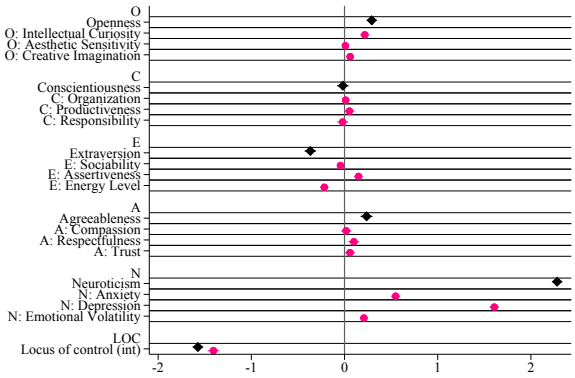
(f) BMI > 30



(g) Currently smoking



(h) Mental Health Difficulties



Note: The graphs show coefficients for the Big-Five factors (in black), or the 15 facets (pink), from separate regressions for each outcome. Demographic controls are gender, age, immigrant status, indicators for family income quartile, and disposable income (coefficients not shown). Not conditioning on education. Additional results in Fig. S.4, regression tables in Tables S.8 and S.9.

Much like Extraversion, Openness has some positive and some negative associations with health outcomes. Individuals with greater Openness to Experience are less likely to follow a bad diet, be obese, physically inactive, but also more likely to drink. The overall association with hospitalizations and length of hospitalizations is negative, but the relation to *bad self-rated* health and mental health problems is positive. There are notable differences on the facet level: while creative imagination increases hospitalizations, number of doctor visits, count of diagnoses, self-rated health, BMI and drinking, several other facets (intellectual curiosity, but especially aesthetic sensitivity) have negative point estimates.[7]

Agreeableness also shows striking heterogeneities in the effects of its facets. While the overall trait is generally associated with worse health outcomes, Respectfulness has consistent negative associations with hospitalizations, diagnoses, obesity, bad diet, and smoking. The overall trait is also associated with a better diet and significantly less drinking (both in frequency and amount), whereas the facet of Trust is associated with a greatly increased probability of smoking.

Neuroticism or Negative Emotionality is associated with worse health outcomes in all domains, and all facets point in the same direction. Especially Depression is associated with general health difficulties, but also greater healthcare utilization and the number of diagnoses. The only exceptions where one facet of Neuroticism has a negative coefficient is Anxiety, which is associated with a lower probability of smoking and of being obese. The latter is, however, not to be understood as a better outcome in the true sense, because Anxiety is significantly *positively* associated with the probability of being underweight (BMI$<$ 18.5, regression not shown).

Given the many significant associations between personality traits and years of schooling, personality is a prime candidate for personal characteristics that are driving the education-health gradient. We cannot study explicitly, with our data, whether the direction of causality is indeed from personality traits or facets towards health behaviors and outcomes. Instead, we rely on other studies with panel data on personality traits, or that exploit natural experiments. With multiple observations of the Big Five and Locus of Control, Cobb-Clark and Schurer (2012) and Cobb-Clark and Schurer (2013) find only very small and non-systematic associations of these traits in reaction

[7]Personality even predicts social distancing during the Covid-19 pandemic (Ludeke et al., 2021).

to health shocks. Cobb-Clark and Schurer (2012), for example, report a reduction in Emotional Stability in men that experience six health shocks between survey waves, yet no significant reduction from eight health shocks. Six health shocks is an extreme accumulation, and corresponds to two standard deviations above the mean for this variable (women were never significantly affected by any number of health shocks). Research on personality change further strengthens our confidence in this relative stability of traits, and consequently the direction of causality going from traits to behaviors: analyzing a wide range of life events, most events fail to have systematic effects on personality traits (Damian et al., 2021; Specht et al., 2011). Bleidorn et al. (2021) summarize the literature as having "mixed evidence for main effects of life events," with the exception of the transition from school to work, and the experience of the first romantic partnership. In our sample of 25-75 year-olds, respondents are expected to have gone through both of these transitions.

Personality traits may be affected by the length of schooling as well. This topic is under-researched. As far as we are aware, there is only a single study in this area. Kassenboehmer et al. (2018) uses measures at three time-points of 575 respondents, and reports that first differences in traits are, with the exception of Extraversion, unrelated to an indicator of college-going. There is no exogenous variation in education that can be exploited—a difficulty most studies share.

3.3 How much of the gradient is due to socio-emotional skills?

We now document how much of the observed education-gradient in health outcomes and behaviors is due to variation in personality traits and other covariates. We implement the decomposition suggested by Gelbach (2016), which provides estimates of the reduction of the gradient due to coefficients (or groups of coefficients). These estimates are invariant to the order in which the covariate groups have been added to the regression. The method avoids the potential bias that is inherent in the standard practice of adding regressors sequentially to "kill the coefficient" (on education, in our example) that is used by existing papers on the education-health gradient, as Andrews and Logan (2010); Conti and Hansman (2013); Cutler and Lleras-Muney (2010).[8]

[8]The insights ("contribution") that one backs out from changes to the coefficient on education from sequential addition of covariates is unfortunately highly dependent on the order in which covariates are added and are thus not unbiased, as argued by Gelbach (2016).

Instead, following Gelbach (2016), the technique suggested and employed here is to 1) run a *baseline* regression of outcomes Y on a small baseline set of covariates X_1 only (where X_1 contains education). This yields the gradient unconditional on covariates (except demographics deemed important, in our case: age, gender, and immigrant status). The first estimate of the coefficient on X_1, $\hat{\beta}_{base}$, will contain omitted variables bias because other relevant covariates are not yet controlled for. Next, step 2) estimates a *full* regression that includes not only X_1 as independent variables but also *all* other covariates we argue are relevant to the gradient, in X_2. Our *full* regression contains the set of 15 personality facets, Locus of Control, risk aversion, patience, income quartiles, and gender, age, and immigration status. The gradient $\hat{\beta}_{full}$ will no longer be biased because all X_2 are accounted for. Step 3) decomposes the difference in coefficients on education between the base- and full-specifications ($\hat{\beta}_{full}$ vs $\hat{\beta}_{base}$) from auxiliary models that estimate the relationship between X_1 and X_2, relying on an omitted-variables bias formula. The contributions of individual variables to the difference $\hat{\beta}_{base}$-$\hat{\beta}_{full}$ can be grouped as well. We thus obtain an estimate for how much of the gradient reduction stems from accounting for differences between education groups on these characteristics.[9]

Figure 5 lists the gradient (coefficient on years of education) from the baseline and full regressions in the left part of the sub-graphs. In all instances, the gradient is reduced from accounting for the full set of covariates. The full black circle shows the gradient after controlling for personality and all other covariates, and by how much the baseline gradient is reduced (expressed as percentages of the original gradient). For example, panel (a) of Fig. 5 shows that the personality facets reduce the gradient in hospitalizations by 11%, Locus of Control by another 24%. Accounting for all covariates together reduces the gradient by 34%.

The right side of each sub-graph displays the contributions of the covariate groups, again expressed as a share of the baseline gradient. The aggregated Big Five personality traits *do not* reduce the gradient in hospitalizations, hospitalization length, or smoking, and have even a negative contribution for the gradient in the CCI (meaning the gradient

[9]One note on the distinction between the Big Five *traits* and the *facets*: As they cannot be included simultaneously in a regression because the traits are functions of the facets and collinear, we instead obtain an estimate of the contribution of the Big Five traits by estimating a separate "full" model that contains the Big Five traits only instead of the facets (but with the same set of other covariates). They will be marked separately in our output, because they are not from the same estimation as all other covariate contributions. Note that we take into account the maturation patterns of personality traits and facets (see Gensowski et al., 2021) by using residual values from a regression of each trait or facet on 5-year age groups.

would be greater in a world where they did not have a role). There are small reductions of the gradient in terms of the Big Five personality traits for the gradients in the number of doctor visits, self-rated health, and obesity. They are dwarfed, however, by the role of personality facets.[10]

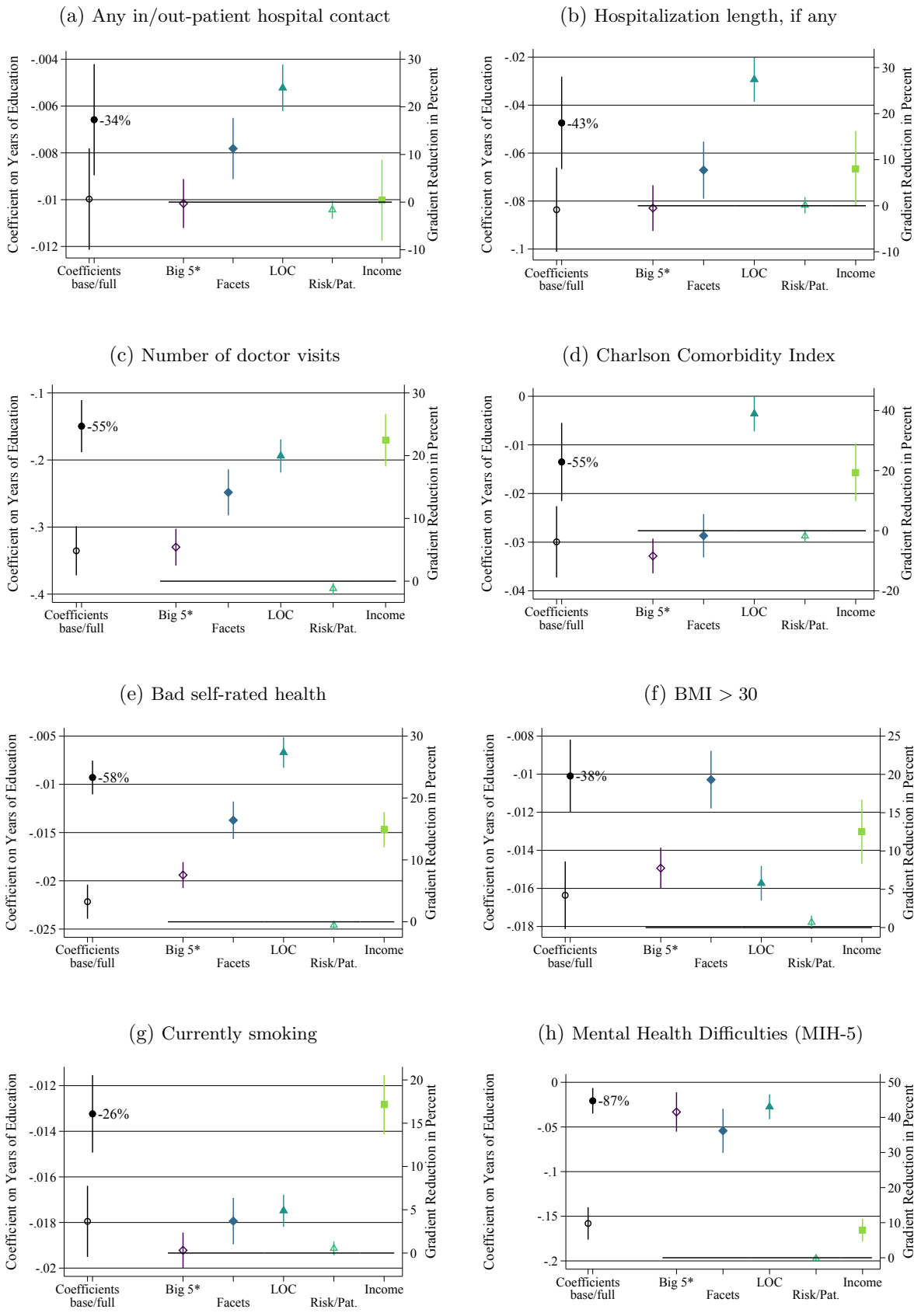
Consistent with Cutler and Lleras-Muney (2010), summary measures of personality (aggregated at the highest level, the ones typically available in economic datasets) have a limited role for the education-health gradient. Yet, we clearly demonstrate that the aggregate traits hide important skill information: using instead the much more fine-grained facets of personality leads to a reduction in the gradients by 10-15%, with the exception of the Charlson Comorbidity Index. And even more important is the Locus of control, which is complementary to the Big Five taxonomy. Adding Locus of control reduces the gradient by 20-40%.

Economic preference parameters do not play a meaningful role for inequality in health by education. There is, however, a role for income, as it reduces the gradient by 8-22% in most outcomes. This clearly contradicts the statements in Smith (2004). The reductions of the gradient in terms of self-described health are similar to the register outcomes - see panel e). There is a significant reduction from the Big Five traits at about 8%, but adding personality *facets* reduces the gradient by 16%, and Locus of Control by 27%. For obesity (BMI exceeding 30), the importance of facets largely exceeds that of Locus of Control (reductions of the gradient by 20% and 5%, respectively, see panel f). The gradient in smoking is only weakly attributable to differences in socio-emotional skills (reduction by less than 10% total), but income accounts for the bulk of the gradient reduction (17 of 26%).

Mental health difficulties (assessed with the MIH-5) stand out from the other health outcomes: All measures of socio-emotional skills greatly reduce the gradient, which is reduced by 87% overall by only those covariates (no role for risk and patience or income measures). This is not surprising when we recall that personality traits are assessed with self-reports that tap into similar domains as the MIH-5.

[10] One exception is the significant role of even the Big Five traits to the gradient in mental health.

Figure 5: Gradient Reductions



Note: Each graph shows first, on the left axis, the baseline gradient (regression coefficient on years of education in each outcome regression, conditioning only on gender, age, and immigration status). The second point estimate shows the gradient in the "full" specification that added personality facets, Locus of Control, risk and patience parameters, and income information (as well as the percent reduction in the gradient from adding all covariates). The right side of each graph (on the right axis) shows the contribution of each covariate set, expressed as the reduction of the gradient in percent, based on Gelbach (2016). The contribution from Big Five traits (as opposed to facets) is from a separate estimation. Regression details in Table S.11.

3.4 How much of the gradient remains to be explained in Sibling-Fixed Effects?

One difficulty with the gradients observed in Section 3.3, as in the most eminent papers of this literature as well, is that they do not rely on exogenous variation in education. Instead, they show how a coefficient (which is possibly picking up unobserved covariates) changes from including more and more covariates. In this study, we have already been able to include more detailed covariates than many other studies. We can go a step further by exploiting the fact that we have answers from sibling pairs. By using a sibling fixed effects approach, we obtain estimates that are not contaminated by shared family background, childhood environment, and partially even shared genes. A precedent for this type of analysis is found in Fletcher and Lehrer (2011) or Fletcher (2013). They argue convincingly that within-family variation in personality identifies the association of these socio-emotional skills independently of family background and genetic endowments.

In order to be able to decompose changes in the gradient from inclusion of both sibling fixed effects and the full list of personality facets and other covariates, we therefore include family indicators in the full specification. The only change necessary from the previous sections' estimation method is to add family indicators to X_2. This yields coefficients equivalent to the previous "full" model with sibling fixed effects.[11] (Small differences in the baseline gradient can occur and are due to the sibling sample being smaller than the full set of survey respondents previously used.)

We now present the decompositions with an additional intermediate step: first, we show how the gradient is reduced from the inclusion of the sibling fixed effects, and then from all covariates, in the left parts of Fig. 6.[12] Accounting for sibling fixed effects reduces the gradient by 21-37% in the register-based outcome and overall self-rated health. Shared family environment accounts for only 9% of the education gradient in mental health difficulties, and 17% of smoking. The greatest reduction of the gradient from the inclusion of sibling fixed effects is in obesity, where the coefficient on years of

[11] Addison et al. (2022) have adapted the methodology proposed by Gelbach (2016) to estimate contributions of multiple types of fixed effects, where the only difference between the "base" and "full" specifications are the fixed effects. They do not consider decomposing effects of the fixed effects and covariates. Since we are interested in this decomposition, and since the typical gradient we are contrasting to the full set of regressors, we include family indicators in the "full" specification and contrast to a "base" without these fixed effects.

[12] Note that the confidence intervals for the "base" and "full" gradients are the usual 95% confidence bands around the coefficients. The confidence bands around the "base minus sibling contribution" are ignoring the estimation uncertainty around the sibling contribution.

education is reduced by 78%. Yet even in this outcome, as in all others, there remains a statistically significant education gradient among siblings. Their magnitude is especially meaningful for outcomes such as hospitalizations, number of doctor visits, subjective health, and smoking.

The total reduction from the full set of covariates is almost the sum of the sibling fixed effects and the previously found reductions without fixed effects (cf Fig. 5). This was not necessarily expected, as the commonly cited correlation of personality among siblings could have reduced their contributions. This almost-addition rather implies that personality traits were not standing in to a substantial extent for the shared family environment characteristics that are now accounted for by the fixed effects.

The right parts of Fig. 6 show the percent changes of the *remaining gradient* after controlling for sibling fixed effects that are accounted for by the usual covariate groups.[13] Indeed, personality facets and Locus of Control still reduce the remaining gradient (after accounting for the reduction from sibling fixed effects). Together, the personality facets and Locus of control decrease the education-health gradient by 30%-50%. It is striking how similar the contributions of personality facets and Locus of Control are when going from the OLS analysis in the previous section to using sibling fixed effects. The relative patterns of Locus of Control and personality hold up in the outcomes of hospitalizations, number of doctor visits, and self-rated health, where Locus of Control accounts for up to twice as much than the personality facets.

For obesity, the family environment accounts for much more of the gradient than in all other health outcomes—the gradient is reduced by 78% from inclusion of sibling fixed effects. The remaining gradient is then reduced to zero (-99%) from the inclusion of personality facets. Interestingly, Locus of Control has no independent role for this outcome. Mental health difficulties are very strongly reduced by personality facets and locus of control, even the Big Five personality traits, as before. Here, we see the smallest reduction of the gradient that can be attributed to a shared family environment, as this accounts for only 9%. Personality instead reduces the gradient by an additional 102%.

Contrary to the results without sibling fixed effects, the gradient in smoking is not sig-

[13] See regression details in Table S.14. The dots in the right half of the graph show, for each covariate set, their contribution to the reduction divided by the "base" gradient net of the contribution of the sibling fixed effects. For example, for any hospitalization, the share of the remaining reduction due to Locus of Control is 20% = 0.0026/(-0.0191 - -0.0059). For number of doctor visits, the contribution of personality is .135 = -0.0427/ (-0.3996 - -0.0824).

nificantly reduced by personality facets (Locus of Control does by about 5%, as before). The gradient in the Charlson Comorbidity Index becomes statistically indistinguishable from zero after adding both personality facets and the sibling fixed effects.

As without sibling fixed effects, there is no role whatsoever for the economic preference parameters, and in most outcomes a sizeable impact of income (which is significant in number of doctor visits, self-rated health, and smoking status).

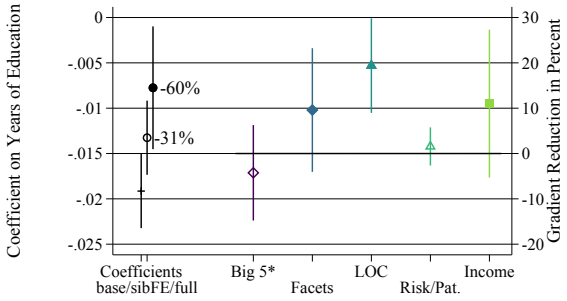
3.5 Heterogeneities by Age and Gender

We next contrast gender and age groups—those above and below age 45, in terms of both their baseline gradient and the reduction from accounting for personality traits as in Section 3.3. Beginning with the probability of ever being in contact with a hospital, we observe in Fig. 7 that the gradient is lower for young males than all other groups, and that there is in fact a substantial gap in the gradient between young males and females. This gap remains also in the gradient with the full set of controls (second spike in the corresponding color on the left hand side). In other health outcomes, however, young females have the largest baseline gradient—see number of doctor visits or self-rated health, or smoking. Baseline gradients are somewhat smaller for older respondents, especially for smoking and mental health difficulties.

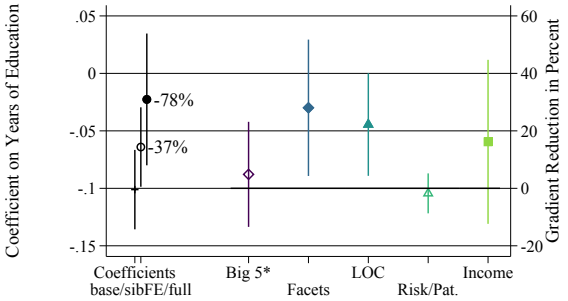
The reductions of the gradient attributed to the different covariate sets are shown again in percent on the right-hand axis, now with colors for the age/gender groups. There is some heterogeneity in the importance of personality facets and locus of control, and no clear pattern across all the different health outcomes. For example, personality traits and facets have the greatest importance for young males in three outcomes (number of doctor visits, self-rated health, and mental health difficulties). In these outcomes, even the Big Five traits are significant components of the gradient. Yet there are no differences between the age and gender groups in terms of hospitalizations, hospitalization length, or the CCI. For obesity, personality facets contribute more strongly to the gradient of young females compared to other groups. Locus of Control reduces the gradients most for females: it matters most for *young* females in terms of hospitalizations and their lengths and doctor visits, maybe obesity, and for *older* females in terms of the CCI, self-rated health and mental health difficulties. To conclude, the contribution of personality to the education-gradient in health does not vary consistently across gender-age groups.

