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Personality and the education–health gradient: A note on “Understanding differences in health behaviors by education”

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Abstract

We test the robustness of the results of Cutler and Lleras-Muney (2010) on the role of personality in explaining the education–health gradient by using alternative measures of child personality available in the National Child Development Study. We show that, alternatively to the authors, conclusions, personality contributes to the education–health gradient to an extent nearly as large as that of cognition.

Keywords

Health; Education; Cognitive ability; Personality

1. Introduction

In Cutler and Lleras-Muney (2010) (henceforth CLM), the authors explore the relationship between health behaviors and educational attainment, often referred to as the education–health gradient. While they analyze a number of potential explanations for the gradient, a central finding of their work is the importance of cognitive ability in explaining differences in health behaviors. In this respect, their work adds to a large body of research documenting the significance of cognitive ability in explaining economic (Cawley et al., 2000) and health outcomes (Gottfredson and Deary, 2004). However, a number of recent studies have demonstrated the importance of other traits distinct from intelligence, often called personality traits or noncognitive skills, in explaining a variety of outcomes (Chiteji, 2010; Conti et al., 2010a,b; Kaestner and Callison, 2011). In line with this more recent literature, CLM include a number of different measures of personality in their analysis, but – somewhat surprisingly – find that they play little role in explaining the education–health gradient.

In this note, we investigate the sensitivity of their results to the inclusion of alternative measures of personality. While CLM use a number of data sets in their analysis, we focus on one dataset in particular, the National Child Development Study (NCDS). This data set is attractive both due to the significance of cognitive ability in explaining the education–health gradient in these data, and because of the availability of measures of noncognitive skills administered in childhood. By using CLM methodology, we first replicate their results, and

then show that alternative measures of noncognitive skills account for a non-trivial share of the education–health gradient, potentially rivaling that of cognitive skills.

This note is structured as follows: Section 2 lays out the personality traits analyzed by CLM and details the additional measures that we use, Section 3 presents the results, and Section 4 concludes.

2. Personality measures

CLM include measures of personality in their model with the aim of analyzing whether and to what extent the education–health gradient could be due to differential “psychological abilities to make behavioral changes.” For this purpose, they include measures meant to capture the ability to translate intentions into actions, such as depression, anxiety, stress, self-esteem, self-efficacy, and self-control. Although these personality measures are actually responsible for reasonably large portions of the gradient for certain individual outcomes (e.g. personality explains 35% of the gradient in “Regular doctor visits last year,” 24% of “Current drinker,” and 21% of “Light exercise” in the NLSY¹) the authors, conclusions are that they play a relatively small role overall.

In the case of the NCDS, CLM include indicators of self-efficacy (whether respondent gets what they want out of life, how much control they have over their lives, and whether they can run their lives how they want) and measures of mental health and stress, as measured by the Malaise index and the General Health Questionnaire (GHQ12). They find these measures to have a negligible impact on the education–health gradient.

We argue that the CLM approach is problematic for the following reasons. First, CLM use measures of cognitive ability and personality traits collected at vastly different times, the former during childhood (at ages 7, 11 and 16), and the latter during adulthood. While they acknowledge that their approach does not allow them to make causal claims about the relationship between education and health, they still compare the explanatory power of measures collected at different points across the lifecycle. However, given the nature of the outcomes being studied (addictive behaviors like smoking and drug use, persistent issues such as obesity), it is unsurprising that early-life traits would be better predictors of education and late-life outcomes than late-life traits, which could have been themselves an outcome of educational attainment and/or health behaviors (see Conti et al. (2010a) for the importance of early-life endowments in explaining the education–health gradient). Second, it is now being increasingly accepted in economics that performance on cognitive tests (especially those administered in a low-stake environment such as a survey context) is highly dependent on noncognitive traits, so conditioning on them is required to ensure that the cognitive tests are not proxying for traits other than intelligence.

In our re-analysis, we try to improve upon the CLM choice of personality traits by including two additional sets of measurements: the Rutter Behavior Scale (Rutter, 1967; Rutter et al., 1970) and a number of syndrome scores from the British Social Adjustment Guide (BSAG, Stott, 1963). The Rutter Scale measures behavior difficulties in the child, and was administered at ages 7 and 11 (to the parents) and at age 16 (both to the parents and to the teacher). The *parental questionnaire*, or *Child Scale A* (Rutter et al., 1970), consists of descriptions of behavior (14 at ages 7 and 11, 18 at age 16) against which the parent (as part of the home interview, usually completed by the mother) was asked to indicate whether each description applies “never” (0), “sometimes” (1), or “frequently” (2)² (at ages 7 and 11), or

¹Interestingly, the NLSY is also the dataset – among all those used by the authors – where the personality scales have been measured at an earlier age.

