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INVESTMENT IN EDUCATION, OBESITY AND HEALTH BEHAVIOURS OF YOUNG ITALIAN ADULTS

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This study reports new evidence on the association between educational outcomes for a sample of young adults in Italy enrolled in the University of Salerno, and selected health behaviours. The results indicate the following: 1. individuals who perform better academically also show behaviours that improve their own health, such as not smoking, low alcohol consumption, and a normal body weight; this finding confirms the complementarities between investment in education and health (Fuchs, 2004; Becker, 2007); and 2. particularly for women, a positive association is observed between the choice of studying sciences (versus humanities), a normal body weight, and the adoption of certain healthy behaviours (engaging in physical activity, and not smoking).

Nel presente lavoro vengono forniti nuovi risultati su un campione di studenti iscritti all'Università di Salerno con riferimento alla relazione fra istruzione e alcuni comportamenti rilevanti per la salute. I risultati indicano quanto segue: 1. gli individui che conseguono migliori risultati accademici mostrano anche comportamenti che migliorano la propria salute, ad esempio non fumare e mantenere un basso consumo di alcolici e un peso corporeo normale, confermando così la complementarità tra investimento in istruzione e salute (Fuchs, 2004; Becker, 2007); 2. per le donne in particolare, è stata osservata una relazione positiva tra la scelta del corso di studi in materie scientifiche (anziché umanistiche), un peso corporeo normale e l'adozione di alcuni comportamenti "salutari" (in particolare, praticare attività fisica e non fumare).

Introduction

The positive correlation between education and health has been widely documented in the economic literature; in many countries and over many time periods, individuals who are more educated enjoy better health and have healthier behaviours (Cutler and Lleras-Muney, 2008, 2012; Grossman, 2000, 2015; Eide and Showalter, 2011), although the mechanism behind this observed association has not been clearly established.

Recently, Grossman (2015) has emphasised that "many studies suggest that years of formal schooling completed is the most important correlate of good health. There is much less consensus as to whether this correlation reflects causality from more schooling to better health. The relationship may be traced, in part, to reverse causality and may also reflect

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an omitted third variable that causes health and schooling to vary in the same direction", concluding that it is necessary "to warrant more research on whether more schooling does, in fact, cause better health outcomes".

As a consequence of the lack of consensus regarding causality, policy makers may be applying inappropriate policy responses in this field; they may use educational policies to promote population health if the causality hypothesis should be definitely established, or they may use policies aimed at reducing health inequalities related to socio-economic causes if the reverse causality hypothesis should have greater importance. Alternatively, policy makers may promote policies aimed at influencing the third variable that causes health and schooling to vary in the same direction.

Moreover, in the literature, the proxy of educational attainment is typically the level of schooling, whereas the *type of education* (or content of schooling) is not considered in the notion of educational attainment[1]. Fuchs (2004) underlines that apart from the level of schooling, the *type of education* could reasonably play a role in the education-health link. Considering the analogy between the contribution of additional years of education to increased earnings, and its contribution to improved health, he observes that "with respect to earnings, we know that college graduates who majored in science or engineering earn much more than humanities majors.[...] Do similar differences exists in the education-health relationship?[...] Are college graduates who majored in biology healthier than French literature majors?[...] Does the content of schooling matter at all? If not, what is it that schooling does to improve health?" (Fuchs, 2004, p. 656).

This work contributes to the debate on the relevance of the health-education link in many aspects. First, it provides new evidence for Italy, and simultaneously considers the health behaviours (i.e. drinking, smoking, and physical exercise) addressed in the literature as the main correlates of education (Suhrcke and de Paz Nieves, 2011; Saint Onge and Krueger, 2017).

Second, investment in education is viewed not only as academic performance but also as the choice of the field of study (i.e. the choice between humanities and sciences). More specifically, in line with the question raised by Fuchs (2004) and considering the role that the content of education may play in the relationship between education and health, this study investigates whether students enrolled in scientific courses are "healthier" compared with those enrolled in humanities.

Third, this work investigates any potential gender differences in the association between health behaviours and type of education. This analysis was performed because there is separate empirical evidence showing that women have healthier behaviours than men (Wardle *et al*., 2004), and that there are gender differences both in educational outcomes and the type of education (content of schooling); women in fact have better educational outcomes but continue to be reluctant to study maths and science (Schneeweis and Zweimuller, 2012; Cozzi *et al*., 2018).