Figure 6: Gradient Reductions — Sibling Fixed Effects

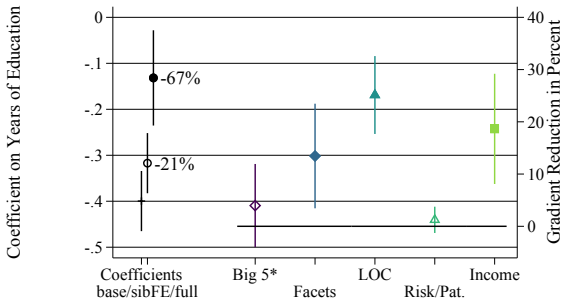
(a) Any in/out-patient hospital contact



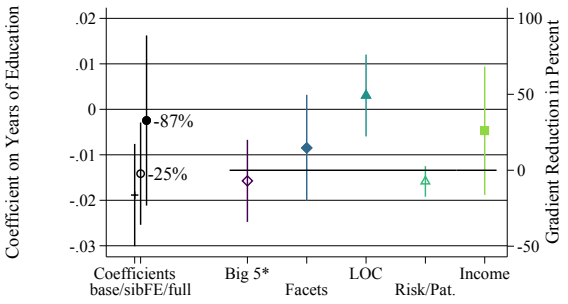
(b) Hospitalization length, if any



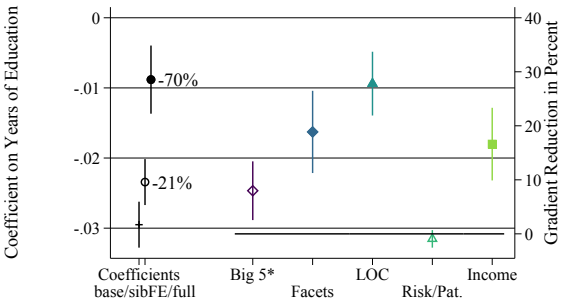
(c) Number of doctor visits



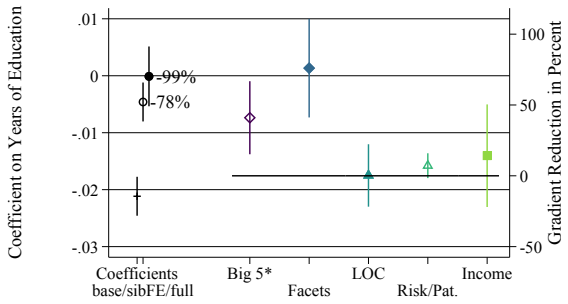
(d) Charlson Comorbidity Index



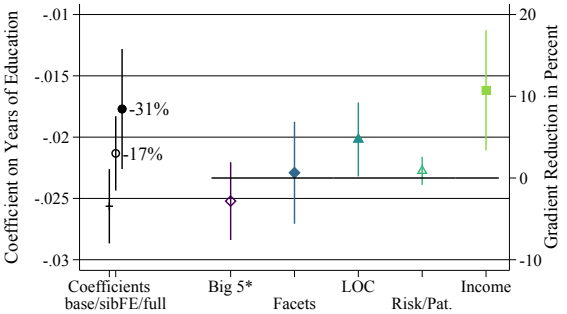
(e) Bad self-rated health



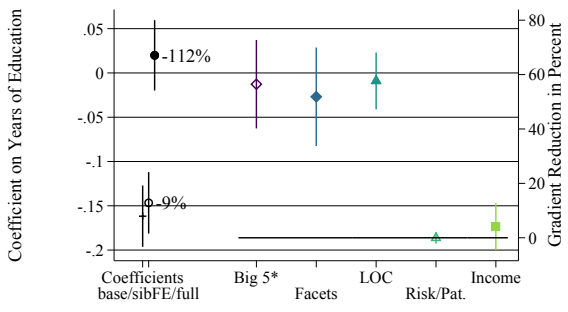
(f) BMI > 30



(g) Currently smoking



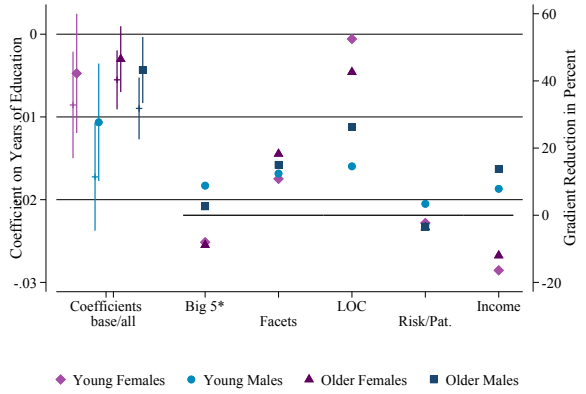
(h) Mental Health Difficulties



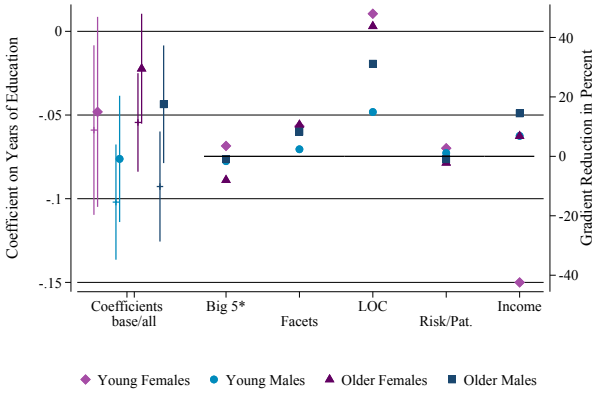
Note: Each graph shows first, on the left axis, the baseline gradient (regression coefficient on years of education in each outcome regression, conditioning only on gender, age, and immigration status), then (with a hollow circle) the reduction of the gradient attributed to sibling fixed effects, and third (with a full black circle) the cumulative reduction of the gradient from the "base" to the "full" specification including sibling fixed effects, personality facets, Locus of Control, risk and patience parameters, and income as covariates. The right sides (right axis) show the contribution of each covariate set to the reduction of the gradient from the base gradient minus the sibling contribution, in percent. The contribution from Big Five traits (as opposed to facets) is from a separate estimation. Regression results in Table S.14.

Figure 7: Gradient Reductions by Age and Gender: Hospitalizations and Doctor Visits

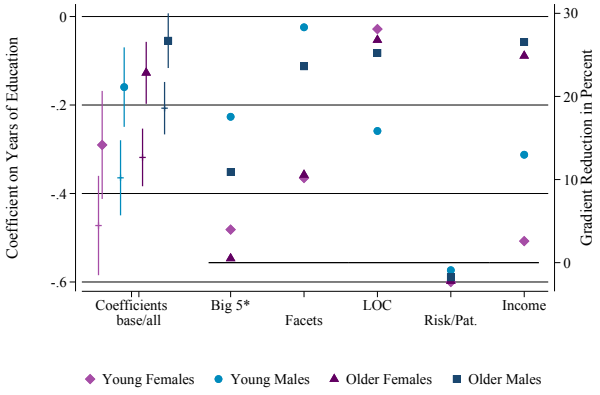
(a) Any in/out-patient hospital contact



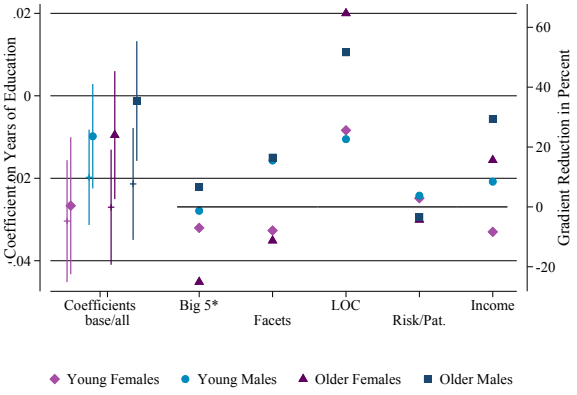
(b) Hospitalization length, if any



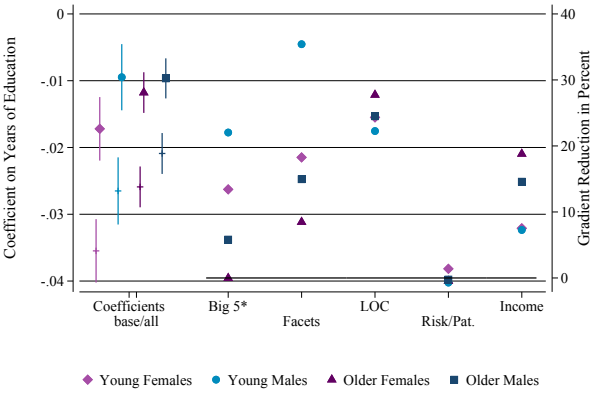
(c) Number of doctor visits



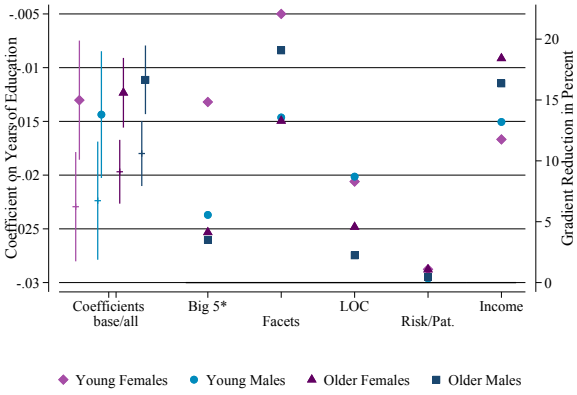
(d) Charlson Comorbidity Index



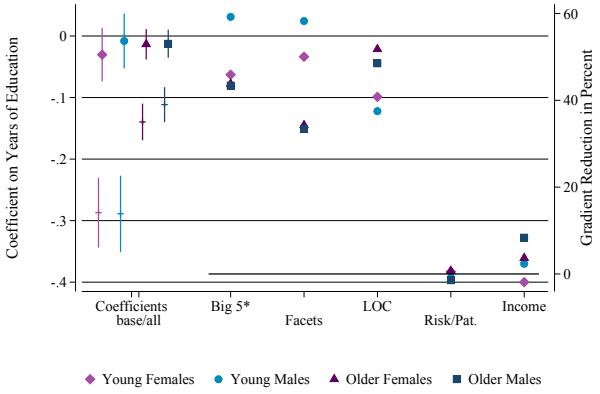
(e) Bad self-rated health



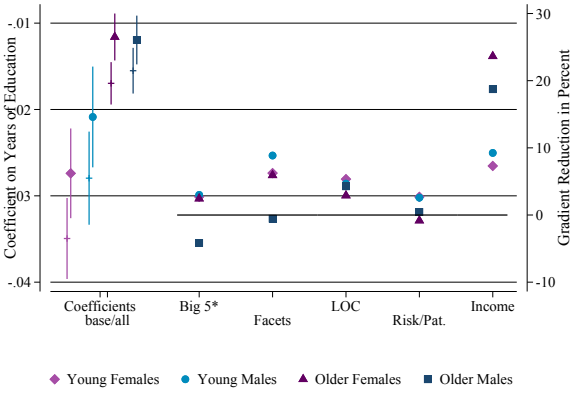
(f) BMI > 30



(g) Mental Health Difficulties



(h) Currently smoking



Note: Each subfigure shows two sets of results for four subsamples, by gender and age ($>$ or $\leq$ 45): First, in the left half of the figure, the absolute magnitude of the gradient in the base regression (with a dash) and the full regression (with a marker symbol corresponding to the legend). The right hand side of each subfigure shows the *gradient reduction* (right hand axis) as in Fig. 5. Full regression details in Tables S.16 to S.19.

4 Discussion and Conclusion

The *education-health gradient* has been found in many countries and time periods, and research suggests that the gradient has been increasing over the last few decades (Kreiner et al., 2018; Meara et al., 2008; Pappas et al., 1993). The previous literature discusses whether the link between education and health is causal, the direction of the link, and whether other unobserved factors, such as cognitive and socio-emotional skills, are affecting both education and health in the same direction (Conti and Hansman, 2013; Cutler and Lleras-Muney, 2010; Lleras-Muney, 2022; Savelyev, 2020).

Our paper documents how socio-emotional skills moderate the education-health gradient using an extraordinarily large and representative survey, high-quality measures of personality traits (facet-level Big Five Inventory) and background information through high-quality administrative registers.We are able to control for shared childhood environment and genes by using sibling fixed effects.

Contrary to Cutler and Lleras-Muney (2010), we find that socio-emotional skills—fine-grained facet-level traits and Locus of Control (LOC)—are significant contributors to the education-health gradient. These effects hold even while controlling for sibling fixed effects.

For policy makers seeking to weaken the gradient, this implies that skill-building is a feasible avenue. It is notable that the role of education decreases once multidimensional human capital is accounted for. Together with the fact that the most recent literature strongly doubts whether formal schooling has causal effects on health (Lleras-Muney, 2022), this de-emphasizes the role of formal schooling and instead strikes a chord for strengthening socio-emotional skills through other channels.

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S Appendix

S.1 Survey Data

The survey was distributed through an electronic mailing system called "e-Boks"—see https://www.e-boks.com/danmark/en/what-is-e-boks/— which is linked to everyone's social security number and which is exclusively used for official communication (including pay slips etc.). Every secure letter from the research team at the University of Copenhagen contained an invitation to participate, which explained briefly the purpose of the study, and that there would be a lottery among all respondents with 200 prizes of 1,000 Danish Crowns each (approximately 130 Euro). The letter also contained information on privacy, such as GDPR laws being observed by our study. After 10 days, all non-respondents were sent reminders (79%), as were partial responders (1.4%, with a different text acknowledging their partial response). The survey was implemented in multiple versions, so that 2 participants could have responded to different sets of questions. This was done in order to achieve maximum coverage of the broad range of sub-topics while not straining participants too much. The survey versions were designed to be overlapping, and there was a core set of questions in all versions: self-assessed health, health behaviors, a personality inventory, economic preferences, a mental health instrument and a proxy for cognitive skills (details on all below). The total length was between 97-134 items. There was no differential drop-out from the longer versions in comparison to shorter ones.

Details of Personality Inventory The BFI-2 has a reasonably short response time, with repeated statements to agree/disagree with (for example, I am someone who ... "Is outgoing, sociable" or "Can be somewhat careless"). The availability of sub-facets addresses the bandwidth-fidelity tradeoff, in that broadly defined traits tend to predict a wider range of criteria, whereas narrowly defined traits tend to predict closely aligned criteria more accurately. Facets from a hierarchical model are not typically available in economics research, as surveys are kept too short to be able to break down traits. Another advantage from administering a longer instrument is that it can prevent the measurement problem of acquiescent responding, the tendency of some individuals to consistently agree (yea-saying) or disagree (nay-saying) with items regardless of their content. The BFI-2 contains an equal number of true-keyed and false-keyed items, in both the long and abbreviated form. The reliability is high. For the short version, for example, the alpha reliabilities are reported to have a range of 0.81 to 0.90 across samples in Soto and John (2017b). The analyses presented in the paper use the short version from all respondents (because the short version contains a sub-set of the items in the long version, it is easy to construct the short version for respondents to the long instrument)—this maximizes the number of observations. Since this survey was administered in Denmark, we used the Danish translation suggested and validated by Vedel et al. (2021).

Linking survey data to register data Due to the possibility of having survey data linked to register data in Statistics Denmark, we can use information from the registers to assess how representative survey respondents are, as the register information is available independently of survey response. When estimating the probability of survey response conditional on background characteristics, we observe that response rates were somewhat higher for individuals with one sibling relative to singletons, and for those for which we do not have information on sibling status (more details below)—see Table S.6. Responses are increasing in age (but also very high for those below the age of 20), education, somewhat increasing in income, and somewhat decreasing in health (although individuals

with much longer hospitalizations have a greater propensity to respond). Women are more likely to respond, and immigrants and their descendants are less likely to do so. These patterns hold across different family types (number of siblings) and gender.

Additional Health Behaviors We code behaviors such that they indicate harmful behavior, similar to illness outcomes in the register data of diagnoses described below. **Little physical activity** indicates less than 3 days per week with moderate or vigorous physical activity. We define a **Bad Diet** as disagreeing partially/entirely on "Do you follow a health-conscious diet?". A **Heavy drinker** is defined as a person who is occasionally binge-drinking; i.e. responding "more than once a month" or more frequently to a question on "In a regular month, on how many days do you have 5 drinks or more?". We also use the answer to "How many 'alcohol units' do you normally drink per week?"[14] as a continuous outcome. We code **Frequent drinking** from "During the last six months, how often have you drunk any alcoholic beverages, like beer, cider, wine, spirits or cocktails?" as three or more days per week. We also ask "How many hours of sleep do you usually get per night?" and code an indicator for less than 7 hours as **little sleep**.

[14] Alcohol units is a concept adult Danes are well acquainted with, and is not something abstract to the regular person. Nevertheless, we provided respondents with additional information in a box, giving examples of units, such as 1 bottle of lager = 1 unit, 1 glass of red/white wine = 1 unit, 1 shot = 1 unit, 1 bottle of liquor of 75 cl. = 25 units etc.

Table S.1: List of Short BFI-2 Instrument, see Soto and John (2017a)

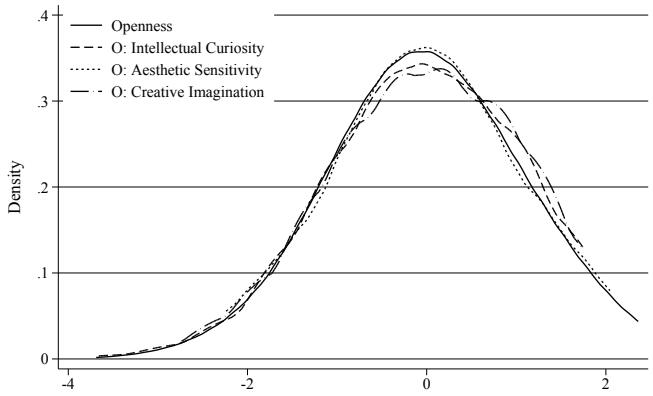
Extraversion	Sociability	Tends to be quiet Is outgoing, sociable
	Assertiveness	Is dominant, acts as a leader Prefers to have others take charge
	Energy Level	Is full of energy Is less active than other people
Agreeableness	Compassion	Is compassionate, has a soft heart Can be cold and uncaring
	Respectfulness	Is respectful, treats others with respect Is sometimes rude to others
	Trust	Assumes the best about people Tends to find fault with others
Conscientiousness	Organization	Tends to be disorganized Keeps things neat and tidy
	Productiveness	Is persistent, works until the task is finished Has difficulty getting started on tasks
	Responsibility	Can be somewhat careless Is reliable, can always be counted on
Negative Emotionality	Anxiety	Is relaxed, handles stress well Worries a lot
	Depression	Tends to feel depressed, blue Feels secure, comfortable with self
	Emotional Volatility	Is emotionally stable, not easily upset Is temperamental, gets emotional easily
Open-Mindedness	Intellectual Curiosity	Has little interest in abstract ideas Is complex, a deep thinker
	Aesthetic Sensitivity	Is fascinated by art, music, or literature Has few artistic interests
	Creative Imagination	Has little creativity Is original, comes up with new ideas

Table S.2: Full List of BFI-2 Items, see Soto and John (2017b)