²Numbers in parentheses represent the score assigned to each response.

“does not apply” (0), “applies somewhat” (1), or “certainly applies” (2) to the child (at age 16). The *teacher’s questionnaire*, or *Child Scale B* (Rutter, 1967) consists of 26 descriptions of behavior against which the teacher was asked to indicate whether the description “does not apply” (0), “applies somewhat” (1), or “certainly applies” (2) to the child. The scale is constructed by summing the responses to all individual items, with a higher score indicating behavioral adjustment problems. The British Social Adjustment Guides (BSAG) were designed to describe the child’s behavior in particular settings, and were administered at ages 7 and 11. Teachers were presented with a number of “phrases,” and asked to underline “items of behavior” they thought described the child’s behavior or attitudes. These underlined phrases were transformed into 12 “Syndromes” representing different aspects of social maladjustment.³ Both sets of measures have been used extensively in previous work. For example, Carneiro et al. (2007) examine the relationship between the BSAG and a variety of outcomes later in life, including schooling and labor market outcomes. Other work in economics where the BSAG has been used as a measure of noncognitive skills include Blanden et al. (2007), Siles (2010) and Jones et al. (2011), while the Rutter scale has been used in Buchanan et al. (2002), Butler and Bynner (2001) and Power and Matthews (1997), among others.

Summary statistics for the measures used are presented in Table 1. A comparison with the original table in CLM (Table A3) reveals that we are able to almost perfectly match both means and sample sizes.

3. Results

In order to test the robustness of the CLM results to alternative measures of personality, we first attempt to replicate them (Table 8 in the original paper). The results are presented in Table 2. First, we notice that (see column 2) the means of all but two variables match those in CLM.⁴ Unfortunately, restricting the sample according to the specifications of the original paper (all individuals with nonmissing cognitive tests at all ages) leads to the inclusion of almost three hundred observations more than in CLM. Despite this, and some potential uncertainty in the exact specifications of background variables and economic controls, the replicated results are remarkably similar to the original ones: in particular, cognitive ability and social integration represent large portions of the gradient, while current and future satisfaction and personality (as defined in CLM) matter very little.

We next compare these results with those obtained using our alternative measures of child personality (BSAG and Rutter). First, we notice that these new measures explain, on average, 16% of the gradient, a portion that is at least comparable (although slightly less) to that of cognitive ability. In fact, the reduction on the education coefficient after including the BSAG and Rutter scores is of a sizeable magnitude for the majority of the outcomes, and it is greater than the reduction due to cognitive ability for diet, being overweight, and number of drinks. Second, when we include our personality measures together with cognitive ability, we see a percent reduction in the coefficient on education which is comparable to the one obtained upon the inclusion of cognitive ability alone. Given that we also observe a reduction in the education coefficient with the inclusion of the BSAG and of the Rutter Scales alone, this would suggest a significant degree of correlation among the two sets of measurements – and indeed, to give one example, the correlation between the teacher-rated Rutter Scale and the reading and math tests at age 16 is >0.35 .⁵

³Unforthcomingness, Withdrawal, Depression, Anxiety, Hostility towards adults, Writing off adults & standards, Anxiety for acceptance by kids, Hostility towards children, Restlessness, Inconsequential behavior, Miscellaneous symptoms, Miscellaneous nervous symptoms.

⁴The exceptions are “heavy drinker” and “number of drinks per week,” which are not precisely defined in CLM.

⁵Conti et al. (2010a) report that the correlation between cognitive and noncognitive endowments is 0.54.

However, although both the BSAG and the Rutter scales are widely used, they capture behavioral problems in general, and do not reflect particular personality traits. Hence, we also include an additional set of results using measures intended to capture specific personality traits, in particular we examine the importance of motivation, and depression and anxiety. Our inclusion of motivation is based on recent work in psychology which has stressed its importance in predicting achievement (Duckworth et al., 2007). We use a series of self-rated measures⁶ as well as a teacher-rated measure (ranking the student from 1 “lazy” to 5 “hardworking”) of academic motivation, both taken at age 16. The Cronbach’s alpha reliability coefficient for the scale constructed from these items is a satisfactory 0.77. Notice also that, although depression and anxiety are stressed by CLM as key personality traits potentially influencing health behaviors, they do not directly test their importance in explaining the education–health gradient using the NCDS. We try to do so by using a subset of the BSAG syndromes (all related to depression and anxiety).⁷ The results reported in Table 3 show that both traits play substantial roles in explaining the gradient (especially motivation), on a scope rivaling that of cognition. For example, motivation accounts for the same reduction in the gradient – 48% – as cognitive ability for the probability of being a current smoker, and for a bigger reduction – 29% *versus* 17% – in the number of cigarettes smoked; we also confirm its bigger role, when compared to cognition, in explaining the gradient in diet, being overweight and number of drinks. While the use of more well-established measures like the BSAG and the Rutter scales is important to verify these results, both motivation and – although to a lesser extent – depression and anxiety appear to be key traits.

