Health and Human Capital Effects on Income: Evidence from the 2014 Community Health Survey of Canada

By
Nicholas Cunningham

A Thesis Submitted to
Saint Mary's University, Halifax, Nova Scotia
in Partial Fulfillment of the Requirements for
the Degree of Commerce.

December 2017 Halifax, Nova Scotia

Approved: Dr. Atul Dar
Thesis Supervisor

Approved: Dr. Mark Raymond
Department Chair

Date: December 4, 2017

Health and Human Capital Effects on Income: Evidence from the 2014 Community Health Survey of Canada

By
Nicholas Cunningham

A Thesis Submitted to
Saint Mary's University, Halifax, Nova Scotia
in Partial Fulfillment of the Requirements for
the Degree of Commerce.

December 2017, Halifax, Nova Scotia

Approved:	Dr. Atul Dar Thesis Supervisor
Approved:	Dr. Mark Raymond Department Chair
Date:	December 4, 2017

Health and Human Capital Effects on Income:
Evidence from the 2014 Community Health Survey of Canada
by Nicholas Cunningham

Abstract

The aim of this study is to measure the impact that individuals' health and human capital has on their Income. We also want to measure the impact on income when health and human capital are interacting together. Using the data set, the 2014 Canadian Community Health Survey (CCHS), the paper examines the direct effects on an individual's level of income when changes to their health and human capital indices are made. In accord with previous studies, the returns to income from our health index and our human capital index separately are found to be positive and statistically significant. When our heath index and human capital index interact together we see a small negative and statistically insignificant correlation between income and the interaction variable. These patterns are likely because more educated people tend to invest more into their health *(Autor 2005)*, and therefore do not see significant returns from increasing their level of health.

I. Introduction

From an economic perspective, human capital is a factor of production used to create goods and services. It can be categorized as the knowledge, skill sets and intangible assets that add economic value to an individual. So how do some people achieve a higher human capital level compared to others? Our purpose here is to examine whether an individual's personal health has an impact on their level of income. An individual who is in better health will be more capable, motivated and productive and thus be able to translate their health attributes into higher income. At the same time the marginal benefit of health might well decline with the level of human capital.

There have been many studies recently that have looked at the returns to health and human capital in the labour market. Evidence suggests that people who are in better health earn more pay, have more success in achieving employment and are more productive. *(Hammermesh, 1993).* We also see evidence from (*Goldin and Katz 2008)* that show that higher levels of human capital leads to wage premiums for people. While there are multiple ways to measure a person's level of human capital, we will be measuring on the highest level of education achieved by respondents.

To capture a respondent's level of health we create a health index which looks at a person's health habits, fitness levels and their mental health status. From Hammermesh *(1993),* we draw conclusions that if they rank higher on the index they will be more motivated and productive towards their educational attainment and finding gainful employment. We also draw

the conclusion that people in better physical health will have a higher likelihood to achieve better employment and earn more in wages.

Since health is considered a normal good, when people become wealthier they also invest more in their health. There is a correlation between health and income, where income affects your health and health affects your income. For this study we acknowledge that there is a reverse causality between health and income, however we will be simply looking at the impacts of health and human capital on income and the interaction affect of health and human capital has together on income.

In Section II we will examine the findings of past studies that look at the interactions between health, human capital and education. Section III presents our data and regressions used in our model along with descriptive statistics. It also shows how we managed our dataset and the variables chosen for our health index. In Section IV we will illustrate and interpret our findings from our regression tests. Finally, Section V will summarize our findings and make recommendations based on our results.

II. Literature Review

Human Capital and Education

Human capital and education are key drivers of growth and prosperity. The differences of human capital between people is an important source of income inequality *(Burgess 2016).* This leads to wage premiums for people with a higher level of human capital (*Goldin and Katz 2008).* They show that higher levels of education lead to increased labour market productivity and

increase national economic growth and that higher economic growth requires more educated workers. They also show that when the education system produces skilled workers at a fast rate, that the average income rises and inequality falls. Since technology is improving, there is a premium for skilled workers, and the return to skills depends on both the demand for technology and the supply of education.