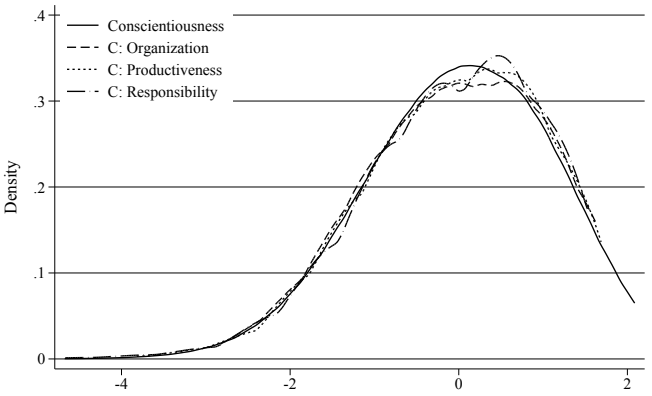
Extraversion	Sociability	Tends to be quiet Is talkative Is outgoing, sociable Is sometimes shy, introverted
	Assertiveness	Is dominant, acts as a leader Has an assertive personality Prefers to have others take charge Finds it hard to influence people
	Energy Level	Is full of energy Shows a lot of Enthusiasm Rarely feels excited or eager Is less active than other people
Agreeableness	Compassion	Is compassionate, has a soft heart Can be cold and uncaring Is helpful and unselfish with others Feels little sympathy for others
	Respectfulness	Is respectful, treats others with respect Is polite, courteous to others Is sometimes rude to others Starts arguments with others
	Trust	Assumes the best about people Has a forgiving nature Tends to find fault with others Is suspicious of others' intentions
Conscientiousness	Organization	Tends to be disorganized Is systematic, likes to keep things in order Keeps things neat and tidy Leaves a mess, doesn't clean up
	Productiveness	Is efficient, gets things done Is persistent, works until the task is finished Tends to be lazy Has difficulty getting started on tasks
	Responsibility	Can be somewhat careless Sometimes behaves irresponsibly Is reliable, can always be counted on Is dependable, steady
Negative Emotionality	Anxiety	Is relaxed, handles stress well Worries a lot Rarely feels anxious or afraid Can be tense
	Depression	Often feels sad Tends to feel depressed, blue Feels secure, comfortable with self Stays optimistic after experiencing a setback
	Emotional Volatility	Is emotionally stable, not easily upset Is temperamental, gets emotional easily Keeps their emotions under control Is moody, has up and down mood swings
Open-Mindedness	Intellectual Curiosity	Has little interest in abstract Ideas Is complex, a deep thinker Avoids intellectual, philosophical discussions Is curious about many different things
	Aesthetic Sensitivity	Is fascinated by art, music, or literature Has few artistic interests Values art and beauty Thinks poetry and plays are boring
	Creative Imagination	Has little creativity Is inventive, finds clever ways to do things Is original, comes up with new Ideas Has difficulty imagining things

Figure S.1: Distribution of Personality Traits/Facets in full Sample

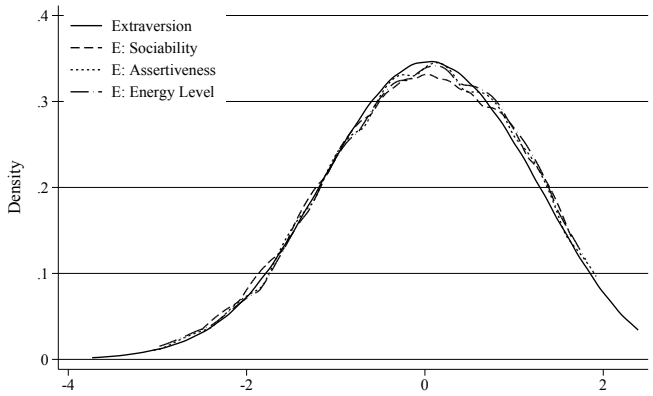
(a) Openness



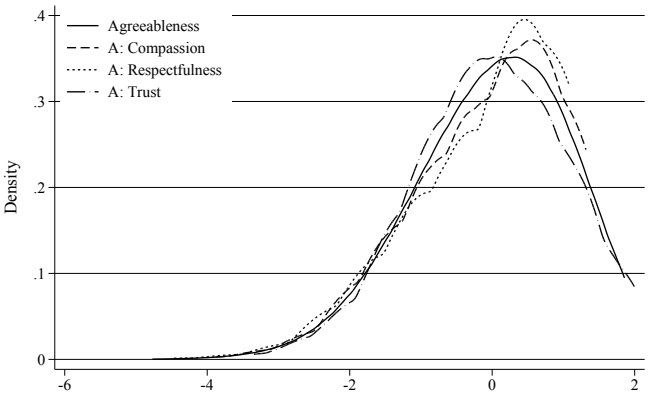
(b) Conscientiousness



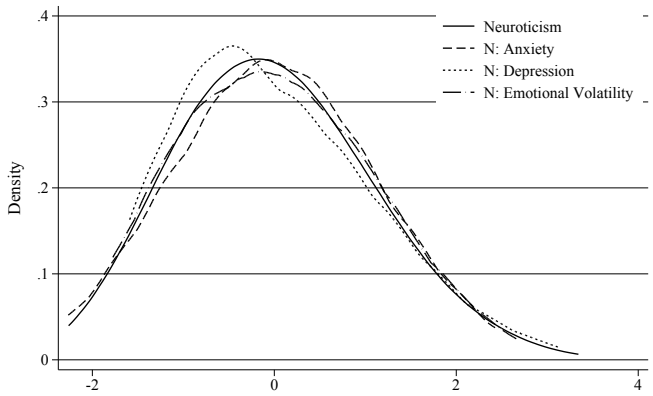
(c) Extraversion



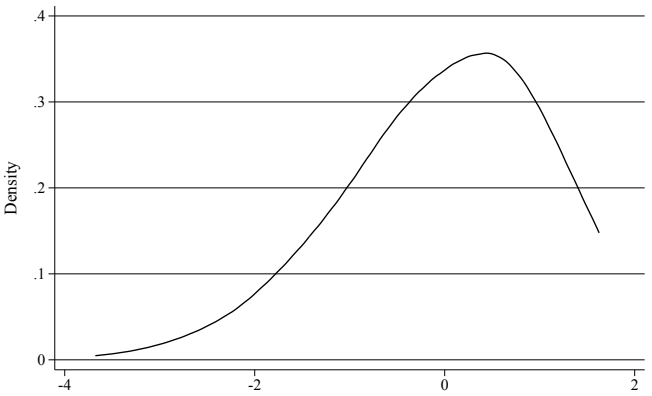
(d) Openness



(e) Conscientiousness



(f) Extraversion



Note: Kernel densities of BFI personality traits and facets in full analysis sample.

Table S.3: Pairwise correlations of Personality Traits and Facets

	O	C	E	A	N	O1	O2	O3	C1	C2	C3	E1	E2	E3	A1	A2	A3	N1	N2	N3
O: Openness	1																			
C: Conscientiousness	0.112	1																		
E: Extraversion	0.285	0.343	1																	
A: Agreeableness	0.210	0.300	0.206	1																
N: Negative Emotionality	-0.090	-0.276	-0.349	-0.256	1															
O1: Intellectual Curiosity	0.720	0.130	0.170	0.212	-0.077	1														
O2: Aesthetic Sensitivity	0.761	0.0002	0.128	0.130	-0.003	0.335	1													
O3: Creative Imagination	0.752	0.134	0.339	0.139	-0.127	0.364	0.304	1												
C1: Organization	0.028	0.828	0.218	0.145	-0.139	0.043	-0.015	0.041	1											
C2: Productiveness	0.159	0.756	0.402	0.242	-0.330	0.155	0.0112	0.202	0.406	1										
C3: Responsibility	0.088	0.723	0.179	0.345	-0.189	0.119	0.009	0.080	0.404	0.368	1									
E1: Sociability	0.183	0.153	0.786	0.196	-0.200	0.079	0.103	0.221	0.085	0.206	0.068	1								
E2: Assertiveness	0.265	0.222	0.726	0.027	-0.189	0.182	0.118	0.295	0.152	0.258	0.103	0.375	1							
E3: Energy Level	0.195	0.400	0.715	0.226	-0.394	0.128	0.065	0.246	0.258	0.442	0.235	0.323	0.286	1						
A1: Compassion	0.198	0.223	0.193	0.795	-0.0659	0.180	0.138	0.130	0.111	0.161	0.273	0.214	0.0556	0.149	1					
A2: Respectfulness	0.154	0.313	0.104	0.793	-0.254	0.195	0.082	0.084	0.176	0.244	0.336	0.082	-0.013	0.160	0.479	1				
A3: Trust	0.141	0.174	0.182	0.764	-0.286	0.125	0.0839	0.111	0.058	0.167	0.206	0.159	0.018	0.223	0.378	0.411	1			
N1: Anxiety	-0.054	-0.128	-0.304	-0.0819	0.827	-0.018	0.008	-0.109	-0.046	-0.217	-0.040	-0.189	-0.194	-0.300	0.062	-0.086	-0.172	1		
N2: Depression	-0.112	-0.324	-0.430	-0.245	0.834	-0.099	-0.016	-0.142	-0.180	-0.383	-0.200	-0.271	-0.246	-0.444	-0.115	-0.224	-0.241	0.577	1	
N3: Emotional Volatility	-0.054	-0.222	-0.122	-0.294	0.790	-0.0721	0.003	-0.059	-0.112	-0.206	-0.218	-0.0314	-0.025	-0.220	-0.105	-0.308	-0.286	0.461	0.465	1

Table S.4: List of Items for Locus of Control

	"How do you see things that happen in your life?"	
1	"I have little control over the things that happen to me."	
2	"There is really no way I can solve some of the problems I have."	
3	"There is little I can do to change many of the important things in my life."	
4	"I often feel helpless in dealing with the problems of life."	
5	"Sometimes I feel that I'm being pushed around in life."	
6	"What happens to me in the future mostly depends on me."	Reverse coded
7	"I can do just about anything I really set my mind to."	Reverse coded

Note: Response categories are from 1 = "completely disagree" via 4 = "neither disagree nor agree" to 7 = "completely agree". To form the index, we sum all items and divide by 7, resulting in a scale from 1-5.

Table S.5: List of MHI-5 Items, see Berwick et al. (1991)

	"How much of the time, during the last month, have you ..."	
1	"... been a very nervous person?"	Anxiety
2	"... felt calm and peaceful?"	General positive affect
3	"... felt downhearted and blue?"	Depression
4	"... been a happy person?"	General positive affect
5	"... felt so down in the dumps that nothing could cheer you up?"	Behavioral/emotional control

Note: Response categories are 1 = "None of the time," 2 = "A little of the time," 3 = "Some of the time," 4 = "A great deal of the time," 5 = "Most of the time," 6 = "All of the time.". Items 2 and 4 are reverse-coded. To form the index, we average all items, resulting in a scale from 5-30, with higher scores reflecting greater difficulties.

Table S.6: Regression of Survey Response, by Number of Siblings and Gender

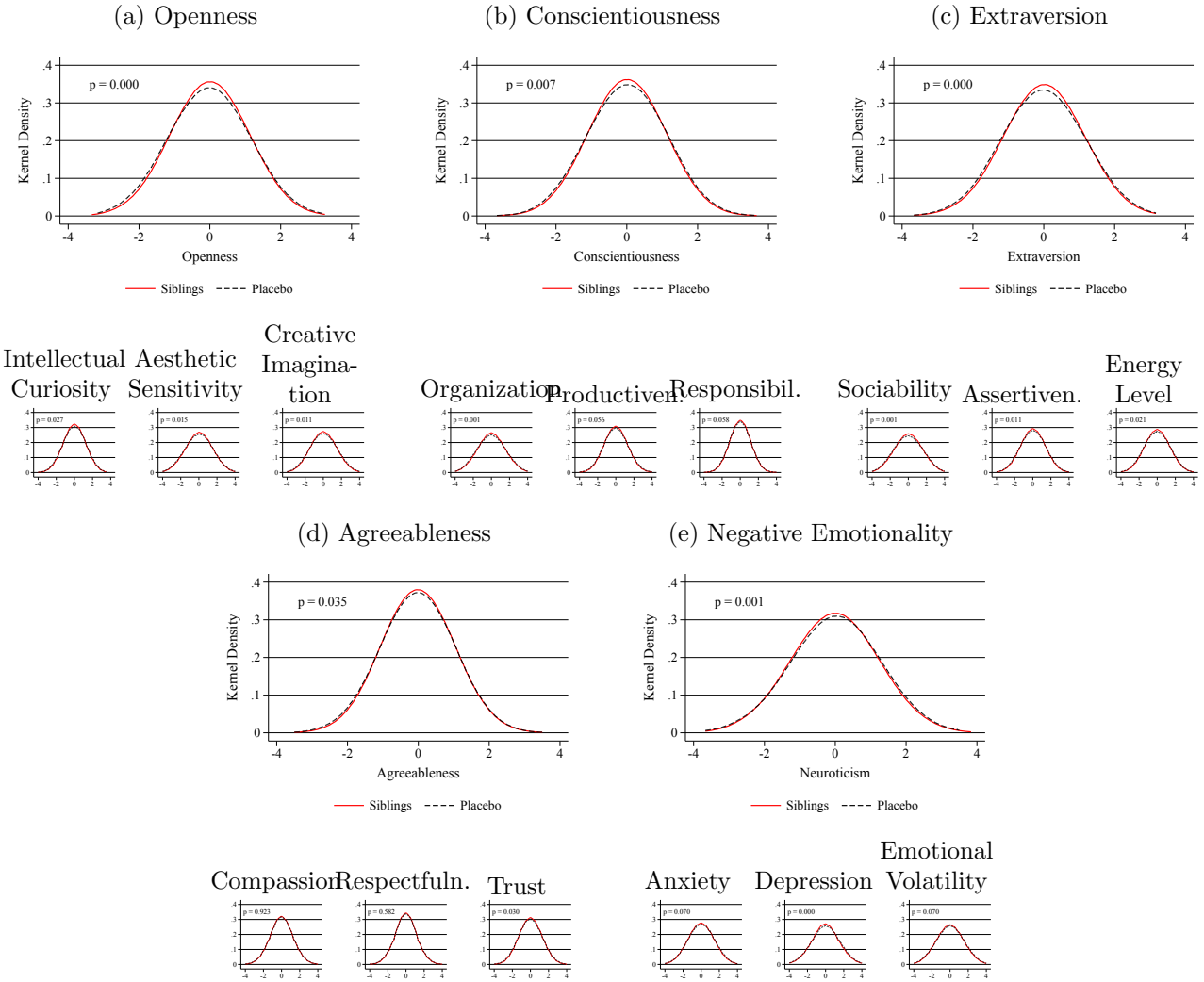
	Response out of Full Sample	Two+ Responses out of Siblings invited
Female	0.074***	0.036***
	(0.0031)	(0.0035)
Age	0.0029***	0.0045***
	(0.00016)	(0.00027)
Number of Siblings by age 17/next earliest	0.0038***	0.099***
	(0.0014)	(0.0038)
Number of siblings missing	−0.014**	0
	(0.0058)	(.)
Age 65+	0.056***	0.035*
	(0.0064)	(0.019)
Immigrant/Descendant	−0.11***	−0.19***
	(0.0059)	(0.015)
Years of education	0.019***	0.014***
	(0.00057)	(0.00091)
Fam. Income Q2	0.015***	0.0016
	(0.0045)	(0.0053)
Fam. Income Q3	0.066***	0.019***
	(0.0047)	(0.0055)
Fam. Income Q4 (Top)	0.11***	0.044***
	(0.0052)	(0.0060)
Fam. Income missing	0.036***	0.069***
	(0.013)	(0.021)
Disposable Income	0.000019	0.00021***
	(0.000075)	(0.000078)
Disposable Income missing	−0.040***	−0.026
	(0.015)	(0.045)
Hospitalization (excl. perinatal)	0.032***	0.0079**
	(0.0035)	(0.0040)
Nights Hospitalized (excl. perinatal)	−0.00090**	0.00052
	(0.00038)	(0.00052)
Number GP visits	0.00013	−0.00010
	(0.00019)	(0.00024)
CCI	−0.0043***	−0.0031**
	(0.00098)	(0.0013)
Constant	−0.16***	−0.48***
	(0.011)	(0.018)
Mean Outcome	0.343	0.261
Adj. R2	0.068	0.109
Observations	94,295	62,183

Note: Showing OLS regression coefficients predicting survey response (standard errors in parentheses): Column (1) shows individual survey response (full BFI facet scales) among all invited persons aged 25-75. Column (2) regresses an indicator for at least two responses out of a family among all invited persons aged 25-75 for whom at least one sibling was also invited. Covariate definitions: Number of siblings observed in the registers at age 17 or earliest observation if that is later. Disposable income corresponds to personal income after tax and interests plus rental value of real estate. Missing values for this variable, as well as number of siblings, was replaced with the mean of non-missing observations among persons invited to the survey aged 25-75. Indicators for family income quartile indicate the quartile (in the overall population) of 2014 per-capita disposable income after transfers. Missing values are replaced with zero in all quartiles. The count of nights hospitalized excludes pregnancy and birth-related contacts. The CCI (Charlson Comorbidity Index) is based on hospital diagnoses occurring during 20 years of data, from 1999-2018. Standard errors are clustered at the family level, $^{*}(p < 0.05)$,$^{**}(p < 0.01)$,$^{***}(p < 0.001)$.

Table S.7: Descriptive Statistics for Full Sample

	Full Sample		Sibling Subsample	
	Mean	Std.Dev	Mean	Std.Dev
Years of education	14.18	(2.60)	14.28	(2.45)
Number of Siblings by age 17/next earliest	2.83	(1.25)	3.07	(1.16)
Female	0.54	(0.50)	0.55	(0.50)
Age	53.02	(13.3)	46.93	(10.8)
Immigrant/Descendant	0.05	(0.22)	0.02	(0.15)
Deceased by 2020	0.01	(0.071)	0.00	(0.048)
Any in/out-patient hospitalization	0.50	(0.50)	0.46	(0.50)
Nights Hospitalized	1.56	(3.94)	1.36	(3.68)
Number GP visits	8.46	(8.40)	7.72	(8.06)
CCI	0.40	(1.66)	0.26	(1.32)
Bad Health	0.19	(0.39)	0.18	(0.39)
BMI>30	0.19	(0.39)	0.20	(0.40)
Smoker	0.14	(0.35)	0.15	(0.36)
O: Intellectual Curiosity	−0.00	(1.00)	0.00	(0.99)
O: Aesthetic Sensitivity	0.00	(1.00)	−0.01	(1.00)
O: Creative Imagination	0.00	(1.00)	−0.01	(1.00)
C: Organization	−0.00	(1.00)	−0.01	(1.02)
C: Productiveness	−0.00	(0.99)	−0.01	(1.00)
C: Responsibility	−0.00	(1.00)	0.00	(0.99)
E: Sociability	0.00	(1.00)	0.00	(1.01)
E: Assertiveness	0.00	(1.00)	0.01	(1.00)
E: Energy Level	0.00	(1.00)	0.01	(1.01)
A: Compassion	0.00	(1.00)	0.00	(0.99)
A: Respectfulness	−0.00	(1.00)	−0.00	(0.98)
A: Trust	−0.00	(1.00)	0.01	(1.00)
N: Anxiety	0.00	(1.00)	−0.01	(1.01)
N: Depression	−0.00	(0.99)	−0.00	(1.02)
N: Emotional Volatility	−0.00	(1.00)	−0.02	(1.01)
Locus of control (internal)	−0.00	(1.00)	0.02	(1.00)
Risk aversion(-)	6.12	(2.02)	6.27	(1.97)
Patience	6.37	(2.03)	6.52	(2.00)
Fam. Income Q1 (Bottom)	0.13	(0.34)	0.15	(0.36)
Fam. Income Q2	0.20	(0.40)	0.19	(0.39)
Fam. Income Q3	0.28	(0.45)	0.29	(0.45)
Fam. Income Q4 (Top)	0.39	(0.49)	0.37	(0.48)
Disposable Income	26.75	(28.9)	27.20	(30.9)
Observations	28,261		18,032	

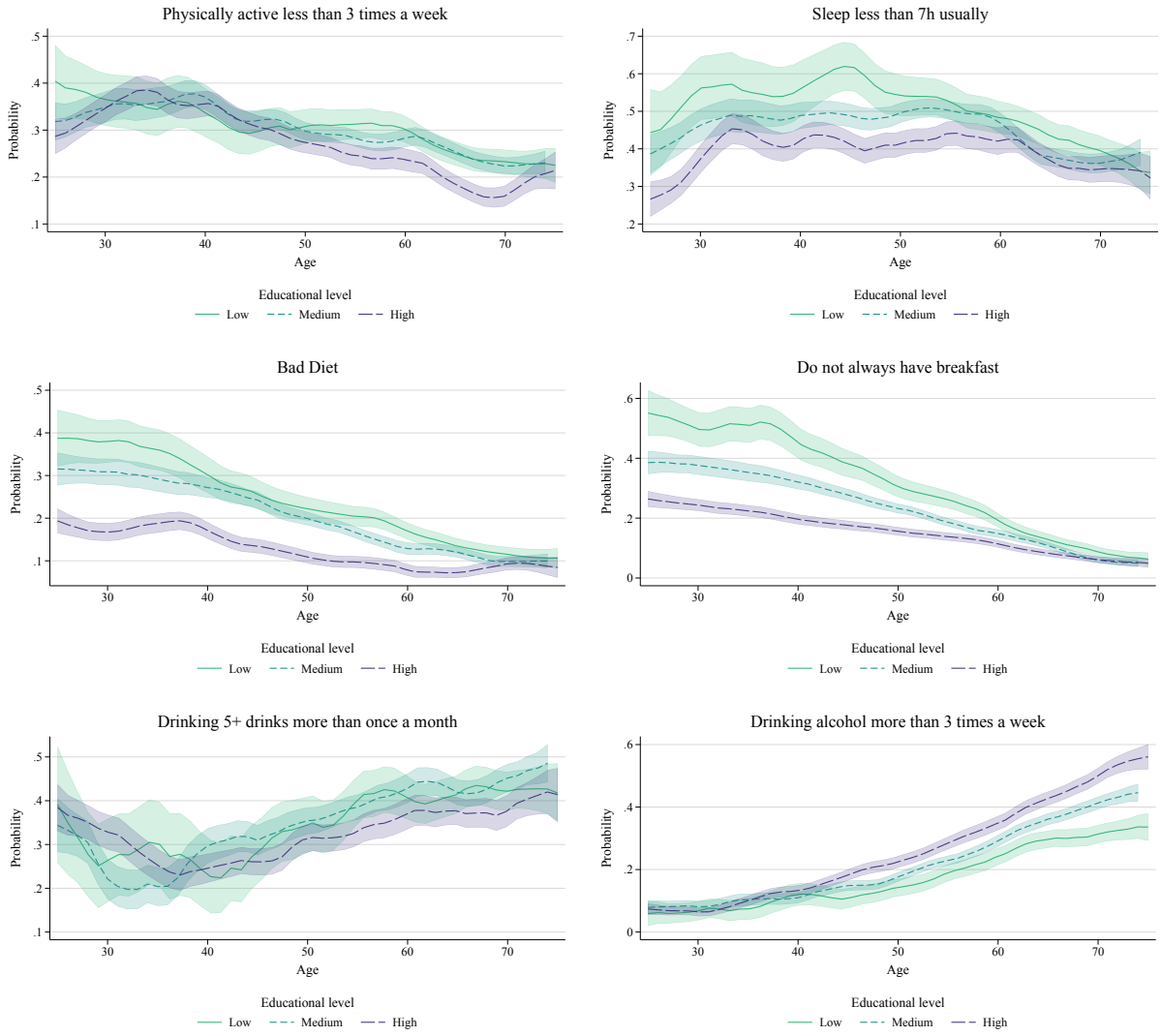
Figure S.2: Distribution of Differences in Personality Traits/Facets in Siblings and Random Placebo Pairs



Note: Contrasting the distribution of gaps in BFI personality traits and facets among siblings versus randomly chosen pairs of strangers ("Placebo"). In families with three or more valid BFI responses from siblings, we randomly selected two. Showing Epanechnikov kernel densities, and listing the p-value of a Kolmogorov-Smirnov test of equal distributions. While the distributions are statistically significantly different from each other, there is almost as much variation within families as across strangers. Sample: Sibling-sample, see Section 2.3.