4. Conclusions

In this note we have tested the robustness of CLM results on the role of personality in explaining the education–health gradient by using alternative measures of child personality available in the NCDS. We have shown that, while cognitive ability plays a significant role, the type of personality measures included and the age at which they are measured play a non-negligible role, and more attention should be paid to these issues in future research. Our analysis demonstrates that personality contributes to the education–health gradient to an extent nearly as large as that of cognition.

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References

- Blanden J, Gregg P, Macmillan L. Accounting for intergenerational income persistence: noncognitive skills, ability, and education. *The Economic Journal*. 2007; 117:C43–C60.
- Buchanan A, Flouri E, Brinke JT. Emotional and behavioral problems in childhood and distress in adult life: risk and protective factors. *Australian and New Zealand Journal of Psychiatry*. 2002; 36(4):521–527. [PubMed: 12169153]
- Butler N, Bynner J. Pregnancy smoking and childhood conduct problems: a causal association? *The Journal of Child Psychology and Psychiatry and Allied Disciplines*. 2001; 42:8.

⁶The questions asked are: “I feel school is largely a waste of time,” “I am quiet in the classroom and get on with my work,” “I think homework is a bore,” “I find it difficult to keep my mind on my work,” “I never take work seriously,” “I don’t like school,” “I think there is no point in planning for the future – you should take things as they come,” and “I am always willing to help the teacher,” ranked from 1 “very true” to 5 “not true at all”.

⁷In particular: depression (ages 7 and 11), anxiety (age 7), anxiety for acceptance by kids (ages 7 and 11), and anxiety for acceptance by adults (age 11).

- Carneiro P, Crawford C, Goodman A. The Impact of Early Cognitive and Non-cognitive Skills on Later Outcomes. Centre for the Economics of Education (CEE), The London School of Economics and Political Science (LSE). 2007
- Cawley, J.; Heckman, JJ.; Lochner, LJ.; Vytlačil, EJ. Understanding the role of cognitive ability in accounting for the recent rise in the return to education. In: Arrow, K.; Bowles, S., editors. Meritocracy and Economic Inequality. Princeton University Press; Princeton, NJ: 2000.
- Chiteji N. Time preference, noncognitive skills and well being across the life course: do noncognitive skills encourage healthy behavior? *American Economic Review*. 2010; 100:200–204. [PubMed: 20953279]
- Conti G, Heckman JJ, Urzua S. The education–health gradient. *American Economic Review Papers and Proceedings*. 2010a; 100:234–238.
- Conti G, Heckman JJ, Urzua S. Understanding the early origins of the education–health gradient: a framework that can also be applied to analyze gene–environment interactions. *Perspectives on Psychological Science*. 2010b; 5(5):585–605. [PubMed: 21738556]
- Cutler D, Lleras-Muney A. Understanding differences in health behaviors by education. *Journal of Health Economics*. 2010; 29:1–28. [PubMed: 19963292]
- Duckworth AL, Peterson C, Matthews MD, Kelly DR. Grit: perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*. 2007; 92:1087–1101. [PubMed: 17547490]
- Gottfredson LS, Deary IJ. Intelligence predicts health and longevity, but why? *Current Directions in Psychological Science*. 2004; 13:1–4.
- Jones AM, Rice N, Dias PR. Long-term effects of school quality on health and lifestyle: evidence from comprehensive schooling reforms in England. *Journal of Human Capital*. 2011; 5:342–376.
- Kaestner R, Callison K. Adolescent cognitive and noncognitive correlates of adult health. *Journal of Human Capital*. 2011; 5:29–69.
- Power C, Matthews S. Origins of health inequalities in a national population sample. *The Lancet*. 1997; 350:1584–1589.
- Rutter, M. A children’s behaviour questionnaire for completion by teachers: preliminary findings. 1967. Tech. Rep. 1
- Rutter, M.; Tizard, J.; Whitmore, K. *Education, Health and Behaviour*. Longmans; London, UK: 1970.
- Siles MA. Personality, education and earnings. *Education Economics*. 2010; 18(2):131–151.
- Stott, D. *The Social-Adjustment of Children: Manual to the Bristol Social-Adjustment Guides*. University of London Press; London, England: 1963.