The basis for a demand for education is that higher education leads to higher levels of human capital which leads to higher wages. The Mincer model *(Mincer 1974)* relates an individual's earnings to their years of schooling and a quadratic function of their labour market experience. The number of years of schooling chosen may affect earnings, and this becomes a question of the rate of return to schooling.

One issue that arises in measuring the returns to university schooling is the gap of returns between different institutions and degrees. *Oreopoulos and Petronijevic (2013)* used U.S. labour force surveys and found there is a substantial gap in earnings between those with degrees and those without. However, *Walker and Zhu (2011)* show very different rates of return for different subjects and by degree class. *Brunello and Cappellari (2008)* find that there are substantial differences in earnings depending on which university is attended. The class of degree is also found to matter in a study by *Naylor et al (2015).* Despite such differences, the findings show, in general, that there are substantial returns to post-secondary education. By using regression discontinuity, Oreopoulus and Petronijevic (2013) find that an additional year of college yields a return of about 10%. They suggest that the evidence for the positive causal return to university is because the graduate premium has remained high despite the increasing number of graduates.

This is due to the advances in technology which increases the demand for skilled workers. An alternative study, Zimmerman (2015), used admission criteria of a relatively low-standards university in Florida to compare people who just got accepted to people who fell just below the threshold of acceptance. He found that marginal admission gives earnings gains of 22%. A counter argument from a Burgess *(2016)* paper suggests that marginal students will have the lowest returns because they are simply marginal, however he states, "Zimmerman and other evidence suggests that the return to marginal students is at least as high as the average return" *(Burgess 2016).* Schooling also generates returns in the form of lower workplace injury rates and less night/evening work *(Hammermesh, 1999),* less unemployment, quicker job finding and lower welfare receipt *(Oreopoulos and Salvanes, 2011).*"

Human Capital and Health

Health is a kind of human capital as well as an input to producing other forms of human capital (on the job training for instance). Being unhealthy depresses the ability to work productively and/or the ability and incentives to invest in human capital *(Bleakley 2010)*. This is intuitive, as people who are sick or have a disease will likely not attend school. We can look at this in another way, that older people who are in worse health than the average student, age 17-25, will most likely not be investing in their human capital especially when they are near the end of their careers.

Bleakley (2010) looked at childhood health possibly affecting both benefits and costs to schooling. This led him to the 'Envelope Theorem'. This theorem implies that improvements in early childhood health affect income by making human capital more productive, but not via more

investment. This means that lifetime income would rise because childhood health allows you to learn faster and grow up stronger. Poor health in early life might also depress the formation of human capital. “Much of a person’s development happens earlier in life and economic theory (e.g., the Ben-Porath model) shows that human-capital investments should be made early in life” *(Bleakley, 2010)*.

An early study of the effects of health on human capital can be seen by *Schapiro (1919)*, who examines the productivity increases among plantation laborers in Costa Rica following deworming treatments. Almost all the workers were infected with hookworm, after treatment they found that only 10% of the workers were still infected. He found that productivity six months after treatment was 15%–30% higher, and the area cultivated had expanded by 50% the following year *(Bleakley 2002)*. This shows us that the productivity of workers is not solely based on their level of education or skill, and that health can be considered an input for the productivity of human capital.

