

4.A. What does education do to our health?

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Introduction

Education and health are the two most important characteristics of human capital. Their economic value lies in the effects they have on productivity: both education and health make individuals more productive. Education and health have a considerable impact on individual well-being, as well. The wealth of nations is to a large extent determined by the educational attainment and the health status of its population. According to the 2003 Human Development Report, “Education, health, nutrition and water and sanitation complement each other, with investments in any one contributing to better outcomes in the others” (UN, 2003, p. 85).

The positive association between education and health can be partly attributed to differences in income between countries. Health and prosperity are positively related. For example, Behrman and Rosenzweig (2004) show that there is a strong negative association between the log of purchasing power parity (adjusted by GDP per worker) and the percentage of low birthweight babies. Low income countries have fewer resources to spend on publicly financed education and health care. Most individuals in low income countries also do not have the means to purchase education and health care themselves. On the other hand, investing in education and health provide the way out of poverty and are necessary conditions for increasing standards of living.

There are three potential explanations for the positive relation between education and health: 1) a better health enables one to invest more in education; 2) common factors – such as genetic endowment, social background or time preferences – affect health and education in a similar way; and 3) education leads to a better health. Education affects health, but investments in health and education also have some common attributes, as argued by Theodore Schultz in his seminal paper *Investment in Human Capital*: Education as well as health expenditures are both consumption and investment. Returns to investments in education and health are uncertain. There are third-party effects involved in both education and health. And the involvement of the public sector in the provision of education and health care is large.

There is large body of empirical evidence to support the claim that there is a positive relation between education and health. In their survey of non market outcomes of

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education, Wolfe and Zuvekas (1997) identify five health and health related effects of education:

- A positive relation between one's education and one's own health status.
- A positive association between schooling and the health status of one's family members (in particular on one's children).
- A positive link between one's own schooling and the schooling received by one's children.
- A positive contribution of schooling to the efficiency of (consumer) choices (*i.e.* on smoking and on the use of health care).
- A relation between schooling and one's own fertility choices and the fertility choices of one's children (in particular a negative effect on the probability of giving birth out of wedlock as a teenager).

Hunt-McCool and Bishop (1998) argue that the fields of education economics and health economics have bifurcated because of the difficulties in valuing inputs and outputs, and that no (monetary) metric exists to measure health outcomes. It is therefore timely to review the health sciences – *i.e.* the health economics, medical sociology and epidemiology – literature on the relation between education and health.

What do we know about the effects of education on health?

The Feinstein *et al.* paper provides an abundance of evidence in support of a positive association between education and health. In view of that, in our contribution we do not concentrate on providing further evidence on this relation. Rather we will focus on the mechanisms behind this relation and the implications and conclusions that can be drawn from this positive association.

What the Feinstein *et al.* paper shows is that there exists a stable statistical significant association between education and health. Further, it is plausible to assume that at least part of this association reflects a genuine causal effect of education on health. So, we have a statistically significant (causal) effect of education on health. What this does not say is whether this is also a significant – in the sense of a sizeable or important – effect. Statistical significance does not tell us whether this is also a relevant effect. The Feinstein *et al.* paper does not provide much guidance as to the relevance of the effect.

In Groot and Maassen van den Brink (2006b) it is argued that a year of education improves the Quality Adjusted Life Years weight (QALY) by 0.036, this is equal to 28 years of education for 1 QALY. At the margin, the costs of a year of education are about EUR 6 000 (OECD, 2001, p. 67). The costs per QALY then amount to about EUR 168 000. Of course, this only pertains to the costs on education in order to obtain a QALY worth of health gain, while education has wider benefits – *i.e.* it improves earnings, well-being, etc. – as well.

The costs per QALY have to be compared with the life-time value of a QALY in order to determine whether investments in education are welfare improving. To calculate the monetary value of the education effect of the quality of health, we use the literature on the value of a statistical life year. In a meta-analysis of 33 studies that have calculated the value of a statistical life Mrozek and Taylor (2002) infer that the value of statistical life is between USD 1.5 million to USD 2.5 million. At a 5% discount rate this would make the

value of a statistical life year somewhere between USD 76 500 and USD 127 500. An estimate of USD 100 000 for a QALY is exactly in the middle of these two estimates. This is roughly equal to EUR90 000. At a 5% discount rate and with a remaining life expectancy at age 18 of 58 years for men and 63 years for women, the discounted present value of a QALY is approximately EUR 1.7 million, *i.e.* six to seven times as high of the costs per QALY.