Table 1

Summary statistics.

Variable	Did not pass A levels		Passed A levels		Min	Max
	N	Mean	N	Mean		
<i>Cognitive measures</i>						
Age 7						
Math (arithmetic)	7128	4.78	2975	6.39	0	10
Drawing (draw-a-man test)	7015	23.15	2915	26.29	0	53
Age 11						
Reading comprehension	6893	14.59	2910	20.90	0	35
Math	6893	14.28	2908	25.20	0	40
Verbal	6894	20.46	2909	28.91	0	40
Non-verbal	6894	19.68	2909	26.28	0	40
Drawing (copying designs)	6882	8.23	2902	8.83	0	12
Age 16						
Reading comprehension	5964	23.87	2640	30.53	0	35
Math	5931	10.73	2637	19.00	0	31
<i>Life satisfaction</i>						
Current (0 = min; 10 = max)	7925	7.23	3339	7.43	0	10
In ten years (0 = min; 10 = max)	7904	8.03	3334	8.11	0	10
<i>Personality scales</i>						
Efficacy 1 (never get what I want out of life = 1)	7902	0.26	3330	0.15	0	1
Efficacy 2 (usually have control over my life = 1)	7914	0.87	3336	0.94	0	1
Efficacy 3 (can run my life how I want = 1)	7914	0.94	3333	0.96	0	1
Malaise index (1 = healthy; 24 = unhealthy)	7931	3.86	3342	2.96	0	24
GHQ12 (1 = low stress; 12 = high stress)	7933	1.83	3342	1.88	0	12
<i>Socialization</i>						
Mother is alive (percent)	7690	0.76	3282	0.82	0	1
Frequency sees mother (0 = every day, 4 = never)	6167	1.84	2757	2.19	1	5
Father is alive (percent)	7754	0.57	3306	0.64	0	1
Frequency sees father (0 = every day, 4 = never)	4577	1.98	2141	2.30	1	5
Frequency eat together as a family (1 = daily, 5 = never)	5087	2.18	2199	2.12	1	5
Frequency go out together as a family (1 = daily, 5 = never)	5123	2.65	2256	2.17	1	5
Frequency visit relatives as a family (1 = daily, 5 = never)	5174	2.11	2276	2.14	1	5
Frequency go on holiday as a family (1 = daily, 5 = never)	5103	3.83	2262	3.50	1	5
Frequency go out alone or with friends (1 = weekly, 4 = never)	6325	2.24	2721	2.17	1	4
Frequency attends religious services (1 = weekly, 4 = never)	6898	3.54	2581	3.04	1	4
<i>BSAG</i>						
Depression (age 7)	7148	1.08	2980	0.56	0	14
Depression (age 11)	6888	1.15	2903	0.53	0	10
Anxiety (age 7)	7149	0.93	2980	0.82	0	12
Anxiety for acceptance by kids (age 7)	7148	0.31	2980	0.24	0	8

Variable	Did not pass A levels		Passed A levels		Min	Max
	N	Mean	N	Mean		
Anxiety for acceptance by kids (age 11)	6888	0.35	2903	0.22	0	8
Anxiety for acceptance by adults (age 11)	6888	0.59	2903	0.44	0	11
Hostility towards children (age 7)	7148	0.28	2980	0.16	0	9
Hostility towards children (age 11)	6888	0.30	2903	0.14	0	10
Hostility towards adults (age 7)	7148	0.80	2980	0.45	0	16
Hostility towards adults (age 11)	6888	0.93	2903	0.49	0	18
Unforthcomingness (age 7)	7149	1.86	2980	1.35	0	15
Unforthcomingness (age 11)	6888	1.69	2902	1.15	0	12
Withdrawal (age 7)	7148	0.34	2980	0.21	0	10
Withdrawal (age 11)	6888	0.36	2902	0.21	0	8
Writing off adults and standards (age 7)	7148	0.98	2980	0.48	0	16
Writing off adults and standards (age 11)	6888	1.09	2903	0.54	0	16
Restlessness (age 7)	7148	0.29	2980	0.13	0	4
Restlessness (age 11)	6888	0.25	2903	0.09	0	4
Inconsequential behavior (age 7)	7148	1.51	2980	0.80	0	11
Inconsequential behavior (age 11)	6888	1.55	2903	0.74	0	12
Miscellaneous symptoms (age 7)	7148	0.63	2980	0.38	0	7
Miscellaneous symptoms (age 11)	6888	0.65	2903	0.38	0	7
Miscellaneous nervous symptoms (age 7)	7148	0.15	2980	0.10	0	4
Miscellaneous nervous symptoms (age 11)	6888	0.12	2903	0.07	0	4
<i>Rutter</i>						
Parent rating (age 7)	6587	6.34	2764	5.75	0	24
Parent rating (age 11)	6115	5.94	2672	5.32	0	23
Parent rating (age 16)	5757	4.37	2481	3.25	0	30
Teacher rating (age 16)	5709	4.84	2561	1.99	0	43