Health and Education

A person’s health can be improved through education as well, perhaps because people who are more educated will have higher earning occupations and be able to invest more in their health. This is shown in a study by *Autor et. al (2005)*, who found that the health returns to education were increasing in the 1980s and 1990s while the returns to education were rising. Smoking, illegal drug use and excessive drinking are more prevalent among the less educated, even though these behaviors are financially costly *(Schoeni, et al. 2008)*. The explanation that the level of education is related to income may only explain a part of the education effect. “The

monetary value of the return to education in terms of health is perhaps half of the return to education, so policies that impact educational attainment could have a large effect on population health." *(Cutler & Lleras-Muney, 2006).* Education might matter for health not just because of the specific knowledge one obtains in school, but rather because education improves general skills, including critical thinking skills and decision-making abilities *(Schoeni, et al. 2008)*. An additional four years of education lowers five-year mortality rates, heart disease, obesity, and lowers the probability of reporting fair or bad health *(Cutler & Lleras-Muney, 2006).* Cutler also shows that people who were more educated were more likely to get vaccines, flu shots and exercise more.

The marginal effect of education on health can be significantly different for men and women. "In more than half the cases, education has a statistically indistinguishable effect for men and women's health" *(Schoeni, et al. 2008)*. He found in some cases that education had a greater impact for women in terms of depression and obesity, and the effect for males was greater with mortality and heavy drinking. Cutler and Lleras-Muney (2006) also examined whether education matters more for those with low family incomes (incomes below $20,000). In most cases, they found that education mattered more among the non-poor than among the poor. A possible interpretation is that income and education are complementary in the production of health. "This would be the case if, for example, education allows people to know about new treatments and income allows them to purchase the treatment" (Cutler & Lleras-Muney 2006).

III. Data and Methodology

The data used in the study are drawn from the 2014 Canadian Community Health Survey public use microdata files. We needed to manage which individuals we want to look at or alternatively who we want to exclude from our sample. The dataset did not include the number of hours worked. Therefore, it remained impossible to calculate the hourly wage. To overcome this data shortcoming, in the personal income estimations, the sample is restricted to the individuals with fulltime employment. We then keep only people who reported their employment status as an employee, and drop any self-employed respondents since self-employed individuals' incomes can be variable and there is no selection process from an employer (in general). We then only kept Canadian-born respondents which eliminated 2,752 observations from our sample. This was to eliminate immigrants who have a potential adaptation period to Canada which could skew their income. We also dropped any respondents who reported their main source of income as anything other than employment income (E.I., senior benefits or investment income for example). To control for diseases and severe injuries we only kept respondents who reported their general health as either "Excellent", "Very Good" or "Good".

Human Capital Index (HK)

For our measurement of human capital, we use the highest level of education achieved by an individual. Respondents that have less than a secondary school graduation were assigned a value 0. Respondents who have a secondary schooling with no post-secondary education were issued a value of 1. People who have some post secondary education were issued a value of 2. Finally, respondents with a post-secondary education were issued a value of 3. The purpose of the values assigned are to capture the effects that increased education increases a person's income.

Health Index (HI)

To capture the health affects of individuals we created an index where respondents were ranked on a scale from 0-10, were 0 is poor health and 10 is excellent health. The weighting of the variables was assigned based on the estimated effect the variable would have on an individual's health. The following selected variables were weighted on a scale from 0-2 and considered to have a larger effect on health. Weekly physical activity was assigned of value of 2 if they reported as very physically active, 0 for not physically active. For low and moderate levels of physical activity, they were assigned values of 1 and 1.5 respectively. For our BMI variable, those who reported as normal weight were assigned a value of 2, overweight and underweight respondents were assigned a value of 1, and 0 for obese people. The next variable selected was an individual's self reported mental health status. The categories were assigned values for those who reported to the following; 1.5 for excellent, 1.25 for very good, 1 for good, 0.5 for fair and 0 for poor. We then added a type of smoker variable, where those who reported as non-smokers were assigned a value of 1, those who occasionally smoked a value of 0.4 and daily smokers received a 0. We then used 2 variables to capture a person's food choices which were categorized as either a "yes" or "no" responses. Those that selected/avoided certain foods for health reasons were assigned a value of 1, and 0 if not. Similarly, if those who selected/avoided certain foods based on concerns of body weight, also were assigned a value of 1, and 0 if not. Next, we looked at the frequency of trouble sleeping at nights. The categories were assigned values for those who reported to the following; 0.5 for none of the time, 0.25 for a little of the time, 0.15 for some of the time, 0.1 for most of the time and 0 for all the time. Our next variable included was the frequency of alcohol use. The categories were assigned values for those who reported to the following; 0.5 for Less than once a month, 0.25 for once a month, 0.15