S.2 Detailed and Additional Results

Figure S.3: Gradient in Other Health Behaviors



Note: Definitions of variables: Bad Diet: Disagree partially/entirely on "Do you follow a health-conscious diet?" Sample: Survey respondents ages 20-75.

Table S.8: Role of Personality in Health Regressions

	Any Hospital in/out-patient		Nights Hospitalized		Number GP visits		CCI	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness	−0.006**		−0.084***		−0.021		−0.004	
	(0.003)		(0.025)		(0.050)		(0.010)	
O: Intellectual Curiosity		−0.005		−0.029		−0.045		−0.005
		(0.003)		(0.026)		(0.053)		(0.011)
O: Aesthetic Sensitivity		−0.012***		−0.093***		−0.168***		0.003
		(0.003)		(0.025)		(0.051)		(0.011)
O: Creative Imagination		0.010***		0.016		0.210***		−0.005
		(0.003)		(0.027)		(0.055)		(0.011)
Conscientiousness	0.009***		−0.015		0.209***		0.001	
	(0.003)		(0.026)		(0.053)		(0.011)	
C: Organization		0.009***		0.045*		0.393***		0.028**
		(0.003)		(0.027)		(0.055)		(0.011)
C: Productiveness		0.012***		−0.005		0.030		0.011
		(0.004)		(0.029)		(0.059)		(0.012)
C: Responsibility		−0.001		0.004		0.030		−0.012
		(0.003)		(0.028)		(0.056)		(0.012)
Extraversion	0.017***		0.107***		0.433***		0.012	
	(0.004)		(0.028)		(0.058)		(0.012)	
E: Sociability		0.022***		0.137***		0.746***		0.041***
		(0.003)		(0.027)		(0.055)		(0.011)
E: Assertiveness		0.007**		0.097***		0.325***		0.042***
		(0.003)		(0.027)		(0.055)		(0.011)
E: Energy Level		−0.019***		−0.197***		−0.766***		−0.105***
		(0.004)		(0.029)		(0.059)		(0.012)
Agreeableness	0.006*		0.116***		0.471***		0.015	
	(0.003)		(0.027)		(0.054)		(0.011)	
A: Compassion		0.003		0.093***		0.356***		0.021*
		(0.004)		(0.029)		(0.058)		(0.012)
A: Respectfulness		−0.009**		−0.040		0.040		−0.006
		(0.004)		(0.029)		(0.059)		(0.012)
A: Trust		0.013***		0.116***		0.190***		0.018
		(0.003)		(0.027)		(0.055)		(0.011)
Neuroticism	0.017***		0.053*		1.329***		−0.041***	
	(0.004)		(0.030)		(0.060)		(0.012)	
N: Anxiety		0.008**		−0.000		0.662***		−0.022*
		(0.004)		(0.031)		(0.063)		(0.013)
N: Depression		0.009**		−0.030		0.519***		−0.039***
		(0.004)		(0.034)		(0.069)		(0.014)
N: Emotional Volatility		0.001		0.048		0.251***		−0.011
		(0.004)		(0.029)		(0.059)		(0.012)
Locus of control (internal)	−0.044***	−0.040***	−0.398***	−0.376***	−1.247***	−1.099***	−0.199***	−0.189***
	(0.004)	(0.004)	(0.030)	(0.030)	(0.060)	(0.061)	(0.012)	(0.013)
Female	0.168***	0.169***	0.245***	0.228***	1.927***	1.843***	0.073***	0.062***
	(0.006)	(0.006)	(0.051)	(0.052)	(0.104)	(0.105)	(0.021)	(0.022)
Age	0.007***	0.007***	0.026***	0.026***	0.102***	0.101***	0.020***	0.020***
	(0.000)	(0.000)	(0.002)	(0.002)	(0.004)	(0.004)	(0.001)	(0.001)
Immigrant/Descendant	−0.006	−0.006	−0.058	−0.050	−0.255	−0.219	−0.039	−0.040
	(0.013)	(0.013)	(0.109)	(0.109)	(0.222)	(0.221)	(0.045)	(0.046)
Risk aversion(-)	0.009***	0.008***	0.062***	0.052***	0.108***	0.091***	0.019***	0.017***
	(0.002)	(0.002)	(0.013)	(0.013)	(0.027)	(0.027)	(0.006)	(0.006)
Patience	−0.000	−0.000	−0.023*	−0.020	0.022	0.030	0.002	0.003
	(0.002)	(0.002)	(0.013)	(0.013)	(0.026)	(0.026)	(0.005)	(0.005)
Fam. Income Q2	−0.012	−0.013	0.031	0.030	−0.354**	−0.365**	−0.016	−0.013
	(0.010)	(0.010)	(0.084)	(0.084)	(0.172)	(0.170)	(0.035)	(0.035)
Fam. Income Q3	0.001	0.003	−0.022	−0.009	−1.187***	−1.151***	−0.087***	−0.080**
	(0.010)	(0.010)	(0.081)	(0.081)	(0.164)	(0.163)	(0.034)	(0.034)
Fam. Income Q4 (Top)	−0.011	−0.007	−0.186**	−0.155*	−1.797***	−1.713***	−0.152***	−0.141***
	(0.010)	(0.010)	(0.082)	(0.082)	(0.167)	(0.166)	(0.034)	(0.034)
Disposable Income	−0.000***	−0.000***	−0.002**	−0.002*	−0.006***	−0.005***	−0.000	−0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)	(0.000)
Constant	−0.019	−0.012	−0.073	−0.022	2.507***	2.578***	−0.757***	−0.741***
	(0.019)	(0.019)	(0.153)	(0.153)	(0.311)	(0.309)	(0.064)	(0.064)
Observations	28,261	28,261	28,261	28,261	28,261	28,261	28,261	28,261

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are shown graphically in Fig. 4.

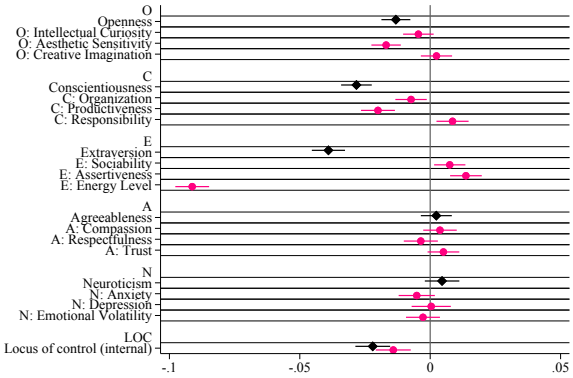
Table S.9: Role of Personality in Health Regressions

	Bad Health		BMI>30		Smoker		MHI-5	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Openness	0.010***		−0.013***		−0.006**		0.188***	
	(0.002)		(0.002)		(0.002)		(0.019)	
O: Intellectual Curiosity		−0.004		−0.021***		0.004*		0.159***
		(0.002)		(0.003)		(0.002)		(0.020)
O: Aesthetic Sensitivity		−0.010***		−0.010***		−0.009***		−0.002
		(0.002)		(0.003)		(0.002)		(0.019)
O: Creative Imagination		0.024***		0.011***		−0.001		0.062***
		(0.002)		(0.003)		(0.002)		(0.020)
Conscientiousness	−0.006**		−0.022***		−0.014***		−0.007	
	(0.002)		(0.003)		(0.002)		(0.020)	
C: Organization		−0.001		−0.019***		0.000		0.015
		(0.002)		(0.003)		(0.002)		(0.020)
C: Productiveness		0.006**		0.008***		0.009***		0.041*
		(0.003)		(0.003)		(0.003)		(0.022)
C: Responsibility		0.012***		0.009***		−0.015***		−0.009
		(0.003)		(0.003)		(0.002)		(0.021)
Extraversion	−0.023***		−0.001		0.005*		−0.250***	
	(0.003)		(0.003)		(0.003)		(0.022)	
E: Sociability		0.021***		0.019***		0.019***		−0.037*
		(0.002)		(0.003)		(0.002)		(0.020)
E: Assertiveness		0.025***		0.026***		0.006**		0.123***
		(0.002)		(0.003)		(0.002)		(0.020)
E: Energy Level		−0.099***		−0.077***		−0.032***		−0.197***
		(0.003)		(0.003)		(0.003)		(0.022)
Agreeableness	0.015***		−0.002		0.005*		0.138***	
	(0.002)		(0.003)		(0.002)		(0.020)	
A: Compassion		0.005**		0.007**		−0.001		0.009
		(0.003)		(0.003)		(0.003)		(0.021)
A: Respectfulness		0.002		−0.014***		−0.008***		0.074***
		(0.003)		(0.003)		(0.003)		(0.022)
A: Trust		0.015***		0.011***		0.019***		0.041**
		(0.002)		(0.003)		(0.002)		(0.020)
Neuroticism	0.047***		0.013***		0.006**		1.800***	
	(0.003)		(0.003)		(0.003)		(0.022)	
N: Anxiety		0.008***		−0.011***		−0.008***		0.520***
		(0.003)		(0.003)		(0.003)		(0.023)
N: Depression		0.038***		0.006*		0.013***		1.557***
		(0.003)		(0.003)		(0.003)		(0.025)
N: Emotional Volatility		0.002		0.012***		0.002		0.208***
		(0.003)		(0.003)		(0.003)		(0.022)
Locus of control (internal)	−0.111***	−0.098***	−0.025***	−0.017***	−0.022***	−0.017***	−1.210***	−1.083***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.023)	(0.022)
Female	−0.014***	−0.011**	0.003	0.004	−0.019***	−0.017***	−0.148***	−0.004
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.039)	(0.038)
Age	0.003***	0.003***	0.000	0.000	−0.001***	−0.001***	−0.059***	−0.058***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Immigrant/Descendant	−0.007	0.000	−0.053***	−0.048***	0.002	0.002	0.849***	0.951***
	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.010)	(0.084)	(0.082)
Risk aversion(-)	0.007***	0.005***	0.008***	0.005***	0.011***	0.009***	0.035***	0.032***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.010)	(0.010)
Patience	−0.000	0.000	−0.005***	−0.004***	−0.005***	−0.005***	−0.001	−0.006
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.010)	(0.009)
Fam. Income Q2	−0.027***	−0.028***	0.029***	0.028***	−0.029***	−0.029***	−0.418***	−0.402***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.007)	(0.007)	(0.064)	(0.063)
Fam. Income Q3	−0.063***	−0.058***	−0.004	0.000	−0.080***	−0.077***	−0.572***	−0.523***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)	(0.061)	(0.060)
Fam. Income Q4 (Top)	−0.103***	−0.094***	−0.052***	−0.043***	−0.100***	−0.096***	−0.523***	−0.534***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)	(0.063)	(0.061)
Disposable Income	−0.000	−0.000	−0.000**	−0.000**	−0.000*	−0.000*	0.002***	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Constant	0.088***	0.094***	0.182***	0.190***	0.233***	0.245***	13.581***	13.508***
	(0.014)	(0.014)	(0.015)	(0.015)	(0.014)	(0.014)	(0.116)	(0.114)
Observations	27,555	27,555	27,802	27,802	27,560	27,560	27,432	27,432

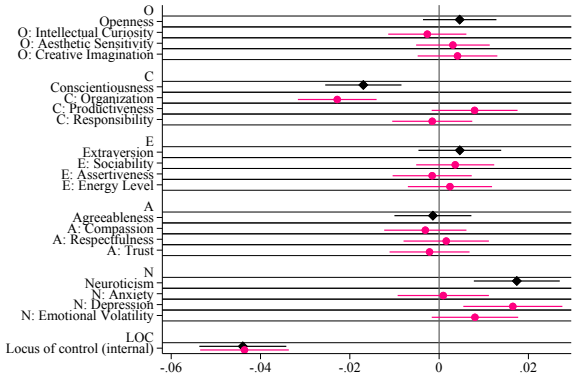
Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are shown graphically in Fig. 4.

Figure S.4: Coefficients on Personality Traits and Facets, Additional Health Outcomes

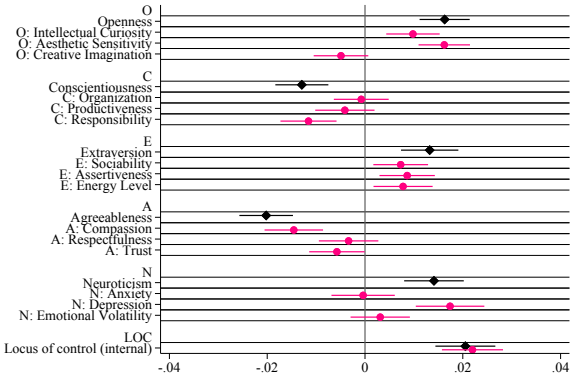
(a) Little Exercise



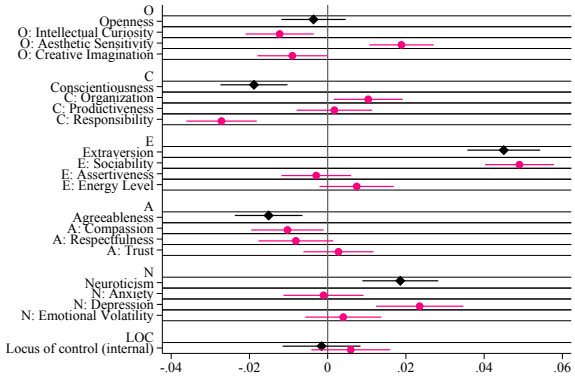
(b) Little Sleep



(c) Frequent Alcohol



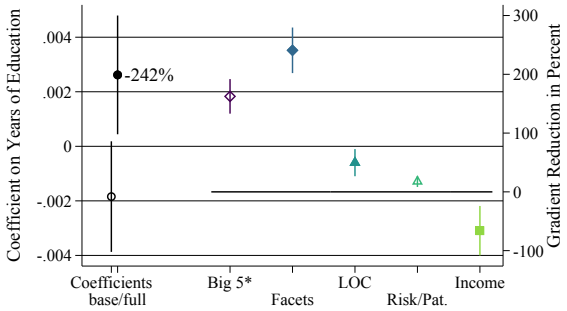
(d) Heavy Drinker



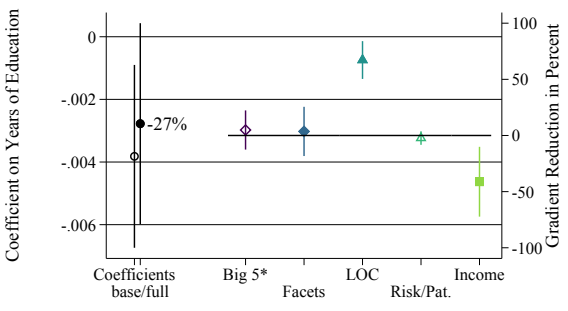
Note: The graphs show coefficients (in black) for the Big-Five factors, or (pink) for the 15 facets, from regressions predicting each outcome. Demographic controls included are gender, age, immigrant status, indicators for family income quartile, and disposable income (coefficients not shown). Not conditioning on education.

Figure S.5: Gradient Reductions: Diet, Exercise, Drinking

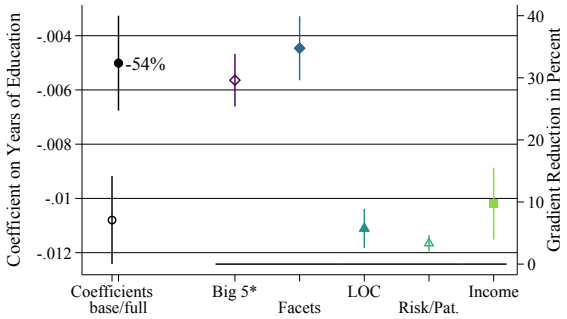
(a) Physically active less than 3 times a week



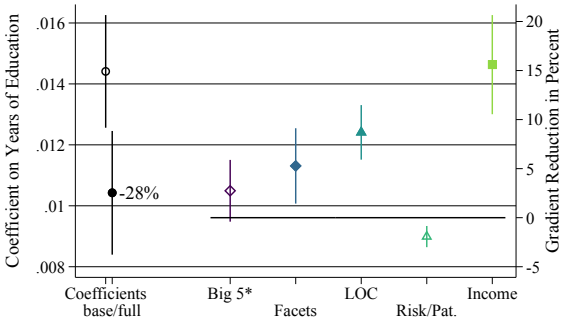
(b) Sleep less than 7h usually



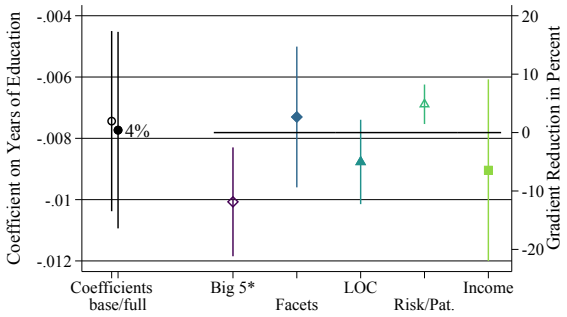
(c) Bad diet



(d) Drink more than twice a week



(e) Drink more than 5+ drinks more than twice a week?



Note: See notes to Fig. 5. Number of observations for panels: a) 27,695, b) 27,382, c) 27,482, d) 27,768. Regression results in Table S.12.