Table 2

Replicated and new results.

Behavior	Mean	N	Coefficient on passing A level																		
			Economic controls					Addition to income and background controls													
			% Reduction in this coefficient for each specification																		
			Economic controls					Addition to income and background controls													
			Demo graphics and background	Economic controls	Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	BSAG and Rutter	Cognitive, BSAG and Rutter	All Factors	Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	BSAG and Rutter	Cognitive, BSAG and Rutter	All factors	
<i>Smoking</i>																					
Current smoker	29%	6752	-0.126** (0.013)	-0.100** (0.014)	-0.039** (0.015)	-0.100** (0.014)	-0.095** (0.014)	-0.081** (0.014)	-0.029** (0.015)	-0.071** (0.014)	-0.038** (0.015)	-0.027* (0.015)	21%	0%	4%	15%	56%	23%	49%	58%	
Former smoker	25%	6752	-0.02 (0.012)	-0.019 (0.014)	-0.014 (0.015)	-0.019 (0.014)	-0.028** (0.014)	-0.02 (0.015)	-0.02 (0.015)	-0.017 (0.014)	-0.015 (0.015)	-0.021 (0.015)	5%	0%	0%	-45%	-5%	10%	20%	-10%	
Quit smoking (ever smoked only)	46%	3653	0.099** (0.021)	0.077** (0.022)	0.031 (0.023)	0.079** (0.022)	0.075** (0.022)	0.053** (0.022)	0.018 (0.024)	0.060** (0.022)	0.031 (0.024)	0.016 (0.024)	22%	-2%	2%	24%	60%	17%	46%	62%	
Number of cigarettes smoked	17	1673	-1.579** (0.569)	-1.276** (0.595)	-1.006 (0.642)	-1.477** (0.592)	-1.275** (0.588)	-0.957 (0.602)	-0.886 (0.634)	-1.314** (0.612)	-1.201* (0.654)	-1.044 (0.645)	19%	-13%	0%	20%	25%	-2%	5%	15%	
Diet/exercise BMI	25.9	6588	-0.571** (0.136)	-0.684** (0.148)	-0.557** (0.162)	-0.689** (0.148)	-0.642** (0.148)	-0.603** (0.151)	-0.499** (0.165)	-0.552** (0.151)	-0.579** (0.162)	-0.515** (0.164)	-20%	-1%	7%	14%	32%	23%	18%	30%	
Underweight	1%	6588	0.007** (0.003)	0.008** (0.003)	0.009** (0.003)	0.008** (0.003)	0.008** (0.003)	0.008** (0.003)	0.008** (0.004)	0.007** (0.003)	0.008** (0.004)	0.008** (0.004)	-14%	0%	0%	0%	0%	14%	0%	0%	
Overweight	52%	6588	-0.075** (0.014)	-0.081** (0.015)	-0.079** (0.017)	-0.082** (0.015)	-0.076** (0.015)	-0.073** (0.016)	-0.072** (0.017)	-0.069** (0.016)	-0.081** (0.017)	-0.072** (0.017)	-8%	-1%	7%	11%	12%	16%	0%	12%	
Obese	15%	6588	-0.039** (0.01)	-0.039** (0.011)	-0.028** (0.012)	-0.040** (0.011)	-0.036** (0.011)	-0.033** (0.012)	-0.025** (0.012)	-0.030** (0.012)	-0.030** (0.012)	-0.027** (0.013)	0%	-3%	8%	15%	36%	23%	23%	31%	
Exercise regularly	75%	6751	0.092** (0.013)	0.069** (0.014)	0.047** (0.015)	0.070** (0.013)	0.065** (0.013)	0.056** (0.014)	0.043** (0.015)	0.055** (0.014)	0.045** (0.015)	0.039** (0.015)	25%	-1%	4%	14%	28%	15%	28%	33%	
Eat fruit every day	53%	6751	0.107** (0.014)	0.103** (0.015)	0.090** (0.017)	0.103** (0.015)	0.098** (0.015)	0.077** (0.016)	0.074** (0.017)	0.086** (0.016)	0.086** (0.017)	0.070** (0.017)	4%	0%	5%	24%	27%	16%	16%	31%	
Eat vegetables every day	17%	6751	0.032** (0.011)	0.018** (0.012)	0.040** (0.013)	0.018** (0.012)	0.018** (0.012)	0.013 (0.012)	0.038** (0.013)	0.014 (0.012)	0.039** (0.013)	0.037** (0.013)	44%	0%	0%	16%	-63%	13%	-66%	-59%	
<i>Drinking</i>																					
Drinker	95%	6752	0.013** (0.006)	0.008 (0.007)	-0.003 (0.007)	0.008 (0.007)	0.007 (0.007)	0.011 (0.007)	0.003 (0.007)	0.002 (0.007)	-0.002 (0.007)	0.003 (0.007)	38%	0%	8%	-23%	38%	46%	77%	38%	
Heavy drinker	20%	6752	0.053** (0.011)	0.026** (0.012)	-0.001 (0.014)	0.026** (0.012)	0.028** (0.012)	0.021* (0.013)	0 (0.014)	0.016 (0.013)	-0.002 (0.014)	-0.001 (0.014)	51%	0%	-4%	9%	49%	19%	53%	51%	
Number of drinks in week	11.8	5585	-1.119** (0.399)	-1.047** (0.434)	-1.259** (0.477)	-1.030** (0.434)	-0.930** (0.434)	-0.707 (0.44)	-0.920* (0.476)	-0.903** (0.446)	-1.160** (0.481)	-0.804* (0.481)	6%	2%	10%	30%	11%	13%	-10%	22%	