The empirical analysis relies on survey data collected at the University of Salerno (in the South of Italy) in 2013 and 2014.

The remainder of this paper is organised as follows: Section 1 reviews the literature on the health-education link; Section 2 focuses on empirical studies concerning health

[1] In the economic literature, differences in human capital accumulation are one of the main factors of gender gaps (Altonji and Blank, 1999). According to Francesconi and Parey (2018), the single most important proximate factor that explains the sizeable, early gender gap in pay is the field of study at university.

behaviours, body weight, and education; Section 3 describes the data; and Section 4 provides the results. The conclusions are reported in Section 5.

1. Mechanisms underlying the link between schooling, health, and health behaviours

According to economists, individuals rationally invest in human capital through education, training, and health behaviours. While Schultz (1962) and Becker (1964) considered education, on-the-job training, and health as types of human capital investment, Grossman modelled optimal investment in health to increase longevity (Grossman, 1972) and to distinguish between returns on investment in knowledge from returns on investment in health (Grossman, 2006)[2]. This difference arises because "investments in knowledge raise wage rates, while investments in health raise the total amount of time available for market and household production in a given year and prolong length of life" (Grossman, 2016, p. 4).

A large body of literature has documented a positive association between health and education; however, because of methodological problems (i.e. measurement problems, omitted variable bias, and reverse causality), many findings are neither robust nor consistent (Suhrcke and de Paz Nieves, 2011; Kristjánsson *et al.*, 2010)[3], and the causality mechanism is not clear. According to Grossman (2000), the association between health and education may be explained in the following ways.

i) Impact of education on health

Causality of schooling on health is observed when more educated persons maintain better health[4]. Prior research has primarily focused on this causal effect of education on health such that educational policies seemed useful to promote population health (Grossman, 1972; Grossman and Kaestner, 1997, Cutler and Lleras-Muney, 2008); however, as mentioned above, a causal effect of education on health or health behaviours has not been clearly established due to methodological problems. While some studies have demonstrated such causality (Lleras-Muney, 2005; Oreopulos, 2006, 2007; De Walque, 2007, 2010), other studies have failed to do so (Arendt, 2005; Reinhold and Jurges, 2010; Braakmann, 2011). Still others have reported mixed evidence, i.e. causality exists for some but not all of the considered health measures or only exists for some population groups (Kenkel *et al.*, 2006; Webbink *et al.*, 2010). Hence, Grossman (2015) concludes that it is necessary "to warrant more research on whether more schooling does in fact cause better health outcomes".

[2] Recently, Galama and van Kipperslius (2015) have presented a unified theory of human capital wherein both health capital and skill capital are endogenously determined within the model.

[3] Many studies rely on panel data or instrumental variables. Sometimes, however, panel data allow for controlling for non-observed time-invariant factors, but biases due to unobserved factors that vary over time may not be completely eliminated (see, for example, Datar and Sturm, 2006, and Cawley and Spiess, 2008); valid instruments are often not available in cross-sectional data. The production of robust research, however, is increasing. Nghiem *et al.* (2018) captured the dynamic relationship between obesity and school performance through lagged effects of both health and learning outcomes; Kristjánsson *et al.* (2010) and McIsaac *et al.* (2015) demonstrated a detrimental causal effect of both poor dietary habits and low physical exercise on education.

[4] This efficiency effect can take the following two forms: productive efficiency because more educated individuals obtain a larger health output from given amounts of endogenous (choice) inputs, and allocative efficiency because education increases information about the true effects of inputs on health, leading individuals to select a better input mix.

ii) Impact of health on education (reverse causality hypothesis)