What are the (causal) mechanisms behind this effect?

Does it represent a truly causal effect (what is it in education then that generates this?), a reverse causal effect, or an effect of common factors (time preference, social or genetic endowment?). The relation between education and health is merely a correlation and not a causal relation if:

- There is a joint relation between education and health, whereby education not only affects health but there is also a reverse causality where health determines investments in education. A reverse effect would create a positive simultaneity bias in measuring the effect of education on health.
- There are other factors – *i.e.* variables that are either not observable or not observed – that affect both education and health.

The causality question is important, not only for determining the exact relation between education and health, but also from a policy point of view. Only if the relation between education and health is a true causal relation can a shift in (public) expenditures from health care to education be effective in improving both the level of education and the health status of the population. If the effect is genuinely causal, a re-allocation of resources can be welfare improving if the impact of education on health is larger than the impact of health care on health. So, it therefore not only matters whether the education effect is a causal effect, but also whether the effect is large enough to warrant additional expenditures on education.

Acemoglu, Johnson and Robinson (2003) argue for a reverse causality between education and health. A shorter life expectancy because of poor health conditions shorten the time horizon of individuals. A shorter time horizon lower the returns and therefore the investments in human capital such as education. Furthermore, children who are in poor health are less able or have less energy to attend school, while workers with poor health may be less inclined to invest in on-the-job training.

One reason why a reverse causality might only be a minor source of bias when estimating the relation between education and health is that educational attainment is essentially established in early adulthood and remains stable afterwards. Most health impairments are not incurred until an adult age, however. Of course, especially in less developed countries, child mortality and morbidity is a cause for concern; infant and child health for most children in developed countries does not impart on their educational attainment.

The latter view is supported by the argument in Hammond (2002). There it is argued that the link between education and health increases with age, *i.e.* that the association is stronger among older populations than among younger people. This is explained by the fact that some health behaviors – such as not wearing a seat belt or condom – constitute a constant risk to health, whereas others – such as smoking and excessive alcohol use – constitute a cumulative risk. This means that the education differential in the latter type of

unhealthy behavior is only translated into observable physical health differences later in life (Hammond, 2002, p. 557). Empirical support for this claim is found in Groot and Maassen van den Brink (2006a). This study finds that the effects of education on self-assessed health become stronger as people get older.

According to UN (2003), a cross-country comparison over time shows that increases in educational attainment precede improvements in health status (UN, 2003, p. 87). This temporal sequencing suggests a causal relation between education and health. As argued above, the causal relation between education and health arises because a higher education leads to a healthier life style and because higher educated people are better able to gather, to process and to interpret information about healthy behavior.

Becker and Mulligan (1994) add a further causal mechanism to this. They argue that education leads to a lower time preference for consumption in the present and a higher time preference for consumption in the future: “Schooling also determines ... [investments in time preference] partly through the study of history and other subjects, for schooling focuses students’ attention on the future. Schooling can communicate images of the situations and difficulties of adult life, which are the future of childhood and adolescence. In addition, through repeated practice at problem solving, schooling helps children to learn the art of scenario simulation. Thus, educated people should be more productive at reducing the remoteness of future pleasures” (Becker and Mulligan, 1994, p. 10).

Education may alter time preferences, but a lower time preference may cause individuals to invest more in education and health as well. So, time preferences may be an intermediate in the relation between education and health – as argued by Becker and Mulligan – but may also be a common (unobserved) causal factor for both investments in education and health. Fuchs (1996) argues that education is correlated with time preference, and that it is time preference that affects health rather than education. This hypothesis is tested by Sander (1995). This study includes cognitive ability and future education as covariates in an equation where smoking and marijuana is explained by college attendance. Future education and cognitive ability are viewed as correlates of time preference. This study finds support for both the argument that education affects health and for the hypothesis that time preference matters.

There is overwhelming evidence for a positive relation between education and health. It is difficult to prove, however, that this relation also represents a causal effect. The studies that have tested for endogeneity in the effect of education on health yield mixed conclusions. The theoretical arguments for a causal relation also do not provide the solid foundation one is looking for. For example, Becker and Mulligan (1994) argue that education leads to a lower preference for consumption in the present and a higher preference for consumption in the future. Education may change time preferences. However, differences in time preference between higher and lower educated people may also reflect a form of self-selection. People who self-select high levels of education are also likely to postpone other immediate forms of gratification that are frequently damaging to one’s health. People with a lower time preference to begin with are more likely to defer consumption and to spend time on investments in human capital that have a pay-off at a later date. Similarly this lower time preference may make that people invest more in health behavior and a healthy life style, refrain from smoking, alcohol abuse, drug taking and other health damaging habits. The association between education and health may then be due to a common causal factor: a lower time preference that makes that one invests more both forms of human capital: education and health. All this does not

preclude, however, that education in itself contributes to a lower time preference and that – aside from these common causal factors – education causes people to live healthier.