for 2 to 3 times a month, 0.1 for once a week and 0 for the two categories that reported drinking more than once a week. Exposure to second hand smoke was also captured with two variables, those exposed to second hand smoke in public and those exposed in their private residences. The respondents who reported having no exposure to second hand smoke in public or private were assigned a value of 0.25 and those who were exposed a value of 0. Our final variable added were respondents using illicit drugs. Those who reported no use were assigned a value of 0.25 and for those using illicit drugs a value of 0. We did not find any precedent for a health index in our literature review, however we felt that an index was necessary to truly capture the many different variables that effect a respondent's level of health.

Our regressions are set as the following:

(1) $\ln Income = \beta_1 + \beta_2 HI + \beta_3 HK + \beta_4 Age + \beta_5 Male + \beta_6 Job\_Type + \beta_7 Province + \mu i$

(2) $B_3 = \alpha_1 + \alpha_2 HI$

(3) $\ln Income = \beta_1 + \beta_2 HI + \alpha_1 HK + \alpha_2 HI*HK + \beta_4 Age + \beta_5 Male + \beta_6 Job\_Type + \beta_7 Province + \mu i$

Equation *(1)* was constructed to capture the direct effects that our health index and human capital index have on income. From our literature review we expect that the coefficients of our health index β_2, and our human capital index β_3 ,to both be postive.. However we wanted to examine whether health also raises the productivity and hence the payoff to human capital. Equation *(2)* is meant to capture the interaction of our health index with human capital. This is represented by equation *(2),* which shows that at a 0 value of health (very poor health), the return to human capital will be captured by α_1. Expectations of α_2 is that it will have a positive but much smaller effect than the health or human capital indices by themselves. Equation *(3)* simply shows our full regression equation which combines equation *(2)* and equation *(1).* We also added

additional controls to our regression to allow for age, gender, occupation and province of residence effects.

The CCHS income data is left ($i \in L$) censured, and is otherwise recorded in intervals ($i \in I$). Using the midpoints of the intervals in an OLS estimation of the Mincerian earnings function may produce biased estimates *(Caudill 1992).* Hence, the more appropriate methodology of "Interval Regression" is employed *(Nelson 1976).* Interval regression fits a linear model with an outcome measured as point data, interval data, left-censored data, or right-censored data. As such, it is a generalization of the models fit by tobit. Interval regression requires two outcome variables, the lower limit of the interval and the upper limit of the interval. In other words, you know the ordered category into which each observation falls, but you do not know the exact value of the observation. Since our income data was reported categorially ($20,000 to $39,999, for instance), we created a lower and upper limit for each category. The lower limit would take the value of $20,000 and the upper limit would be $39,999. We then replicated the process for each category and took the log of the upper and lower income limits. This method was chosen to be able to interpret our results as a percentage impact on income. Alternatively, an ordered probit model could be used which would show the probability of jumping from one category of income to the next, however we felt the results from an interval regression model would give a clearer interpretation of the coefficients. This is because models estimated as interval regression can be interpreted as regular regression models.

Summary Statistics

Figure 1 shows the frequency distribution of the health index. We observe that most of our sample falls between 2 and 6, with a mean index score of 4.03. This suggests most of our sample falls under average or slightly below average levels of health, based on our chosen variables and weighting.