Better health may result in more schooling because healthier students may be more efficient producers of additions to the stock of knowledge (or human capital) via formal schooling (Currie, 2009). Suhrcke *et al.* (2011) present an analytical framework summarising the link between health and education, wherein health includes not only health conditions (e.g. obesity and overweight, chronic illnesses, and sleeping disorders) but also health behaviours (i.e. alcohol consumption, drug use, smoking, and physical activity). Moreover, health can influence education not only directly but also indirectly through various mediating factors (Surchke *et al.*, 2011). Ding *et al.* (2009) defines these factors as all those aspects determined by health that, in turn, can impact on educational outcomes. Such aspects include the following: cognitive and learning skill development, treatment received by children in the classroom in connection with their health condition, discrimination by peers, self-esteem, and physical energy. For example, adolescents with a high body mass index (BMI) tend to have a poorer self-image and fewer friends, and they tend to be more vulnerable to bullying and depression, as well as more pessimistic about the future (Crosnoe, 2007; Falkner *et al.*, 2001; Puhl, 2011; von Hippel and Lynch, 2014). According to Benson *et al.* (2018), the fact that young women who are overweight or obese have half the odds of attaining higher levels of education may represent an underestimated social cost of the obesity epidemic; further research should investigate the mechanisms that limit the educational attainment of overweight or obese individuals.

iii) Third factors influencing both education and health

There are many factors that may influence both education and health, including those related to the individual, his/her parents and family, and his/her communities (i.e. peers and school/university). According to Grossman (2000), the "third variable" explanation is particularly relevant if one believes that a large unexplained variation in health remains after controlling for schooling and other determinants.

Among individual characteristics, there are some that have been analysed deeply with regard to gender (i.e. time preferences and self-esteem) and have recently become relevant in explaining both educational and health outcomes (Sutter *et al.*, 2019); there are other characteristics that are currently receiving considerable attention (i.e. genetic characteristics), and represent a link that is becoming clearer between economics and human biology (Komlos and Kelly, 2016).

For example, among third factors, Grossman (2000) noted that the time preference hypothesis, first proposed by Fuchs in 1982, presents one challenge to the conclusion that the role of schooling is causal. According to this hypothesis, individuals with lower rates of time discount are more likely to stay in school longer and engage in behaviours that contribute to better health (Fuchs, 2004). Similarly, Becker (2007), following Becker and Mulligan (1997), modelled complementarities between health and schooling such that more educated persons discount the future less, and persons who are healthier invest more in both education and in lowering their discount rates on future utility. The time preference hypothesis appears to be confirmed by recent studies; in fact, Castillo *et al.* (2018b) reported that more impatient children are less likely to graduate from high school, whereas, according to Sutter *et al.* (2013), these children end up spending more money on unhealthy behaviours, such as smoking or alcohol consumption.

A third factor that clearly plays a role in influencing both health and education is parental characteristics. Parents with a higher socio-economic status (SES) tend to have children who are healthy, who have strong cognitive and academic skills, and who achieve high levels of

educational attainment (von Hippel and Lynch, 2014). Interestingly, there is also evidence that more patient parents have more patient children; this phenomenon can, in turn, have an impact on educational outcomes (Kosse and Pfeiffer, 2012). Moreover, children of impatient or present-biased parents are more likely to be obese (Stocklosa *et al.*, 2018). These findings can be considered as examples of the intergenerational transmission of parental characteristics. Some studies also emphasise the effects that different parenting styles or preferences between mothers and fathers could have on the schooling and eating behaviours of children. Twin-based studies have demonstrated that the father's schooling is the most important factor that influences children's schooling, whereas studies based on instrumental variables have typically shown that the mother's schooling is the most important factor (Black and Devereux, 2011; Holmund *et al.*, 2011). Mothers more often choose healthier food, whereas fathers have stronger preferences for fast, processed, and junk food (Fielding-Singh, 2017).

2. Health behaviours and educational outcomes: previous empirical studies

A rather impressive body of research – carried out mainly in the US – suggests that health status and health behaviours are significantly and positively correlated with educational outcomes in both developing and industrialised countries. In this section, we briefly review empirical studies that were performed in high-income countries focusing on overweight and unhealthy behaviours (alcohol, smoking, and lack of physical exercise). Even though these studies have, at times, led to inconsistent conclusions because of methodological problems (Suhrcke and de Paz Nieves, 2011), overall, certain general conclusions may be useful for policy makers.