Behavior	Mean	N	% Reduction in this coefficient for each specification																		
			Coefficient on passing A level					Addition to income and background controls													
			Economic controls					Addition to income and background controls													
			Demo graphics and back ground	Economic controls	Addition to income and background controls			Addition to income and background controls													
					Cognitive ability	Current and future satisfaction	Persona lity	Social Integra tion	All original factors	BSAG and Rutter	Cognitive, BSAG and Rutter	All Factors	Cognitive ability	Current and future satisfaction	Persona lity	Social Integra tion	All original factors	BSAG and Rutter	Cognitive, BSAG and Rutter	All factors	
<i>Illegal drugs</i>																					
Illegal drugs in last 12 months	8%	6707	0.004 (0.008)	0.008 (0.008)	0.008 (0.009)	0.008 (0.008)	0.009 (0.008)	0.004 (0.008)	0.004 (0.009)	0.013 (0.008)	0.009 (0.009)	0.005 (0.009)	-100%	0%	-25%	100%	100%	100%	-125%	-25%	75%
Ever tried illegal drugs	34%	6707	0.070** (0.013)	0.069** (0.014)	0.057** (0.015)	0.070** (0.014)	0.074** (0.014)	0.056** (0.014)	0.050** (0.015)	0.082** (0.015)	0.061** (0.015)	0.055** (0.015)	1%	17%	-7%	19%	27%	27%	-19%	11%	20%
Unweighted percentages (significant outcomes)													14%	18%	3%	14%	24%	24%	16%	18%	24%
Unweighted percentages (original significant outcomes)													15%	21%	3%	10%	24%	24%	15%	19%	24%

The sample includes all people with cognitive measures at all ages. The left side of the table presents the coefficient on a binary indicator for passing the A-level, given each set of controls. The right side of the table presents the % reduction in this coefficient for each specification. Economic controls are compared to just demographics and background controls, while all other % reductions are the additional reduction beyond economic controls. Demographic controls include age, sex, race and ethnic dummies. Parental and background measures include height at age 16, birthweight, SES of dad at birth, age 7, age 11 and age 16, marital status and current SES. Three cognitive tests are included: at age 7 (math and drawing), age 11 (reading, math, verbal, non-verbal, and drawing), and age 16 (math and reading comprehension). Current life satisfaction is measured by a 10 point scale based on a question of how good life has turned out so far. Future life satisfaction is a 10 point scale based on where the subject expects themselves to be in 10 years. Personality measures include 3 measures of efficacy based on answers to three questions, and the malaise score. Social integration measures include: parents alive, see parents, frequency visit relatives with family, frequency go out together as family, frequency spend holidays together as family, frequency go out alone or with friends, frequency attends religious service. BSAG and Rutter are described in the text. Missing variables were included as zeros, with dummies identifying missing data. Health outcomes are measured at wave 6.