Table S.10: Contributions to the Health Gradient (Big Five Factors), Full Sample

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0100***	−0.0836***	−0.3354***	−0.0299***	−0.0222***	−0.0164***	−0.0179***	−0.1580***
	(0.0011)	(0.0090)	(0.0187)	(0.0037)	(0.0009)	(0.0009)	(0.0008)	(0.0092)
Female	0.1805***	0.3310***	2.8016***	0.0763***	0.0115**	−0.0027	−0.0209***	0.5320***
	(0.0058)	(0.0469)	(0.0976)	(0.0196)	(0.0047)	(0.0047)	(0.0042)	(0.0480)
Age	0.0073***	0.0250***	0.0904***	0.0193***	0.0020***	−0.0001	−0.0017***	−0.0582***
	(0.0002)	(0.0018)	(0.0037)	(0.0007)	(0.0002)	(0.0002)	(0.0002)	(0.0018)
Immigrant/Descendant	0.0058	0.0440	0.4053*	0.0220	0.0416***	−0.0393***	0.0223**	1.4737***
	(0.0134)	(0.1089)	(0.2268)	(0.0454)	(0.0110)	(0.0110)	(0.0096)	(0.1130)
Constant	0.1605***	1.2421***	6.8865***	−0.2369***	0.3929***	0.4324***	0.4930***	15.1892***
	(0.0198)	(0.1606)	(0.3347)	(0.0670)	(0.0161)	(0.0162)	(0.0142)	(0.1646)
Full Regression:								
Years of education	−0.0074***	−0.0518***	−0.1660***	−0.0145***	−0.0101***	−0.0112***	−0.0134***	−0.0049
	(0.0012)	(0.0098)	(0.0198)	(0.0041)	(0.0009)	(0.0010)	(0.0009)	(0.0074)
Female	0.1685***	0.2451***	1.9289***	0.0731***	−0.0135***	0.0036	−0.0184***	−0.1476***
	(0.0063)	(0.0514)	(0.1042)	(0.0214)	(0.0048)	(0.0052)	(0.0045)	(0.0391)
Age	0.0073***	0.0255***	0.0995***	0.0202***	0.0024***	0.0001	−0.0011***	−0.0590***
	(0.0002)	(0.0019)	(0.0038)	(0.0008)	(0.0002)	(0.0002)	(0.0002)	(0.0014)
Immigrant/Descendant	−0.0035	−0.0440	−0.2089	−0.0345	−0.0039	−0.0495***	0.0060	0.8508***
	(0.0135)	(0.1091)	(0.2214)	(0.0455)	(0.0102)	(0.0110)	(0.0096)	(0.0840)
Openness	−0.0034	−0.0633**	0.0458	0.0023	0.0140***	−0.0082***	−0.0001	0.1901***
	(0.0031)	(0.0251)	(0.0510)	(0.0105)	(0.0023)	(0.0025)	(0.0022)	(0.0191)
Conscientiousness	0.0078**	−0.0237	0.1809***	−0.0011	−0.0078***	−0.0239***	−0.0164***	−0.0080
	(0.0032)	(0.0263)	(0.0533)	(0.0110)	(0.0024)	(0.0026)	(0.0023)	(0.0200)
Extraversion	0.0168***	0.1093***	0.4393***	0.0123	−0.0226***	−0.0010	0.0049*	−0.2499***
	(0.0035)	(0.0284)	(0.0576)	(0.0118)	(0.0026)	(0.0029)	(0.0025)	(0.0216)
Agreeableness	0.0058*	0.1158***	0.4717***	0.0153	0.0147***	−0.0018	0.0047**	0.1377***
	(0.0033)	(0.0265)	(0.0538)	(0.0111)	(0.0025)	(0.0027)	(0.0023)	(0.0202)
Neuroticism	0.0170***	0.0510*	1.3212***	−0.0416***	0.0468***	0.0123***	0.0056**	1.7996***
	(0.0036)	(0.0295)	(0.0599)	(0.0123)	(0.0027)	(0.0030)	(0.0026)	(0.0225)
Locus of control (internal)	−0.0422***	−0.3875***	−1.2144***	−0.1960***	−0.1088***	−0.0223***	−0.0193***	−1.2089***
	(0.0037)	(0.0297)	(0.0603)	(0.0124)	(0.0028)	(0.0030)	(0.0026)	(0.0227)
Risk aversion(-)	0.0088***	0.0583***	0.0963***	0.0184***	0.0063***	0.0069***	0.0105***	0.0344***
	(0.0016)	(0.0133)	(0.0270)	(0.0056)	(0.0012)	(0.0013)	(0.0012)	(0.0102)
Patience	−0.0001	−0.0201	0.0299	0.0025	0.0003	−0.0042***	−0.0045***	−0.0012
	(0.0016)	(0.0127)	(0.0258)	(0.0053)	(0.0012)	(0.0013)	(0.0011)	(0.0097)
Fam. Income Q2	−0.0060	0.0719	−0.2210	−0.0039	−0.0188**	0.0378***	−0.0184**	−0.4145***
	(0.0105)	(0.0848)	(0.1720)	(0.0353)	(0.0079)	(0.0085)	(0.0075)	(0.0646)
Fam. Income Q3	0.0133	0.0620	−0.9184***	−0.0635*	−0.0472***	0.0141*	−0.0587***	−0.5644***
	(0.0101)	(0.0823)	(0.1670)	(0.0343)	(0.0077)	(0.0083)	(0.0073)	(0.0626)
Fam. Income Q4 (Top)	0.0062	−0.0664	−1.4149***	−0.1182***	−0.0798***	−0.0262***	−0.0695***	−0.5119***
	(0.0105)	(0.0852)	(0.1729)	(0.0355)	(0.0079)	(0.0086)	(0.0075)	(0.0648)
Disposable Income	−0.0003***	−0.0013	−0.0046***	−0.0001	−0.0000	−0.0001	−0.0000	0.0023***
	(0.0001)	(0.0009)	(0.0017)	(0.0004)	(0.0001)	(0.0001)	(0.0001)	(0.0006)
Constant	0.0777***	0.6118***	4.6995***	−0.5647***	0.2208***	0.3297***	0.4097***	13.6449***
	(0.0246)	(0.2000)	(0.4058)	(0.0834)	(0.0186)	(0.0201)	(0.0177)	(0.1523)
Decomposition of Reduction								
Personality	0.0000	0.0004	−0.0182***	0.0025***	−0.0017***	−0.0013***	−0.0001	−0.0657***
	(0.0003)	(0.0021)	(0.0050)	(0.0009)	(0.0002)	(0.0002)	(0.0002)	(0.0045)
Locus of Control (external)	−0.0026***	−0.0242***	−0.0759***	−0.0123***	−0.0068***	−0.0014***	−0.0012***	−0.0762***
	(0.0002)	(0.0021)	(0.0047)	(0.0009)	(0.0003)	(0.0002)	(0.0002)	(0.0031)
Econ	0.0002*	−0.0000	0.0038**	0.0005*	0.0001*	−0.0001	−0.0001	0.0006
	(0.0001)	(0.0008)	(0.0015)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0006)
Income	−0.0002	−0.0080**	−0.0791***	−0.0062***	−0.0037***	−0.0024***	−0.0032***	−0.0120***
	(0.0004)	(0.0035)	(0.0072)	(0.0015)	(0.0003)	(0.0004)	(0.0003)	(0.0027)
Total reduction	−0.0026***	−0.0318***	−0.1694***	−0.0154***	−0.0121***	−0.0052***	−0.0046***	−0.1532***
	(0.0005)	(0.0041)	(0.0093)	(0.0017)	(0.0005)	(0.0004)	(0.0004)	(0.0069)
Observations	28,261	28,261	28,261	28,261	27,555	27,802	27,560	27,432

Note: Regression coefficients from OLS on full sample, ages 25-75. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Personality" stands only for the Big Five factors, not facets (shown in Table S.11).

Table S.11: Contributions to the Health Gradient, Full Sample

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0100***	−0.0836***	−0.3354***	−0.0299***	−0.0222***	−0.0164***	−0.0179***	−0.1580***
	(0.0011)	(0.0090)	(0.0187)	(0.0037)	(0.0009)	(0.0009)	(0.0008)	(0.0092)
Full Regression:								
Years of education	−0.0066***	−0.0474***	−0.1496***	−0.0135***	−0.0093***	−0.0101***	−0.0132***	−0.0207***
	(0.0012)	(0.0098)	(0.0198)	(0.0041)	(0.0009)	(0.0010)	(0.0009)	(0.0073)
Female	0.1694***	0.2290***	1.8465***	0.0621***	−0.0107**	0.0041	−0.0167***	−0.0036
	(0.0064)	(0.0520)	(0.1050)	(0.0217)	(0.0047)	(0.0051)	(0.0046)	(0.0385)
Age	0.0073***	0.0253***	0.0990***	0.0201***	0.0024***	0.0001	−0.0011***	−0.0585***
	(0.0002)	(0.0019)	(0.0038)	(0.0008)	(0.0002)	(0.0002)	(0.0002)	(0.0014)
Immigrant/Descendant	−0.0035	−0.0339	−0.1693	−0.0359	0.0034	−0.0450***	0.0061	0.9588***
	(0.0135)	(0.1093)	(0.2206)	(0.0456)	(0.0099)	(0.0109)	(0.0096)	(0.0818)
O: Intellectual Curiosity	−0.0027	−0.0125	0.0077	−0.0003	−0.0003	−0.0178***	0.0088***	0.1667***
	(0.0033)	(0.0267)	(0.0538)	(0.0111)	(0.0024)	(0.0026)	(0.0024)	(0.0197)
O: Aesthetic Sensitivity	−0.0103***	−0.0814***	−0.1330***	0.0057	−0.0079***	−0.0080***	−0.0061***	0.0026
	(0.0032)	(0.0256)	(0.0516)	(0.0107)	(0.0023)	(0.0025)	(0.0023)	(0.0189)
O: Creative Imagination	0.0094***	0.0124	0.1987***	−0.0059	0.0235***	0.0103***	−0.0019	0.0603***
	(0.0033)	(0.0270)	(0.0546)	(0.0113)	(0.0024)	(0.0027)	(0.0024)	(0.0200)
C: Organization	0.0080**	0.0387	0.3723***	0.0258**	−0.0028	−0.0207***	−0.0015	0.0123
	(0.0033)	(0.0272)	(0.0548)	(0.0113)	(0.0025)	(0.0027)	(0.0024)	(0.0201)
C: Productiveness	0.0116***	−0.0089	0.0173	0.0101	0.0053**	0.0073**	0.0080***	0.0389*
	(0.0036)	(0.0293)	(0.0592)	(0.0122)	(0.0027)	(0.0029)	(0.0026)	(0.0218)
C: Responsibility	−0.0012	0.0032	0.0291	−0.0126	0.0114***	0.0090***	−0.0155***	−0.0092
	(0.0034)	(0.0277)	(0.0560)	(0.0116)	(0.0025)	(0.0027)	(0.0024)	(0.0206)
E: Sociability	0.0215***	0.1346***	0.7368***	0.0407***	0.0206***	0.0188***	0.0183***	−0.0382*
	(0.0033)	(0.0271)	(0.0547)	(0.0113)	(0.0025)	(0.0027)	(0.0024)	(0.0200)
E: Assertiveness	0.0082**	0.1039***	0.3461***	0.0435***	0.0268***	0.0273***	0.0074***	0.1259***
	(0.0034)	(0.0274)	(0.0553)	(0.0114)	(0.0025)	(0.0027)	(0.0024)	(0.0203)
E: Energy Level	−0.0185***	−0.1911***	−0.7477***	−0.1032***	−0.0979***	−0.0754***	−0.0301***	−0.1943***
	(0.0036)	(0.0293)	(0.0591)	(0.0122)	(0.0026)	(0.0029)	(0.0026)	(0.0217)
A: Compassion	0.0033	0.0921***	0.3515***	0.0209*	0.0049*	0.0067**	−0.0010	0.0087
	(0.0036)	(0.0289)	(0.0584)	(0.0121)	(0.0026)	(0.0029)	(0.0026)	(0.0215)
A: Respectfulness	−0.0083**	−0.0374	0.0484	−0.0051	0.0023	−0.0133***	−0.0075***	0.0756***
	(0.0036)	(0.0294)	(0.0594)	(0.0123)	(0.0027)	(0.0029)	(0.0026)	(0.0218)
A: Trust	0.0127***	0.1135***	0.1834***	0.0179	0.0142***	0.0100***	0.0180***	0.0399**
	(0.0034)	(0.0274)	(0.0553)	(0.0114)	(0.0025)	(0.0027)	(0.0024)	(0.0203)
N: Anxiety	0.0077**	−0.0047	0.6486***	−0.0228*	0.0076***	−0.0121***	−0.0095***	0.5182***
	(0.0039)	(0.0313)	(0.0632)	(0.0131)	(0.0028)	(0.0031)	(0.0028)	(0.0232)
N: Depression	0.0103**	−0.0240	0.5390***	−0.0369***	0.0390***	0.0070**	0.0153***	1.5600***
	(0.0042)	(0.0339)	(0.0685)	(0.0142)	(0.0031)	(0.0034)	(0.0030)	(0.0252)
N: Emotional Volatility	0.0010	0.0445	0.2394***	−0.0117	0.0017	0.0111***	0.0010	0.2067***
	(0.0036)	(0.0293)	(0.0592)	(0.0122)	(0.0027)	(0.0029)	(0.0026)	(0.0217)
Locus of control (internal)	−0.0383***	−0.3668***	−1.0708***	−0.1862***	−0.0963***	−0.0152***	−0.0140***	−1.0786***
	(0.0037)	(0.0303)	(0.0611)	(0.0126)	(0.0027)	(0.0030)	(0.0027)	(0.0224)
Risk aversion(-)	0.0073***	0.0497***	0.0832***	0.0162***	0.0044***	0.0047***	0.0085***	0.0312***
	(0.0017)	(0.0135)	(0.0272)	(0.0056)	(0.0012)	(0.0013)	(0.0012)	(0.0100)
Patience	0.0002	−0.0182	0.0364	0.0031	0.0006	−0.0035***	−0.0043***	−0.0050
	(0.0016)	(0.0127)	(0.0256)	(0.0053)	(0.0011)	(0.0013)	(0.0011)	(0.0094)
Fam. Income Q2	−0.0075	0.0686	−0.2427	−0.0024	−0.0199***	0.0364***	−0.0182**	−0.3852***
	(0.0104)	(0.0847)	(0.1710)	(0.0353)	(0.0077)	(0.0084)	(0.0075)	(0.0628)
Fam. Income Q3	0.0135	0.0685	−0.9071***	−0.0584*	−0.0428***	0.0165**	−0.0556***	−0.4892***
	(0.0101)	(0.0823)	(0.1661)	(0.0343)	(0.0074)	(0.0082)	(0.0072)	(0.0610)
Fam. Income Q4 (Top)	0.0080	−0.0478	−1.3741***	−0.1108***	−0.0730***	−0.0201**	−0.0663***	−0.4870***
	(0.0105)	(0.0851)	(0.1718)	(0.0355)	(0.0077)	(0.0084)	(0.0075)	(0.0630)
Disposable Income	−0.0003***	−0.0012	−0.0041**	−0.0000	0.0000	−0.0001	−0.0000	0.0017***
	(0.0001)	(0.0009)	(0.0017)	(0.0004)	(0.0001)	(0.0001)	(0.0001)	(0.0006)
Constant	0.0746***	0.6014***	4.5445***	−0.5632***	0.2156***	0.3233***	0.4185***	13.7801***
	(0.0247)	(0.2004)	(0.4044)	(0.0835)	(0.0181)	(0.0199)	(0.0176)	(0.1485)
Decomposition of Reduction								
Personality	−0.0011***	−0.0065**	−0.0475***	0.0005	−0.0036***	−0.0032***	−0.0007***	−0.0572***
	(0.0003)	(0.0026)	(0.0063)	(0.0011)	(0.0003)	(0.0003)	(0.0002)	(0.0051)
Locus of Control (external)	−0.0024***	−0.0229***	−0.0669***	−0.0116***	−0.0061***	−0.0009***	−0.0009***	−0.0680***
	(0.0002)	(0.0021)	(0.0045)	(0.0009)	(0.0003)	(0.0002)	(0.0002)	(0.0028)
Econ	0.0002*	−0.0001	0.0039***	0.0005*	0.0001*	−0.0001	−0.0001	0.0003
	(0.0001)	(0.0007)	(0.0015)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0006)
Income	−0.0000	−0.0067*	−0.0754***	−0.0058***	−0.0033***	−0.0020***	−0.0031***	−0.0125***
	(0.0004)	(0.0035)	(0.0072)	(0.0015)	(0.0003)	(0.0004)	(0.0003)	(0.0026)
Total reduction	−0.0034***	−0.0362***	−0.1858***	−0.0164***	−0.0129***	−0.0063***	−0.0047***	−0.1373***
	(0.0005)	(0.0043)	(0.0098)	(0.0018)	(0.0006)	(0.0005)	(0.0004)	(0.0071)
Mean Outcome	0.502	1.562	8.465	0.402	0.191	0.193	0.140	10.221
Observations	28,261	28,261	28,261	28,261	27,555	27,802	27,560	27,432

Note: Regression coefficients from OLS on full sample, ages 25-75. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Personality" stands for the full set of facets in the full regression. The top panel for the Base Gradient suppresses the coefficients on age, immigrant status, and constant, which can be seen in Table S.10 (as the baseline regression is fully equivalent). See Section 2 for variable descriptions. This table corresponds to output in Fig. 5.

Table S.12: Contributions to the Health Gradient, Additional Health Outcomes, Full Sample

	(1) Little Exercise	(2) Little Sleep	(3) Frequent Alcohol	(4) Heavy Drinker
Base Gradient:				
Years of education	−0.0018*	−0.0038**	0.0144***	−0.0074***
	(0.0010)	(0.0015)	(0.0009)	(0.0015)
Full Regression:				
Years of education	0.0026**	−0.0028*	0.0104***	−0.0077***
	(0.0011)	(0.0016)	(0.0010)	(0.0016)
Female	−0.0069	−0.0658***	−0.1029***	−0.1469***
	(0.0059)	(0.0086)	(0.0055)	(0.0086)
Age	−0.0037***	−0.0018***	0.0084***	0.0037***
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Immigrant/Descendant	0.0381***	0.0540***	−0.0380***	−0.0538**
	(0.0124)	(0.0186)	(0.0116)	(0.0211)
O: Intellectual Curiosity	−0.0055*	−0.0017	0.0061**	−0.0096**
	(0.0030)	(0.0045)	(0.0028)	(0.0045)
O: Aesthetic Sensitivity	−0.0175***	0.0037	0.0138***	0.0206***
	(0.0029)	(0.0042)	(0.0027)	(0.0042)
O: Creative Imagination	0.0026	0.0039	−0.0041	−0.0095**
	(0.0031)	(0.0046)	(0.0028)	(0.0046)
C: Organization	−0.0070**	−0.0232***	0.0007	0.0092**
	(0.0031)	(0.0045)	(0.0029)	(0.0045)
C: Productiveness	−0.0198***	0.0077	−0.0032	0.0009
	(0.0033)	(0.0049)	(0.0031)	(0.0049)
C: Responsibility	0.0086***	−0.0015	−0.0114***	−0.0271***
	(0.0031)	(0.0046)	(0.0029)	(0.0046)
E: Sociability	0.0077**	0.0034	0.0079***	0.0484***
	(0.0031)	(0.0045)	(0.0029)	(0.0045)
E: Assertiveness	0.0134***	−0.0011	0.0072**	−0.0017
	(0.0031)	(0.0045)	(0.0029)	(0.0046)
E: Energy Level	−0.0916***	0.0027	0.0065**	0.0084*
	(0.0033)	(0.0048)	(0.0031)	(0.0048)
A: Compassion	0.0038	−0.0031	−0.0142***	−0.0105**
	(0.0033)	(0.0047)	(0.0030)	(0.0047)
A: Respectfulness	−0.0037	0.0017	−0.0039	−0.0078
	(0.0033)	(0.0049)	(0.0031)	(0.0049)
A: Trust	0.0052*	−0.0023	−0.0053*	0.0025
	(0.0031)	(0.0046)	(0.0029)	(0.0046)
N: Anxiety	−0.0049	0.0007	0.0006	−0.0018
	(0.0035)	(0.0052)	(0.0033)	(0.0052)
N: Depression	0.0001	0.0169***	0.0160***	0.0245***
	(0.0038)	(0.0057)	(0.0036)	(0.0057)
N: Emotional Volatility	−0.0026	0.0078	0.0039	0.0034
	(0.0033)	(0.0049)	(0.0031)	(0.0049)
Locus of control (internal)	−0.0146***	−0.0431***	0.0200***	0.0071
	(0.0034)	(0.0051)	(0.0032)	(0.0052)
Risk aversion(-)	−0.0038**	0.0050**	0.0021	0.0105***
	(0.0015)	(0.0022)	(0.0014)	(0.0023)
Patience	−0.0039***	0.0002	−0.0052***	−0.0095***
	(0.0014)	(0.0021)	(0.0013)	(0.0021)
Fam. Income Q2	0.0198**	0.0587***	−0.0250***	−0.0438***
	(0.0096)	(0.0141)	(0.0089)	(0.0146)
Fam. Income Q3	0.0202**	0.0647***	−0.0159*	−0.0500***
	(0.0093)	(0.0137)	(0.0087)	(0.0141)
Fam. Income Q4 (Top)	0.0213**	0.0451***	0.0292***	−0.0140
	(0.0096)	(0.0143)	(0.0090)	(0.0146)
Disposable Income	0.0003***	0.0003	0.0001	0.0000
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Constant	0.4688***	0.5139***	−0.2690***	0.3703***
	(0.0227)	(0.0333)	(0.0211)	(0.0337)
Years of education				
Personality	−0.0044***	−0.0001	0.0008***	−0.0002
	(0.0004)	(0.0004)	(0.0003)	(0.0005)
Locus of Control (external)	−0.0009***	−0.0026***	0.0013***	0.0004
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Econ	−0.0003***	0.0001	−0.0003***	−0.0004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Income	0.0012***	0.0016***	0.0022***	0.0005
	(0.0004)	(0.0006)	(0.0004)	(0.0006)
Total reduction	−0.0045***	−0.0010	0.0040***	0.0003
	(0.0005)	(0.0007)	(0.0005)	(0.0007)
Mean Outcome	0.282	0.433	0.249	0.356
Observations	27,663	16,263	27,945	14,830

Note: Regression coefficients from OLS on full sample, ages 25-75. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients. Lower number of observations for sleep and heavy drinking because not all respondents were given those questions (variation in questionnaire versions).