All studies report a causal negative effect of binge drinking on academic performance (Chatterji and De Simone, 2005) and educational attainment (although the effect is small in some cases: Dee and Evans, 1997; Koch and Ribar, 2001); some works highlight a positive relationship between physical exercise and scholastic performance in the short-term, but causal effects are not clearly established (Taras and Potts-Datema, 2005; Castelli *et al.*, 2007; Trudeau and Shepard, 2008; Henning Budde *et al.*, 2008; Singh and McMahan, 2006); a negative association has also been demonstrated between smoking and education (Cook and Hutchinson, 2006; Ding *et al.*, 2009[5]; Collins *et al.*, 2007; lately, Sabado *et al.*, 2017; for Iceland, Svandottir *et al.*, 2015). A large body of research shows a negative correlation between obesity, overweight, and education – albeit with some contradictory results – but very few studies report a clear causal effect (Schwimmwer *et al.*, 2003). More specifically, following Sabia's work (2007), other studies report a significant negative relationship between weight and education (Taras and Potts-Datema, 2005; more lately: Nghiem *et al.*, 2018, on Australian data; Barone and O'Higgins, 2010, in terms of higher early school leaving in Italy; von Hippel and Lynch, 2014; Lu *et al.*, 2014). Some studies in the US, however, conclude that overweight and obese children aged five to twelve (Kaestner and Grossman, 2008, 2009), and teens (Kaestner *et al.*, 2009, 2011) have levels of attainment that are approximately the same as those who have an average weight. Finally, Kristjánsson *et al.* (2010) on data from Iceland reported that lower BMI, physical activity, and good dietary habits were all associated with higher academic achievement (however, health behaviour was positively and robustly associated with greater self-esteem).

[5] They deal with endogeneity issues by relying on genetic markers as instrumental variables.

Notably, with the exception of smoking, gender differences have been observed in the correlation between health behaviours and educational outcomes. Balsa *et al.* (2011) reported interesting gender differences regarding drinking (e.g. alcohol consumption has a small negative effect on the grade point average (GPA) only for men). Carlson *et al.* (2008), using US panel national data[6] on physical exercise, observed a small but significant benefit of certain health behaviours on performance in maths and reading only for girls. Knaus *et al.* (2018), using German data on school children, showed that increased sports activity is beneficial for cognitive skills (as measured by grades in maths and German, for example), but there are gender differences regarding non-cognitive skills (e.g. girls improve peer relations, whereas boys experience an increase in behaviour problems and peer problems). Regarding overeating, some studies report gender differences, as well; according to the results reported by Datar *et al.* (2004), the negative association between body weight and educational attainment is stronger for boys than for girls (Cawley and Spiess, 2008) in children aged two to three; in older children (Wendt and Kinsey, 2009), adolescents and young adults (Sabia, 2007; Crosnoe, 2007), the association is stronger for young women than for young men, particularly with regard to math skills (Murasko, 2015). Using survey data from second-year university students in Salerno, Barone and Nese (2014, 2016) reported a significant negative relationship between body weight and academic performance, particularly for female students. Recently, Sabia and Rees (2015) took into account the role of psychological factors, and demonstrated that increased body weight leads to decreased self-esteem among female but not male students; hence, these authors argue that physicality plays gender-specific roles in academic achievement during late adolescence.

3. Empirical analysis

This work analyses cross-sectional data providing information on the field of study (humanities versus science), academic performance, and health behaviours.

The data were collected at the University of Salerno at the beginning of the first-term academic courses during two time periods: October-November 2013 and October-November 2014. Questionnaires were usually distributed before the lectures started[7] in classrooms in which second-year courses were taught. A distinct feature of our sample is that the recruited students were enrolled[8] in a variety of courses of study: sociology, arts, foreign languages, primary teacher education, computer science, management engineering, civil engineering, mechanical engineering, and pharmaceutical sciences.

The questionnaire included 50 questions concerning: 1. individual demographic characteristics and family background; 2. past studies; 3. current studies; and finally 4.

[6] Most studies concerning the relationship between physical exercise and education rely on cross-sectional data.

[7] In a few cases, we distributed the questionnaire during the lecture break.