Our reading of the literature is that the effect of education on health represents a genuine causal effect, that the reverse effect running from health to education is relatively small (at least for adults), and that there are common factors – most notably time preferences – that affect both investments in health and education.

The available evidence suggests that there is a strong link between education and health. This view is supported by the results of the meta-analysis presented in Groot and Maassen van den Brink (2006b). The relationship found in the meta-analysis might actually be an underestimate of the real magnitude of the effect. This is because lower levels of education appear to be associated with underreporting of illness by patients (see Mackenbach, Looman and van der Meer, 1996).

One important aspect that should not be overlooked is the role of intermediate variables in the relation between education and health. One example is that through intermediate variables parental education affects health. Most studies do not find a direct linkage between parental education and health at an adult age if one's own level of educational attainment is controlled for. These studies do, however find that one's own education has a positive effect on health and that parental education is an important factor explaining one's own education. So, parental education does have an effect on health through its effect on educational achievements. But that is not all. The findings also suggest that parental education has an effect on birth weight. Birth weight has both a direct and an indirect effect on adult health. Birth weight affects health indirectly through its effect on subsequent educational attainment. So there are several intermediate factors that provide linkages between parental education and health.

If we accept that there is an effect of education on health, this raises a number of questions, including:

- Is it a *uniform effect* (*i.e.* each year of education adds a similar amount to your health) or a *non-linear effect* (*e.g.* highest for primary and secondary education)? Is there an interaction with the age at which education is taken (*e.g.* smoking initiation when you are teenager at higher secondary school)? Is health education itself an important factor in this?
- Is it an effect on health per se (and if so, is it an effect on life expectancy, on quality of life, or both?), an effect on prevention and healthy behaviour (*i.e.* higher educated invest more in healthy behaviour – are less likely to smoke or obese, take more precaution, have more means to lead a healthier life-style, and are better informed about it – and are therefore in better health), an effect on health care use (*i.e.* higher educated use health care more often and are therefore in better health)?

We know fairly little about the answers to these questions.

A tentative answer to the second question is that the effect of education on health seems to be driven primarily by differences in healthy behaviour. As argued by Grossman and Kaestner (1997) higher educated people are less likely to smoke, exercise more, wear seatbelts more often, and are more likely to participate in screening programmes for breast cancer and cervix cancer. We can add to that the prevalence of overweight and obesity is also much lower among higher educated people. This raises the question why health behaviours differ so much between people of different levels of education.

With regard to the first question, it should be noted that most health related risk behaviours – such as smoking, alcohol and drug use – are initiated during adolescence when young people are in secondary education. In countries with educational streaming in secondary education – *i.e.* most European countries – this is the time when large educational differences in (un)healthy behaviour first occur. For example, in the Netherlands adolescents in the lowest form of secondary education (VMBO) are twice as likely to initiate smoking than young people attending the highest form of secondary education (VWO). Similarly, binge drinking occurs far more frequently among boys (and increasingly so among girls) in the lowest forms of secondary education than among teenagers in the higher forms of secondary education.

We should also distinguish between different forms of (un)healthy behaviour and their impact on future health:

- The prevalence of smoking is much higher among lower educated people. Among others, smoking increases the risk of (lung) cancer and cardiovascular disease. Smoking has a substantial impact on mortality rates. Average life expectancy of smokers is about six years less than for non-smokers.
- On average, higher educated people consume more alcohol than the lower educated. However, epidemiological studies seem to suggest that moderate alcohol consumption has positive rather than negative health effect (*i.e.* lowers the mortality rate). Binge drinking, however, seems to be more prevalent among lower educated youngsters.
- Overweight and obesity is – like smoking – more prevalent among lower educated people. Obesity increases the risk for cancer and cardiovascular disease. However, the main impact of obesity is on morbidity rather than mortality. In particular, overweight and obesity increases the risk of diabetes.

So, the mechanisms by which education can have an impact on mortality and morbidity are diverse. Generally speaking, lower educated people tend toward extreme forms of behaviour more frequently.