Table S.13: Contributions to the Health Gradient (Big Five Factors) — Sibling Fixed Effects

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0191***	−0.1011***	−0.3996***	−0.0189***	−0.0295***	−0.0212***	−0.0256***	−0.1617***
	(0.0021)	(0.0176)	(0.0334)	(0.0057)	(0.0017)	(0.0017)	(0.0015)	(0.0177)
Female	0.2141***	0.5330***	3.2167***	0.0915***	0.0163**	−0.0090	−0.0137*	0.5051***
	(0.0101)	(0.0856)	(0.1622)	(0.0279)	(0.0081)	(0.0085)	(0.0075)	(0.0857)
Age	0.0093***	0.0170***	0.0432***	0.0140***	0.0023***	0.0012***	−0.0006	−0.0659***
	(0.0005)	(0.0043)	(0.0081)	(0.0014)	(0.0004)	(0.0004)	(0.0004)	(0.0043)
Immigrant/Descendant	0.0823**	0.2514	1.9481***	0.0448	0.0241	−0.0457	0.0438	1.5980***
	(0.0392)	(0.3309)	(0.6266)	(0.1077)	(0.0316)	(0.0329)	(0.0291)	(0.3469)
Constant	0.1808***	1.7331***	9.4538***	−0.1938*	0.4854***	0.4513***	0.5525***	15.6167***
	(0.0382)	(0.3229)	(0.6116)	(0.1051)	(0.0305)	(0.0320)	(0.0283)	(0.3232)
Full Regression:								
Years of education	−0.0085**	−0.0292	−0.1423***	−0.0042	−0.0093***	−0.0005	−0.0176***	0.0302
	(0.0034)	(0.0291)	(0.0528)	(0.0095)	(0.0025)	(0.0027)	(0.0025)	(0.0206)
Female	0.2069***	0.5123***	2.2451***	0.1545***	−0.0169	0.0079	−0.0416***	−0.2408***
	(0.0153)	(0.1293)	(0.2343)	(0.0422)	(0.0112)	(0.0119)	(0.0110)	(0.0921)
Age	0.0091***	0.0119	0.0795***	0.0095**	0.0019*	−0.0002	−0.0008	−0.0465***
	(0.0015)	(0.0129)	(0.0234)	(0.0042)	(0.0011)	(0.0012)	(0.0011)	(0.0091)
Immigrant/Descendant	0.0585	0.4591	4.2245	0.1852	1.2543***	0.4906	−0.3952	5.2506
	(0.4667)	(3.9519)	(7.1648)	(1.2892)	(0.3366)	(0.3591)	(0.3308)	(3.8610)
Openness	0.0143*	−0.0039	0.2582**	0.0347	0.0189***	−0.0126**	0.0061	0.1450***
	(0.0079)	(0.0665)	(0.1207)	(0.0217)	(0.0058)	(0.0061)	(0.0057)	(0.0474)
Conscientiousness	0.0076	0.0141	0.1626	−0.0038	−0.0149**	−0.0323***	−0.0057	0.0432
	(0.0081)	(0.0683)	(0.1239)	(0.0223)	(0.0059)	(0.0063)	(0.0058)	(0.0484)
Extraversion	0.0059	0.0436	0.3625***	−0.0313	−0.0265***	0.0024	0.0086	−0.2618***
	(0.0085)	(0.0722)	(0.1309)	(0.0235)	(0.0063)	(0.0066)	(0.0062)	(0.0513)
Agreeableness	−0.0000	0.0489	0.4702***	−0.0049	0.0166***	0.0016	0.0184***	0.1450***
	(0.0082)	(0.0697)	(0.1263)	(0.0227)	(0.0060)	(0.0064)	(0.0060)	(0.0496)
Neuroticism	0.0173*	0.1376*	1.3318***	−0.0065	0.0464***	0.0207***	0.0135**	1.8547***
	(0.0089)	(0.0756)	(0.1371)	(0.0247)	(0.0066)	(0.0070)	(0.0065)	(0.0536)
Locus of control (internal)	−0.0399***	−0.2184***	−1.2017***	−0.1015***	−0.0993***	−0.0070	−0.0184***	−1.2558***
	(0.0089)	(0.0756)	(0.1371)	(0.0247)	(0.0065)	(0.0070)	(0.0065)	(0.0537)
Risk aversion(-)	0.0140***	0.0749**	0.1310**	0.0101	0.0054*	0.0083***	0.0014	0.0256
	(0.0041)	(0.0345)	(0.0626)	(0.0113)	(0.0030)	(0.0032)	(0.0029)	(0.0245)
Patience	−0.0038	0.0144	−0.0628	0.0143	0.0026	−0.0056*	−0.0028	−0.0053
	(0.0037)	(0.0317)	(0.0576)	(0.0104)	(0.0028)	(0.0029)	(0.0027)	(0.0226)
Fam. Income Q2	0.0200	0.0945	0.3667	−0.0309	−0.0523***	0.0179	−0.0288	−0.3225**
	(0.0259)	(0.2194)	(0.3978)	(0.0716)	(0.0190)	(0.0203)	(0.0188)	(0.1562)
Fam. Income Q3	0.0106	0.0139	−0.5941	−0.1248*	−0.0769***	0.0210	−0.0756***	−0.5044***
	(0.0257)	(0.2173)	(0.3940)	(0.0709)	(0.0189)	(0.0201)	(0.0186)	(0.1539)
Fam. Income Q4 (Top)	−0.0068	−0.1480	−1.0363**	−0.1013	−0.1009***	−0.0046	−0.0652***	−0.4179***
	(0.0266)	(0.2252)	(0.4082)	(0.0735)	(0.0195)	(0.0208)	(0.0193)	(0.1595)
Disposable Income	−0.0003	−0.0005	−0.0006	0.0003	−0.0001	−0.0000	0.0001	0.0026**
	(0.0002)	(0.0016)	(0.0029)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0011)
Decomposition of Reduction								
Personality	0.0006	−0.0031	−0.0126	0.0010	−0.0019***	−0.0019***	0.0006	−0.0828***
	(0.0007)	(0.0060)	(0.0129)	(0.0019)	(0.0006)	(0.0006)	(0.0005)	(0.0122)
Locus of Control (external)	−0.0030***	−0.0163***	−0.0895***	−0.0076***	−0.0075***	−0.0005	−0.0014***	−0.0937***
	(0.0007)	(0.0058)	(0.0124)	(0.0019)	(0.0008)	(0.0005)	(0.0005)	(0.0085)
Econ	−0.0002	0.0012	−0.0039	0.0010	0.0002	−0.0003	−0.0002	−0.0003
	(0.0003)	(0.0023)	(0.0041)	(0.0007)	(0.0002)	(0.0002)	(0.0002)	(0.0016)
Income	−0.0015	−0.0110	−0.0615***	−0.0036	−0.0041***	−0.0007	−0.0024***	−0.0060
	(0.0011)	(0.0093)	(0.0171)	(0.0030)	(0.0008)	(0.0009)	(0.0008)	(0.0066)
Siblings	−0.0065**	−0.0427	−0.0899*	−0.0054	−0.0069***	−0.0172***	−0.0048**	−0.0091
	(0.0033)	(0.0278)	(0.0507)	(0.0090)	(0.0024)	(0.0027)	(0.0024)	(0.0199)
Total reduction	−0.0106***	−0.0719**	−0.2573***	−0.0146	−0.0202***	−0.0207***	−0.0081***	−0.1919***
	(0.0034)	(0.0287)	(0.0536)	(0.0093)	(0.0027)	(0.0028)	(0.0025)	(0.0264)
Mean Outcome								
Observations	9,023	9,023	9,023	9,023	8,751	8,785	8,711	8,598

Note: Regressions on the sibling sample, ages 25-75. Contrasting the base gradient that does not include sibling fixed effects to the "Full" regression that adds all covariates as well as these fixed effects (output suppressed). Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Siblings" stands for the contribution of sibling fixed effects. "Personality" stands here only for the Big Five factors, not facets (shown in Table S.14).

Table S.14: Contributions to the Health Gradient — Sibling Fixed Effects

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0191***	−0.1011***	−0.3996***	−0.0189***	−0.0295***	−0.0212***	−0.0256***	−0.1617***
	(0.0021)	(0.0176)	(0.0334)	(0.0057)	(0.0017)	(0.0017)	(0.0015)	(0.0177)
Full Regression:								
Years of education	−0.0077**	−0.0227	−0.1317**	−0.0025	−0.0088***	−0.0001	−0.0177***	0.0199
	(0.0035)	(0.0292)	(0.0529)	(0.0095)	(0.0025)	(0.0027)	(0.0025)	(0.0203)
Female	0.2063***	0.4923***	2.2348***	0.1461***	−0.0120	0.0113	−0.0361***	−0.0556
	(0.0155)	(0.1315)	(0.2376)	(0.0429)	(0.0111)	(0.0120)	(0.0112)	(0.0915)
Age	0.0091***	0.0118	0.0822***	0.0095**	0.0021*	−0.0002	−0.0008	−0.0445***
	(0.0015)	(0.0129)	(0.0233)	(0.0042)	(0.0011)	(0.0012)	(0.0011)	(0.0089)
Immigrant/Descendant	0.0960	0.3834	4.8344	0.1666	1.2698***	0.5138	−0.3898	5.6162
	(0.4668)	(3.9524)	(7.1434)	(1.2899)	(0.3291)	(0.3560)	(0.3305)	(3.7722)
O: Intellectual Curiosity	0.0042	−0.0206	0.0891	−0.0265	−0.0012	−0.0132**	0.0097*	0.1230***
	(0.0080)	(0.0674)	(0.1218)	(0.0220)	(0.0057)	(0.0062)	(0.0058)	(0.0466)
O: Aesthetic Sensitivity	−0.0036	−0.0940	−0.0238	0.0408*	0.0035	−0.0069	−0.0071	0.0636
	(0.0076)	(0.0646)	(0.1167)	(0.0211)	(0.0055)	(0.0059)	(0.0055)	(0.0449)
O: Creative Imagination	0.0207**	0.1393**	0.3550***	0.0292	0.0237***	0.0003	0.0073	0.0125
	(0.0082)	(0.0696)	(0.1259)	(0.0227)	(0.0059)	(0.0064)	(0.0059)	(0.0483)
C: Organization	0.0154*	0.1426**	0.4300***	0.0362	−0.0116**	−0.0235***	−0.0054	−0.0132
	(0.0082)	(0.0695)	(0.1256)	(0.0227)	(0.0059)	(0.0064)	(0.0059)	(0.0480)
C: Productiveness	0.0098	−0.1198*	−0.2657**	−0.0280	−0.0002	−0.0023	0.0117*	0.1250**
	(0.0086)	(0.0727)	(0.1315)	(0.0237)	(0.0062)	(0.0067)	(0.0062)	(0.0505)
C: Responsibility	−0.0102	0.0300	0.0632	−0.0030	0.0151***	0.0027	−0.0040	−0.0258
	(0.0081)	(0.0688)	(0.1243)	(0.0224)	(0.0058)	(0.0063)	(0.0059)	(0.0477)
E: Sociability	0.0225***	0.1517**	0.5999***	−0.0050	0.0201***	0.0122*	0.0166***	−0.0768
	(0.0082)	(0.0693)	(0.1252)	(0.0226)	(0.0059)	(0.0063)	(0.0059)	(0.0480)
E: Assertiveness	0.0002	0.0043	0.2440**	0.0251	0.0160***	0.0281***	0.0041	0.0524
	(0.0081)	(0.0686)	(0.1240)	(0.0224)	(0.0058)	(0.0063)	(0.0058)	(0.0477)
E: Energy Level	−0.0275***	−0.2005***	−0.4106***	−0.0845***	−0.0933***	−0.0558***	−0.0172***	−0.1423***
	(0.0088)	(0.0743)	(0.1343)	(0.0243)	(0.0063)	(0.0068)	(0.0064)	(0.0515)
A: Compassion	0.0041	0.0254	0.0922	0.0011	0.0080	0.0089	0.0028	0.0372
	(0.0086)	(0.0724)	(0.1309)	(0.0236)	(0.0061)	(0.0066)	(0.0062)	(0.0507)
A: Respectfulness	−0.0028	−0.0530	0.1131	0.0063	−0.0015	−0.0158**	0.0011	0.0914*
	(0.0088)	(0.0742)	(0.1341)	(0.0242)	(0.0063)	(0.0068)	(0.0063)	(0.0516)
A: Trust	−0.0011	0.1058	0.3187**	0.0070	0.0123**	0.0111*	0.0188***	0.0025
	(0.0081)	(0.0687)	(0.1241)	(0.0224)	(0.0058)	(0.0063)	(0.0059)	(0.0477)
N: Anxiety	0.0085	0.0192	0.7777***	−0.0199	0.0032	−0.0085	−0.0084	0.5425***
	(0.0093)	(0.0788)	(0.1425)	(0.0257)	(0.0067)	(0.0072)	(0.0067)	(0.0548)
N: Depression	0.0107	−0.0044	0.6109***	−0.0175	0.0375***	0.0177**	0.0239***	1.5387***
	(0.0100)	(0.0851)	(0.1537)	(0.0278)	(0.0072)	(0.0078)	(0.0073)	(0.0590)
N: Emotional Volatility	−0.0025	0.0975	0.1344	0.0138	0.0045	0.0071	0.0028	0.2730***
	(0.0086)	(0.0731)	(0.1322)	(0.0239)	(0.0062)	(0.0067)	(0.0062)	(0.0507)
Locus of control (internal)	−0.0345***	−0.1909**	−1.0698***	−0.0935***	−0.0863***	−0.0002	−0.0137**	−1.1330***
	(0.0091)	(0.0769)	(0.1390)	(0.0251)	(0.0065)	(0.0070)	(0.0066)	(0.0534)
Risk aversion(-)	0.0129***	0.0654*	0.1298**	0.0081	0.0039	0.0066**	−0.0002	0.0228
	(0.0041)	(0.0348)	(0.0630)	(0.0114)	(0.0029)	(0.0032)	(0.0030)	(0.0242)
Patience	−0.0036	0.0140	−0.0630	0.0150	0.0030	−0.0052*	−0.0027	0.0005
	(0.0038)	(0.0318)	(0.0574)	(0.0104)	(0.0027)	(0.0029)	(0.0027)	(0.0221)
Fam. Income Q2	0.0189	0.0854	0.3578	−0.0272	−0.0496***	0.0188	−0.0290	−0.2953*
	(0.0259)	(0.2193)	(0.3963)	(0.0716)	(0.0186)	(0.0201)	(0.0188)	(0.1526)
Fam. Income Q3	0.0104	0.0031	−0.5807	−0.1260*	−0.0749***	0.0221	−0.0742***	−0.4339***
	(0.0257)	(0.2172)	(0.3926)	(0.0709)	(0.0184)	(0.0199)	(0.0186)	(0.1505)
Fam. Income Q4 (Top)	−0.0067	−0.1527	−1.0254**	−0.1018	−0.0971***	−0.0031	−0.0642***	−0.3920**
	(0.0266)	(0.2250)	(0.4066)	(0.0734)	(0.0191)	(0.0206)	(0.0192)	(0.1557)
Disposable Income	−0.0002	−0.0003	−0.0000	0.0003	−0.0000	−0.0000	0.0001	0.0024**
	(0.0002)	(0.0016)	(0.0029)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0011)
Decomposition of Reduction								
Personality	−0.0013	−0.0180**	−0.0427***	−0.0021	−0.0044***	−0.0035***	−0.0001	−0.0760***
	(0.0009)	(0.0078)	(0.0162)	(0.0025)	(0.0009)	(0.0008)	(0.0007)	(0.0135)
Locus of Control (external)	−0.0026***	−0.0142**	−0.0797***	−0.0070***	−0.0065***	−0.0000	−0.0010**	−0.0846***
	(0.0007)	(0.0058)	(0.0121)	(0.0019)	(0.0007)	(0.0005)	(0.0005)	(0.0078)
Econ	−0.0002	0.0011	−0.0039	0.0010	0.0002	−0.0003	−0.0002	0.0001
	(0.0003)	(0.0023)	(0.0041)	(0.0007)	(0.0002)	(0.0002)	(0.0002)	(0.0016)
Income	−0.0015	−0.0104	−0.0591***	−0.0037	−0.0039***	−0.0007	−0.0023***	−0.0060
	(0.0011)	(0.0093)	(0.0171)	(0.0030)	(0.0008)	(0.0009)	(0.0008)	(0.0065)
Siblings	−0.0059*	−0.0371	−0.0824	−0.0047	−0.0061**	−0.0166***	−0.0043*	−0.0151
	(0.0033)	(0.0278)	(0.0506)	(0.0091)	(0.0024)	(0.0027)	(0.0024)	(0.0194)
Total reduction	−0.0114***	−0.0785***	−0.2679***	−0.0164*	−0.0207***	−0.0210***	−0.0079***	−0.1816***
	(0.0034)	(0.0289)	(0.0539)	(0.0094)	(0.0027)	(0.0028)	(0.0025)	(0.0264)
Mean Outcome	0.476	1.397	7.579	0.272	0.181	0.197	0.147	10.340
Observations	9,023	9,023	9,023	9,023	8,751	8,785	8,711	8,598

Note: Regressions on the sibling sample, ages 25-75. Contrasting the base gradient that does not include sibling fixed effects to the "Full" regression that adds all covariates as well as these fixed effects (output suppressed). Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Siblings" stands for the contribution of sibling fixed effects. Full results for the base regression are shown in Table S.13. This table corresponds to output in Fig. 6.