[8] Unfortunately, we have no information on the socio-demographic and physical characteristics of the students who did not attend. We tried to address this issue by recruiting students who attended the main courses at the beginning of the second academic year (when the rate of attendance is still high). Typically, students who do not attend lectures are those who are less motivated, and fail to obtain positive academic results. Thus, one could argue that their exclusion from the sample may generate a downward bias in the relationship between BMI and academic achievement. However, we are confident that this sample selection issue is not relevant to our aim because: 1. we primarily focus on gender differences; and 2. the probability of withdrawing from university (or of not attending lectures) should not be affected by gender differences (as confirmed in the data collected from the courses of study).

health indicators and healthy/unhealthy behaviours. The questionnaires were filled in anonymously. Few students refused to complete the questionnaire (fewer than 20) and, in total, 2,200 questionnaires were collected. After excluding observations with "missing" values for the explanatory variables[9], the final sample included approximately 2,000 students, most of whom (approximately 80%) were second-year students.

The data analysis first elicits the sample characteristics through calculations of the mean values for all variables; second, simple correlation methods are used to evaluate the relationship between educational outcomes, health indicators, and health behaviours. The choice of the variables has been inspired by previous literature. More specifically, the empirical measures used in the analysis are as follows: chronic illnesses and BMI (as health indicators); weight control, physical exercise, drinking, smoking, and consumption of snacks, pastries, and sodas (as health behaviours); the field of study chosen (humanities vs science); academic performance in comparison with their classmates in terms of exams passed and mean score reported[10]; course attendance; upper secondary school score and the type of diploma achieved; and the parents' level of schooling.

3.1. Descriptive statistics

The descriptive statistics are reported in table 1 for the total sample and for men and women, separately.

Overall, the data reveal that women have a better academic performance compared with men, and are more likely to choose to study humanities versus sciences. These findings are consistent with national data, according to which women are more likely to enrol in university and to choose to study humanities. Recent data (MIUR, 2017) show that the rate of female enrolment at university (55.6%) is higher than that of male enrolment (44.9%) and, moreover, women are overrepresented in humanities (78.3% of the students enrolled in humanities are women) but underrepresented in sciences (the percentage of women is only 27.9%). In this respect, one could argue that parental preferences may influence a child's choice between traditionally male occupations (i.e. engineers) and female occupations (i.e. teachers)[11]. In addition, risk preferences may play an important role in explaining these observed gender differences. In fact, experiments involving elicited risk preferences have revealed that more risk averse adolescents (typically girls, Eckel and Grossman, 2008) are less likely to receive disciplinary referrals in school, and are less likely to drop out of high school (Castillo *et al.*, 2018a), although it is unclear to date how cognitive abilities are related to risk taking in children and adolescents (in particular, whether students with higher maths grades make more risk-neutral choices).

[9] We have investigated the presence of sample selection bias by regression of the probability of no response on the following variables reported for the entire sample: gender, age, and the presence of the lecturer during the administration of the questionnaire (e.g. at the beginning of the lesson or during the break). We did not detect significant evidence of a self-selection bias (the results are available upon request).

[10] More specifically, first, we calculated the median number of credits (per year) and the median score reported by students attending various courses. Second, each sampled student was considered to be successful when he/she reported a number of credits (per year) and an overall score equal to or higher than the median values reported by his/her classmates.

[11] According to the role socialisation theory, the social context transmits gender roles and stereotypes, i.e. children learn gender roles through their interactions with parents and school teachers (Marini, 1990).

Table 1. Summary statistics – data drawn from the survey at the University of Salerno