The implications for educational policy

Total benefits of education are larger than just income and productivity effects. If Becker and Mulligan (1994) are correct and education changes time preferences, this has an effect not only on health but on all investments in positive behaviour that generate benefits in the future.

Groot and Maassen van den Brink (2003) survey the literature on the rate of return to education and conclude that the average individual return to a year of education – *i.e.* the direct wage effect of education – is 6 to 8%. The total rate of return is higher than this if we also include the value of the education effect on the value of health.

Only if education has a causal effect on health may it be worthwhile to invest in education in order to improve public health. The calculations presented above seem to suggest that the monetary value of the health benefits of investing in education are much larger than the cost of the investment. However, the benefits almost all accrue to the individual who invests in education: the individual is the main beneficiary of reduction in morbidity and mortality because of the higher educational attainment.

Investments in health behavior by higher educated people may create positive externalities. Society may gain if the costs for health care decrease as a result of the better health status of higher educated people. Positive externalities also arise if higher educated people, for example, are more likely to take vaccination, engage in activities to prevent spreading sexual transmittable diseases more frequently, or if their healthy behavior encourages others to adopt similar behavior.

The implications for health care policy

A relevant question for health policy to ask is whether increasing the educational level of the population may not only improve the health status of the population but may also reduce the costs for health care. In all western countries health care costs are rising rapidly, and governments are seeking ways to control these escalating costs. Will the increase in the educational attainment of the population curb the rising health care costs?

Higher educated people are healthier and are therefore less likely to consume health care. So, within every age group higher educated people make fewer costs for health care than lower educated people. However, if one controls for health status – *i.e.* for diseases and handicaps – higher educated are more likely to consume health care. If a higher educated person has an health impairment, (s)he is more likely to seek medical help sooner. Higher educated people are also more informed and more assertive about the opportunities and the possibilities to obtain medical help, which also increases the chance of health care use.

Furthermore, higher educated people have a longer life expectancy. For example, according to van Oers (2003), life expectancy in the Netherlands for men with the lowest level of education is 5 years less than men with a university education. For women this difference is 2.6 years. Elo and Preston (1996) find for the United States large effects of education on mortality as well. For working-age men the ratio of death rates between the lowest and the highest education level is 2.22. For women, education has a somewhat smaller effect: here the ratio between the highest and the lowest education level is 1.79. The higher life expectancy of higher educated people increases the costs for elderly care for this group. Elderly people are also more likely to have a chronic disease.

All in all it seems questionable whether the increase in educational attainment will lead to savings in health care consumption or a reduction in the growth of health care expenditures.

Conclusion

Education is associated with a number of desirable aspects in life. Recent studies have shown that happiness or life satisfaction is positively determined by health, a stable job, and a satisfying family life. Diseases and illnesses, unemployment, divorce and criminal behaviour are strong determinants of depressions and negative attitudes toward life. Many of the aspects that make people unhappy are more prevalent among the lower educated than among the higher educated. Unemployment rates are generally much higher among lower educated workers than among the higher educated. Lower educated people experience more health problems and have a shorted life expectancy than higher educated. Lower educated people are more likely to smoke, engage in excessive alcohol consumption and to be overweight and obese. Lower educated people commit violent crimes more frequently. Other forms of criminal behaviour are also more prevalent

among lower educated people. Only tax fraud is committed more frequently by higher educated people (Groot and Maassen van den Brink, 2003).

Education contributes to lower unemployment rates, less criminal behaviour and less unhealthy behaviour. There appear to be large benefits – both for individuals and for society – attached to education. Nevertheless, these social benefits of education play only a minor role in policy-making. The importance of good education seems to be underestimated. During the past decade in most western countries, public expenditures on health care and law enforcement have increased more than public expenditures on education.

In a sense, western countries try to remedy the negative effects and social costs of a relatively low educated population by providing unemployment benefits, law enforcement through policing and higher sentencing, and by increasing health care budgets to counter the detrimental effects of unhealthy behaviour.

More and better education could yield savings in health care, law enforcement and unemployment benefits. This makes that the relation between education and health has important implications for public policy. Public policies tend to be highly compartmentalised: education is the domain of the Ministry of Education while health care is looked after by the Ministry of Health. What the Feinstein *et al.* paper has shown is that there are large spill-over effects between education and health. This implies that education and health policies do not have an effect within their own domain, but that there are large costs and benefits associated with these policies. This entails that these policies should not be looked upon in isolation, but that rather a more comprehensive or integrated policy approach to education and health is called for.

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