Table S.15: Contributions to the Health Gradient in Additional Health Outcomes — Sibling Fixed Effects

	(1) Little Exercise	(2) Little Sleep	(3) Frequent Alcohol	(4) Heavy Drinker
Base Gradient:				
Years of education	−0.0029	−0.0146***	0.0190***	−0.0004
	(0.0023)	(0.0033)	(0.0021)	(0.0034)
Full Regression:				
Years of education	0.0086**	−0.0120**	0.0075**	−0.0010
	(0.0038)	(0.0052)	(0.0034)	(0.0053)
Female	−0.0133	−0.1365***	−0.0783***	−0.1284***
	(0.0169)	(0.0231)	(0.0151)	(0.0231)
Age	−0.0046***	0.0025	0.0079***	0.0013
	(0.0016)	(0.0023)	(0.0015)	(0.0023)
Immigrant/Descendant	0.3818	−0.0138	0.0805	0.1610
	(0.4380)	(0.4886)	(0.3974)	(0.4586)
O: Intellectual Curiosity	0.0049	0.0067	−0.0086	−0.0183
	(0.0086)	(0.0120)	(0.0077)	(0.0122)
O: Aesthetic Sensitivity	−0.0114	0.0079	0.0053	0.0106
	(0.0083)	(0.0117)	(0.0075)	(0.0118)
O: Creative Imagination	−0.0108	0.0143	0.0022	−0.0043
	(0.0091)	(0.0127)	(0.0082)	(0.0129)
C: Organization	−0.0251***	−0.0210*	0.0068	0.0085
	(0.0092)	(0.0127)	(0.0082)	(0.0130)
C: Productiveness	−0.0253***	0.0153	0.0143*	0.0255*
	(0.0095)	(0.0133)	(0.0086)	(0.0136)
C: Responsibility	0.0117	−0.0028	−0.0163**	−0.0190
	(0.0088)	(0.0120)	(0.0079)	(0.0121)
E: Sociability	−0.0038	0.0150	0.0108	0.0398***
	(0.0088)	(0.0121)	(0.0080)	(0.0124)
E: Assertiveness	0.0075	−0.0138	0.0024	−0.0207*
	(0.0089)	(0.0123)	(0.0080)	(0.0126)
E: Energy Level	−0.0639***	0.0132	0.0035	0.0006
	(0.0096)	(0.0134)	(0.0087)	(0.0139)
A: Compassion	−0.0038	0.0046	−0.0191**	−0.0179
	(0.0094)	(0.0126)	(0.0084)	(0.0126)
A: Respectfulness	0.0023	−0.0149	−0.0107	−0.0127
	(0.0095)	(0.0132)	(0.0085)	(0.0133)
A: Trust	0.0042	−0.0080	0.0008	−0.0116
	(0.0090)	(0.0126)	(0.0081)	(0.0128)
N: Anxiety	−0.0049	0.0024	−0.0050	−0.0147
	(0.0101)	(0.0139)	(0.0091)	(0.0141)
N: Depression	−0.0042	0.0236	0.0081	0.0370**
	(0.0110)	(0.0152)	(0.0099)	(0.0155)
N: Emotional Volatility	0.0022	0.0068	−0.0110	0.0172
	(0.0096)	(0.0133)	(0.0086)	(0.0135)
Locus of control (internal)	−0.0210**	−0.0338**	−0.0019	0.0105
	(0.0099)	(0.0138)	(0.0089)	(0.0143)
Risk aversion(-)	−0.0031	−0.0001	−0.0055	0.0031
	(0.0045)	(0.0063)	(0.0041)	(0.0064)
Patience	−0.0025	0.0042	−0.0005	0.0001
	(0.0041)	(0.0058)	(0.0037)	(0.0059)
Fam. Income Q2	0.0009	0.0783*	0.0034	−0.0582
	(0.0327)	(0.0460)	(0.0292)	(0.0501)
Fam. Income Q3	−0.0441	0.0626	0.0317	−0.0342
	(0.0316)	(0.0448)	(0.0282)	(0.0477)
Fam. Income Q4 (Top)	−0.0238	0.0334	0.0411	−0.0251
	(0.0319)	(0.0452)	(0.0284)	(0.0477)
Disposable Income	0.0004**	0.0000	0.0001	0.0004
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Decomposition of Reduction				
Personality	−0.0033***	0.0005	−0.0003	−0.0038**
	(0.0012)	(0.0016)	(0.0010)	(0.0017)
Locus of Control (external)	−0.0016**	−0.0029**	−0.0001	0.0008
	(0.0008)	(0.0012)	(0.0007)	(0.0011)
Econ	−0.0002	0.0002	−0.0001	0.0000
	(0.0003)	(0.0003)	(0.0002)	(0.0003)
Income	0.0005	−0.0008	0.0021**	0.0017
	(0.0011)	(0.0016)	(0.0010)	(0.0015)
Siblings	−0.0069*	0.0004	0.0100***	0.0019
	(0.0036)	(0.0051)	(0.0033)	(0.0052)
Total reduction	−0.0115***	−0.0026	0.0115***	0.0006
	(0.0037)	(0.0052)	(0.0034)	(0.0053)
Mean Outcome	0.288	0.473	0.237	0.346
Observations	6,591	3,908	6,682	3,493

Note: Regressions on the sibling sample, ages 25-75. Contrasting the base gradient that does not include sibling fixed effects to the "Full" regression that adds all covariates as well as these fixed effects (output suppressed). Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Siblings" stands for the contribution of sibling fixed effects. Lower number of observations for sleep and heavy drinking because not all respondents were given those questions (variation in questionnaire versions).

Table S.16: Contributions to the Health Gradient, Females, Age <= 45

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0086***	−0.0590**	−0.4724***	−0.0304***	−0.0355***	−0.0229***	−0.0349***	−0.2870***
	(0.0033)	(0.0258)	(0.0573)	(0.0075)	(0.0024)	(0.0026)	(0.0024)	(0.0290)
Full Regression:								
Years of education	−0.0047	−0.0481*	−0.2902***	−0.0267***	−0.0172***	−0.0130***	−0.0274***	−0.0303
	(0.0037)	(0.0290)	(0.0623)	(0.0085)	(0.0024)	(0.0028)	(0.0027)	(0.0222)
Age	−0.0023	−0.0294***	−0.0821***	0.0134***	0.0086***	0.0050***	0.0055***	−0.0684***
	(0.0014)	(0.0112)	(0.0242)	(0.0033)	(0.0009)	(0.0011)	(0.0010)	(0.0086)
Immigrant/Descendant	0.0436*	0.2411	−0.4882	0.0195	−0.0021	−0.0488**	−0.0212	1.0469***
	(0.0254)	(0.2003)	(0.4308)	(0.0586)	(0.0170)	(0.0196)	(0.0183)	(0.1549)
O: Intellectual Curiosity	−0.0151*	−0.0920	0.0440	0.0146	0.0029	−0.0223***	0.0057	0.1204**
	(0.0089)	(0.0697)	(0.1500)	(0.0204)	(0.0059)	(0.0068)	(0.0064)	(0.0531)
O: Aesthetic Sensitivity	−0.0156*	−0.1667***	−0.2237	0.0092	−0.0098*	−0.0073	−0.0087	0.0727
	(0.0082)	(0.0642)	(0.1382)	(0.0188)	(0.0054)	(0.0063)	(0.0059)	(0.0490)
O: Creative Imagination	0.0170**	0.0369	0.3849***	−0.0137	0.0252***	0.0085	−0.0049	0.1500***
	(0.0083)	(0.0657)	(0.1414)	(0.0192)	(0.0055)	(0.0064)	(0.0060)	(0.0502)
C: Organization	0.0002	−0.1074*	0.1272	−0.0064	−0.0108**	−0.0159***	−0.0059	0.0442
	(0.0079)	(0.0620)	(0.1335)	(0.0182)	(0.0052)	(0.0060)	(0.0057)	(0.0476)
C: Productiveness	0.0120	0.0240	−0.0863	0.0121	−0.0005	0.0008	0.0083	0.0863
	(0.0089)	(0.0704)	(0.1514)	(0.0206)	(0.0059)	(0.0069)	(0.0064)	(0.0538)
C: Responsibility	−0.0130	0.0023	0.0491	0.0025	0.0129**	0.0181***	−0.0157**	−0.1362**
	(0.0088)	(0.0696)	(0.1497)	(0.0204)	(0.0058)	(0.0068)	(0.0064)	(0.0534)
E: Sociability	0.0219***	0.0762	0.8595***	0.0111	0.0141**	0.0173***	0.0279***	0.0098
	(0.0084)	(0.0660)	(0.1420)	(0.0193)	(0.0055)	(0.0064)	(0.0060)	(0.0505)
E: Assertiveness	0.0241***	0.1219*	0.2309	0.0327*	0.0265***	0.0307***	0.0094	0.0554
	(0.0083)	(0.0654)	(0.1408)	(0.0192)	(0.0055)	(0.0064)	(0.0060)	(0.0500)
E: Energy Level	−0.0133	−0.0335	−0.4304***	−0.0595***	−0.0842***	−0.0634***	−0.0254***	−0.1240**
	(0.0090)	(0.0708)	(0.1523)	(0.0207)	(0.0059)	(0.0069)	(0.0065)	(0.0542)
A: Compassion	0.0073	0.1340*	0.3689**	0.0073	−0.0085	0.0040	−0.0117*	−0.0342
	(0.0097)	(0.0764)	(0.1644)	(0.0224)	(0.0064)	(0.0075)	(0.0070)	(0.0584)
A: Respectfulness	0.0092	0.0681	0.2557	0.0094	0.0136**	−0.0064	−0.0153**	0.0185
	(0.0102)	(0.0802)	(0.1725)	(0.0235)	(0.0067)	(0.0078)	(0.0073)	(0.0614)
A: Trust	0.0051	0.0709	0.0392	0.0322*	0.0131**	0.0142**	0.0217***	0.0385
	(0.0085)	(0.0668)	(0.1437)	(0.0195)	(0.0056)	(0.0065)	(0.0061)	(0.0509)
N: Anxiety	0.0237**	0.1164	1.0104***	−0.0173	0.0113*	−0.0063	−0.0043	0.5660***
	(0.0099)	(0.0784)	(0.1686)	(0.0229)	(0.0066)	(0.0076)	(0.0072)	(0.0599)
N: Depression	0.0013	0.0479	0.2955*	−0.0067	0.0438***	0.0317***	0.0240***	1.7763***
	(0.0104)	(0.0823)	(0.1770)	(0.0241)	(0.0069)	(0.0080)	(0.0075)	(0.0632)
N: Emotional Volatility	0.0026	0.0026	0.0817	−0.0113	0.0031	0.0138**	0.0023	0.1198**
	(0.0088)	(0.0694)	(0.1492)	(0.0203)	(0.0058)	(0.0068)	(0.0064)	(0.0532)
Locus of control (internal)	−0.0440***	−0.2774***	−1.3013***	−0.0762***	−0.0845***	−0.0189***	−0.0183***	−1.1348***
	(0.0094)	(0.0741)	(0.1594)	(0.0217)	(0.0062)	(0.0072)	(0.0068)	(0.0566)
Risk aversion(-)	−0.0001	0.0457	−0.0381	0.0178*	0.0109***	0.0024	0.0121***	0.0133
	(0.0041)	(0.0325)	(0.0700)	(0.0095)	(0.0027)	(0.0032)	(0.0030)	(0.0250)
Patience	0.0033	0.0087	0.1573**	−0.0009	0.0002	−0.0025	−0.0063**	−0.0145
	(0.0039)	(0.0306)	(0.0659)	(0.0090)	(0.0026)	(0.0030)	(0.0028)	(0.0234)
Fam. Income Q2	0.0263	0.3412**	0.7727**	0.0171	−0.0179	0.0402**	−0.0225	−0.0099
	(0.0214)	(0.1683)	(0.3621)	(0.0493)	(0.0141)	(0.0164)	(0.0154)	(0.1286)
Fam. Income Q3	0.0463**	0.7815***	0.3045	0.0331	−0.0280*	0.0252	−0.0608***	−0.0983
	(0.0222)	(0.1750)	(0.3764)	(0.0512)	(0.0146)	(0.0171)	(0.0160)	(0.1333)
Fam. Income Q4 (Top)	0.0519**	0.6039***	0.1446	0.1570***	−0.0491***	−0.0356*	−0.0439**	0.0250
	(0.0260)	(0.2045)	(0.4398)	(0.0598)	(0.0171)	(0.0199)	(0.0187)	(0.1560)
Disposable Income	−0.0010	−0.0087	−0.0074	−0.0033*	−0.0001	−0.0005	0.0002	0.0039
	(0.0007)	(0.0059)	(0.0126)	(0.0017)	(0.0005)	(0.0006)	(0.0005)	(0.0044)
Constant	0.5329***	2.6463***	15.0950***	−0.0408	0.0430	0.1909***	0.3454***	14.0957***
	(0.0620)	(0.4884)	(1.0506)	(0.1430)	(0.0409)	(0.0478)	(0.0447)	(0.3726)
Decomposition of Reduction								
Personality	−0.0009	−0.0060	−0.0481**	0.0024	−0.0065***	−0.0051***	−0.0022***	−0.1436***
	(0.0010)	(0.0079)	(0.0195)	(0.0023)	(0.0010)	(0.0009)	(0.0008)	(0.0171)
Locus of Control (external)	−0.0045***	−0.0283***	−0.1328***	−0.0078***	−0.0086***	−0.0019***	−0.0019***	−0.1171***
	(0.0010)	(0.0078)	(0.0184)	(0.0023)	(0.0008)	(0.0007)	(0.0007)	(0.0096)
Econ	0.0002	−0.0016	0.0110*	−0.0009	−0.0005*	−0.0002	−0.0009***	−0.0014
	(0.0003)	(0.0028)	(0.0061)	(0.0008)	(0.0003)	(0.0003)	(0.0003)	(0.0020)
Income	0.0014	0.0250**	−0.0123	0.0025	−0.0027***	−0.0027**	−0.0026**	0.0054
	(0.0015)	(0.0116)	(0.0247)	(0.0034)	(0.0010)	(0.0011)	(0.0011)	(0.0087)
Total reduction	−0.0038**	−0.0109	−0.1821***	−0.0037	−0.0183***	−0.0099***	−0.0075***	−0.2567***
	(0.0018)	(0.0138)	(0.0327)	(0.0040)	(0.0016)	(0.0015)	(0.0013)	(0.0237)
Mean Outcome	0.428	1.596	9.509	0.150	0.165	0.186	0.158	11.582
Observations	4,702	4,702	4,702	4,702	4,651	4,627	4,628	4,572

Note: Regression coefficients from OLS on females only, ages 25-45. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Personality" stands for the full set of facets in the full regression. The top panel for the Base Gradient suppresses the coefficients on age, immigrant status, and constant. This table corresponds to Table S.11, except for the selected sample. See Section 2 for variable descriptions.

Table S.17: Contributions to the Health Gradient, Males, Age <= 45

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0172***	−0.1020***	−0.3645***	−0.0198***	−0.0265***	−0.0224***	−0.0280***	−0.2888***
	(0.0033)	(0.0176)	(0.0433)	(0.0059)	(0.0026)	(0.0028)	(0.0028)	(0.0316)
Full Regression:								
Years of education	−0.0106***	−0.0762***	−0.1595***	−0.0098	−0.0095***	−0.0144***	−0.0209***	−0.0081
	(0.0036)	(0.0192)	(0.0458)	(0.0065)	(0.0025)	(0.0030)	(0.0030)	(0.0228)
Age	0.0053***	0.0217***	0.1158***	0.0075***	0.0052***	0.0079***	0.0029**	−0.0726***
	(0.0015)	(0.0078)	(0.0186)	(0.0026)	(0.0010)	(0.0012)	(0.0012)	(0.0092)
Immigrant/Descendant	−0.0262	−0.2356	0.4171	−0.0547	0.0032	−0.0235	0.0928***	1.2874***
	(0.0289)	(0.1535)	(0.3655)	(0.0515)	(0.0200)	(0.0240)	(0.0239)	(0.1848)
O: Intellectual Curiosity	−0.0144*	−0.0735	−0.2061*	−0.0326**	−0.0111*	−0.0078	0.0065	0.1212**
	(0.0087)	(0.0464)	(0.1105)	(0.0156)	(0.0061)	(0.0072)	(0.0072)	(0.0547)
O: Aesthetic Sensitivity	−0.0191**	−0.0143	0.0036	−0.0087	−0.0130**	−0.0124*	0.0088	−0.0102
	(0.0081)	(0.0431)	(0.1026)	(0.0145)	(0.0057)	(0.0067)	(0.0067)	(0.0508)
O: Creative Imagination	−0.0014	−0.0349	0.3307***	0.0109	0.0244***	0.0021	−0.0001	0.0667
	(0.0088)	(0.0468)	(0.1115)	(0.0157)	(0.0061)	(0.0073)	(0.0073)	(0.0553)
C: Organization	−0.0031	−0.0314	0.3348***	0.0152	−0.0100*	−0.0271***	−0.0080	0.0087
	(0.0084)	(0.0446)	(0.1062)	(0.0150)	(0.0059)	(0.0070)	(0.0069)	(0.0527)
C: Productiveness	0.0193**	0.0624	−0.0348	−0.0062	0.0043	0.0081	0.0157**	−0.1129**
	(0.0092)	(0.0487)	(0.1159)	(0.0163)	(0.0064)	(0.0076)	(0.0075)	(0.0575)
C: Responsibility	0.0155*	0.0309	−0.0916	0.0087	0.0054	0.0174**	−0.0306***	−0.0326
	(0.0092)	(0.0486)	(0.1158)	(0.0163)	(0.0064)	(0.0076)	(0.0075)	(0.0574)
E: Sociability	0.0082	0.0068	0.3525***	0.0142	0.0248***	0.0115	0.0252***	−0.0450
	(0.0087)	(0.0462)	(0.1101)	(0.0155)	(0.0060)	(0.0072)	(0.0071)	(0.0545)
E: Assertiveness	0.0215**	0.1490***	0.2981***	0.0367**	0.0095	0.0392***	0.0127*	0.2063***
	(0.0091)	(0.0483)	(0.1150)	(0.0162)	(0.0063)	(0.0075)	(0.0075)	(0.0571)
E: Energy Level	−0.0069	−0.1200**	−0.6421***	−0.0384**	−0.0952***	−0.0757***	−0.0304***	−0.1482**
	(0.0099)	(0.0524)	(0.1249)	(0.0176)	(0.0069)	(0.0082)	(0.0081)	(0.0619)
A: Compassion	0.0076	0.0590	0.2694**	0.0293*	0.0047	0.0039	−0.0010	−0.0671
	(0.0089)	(0.0474)	(0.1129)	(0.0159)	(0.0062)	(0.0074)	(0.0074)	(0.0561)
A: Respectfulness	−0.0123	−0.0376	0.0986	−0.0473***	−0.0087	−0.0251***	0.0001	0.1406**
	(0.0094)	(0.0499)	(0.1188)	(0.0167)	(0.0065)	(0.0078)	(0.0077)	(0.0589)
A: Trust	0.0060	0.0765*	−0.1701	0.0309**	0.0055	0.0158**	0.0166**	−0.0461
	(0.0087)	(0.0462)	(0.1100)	(0.0155)	(0.0060)	(0.0072)	(0.0072)	(0.0546)
N: Anxiety	−0.0191*	−0.1118**	0.4269***	−0.0155	0.0136*	−0.0066	−0.0154*	0.6686***
	(0.0103)	(0.0547)	(0.1303)	(0.0184)	(0.0072)	(0.0086)	(0.0085)	(0.0643)
N: Depression	0.0364***	0.0752	0.3896***	0.0308	0.0356***	−0.0013	0.0224**	1.6533***
	(0.0113)	(0.0602)	(0.1433)	(0.0202)	(0.0079)	(0.0094)	(0.0093)	(0.0711)
N: Emotional Volatility	0.0196**	0.0337	0.2856**	−0.0197	0.0024	0.0012	0.0192**	0.2627***
	(0.0095)	(0.0507)	(0.1207)	(0.0170)	(0.0066)	(0.0079)	(0.0078)	(0.0597)
Locus of control (internal)	−0.0277***	−0.1682***	−0.6381***	−0.0494***	−0.0647***	−0.0220***	−0.0144*	−1.1787***
	(0.0102)	(0.0542)	(0.1290)	(0.0182)	(0.0071)	(0.0084)	(0.0084)	(0.0642)
Risk aversion(-)	0.0109**	−0.0217	0.0741	0.0056	−0.0027	0.0049	0.0070*	0.0214
	(0.0043)	(0.0231)	(0.0550)	(0.0078)	(0.0030)	(0.0036)	(0.0036)	(0.0275)
Patience	−0.0039	−0.0288	0.0889*	−0.0091	0.0015	0.0016	−0.0076**	0.0520**
	(0.0039)	(0.0209)	(0.0497)	(0.0070)	(0.0027)	(0.0033)	(0.0032)	(0.0248)
Fam. Income Q2	0.0069	0.0619	−0.2566	−0.0513	−0.0280*	0.0185	0.0075	−0.3726**
	(0.0231)	(0.1227)	(0.2921)	(0.0412)	(0.0161)	(0.0191)	(0.0190)	(0.1457)
Fam. Income Q3	0.0052	0.0090	−0.6011**	−0.0970**	−0.0412**	0.0102	−0.0266	−0.3081**
	(0.0236)	(0.1255)	(0.2989)	(0.0421)	(0.0165)	(0.0196)	(0.0194)	(0.1482)
Fam. Income Q4 (Top)	−0.0366	−0.1149	−0.8518**	−0.0976**	−0.0434**	−0.0441*	−0.0338	−0.2361
	(0.0277)	(0.1470)	(0.3501)	(0.0493)	(0.0196)	(0.0229)	(0.0226)	(0.1731)
Disposable Income	0.0002	−0.0002	−0.0035	0.0016*	−0.0000	−0.0003	−0.0003	−0.0006
	(0.0005)	(0.0024)	(0.0058)	(0.0008)	(0.0004)	(0.0004)	(0.0004)	(0.0029)
Constant	0.2172***	1.4094***	2.4906***	0.0269	0.1411***	0.0656	0.3867***	13.8946***
	(0.0649)	(0.3451)	(0.8219)	(0.1158)	(0.0453)	(0.0540)	(0.0533)	(0.4082)
Decomposition of Reduction								
Personality	−0.0021*	−0.0024	−0.1032***	−0.0031	−0.0094***	−0.0030***	−0.0025**	−0.1683***
	(0.0011)	(0.0058)	(0.0163)	(0.0020)	(0.0011)	(0.0010)	(0.0010)	(0.0190)
Locus of Control (external)	−0.0025***	−0.0152***	−0.0578***	−0.0045***	−0.0059***	−0.0019**	−0.0013*	−0.1083***
	(0.0009)	(0.0051)	(0.0126)	(0.0017)	(0.0008)	(0.0008)	(0.0008)	(0.0105)
Econ	−0.0006*	−0.0011	0.0033	−0.0007	0.0002	−0.0001	−0.0007**	0.0026
	(0.0003)	(0.0018)	(0.0044)	(0.0006)	(0.0002)	(0.0003)	(0.0003)	(0.0022)
Income	−0.0014	−0.0070	−0.0473***	−0.0017	−0.0019**	−0.0030***	−0.0026**	−0.0068
	(0.0013)	(0.0067)	(0.0160)	(0.0022)	(0.0009)	(0.0011)	(0.0010)	(0.0079)
Total reduction	−0.0066***	−0.0258***	−0.2050***	−0.0099***	−0.0170***	−0.0080***	−0.0071***	−0.2807***
	(0.0016)	(0.0083)	(0.0229)	(0.0028)	(0.0016)	(0.0014)	(0.0014)	(0.0258)
Mean Outcome	0.295	0.728	4.617	0.098	0.147	0.181	0.175	11.074
Observations	3,557	3,557	3,557	3,557	3,507	3,515	3,502	3,463

Note: Regression coefficients from OLS on males only, ages 25-45. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Personality" stands for the full set of facets in the full regression. The top panel for the Base Gradient suppresses the coefficients on age, immigrant status, and constant. This table corresponds to Table S.11, except for the selected sample. See Section 2 for variable descriptions.