	I Whole sample			II Women			III Men		
	Mean (std dev)	Min.	Max	Mean (std dev)	Min.	Max	Mean (std dev)	Min.	Max
BMI	22.67 (0.08)	14.69	66.4	21.82 (0.09)	14.69	41.1	24.01 (0.15)	17.37	66.41
Mother's education	2.77 (0.02)	1	4	2.68 (0.02)	1	4	2.90 (0.03)	1	4
Father's education	2.80 (0.02)	1	4	2.74 (0.02)	1	4	2.90 (0.03)	1	4
Age	20.80 (0.04)	18	35	20.76 (0.06)	18	35	20.86 (0.07)	18	32
Attending courses	3.57 (0.01)	1	5	3.55 (0.02)	1	5	3.60 (0.02)	1	5
Upper-school score	82.68 (0.24)	60	100	82.76 (0.29)	60	100	82.72 (0.39)	60	100
Smoking	0.69 (1.08)	1	5	0.64 (1.03)	1	5	0.77 (1.15)	1	5
Drinking	1.89 (0.02)	1	5	1.73 (0.02)	1	5	2.11 (0.03)	1	5
Weight control	2.21 (0.14)	1	3	2.26 (0.02)	1	3	2.14 (0.02)	1	3
Unhealthy food	2.65 (0.02)	1	5	2.73 (0.03)	1	5	2.54 (0.03)	1	5
No illnesses	2.72 (0.02)	1	5	2.71 (002)	1	5	2.74 (0.02)	1	5
	%			%			%		
Humanities	48.33	0	1	43.64	0	1	33.91	0	1
Liceo	64.71	0	1	67.00	0	1	69.92	0	1
Acc. performance	37.41	0	1	39.44	0	1	34.38	0	1
No physical exercise	43.03	0	1	33.23	0	1	58.81	0	1
N. of observations	1,938			1,169			768		

Legend: *BMI (Body Mass Index)*: weight/(height in cm)^2; *mother's/father's education*: average parental schooling level (1 = none; 2 = primary school; 3 = secondary school; 4 = university degree); *attending courses*: indicates whether the student usually attended courses in the previous academic years (1 = usually; 5 = never); *upper-school score*: score reported on the upper-secondary school diploma (ranging from 60/100 to 100/100); *smoking*: variable ranging from 1 to 5 according to the number of cigarettes smoked (1 = non-smoker; 5 = strong smoker); *drinking*: variable ranging from 1 to 5 (1 = no alcohol; 5 = binge drinking); *weight control*: indicates whether he/she controls his/her weight (1 = never; 3 = very often); *unhealthy food*: indicates whether he/she consume snacks, pastries, or sodas (1 = never; 5 = very often); *no illnesses*: indicates whether he/she suffers from chronic diseases that make it more difficult to study (3 = no chronic diseases); *humanities*: variable equal to 1 if he/she is enrolled in humanities (sociology, arts, philosophy, and school of education), or 0 otherwise (computer sciences, engineering, and chemistry); *academic performance*: variable equal to 1 if he/she has reported a number of credits (per year) and an overall score equal to or higher than the median values reported by his/her classmates; *no physical exercise*: variable equal to 1 if he/she does not engage in physical exercise.

Consistently with previous findings (Wardle *et al.*, 2004), girls tend to have healthier behaviours compared with boys, as girls are less likely to smoke and to drink alcohol; at the same time, girls are more likely to control body weight and to engage in physical exercise. This phenomenon raises the question of whether girls have healthier behaviours due to biological reasons or because of the environment in which they live (i.e. nature versus nurture? – Marini, 1990). In this respect, one could argue that girls are less likely to engage in unhealthy lifestyles because parental supervision is generally higher for girls than for boys (Fox, 1977)[12]. Moreover, the gender stereotypes that prevail in society tend to associate girls with beauty and kindness (not surprisingly, obesity lowers the probability of getting married more for women than for men; Gortmaker *et al.*, 1993).

4. Results

In this section, we analyse the correlation among health indicators, health behaviours, and educational outcomes. This analysis does not pursue any investigation of causality between the selected health indicators and education because of the unavailability of longitudinal observations and of reliable instrumental variables[13]; each correlation coefficient reported in tables 2 and 3 only measures the degree of association between two variables[14]. We focus on men and women, separately.

When women are considered, alcohol consumption and smoking are significantly and positively correlated; BMI is positively correlated with unhealthy food, and, in turn, unhealthy food is negatively correlated with physical exercise and weight control. Among men, a stronger correlation emerges between smoking and drinking than among women; no physical exercise is significantly and positively correlated with smoking, unhealthy food, and BMI.

Next, we consider the nexus between health/health behaviours and academic performance. Chronic illnesses negatively impact on women, but only at a 10% significance level. Consistently with previous studies (Sabia, 2007; Crosnoe, 2007), gender differences emerge in the link between being overweight and education; for women, the correlation between academic performance and BMI (as well as between diploma score and BMI) is slightly stronger than for men, and is statistically significant at least at the 5% level. If we consider the choice of *liceo* as a proxy for one's attitude regarding academic studies[15], a negative correlation between choice of school and being overweight emerges only among women. For both men and women, however, a significant correlation emerges between school and academic performance and the selected healthy behaviours regarding smoking and drinking[16].