* Indicates statistical significance at the 10%, 5% and 1% level, respectively.
 ** Indicates statistical significance at the 10%, 5% and 1% level, respectively.
 *** Indicates statistical significance at the 10%, 5% and 1% level, respectively.

Table 3

Results with alternative personality measures.

Behavior	Mean	N	Coefficient on passing Δ level			% Reduction in this coefficient for each specification																
			Demo-graphics and background	Economic controls	Addition to income and background controls	Economic controls					Addition to income and background controls											
						Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	Motivation	Depression and Anxiety	All Factors	Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	Motivation	Depression and anxiety	All factors	
<i>Smoking</i>																						
Current smoker	29%	6752	-0.126*** (0.013)	-0.100*** (0.014)	-0.039*** (0.015)	-0.039*** (0.015)	-0.100*** (0.014)	-0.081*** (0.014)	-0.029** (0.015)	-0.039*** (0.014)	-0.088*** (0.014)	-0.007 (0.015)	21%	48%	0%	4%	15%	56%	48%	10%	74%	
Former smoker	25%	6752	-0.020 (0.012)	-0.019 (0.014)	-0.014 (0.015)	-0.019 (0.014)	-0.028** (0.014)	-0.020 (0.015)	0.008 (0.014)	0.008 (0.014)	-0.021 (0.014)	-0.003 (0.015)	5%	25%	0%	0%	-45%	-5%	135%	-10%	80%	
Quit smoking (ever smoked only)	46%	3653	0.099*** (0.021)	0.077*** (0.022)	0.031 (0.023)	0.075*** (0.022)	0.055** (0.022)	0.018 (0.024)	0.053** (0.022)	0.068*** (0.022)	0.012 (0.024)	22%	46%	-2%	2%	24%	60%	24%	24%	9%	66%	
Number of cigarettes smoked	17.	0 1673	-1.579*** (0.569)	-1.276** (0.595)	-1.006 (0.642)	-1.275** (0.588)	-0.957 (0.602)	-0.886 (0.634)	-0.823 (0.607)	-1.263** (0.602)	-0.746 (0.642)	19%	17%	-13%	0%	20%	25%	29%	29%	1%	34%	
<i>Diet/exercise</i>																						
BMI	25.9	6588	-0.571*** (0.136)	-0.684*** (0.148)	-0.557*** (0.162)	-0.642*** (0.148)	-0.603*** (0.151)	-0.499** (0.163)	-0.637*** (0.152)	-0.553*** (0.148)	-0.490*** (0.165)	-20%	22%	-1%	7%	14%	32%	8%	8%	23%	34%	
Underweight	1%	6588	0.007** (0.003)	0.008** (0.003)	0.009** (0.003)	0.008** (0.003)	0.008** (0.003)	0.008** (0.004)	0.008** (0.003)	0.008** (0.003)	0.008** (0.004)	-14%	-14%	0%	0%	0%	0%	0%	0%	0%	0%	
Overweight	52%	6588	-0.075*** (0.014)	-0.081*** (0.015)	-0.079*** (0.017)	-0.076** (0.015)	-0.073*** (0.016)	-0.072*** (0.017)	-0.074*** (0.016)	-0.072*** (0.016)	-0.070*** (0.017)	-8%	3%	-1%	7%	11%	12%	9%	9%	12%	15%	
Obese	15%	6588	-0.039*** (0.010)	-0.039*** (0.011)	-0.028** (0.012)	-0.036*** (0.011)	-0.033*** (0.012)	-0.025** (0.012)	-0.036*** (0.012)	-0.030*** (0.011)	-0.026** (0.013)	0%	28%	-3%	8%	15%	36%	8%	8%	23%	33%	
Exercise regularly	75%	6751	0.092*** (0.013)	0.069*** (0.014)	0.047*** (0.015)	0.070*** (0.013)	0.056*** (0.014)	0.043*** (0.015)	0.056*** (0.014)	0.064*** (0.014)	0.038*** (0.015)	25%	24%	-1%	4%	14%	28%	14%	14%	5%	34%	
Eat fruit every day	53%	6751	0.107*** (0.014)	0.103*** (0.015)	0.090*** (0.017)	0.103*** (0.015)	0.077*** (0.016)	0.074*** (0.017)	0.081*** (0.016)	0.098*** (0.015)	0.066*** (0.017)	4%	12%	0%	5%	24%	27%	21%	21%	5%	35%	
Eat vegetables every day	17%	6751	0.032*** (0.011)	0.018*** (0.012)	0.040*** (0.013)	0.018*** (0.012)	0.013*** (0.012)	0.038*** (0.013)	0.014*** (0.012)	0.016*** (0.012)	0.034*** (0.013)	44%	-69%	0%	0%	16%	-63%	13%	13%	6%	-50%	
<i>Drinking</i>																						
Drinker	95%	6752	0.013** (0.006)	0.008 (0.007)	-0.003 (0.007)	0.007 (0.007)	0.011 (0.007)	0.003 (0.007)	0.005 (0.007)	0.004 (0.007)	0.002 (0.007)	38%	85%	0%	8%	-23%	38%	23%	23%	31%	46%	
Heavy drinker	20%	6752	0.053*** (0.011)	0.026** (0.012)	-0.001 (0.014)	0.028** (0.012)	0.021* (0.013)	-0.000 (0.014)	0.031** (0.013)	0.021** (0.013)	0.003 (0.014)	51%	51%	0%	-4%	9%	49%	-9%	-9%	9%	43%	