Table S.18: Contributions to the Health Gradient, Females, Age > 45

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0055***	−0.0544***	−0.3185***	−0.0270***	−0.0259***	−0.0197***	−0.0170***	−0.1397***
	(0.0018)	(0.0150)	(0.0332)	(0.0071)	(0.0016)	(0.0015)	(0.0013)	(0.0152)
Full Regression:								
Years of education	−0.0030	−0.0223	−0.1272***	−0.0095	−0.0118***	−0.0123***	−0.0116***	−0.0134
	(0.0020)	(0.0167)	(0.0357)	(0.0079)	(0.0016)	(0.0017)	(0.0014)	(0.0126)
Age	0.0045***	0.0272***	0.1101***	0.0268***	−0.0014***	−0.0038***	−0.0039***	−0.0456***
	(0.0006)	(0.0049)	(0.0105)	(0.0023)	(0.0005)	(0.0005)	(0.0004)	(0.0037)
Immigrant/Descendant	−0.0222	0.0085	−0.5496	−0.0558	0.0053	−0.0587***	−0.0278	0.6572***
	(0.0252)	(0.2083)	(0.4445)	(0.0984)	(0.0192)	(0.0206)	(0.0171)	(0.1568)
O: Intellectual Curiosity	−0.0024	−0.0006	0.0964	0.0006	0.0028	−0.0148***	0.0109***	0.2113***
	(0.0054)	(0.0444)	(0.0947)	(0.0210)	(0.0041)	(0.0044)	(0.0037)	(0.0333)
O: Aesthetic Sensitivity	−0.0052	−0.0655	−0.1143	0.0274	−0.0007	−0.0090**	−0.0147***	−0.0359
	(0.0053)	(0.0433)	(0.0925)	(0.0205)	(0.0040)	(0.0043)	(0.0036)	(0.0326)
O: Creative Imagination	0.0125**	0.0654	0.2162**	0.0108	0.0261***	0.0084*	−0.0033	0.0278
	(0.0053)	(0.0434)	(0.0926)	(0.0205)	(0.0040)	(0.0043)	(0.0036)	(0.0325)
C: Organization	0.0121**	0.1207***	0.4576***	0.0616***	0.0024	−0.0214***	−0.0023	−0.0272
	(0.0055)	(0.0456)	(0.0974)	(0.0216)	(0.0042)	(0.0045)	(0.0038)	(0.0342)
C: Productiveness	0.0066	−0.0487	0.0743	0.0466**	0.0036	0.0066	0.0062	0.0702*
	(0.0059)	(0.0485)	(0.1036)	(0.0229)	(0.0045)	(0.0048)	(0.0040)	(0.0366)
C: Responsibility	−0.0014	−0.0526	−0.0095	−0.0139	0.0128***	−0.0025	−0.0089**	0.0220
	(0.0056)	(0.0462)	(0.0985)	(0.0218)	(0.0043)	(0.0046)	(0.0038)	(0.0348)
E: Sociability	0.0215***	0.1278***	0.8711***	0.0638***	0.0222***	0.0173***	0.0155***	−0.0216
	(0.0054)	(0.0449)	(0.0957)	(0.0212)	(0.0042)	(0.0044)	(0.0037)	(0.0336)
E: Assertiveness	0.0004	0.0823*	0.3205***	0.0373*	0.0293***	0.0254***	0.0077**	0.0950***
	(0.0054)	(0.0448)	(0.0956)	(0.0212)	(0.0041)	(0.0044)	(0.0037)	(0.0336)
E: Energy Level	−0.0220***	−0.2307***	−0.8487***	−0.1404***	−0.1042***	−0.0728***	−0.0291***	−0.2767***
	(0.0056)	(0.0464)	(0.0990)	(0.0219)	(0.0043)	(0.0046)	(0.0038)	(0.0348)
A: Compassion	0.0075	0.1143**	0.2901***	0.0119	0.0127***	0.0163***	−0.0042	0.0508
	(0.0060)	(0.0494)	(0.1054)	(0.0233)	(0.0046)	(0.0049)	(0.0041)	(0.0371)
A: Respectfulness	−0.0094	−0.0089	0.1617	−0.0056	0.0034	−0.0086*	−0.0063	0.0425
	(0.0061)	(0.0500)	(0.1067)	(0.0236)	(0.0046)	(0.0049)	(0.0041)	(0.0375)
A: Trust	0.0118**	0.0758*	0.2180**	0.0185	0.0214***	0.0107**	0.0196***	0.1161***
	(0.0055)	(0.0452)	(0.0964)	(0.0213)	(0.0042)	(0.0045)	(0.0037)	(0.0340)
N: Anxiety	0.0071	−0.0334	0.6638***	−0.0525**	0.0040	−0.0136***	−0.0076*	0.4733***
	(0.0061)	(0.0502)	(0.1072)	(0.0237)	(0.0046)	(0.0050)	(0.0042)	(0.0378)
N: Depression	0.0098	0.0236	0.7255***	−0.0522**	0.0363***	0.0072	0.0130***	1.4477***
	(0.0066)	(0.0543)	(0.1160)	(0.0257)	(0.0050)	(0.0054)	(0.0045)	(0.0408)
N: Emotional Volatility	−0.0066	−0.0140	0.1277	−0.0143	−0.0002	0.0068	−0.0012	0.2321***
	(0.0058)	(0.0478)	(0.1021)	(0.0226)	(0.0044)	(0.0047)	(0.0040)	(0.0359)
Locus of control (internal)	−0.0346***	−0.3514***	−1.2587***	−0.2577***	−0.1050***	−0.0133***	−0.0073*	−1.0549***
	(0.0058)	(0.0478)	(0.1020)	(0.0226)	(0.0044)	(0.0047)	(0.0040)	(0.0359)
Risk aversion(-)	0.0054**	0.0610***	0.1705***	0.0149	0.0033	0.0056**	0.0058***	0.0327*
	(0.0027)	(0.0224)	(0.0479)	(0.0106)	(0.0021)	(0.0022)	(0.0019)	(0.0169)
Patience	−0.0005	−0.0219	−0.0026	0.0085	−0.0002	−0.0070***	−0.0019	−0.0361**
	(0.0026)	(0.0215)	(0.0458)	(0.0101)	(0.0020)	(0.0021)	(0.0018)	(0.0161)
Fam. Income Q2	0.0009	0.0735	0.0295	0.1274*	−0.0474***	−0.0070	−0.0308**	−0.3214***
	(0.0194)	(0.1597)	(0.3408)	(0.0755)	(0.0149)	(0.0158)	(0.0132)	(0.1201)
Fam. Income Q3	0.0274	0.0687	−0.5854*	0.0518	−0.0794***	−0.0293*	−0.0786***	−0.4298***
	(0.0188)	(0.1548)	(0.3304)	(0.0732)	(0.0144)	(0.0153)	(0.0128)	(0.1165)
Fam. Income Q4 (Top)	0.0413**	0.0901	−1.0236***	0.0213	−0.1109***	−0.0506***	−0.0870***	−0.4671***
	(0.0189)	(0.1559)	(0.3326)	(0.0737)	(0.0145)	(0.0154)	(0.0129)	(0.1170)
Disposable Income	−0.0007*	−0.0032	−0.0159**	−0.0008	−0.0005**	−0.0008***	−0.0005*	0.0040*
	(0.0004)	(0.0030)	(0.0063)	(0.0014)	(0.0003)	(0.0003)	(0.0002)	(0.0022)
Constant	0.3817***	0.1831	4.6319***	−1.0978***	0.5209***	0.6660***	0.5785***	13.0121***
	(0.0546)	(0.4510)	(0.9624)	(0.2131)	(0.0417)	(0.0446)	(0.0373)	(0.3395)
Decomposition of Reduction								
Personality	−0.0010	−0.0058	−0.0336***	0.0030	−0.0022***	−0.0026***	−0.0010**	−0.0478***
	(0.0007)	(0.0054)	(0.0130)	(0.0026)	(0.0007)	(0.0006)	(0.0005)	(0.0085)
Locus of Control (external)	−0.0023***	−0.0238***	−0.0853***	−0.0175***	−0.0072***	−0.0009***	−0.0005*	−0.0723***
	(0.0004)	(0.0035)	(0.0084)	(0.0018)	(0.0005)	(0.0003)	(0.0003)	(0.0048)
Econ	0.0002	0.0012	0.0070**	0.0012*	0.0001	−0.0002	0.0001	−0.0010
	(0.0002)	(0.0013)	(0.0030)	(0.0006)	(0.0001)	(0.0001)	(0.0001)	(0.0010)
Income	0.0007	−0.0037	−0.0793***	−0.0042	−0.0049***	−0.0036***	−0.0040***	−0.0051
	(0.0007)	(0.0061)	(0.0133)	(0.0029)	(0.0006)	(0.0006)	(0.0005)	(0.0046)
Total reduction	−0.0025***	−0.0321***	−0.1912***	−0.0175***	−0.0141***	−0.0074***	−0.0054***	−0.1262***
	(0.0009)	(0.0078)	(0.0189)	(0.0037)	(0.0010)	(0.0008)	(0.0007)	(0.0118)
Mean Outcome	0.647	1.744	9.776	0.546	0.210	0.195	0.121	10.043
Observations	10,645	10,645	10,645	10,645	10,353	10,439	10,333	10,274

Note: Regression coefficients from OLS on females only, ages 46-75. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Personality" stands for the full set of facets in the full regression. The top panel for the Base Gradient suppresses the coefficients on age, immigrant status, and constant. This table corresponds to Table S.11, except for the selected sample. See Section 2 for variable descriptions.

Table S.19: Contributions to the Health Gradient, Males, Age > 45

	(1) Any Hospital in/out-patient	(2) Nights Hospital	(3) Number GP visits	(4) CCI	(5) Bad Health	(6) BMI>30	(7) Smoker	(8) MHI-5
Base Gradient:								
Years of education	−0.0090***	−0.0927***	−0.2071***	−0.0214***	−0.0209***	−0.0180***	−0.0155***	−0.1115***
	(0.0019)	(0.0168)	(0.0302)	(0.0069)	(0.0016)	(0.0015)	(0.0013)	(0.0145)
Full Regression:								
Years of education	−0.0043**	−0.0436**	−0.0546*	−0.0013	−0.0097***	−0.0111***	−0.0120***	−0.0125
	(0.0020)	(0.0179)	(0.0315)	(0.0074)	(0.0015)	(0.0016)	(0.0014)	(0.0116)
Age	0.0098***	0.0598***	0.2259***	0.0327***	0.0012***	−0.0027***	−0.0026***	−0.0498***
	(0.0006)	(0.0056)	(0.0098)	(0.0023)	(0.0005)	(0.0005)	(0.0004)	(0.0036)
Immigrant/Descendant	−0.0119	−0.2787	−0.0836	−0.0814	0.0180	−0.0289	0.0012	0.9149***
	(0.0288)	(0.2533)	(0.4455)	(0.1046)	(0.0217)	(0.0230)	(0.0203)	(0.1665)
O: Intellectual Curiosity	0.0039	0.0273	−0.0152	−0.0035	0.0014	−0.0199***	0.0108***	0.1295***
	(0.0056)	(0.0491)	(0.0863)	(0.0203)	(0.0042)	(0.0045)	(0.0040)	(0.0318)
O: Aesthetic Sensitivity	−0.0121**	−0.0600	−0.0505	−0.0120	−0.0097**	−0.0032	−0.0020	−0.0031
	(0.0054)	(0.0476)	(0.0837)	(0.0197)	(0.0041)	(0.0043)	(0.0038)	(0.0308)
O: Creative Imagination	0.0056	−0.0317	0.0032	−0.0244	0.0164***	0.0139***	−0.0015	0.0315
	(0.0061)	(0.0540)	(0.0949)	(0.0223)	(0.0046)	(0.0049)	(0.0043)	(0.0349)
C: Organization	0.0129**	0.0711	0.4052***	0.0146	−0.0019	−0.0224***	0.0033	0.0332
	(0.0061)	(0.0541)	(0.0951)	(0.0223)	(0.0046)	(0.0049)	(0.0044)	(0.0350)
C: Productiveness	0.0126*	−0.0107	0.0037	−0.0223	0.0124**	0.0108**	0.0064	0.0457
	(0.0065)	(0.0574)	(0.1009)	(0.0237)	(0.0049)	(0.0052)	(0.0046)	(0.0371)
C: Responsibility	−0.0001	0.0325	0.0435	−0.0236	0.0105**	0.0120**	−0.0154***	0.0218
	(0.0059)	(0.0520)	(0.0914)	(0.0215)	(0.0044)	(0.0047)	(0.0042)	(0.0337)
E: Sociability	0.0283***	0.2065***	0.6364***	0.0330	0.0202***	0.0248***	0.0140***	−0.0754**
	(0.0059)	(0.0521)	(0.0916)	(0.0215)	(0.0044)	(0.0047)	(0.0042)	(0.0337)
E: Assertiveness	0.0037	0.0869	0.3766***	0.0569**	0.0327***	0.0255***	0.0060	0.1485***
	(0.0061)	(0.0536)	(0.0942)	(0.0221)	(0.0046)	(0.0049)	(0.0043)	(0.0347)
E: Energy Level	−0.0233***	−0.2284***	−0.7746***	−0.1088***	−0.0957***	−0.0784***	−0.0323***	−0.1529***
	(0.0067)	(0.0589)	(0.1036)	(0.0243)	(0.0050)	(0.0053)	(0.0047)	(0.0381)
A: Compassion	−0.0041	0.0321	0.3331***	0.0326	0.0041	−0.0004	0.0064	0.0368
	(0.0060)	(0.0530)	(0.0931)	(0.0219)	(0.0045)	(0.0048)	(0.0043)	(0.0344)
A: Respectfulness	−0.0110*	−0.0856	−0.1324	0.0076	0.0027	−0.0149***	−0.0089**	0.0993***
	(0.0060)	(0.0529)	(0.0930)	(0.0218)	(0.0045)	(0.0048)	(0.0043)	(0.0344)
A: Trust	0.0221***	0.1918***	0.2893***	0.0030	0.0091**	0.0046	0.0136***	0.0047
	(0.0061)	(0.0533)	(0.0937)	(0.0220)	(0.0045)	(0.0048)	(0.0043)	(0.0347)
N: Anxiety	0.0117*	0.0217	0.5151***	0.0131	0.0080	−0.0171***	−0.0127**	0.5051***
	(0.0069)	(0.0611)	(0.1074)	(0.0252)	(0.0052)	(0.0055)	(0.0049)	(0.0396)
N: Depression	0.0053	−0.1298*	0.5862***	−0.0428	0.0460***	−0.0040	0.0078	1.5069***
	(0.0076)	(0.0673)	(0.1183)	(0.0278)	(0.0058)	(0.0061)	(0.0054)	(0.0435)
N: Emotional Volatility	0.0044	0.0808	0.2089**	0.0010	0.0021	0.0148***	−0.0072	0.2154***
	(0.0067)	(0.0587)	(0.1033)	(0.0243)	(0.0050)	(0.0053)	(0.0047)	(0.0380)
Locus of control (internal)	−0.0454***	−0.5567***	−1.0068***	−0.2125***	−0.0976***	−0.0077	−0.0126***	−1.0408***
	(0.0069)	(0.0603)	(0.1061)	(0.0249)	(0.0052)	(0.0055)	(0.0049)	(0.0391)
Risk aversion(-)	0.0120***	0.0819***	0.1011**	0.0285***	0.0026	0.0025	0.0062***	0.0501***
	(0.0030)	(0.0261)	(0.0459)	(0.0108)	(0.0022)	(0.0024)	(0.0021)	(0.0169)
Patience	0.0015	−0.0167	0.0368	0.0036	−0.0001	−0.0031	−0.0041**	0.0121
	(0.0028)	(0.0243)	(0.0428)	(0.0101)	(0.0021)	(0.0022)	(0.0020)	(0.0157)
Fam. Income Q2	−0.0092	0.0562	−0.2563	−0.0066	−0.0531***	0.0315*	−0.0627***	−0.7606***
	(0.0226)	(0.1988)	(0.3496)	(0.0821)	(0.0170)	(0.0182)	(0.0160)	(0.1290)
Fam. Income Q3	0.0139	−0.0551	−0.7829**	−0.0474	−0.0849***	−0.0060	−0.0922***	−0.8987***
	(0.0215)	(0.1891)	(0.3325)	(0.0781)	(0.0162)	(0.0173)	(0.0152)	(0.1227)
Fam. Income Q4 (Top)	−0.0191	−0.2513	−1.3475***	−0.1667**	−0.1093***	−0.0385**	−0.1126***	−0.9018***
	(0.0213)	(0.1874)	(0.3295)	(0.0774)	(0.0160)	(0.0171)	(0.0151)	(0.1215)
Disposable Income	−0.0002	−0.0001	−0.0018	0.0005	−0.0000	−0.0001	−0.0000	0.0019***
	(0.0001)	(0.0010)	(0.0018)	(0.0004)	(0.0001)	(0.0001)	(0.0001)	(0.0007)
Constant	−0.1436**	−1.5554***	−4.5130***	−1.5927***	0.3433***	0.5369***	0.5477***	13.2197***
	(0.0591)	(0.5197)	(0.9139)	(0.2146)	(0.0443)	(0.0472)	(0.0417)	(0.3363)
Decomposition of Reduction								
Personality	−0.0013**	−0.0077	−0.0489***	−0.0035*	−0.0031***	−0.0034***	0.0001	−0.0372***
	(0.0006)	(0.0050)	(0.0101)	(0.0021)	(0.0006)	(0.0005)	(0.0004)	(0.0077)
Locus of Control (external)	−0.0024***	−0.0289***	−0.0523***	−0.0110***	−0.0051***	−0.0004	−0.0007**	−0.0541***
	(0.0004)	(0.0038)	(0.0067)	(0.0015)	(0.0005)	(0.0003)	(0.0003)	(0.0044)
Econ	0.0003**	0.0009	0.0036*	0.0007	0.0000	−0.0001	−0.0001	0.0016**
	(0.0001)	(0.0012)	(0.0020)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0008)
Income	−0.0012**	−0.0134**	−0.0550***	−0.0063***	−0.0030***	−0.0029***	−0.0029***	−0.0093***
	(0.0006)	(0.0053)	(0.0094)	(0.0022)	(0.0005)	(0.0005)	(0.0004)	(0.0035)
Total reduction	−0.0046***	−0.0491***	−0.1525***	−0.0201***	−0.0112***	−0.0069***	−0.0036***	−0.0990***
	(0.0008)	(0.0072)	(0.0142)	(0.0030)	(0.0009)	(0.0007)	(0.0006)	(0.0107)
Mean Outcome	0.454	1.654	7.912	0.481	0.201	0.199	0.139	9.416
Observations	9,357	9,357	9,357	9,357	9,044	9,221	9,097	9,123

Note: Regression coefficients from OLS on males only, ages 46-75. Bottom Panel shows the decomposition of the contributions of covariate sets to reducing the coefficient on years of education between the "Base" and "Full" gradients, where "Personality" stands for the full set of facets in the full regression. The top panel for the Base Gradient suppresses the coefficients on age, immigrant status, and constant. This table corresponds to Table S.11, except for the selected sample. See Section 2 for variable descriptions.