[12] See social control theory (Fox, 1977); other contributions in this context are Taylor and Rampino (2013) and Gottfredson and Hirshi (1990).

[13] See note 3.

[14] We consider correlations within pairs of variables without controlling for confounding third variables, i.e. when we observe the correlation between academic performance and being overweight, we ignore the fact that being overweight may be positively correlated with the consumption of unhealthy food and, in turn, academic performance may be negatively correlated with unhealthy food. Hence, the estimated correlation coefficient is likely to be biased (the "sign" itself of the relationship cannot be established with certainty).

[15] We consider *liceo*, traditionally more oriented towards tertiary education, versus upper-secondary school for technicians and accountants, less oriented towards tertiary education.

[16] Drinking is significantly correlated only with the diploma score both for men and women.

Table 2. Correlation matrix[a] for study variables (University of Salerno, women)

	Mother's schooling	Father's schooling	Drinking	Smoking	No physical exercise	Unhealthy food	BMI	Weight control	Academic performance	Attending courses	Humanities	*Liceo*	Diploma score	No illnesses
Mother's schooling	1													
Father's schooling	0.52***	1												
Drinking	0.08***	0.10***	1											
Smoking	0.06**	0.03	0.04***	1										
No physical exercise	–0.13***	–0.13***	–0.08***	0.01	1									
Unhealthy food	–0.01	–0.04	–0.04	–0.08***	0.10***	1								
BMI	–0.12***	–0.12***	–0.06**	0.01	0.03	0.08***	1							
Weight control	–0.03	–0.01	–0.01	0.05	–0.16***	–0.13***	0.13***	1						
Academic performance	0.01	0.05*	–0.03	–0.10***	–0.03	0.02	–0.09***	0.01	1					
Attending courses	0.02	–0.01	–0.08***	–0.13***	0.01	0.01	0.02	0.06*	0.17***	1				
Humanities	–0.08***	–0.11***	0.01	0.05*	0.07**	0.02	0.06*	–0.01	–0.06**	–0.21***	1			
Liceo	0.17***	0.20***	–0.02	0.01	–0.04	0.05*	–0.08***	–0.03	0.08***	0.12***	–0.30***	1		
Diploma score	0.09***	0.12***	–0.06**	–0.18***	0.06**	0.03	–0.09***	–0.01	0.37***	0.25***	–0.20***	0.01	1	
No illnesses	0.05	–0.02	–0.04	–0.05*	–0.06**	0.02	–0.05*	–0.06*	0.06*	0.05*	0.01	0.05	0.05	1

Key: [a] each cell reports the Spearman correlation coefficient between two variables; *** statistically significant at 0.01 level; ** significant at 0.05 level; * significant at 0.1 level.

Table 3. Correlation matrix[a] for study variables (University of Salerno, men)

	Mother's schooling	Father's schooling	Drinking	Smoking	No physical exercise	Unhealthy food	BMI	Weight control	Academic performance	Attending courses	Humanities	*Liceo*	Diploma score	No illnesses
Mother's schooling	1													
Father's schooling	0.52***	1												
Drinking	0.06*	0.04	1											
Smoking	0.08***	0.02	0.31***	1										
No physical exercise	–0.13***	–0.08**	0.011	0.08**	1									
Unhealthy food	–0.05	–0.08**	0.05	–0.05	0.09***	1								
BMI	–0.11***	–0.03	–0.01	0.06	0.06*	–0.05	1							
Weight control	–0.04	–0.01	–0.06*	–0.07*	–0.17***	–0.14***	0.12***	1						
Academic performance	0.03	0.06	–0.02	–0.11***	–0.01	–0.01	–0.06*	0.01	1					
Attending courses	–0.02	0.01	–0.13***	–0.20***	0.02	–0.01	–0.04	0.05	0.17***	1				
Humanities	0.01	–0.03	–0.05	0.04	0.05	0.08**	–0.05	–0.07*	–0.01	–0.21***	1			
Liceo	0.20***	0.20***	0.07*	0.03	–0.09**	–0.03	–0.01	–0.03	0.09**	0.08*	–0.03	1		
Diploma score	0.04	–0.01	–0.08**	–0.17***	–0.04	0.05	–0.05	–0.03	0.26***	0.19***	–0.14***	0.02	1	
No illnesses	0.02	0.04	–0.06*	–0.12***	–0.07*	0.02	–0.06	0.04	0.04	0.07**	0.01	0.06*	0.11*	1

Key: [a] each cell reports the Spearman correlation coefficient between two variables; *** statistically significant at 0.01 level; ** significant at 0.05 level; * significant at 0.1 level.