Behavior	Mean	N	Coefficient on passing A level																			
			Economic controls					Addition to income and background controls														
			Demo graphics and back ground	Economic controls	Addition to income and background controls	Cognitive ability	Current and future satisfaction	Persona lity	Social inte gration	All original factors	Motiva tion	Depression and Anxiety	All Factors	Economic controls	Current and future satisfac tion	Persona lity	Social integra tion	All original factors	Motiva tion	Depression and anxiety	All factors	
Number of drinks in week	11.8	5585	-1.119*** (0.399)	-1.047** (0.434)	-1.259*** (0.477)	-1.030** (0.434)	-0.930** (0.434)	-0.707 (0.440)	-0.920* (0.476)	-0.124 (0.445)	-1.078** (0.438)	-0.500 (0.479)	6%	-19%	2%	10%	30%	11%	82%	-3%	49%	
<i>Illegal drugs</i>																						
Illegal drugs in last 12 months	8%	6707	0.004 (0.008)	0.008 (0.008)	0.008 (0.009)	0.008 (0.008)	0.009 (0.008)	0.004 (0.008)	0.004 (0.009)	0.024*** (0.008)	0.009 (0.008)	0.012 (0.009)	-100%	0%	0%	-25%	100%	100%	-400%	-25%	-100%	
Ever tried illegal drugs	34%	6707	0.070*** (0.013)	0.069*** (0.014)	0.057*** (0.015)	0.070*** (0.014)	0.074*** (0.014)	0.056*** (0.014)	0.050*** (0.015)	0.118*** (0.014)	0.073*** (0.014)	0.076*** (0.015)	1%	17%	-1%	-7%	19%	27%	-70%	-6%	-10%	
Unweighted percentages (significant outcomes)													14%	18%	-1%	3%	14%	24%	14%	9%	29%	
Unweighted percentages (original significant outcomes)													15%	21%	-1%	3%	10%	24%	24%	8%	34%	

The sample includes all people who took cognitive tests at all ages. The left side of the table presents the coefficient on a binary indicator for passing the A-level, given each set of controls. The right side of the table presents the % reduction in this coefficient for each specification. Economic controls are compared to just demographics and background controls, while all other % reductions are relative to a specification that includes demographics and background controls and economic controls. Demographic controls include age, sex, race and ethnic dummies. Parental and background measures include height at age 16, birthweight, SES of dad at birth, age 7, age 11 and age 16 (math and drawing), age 11 (reading, math, verbal, non-verbal, and drawing), and age 16 (math and reading comprehension). Current life satisfaction is measured by a 10 point scale based on a question of how good life has turned out so far. Future life satisfaction is a 10 point scale based on where the subject expects himself to be in 10 years. Personality measures include 3 measures of efficacy based on answers to three questions, and the malaise score. Social integration measures include: parents alive, see parents, frequency visit relatives with family, frequency go out together as family, frequency spend holidays together as family, frequency go out alone or with friends, frequency attends religious service. Motivation and depression and anxiety are described in the text. Missing variables were included as zeros, with dummies identifying missing data. Health outcomes are measured at wave 6.

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