In the context of the hypothesised relationship between health/health behaviours and field of study, for girls, we find a positive and statistically significant correlation between the choice of studying humanities, being overweight, and the adoption of unhealthy lifestyles (in terms of smoking and not practising physical exercise); the choice of *liceo* and diploma score are negatively correlated with the choice of humanities (that is, more motivated students self-select in the courses of study, e.g. scientific courses, which are characterised by a higher dropout risk but also by higher returns in the labour market; Convert, 2005; Maestri, 2013). Consistently with the results above, for men, no significant correlation emerges between the field of study and BMI. These gender differences suggest that unobserved characteristics – i.e. self-esteem (Sabia, 2007) – may mediate the relationship between being overweight and education in a gender-specific manner.

Although the evidence in Tables 2 and 3 indicates that health status and health behaviours are significantly correlated with educational outcomes, no causal relationship can be established. The reported correlation, in fact, can be confounded by a complex nexus of variables, for example, parental characteristics. As expected, parental schooling is strongly correlated with being overweight and lifestyles both for men and women; however, when women are considered, parental schooling is also significantly correlated with educational outcomes (i.e. diploma score and field of study), whereas, for men, parental education matters only with respect to the choice of *liceo* at the age of 14.

5. Conclusions

The literature on the health-education link has primarily focused on: 1. complementarities among health behaviours and education, particularly in the US (Fuchs, 2004; Grossman, 2015); and 2. gender differences. This study contributes to the literature in this field by reporting new evidence for young adults in Italy at the University of Salerno. It was hypothesised that students who reported a better academic performance would also be healthier and have healthier behaviours.

Our results reveal a significant correlation, which is stronger for girls compared with boys, between academic performance and secondary school score, on the one hand, and being overweight, on the other. For both genders, a significant correlation emerges between educational performance, on the one hand, and smoking and alcohol drinking, on the other. Hence, slight gender differences emerge only in the relationship between education and being overweight, which is consistent with previous studies (Sabia, 2007; Crosnoe, 2007).

In line with the question raised by Fuchs (2004), emphasising the role of the type of study in the education-health link, this work also focuses on the choice between humanities and sciences, taking into account that scientific subjects imply higher returns in the labour market, albeit at the cost of greater effort. According to our results, girls are less likely than boys to choose to study sciences, and the choice to study sciences is positively correlated with a normal body weight and the adoption of healthy behaviours (e.g. engaging in physical activity and not smoking). This finding indicates that the gender gap in the labour market and the gender gap in health may be correlated (and may also reinforce each other in case of mutual causality).

Overall, for both girls and boys, we observe a positive correlation between parental schooling and healthy behaviours. Although the observed correlation among being overweight, health behaviours, and education does not establish causality mechanisms, it

is easier to acknowledge that more educated parents are more likely to encourage healthy behaviours in their children; once again, however, gender differences emerge, in that parental education strongly influences only the educational performance of daughters. These results therefore suggest that a tighter parental supervision may foster responsibility and a positive attitude about schooling among girls, thereby favouring school performance (Fox, 1977; Taylor and Rampino, 2013; Gottfredson and Hirshi, 1990); alternatively, potential "role model effects" are likely to enhance the impact of mothers' schooling on daughters' schooling (Amin *et al.*, 2015).

We hope that this paper will serve as a stimulus for further work in this direction in Italy, relying on representative samples at national level. Overall, the results from the literature exploring the likelihood that, at the individual level, investment in health would lead to better educational outcomes are such that health, education, and family policies (Cunha *et al.*, 2006) could be considered as having an important role in the increase of human capital and productivity.

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