Figure 1

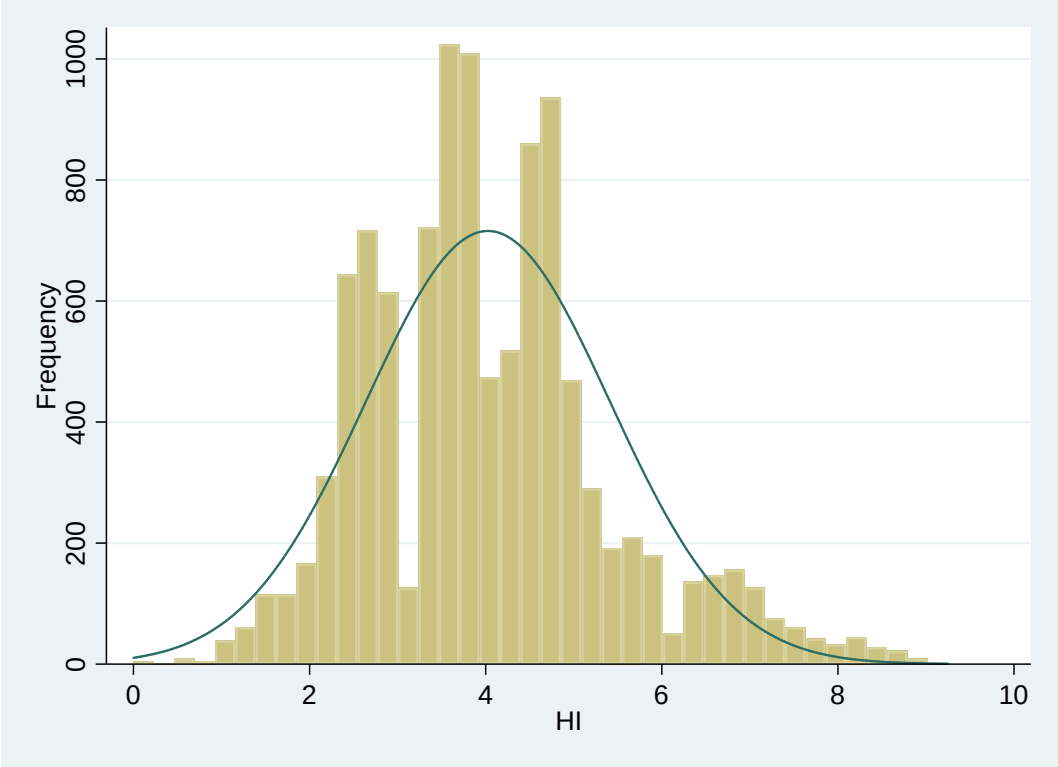

Table 1 shows the tabulation of our human capital index. We observe that a large portion, almost 70%, of our sample has post secondary education. This percentage of respondents with post secondary education could possibly affect our interaction coefficient $\alpha_{2,}$ where the returns to improvments in health will mostly be interacting with those with higher levels of education. A possible explanation of this large amount of respondents with post secondary educations is due to

the fact that we only kept respondents who reported their self perceived health status' as "Excellent", "Very Good" or "Good" to eliminate people with severe injuries and diseases.

Table 1: Human Capital Index

HK	Obs.	Percent
0	785	7.3
1	2,156	20.07
2	433	4.03
3	7,371	68.6
Total	10,745	100

This would be consistent with our literature findings from Autor *(2005)*, that people with higher levels of human capital invest more into their health, which would suggest that our respondents who self reported themselves in better health are also more educated. Therefore we examined in Table 2 whether the exclusion of our control for injuries and diseases would have significant effects on our human capital and health indices. From Table 2, we can observe that the inclusion of our control for injuries and diseases has little affect on the indices respected means.

Table 2	**Control for Disease**		**No Control for Disease**	
Variable:	Mean	Std. Dev.	Mean	Std. Dev.
HI	4.025	1.385	3.969	1.398
HK	2.339	1.032	2.311	1.05
HI_HK	9.526	5.492	9.305	5.52
obs.	10,745	10,745	11,689	11,689

Table 3 shows the summary of the health index by each category of human capital. We observe that as the level of human capital rises, that the means are slightly increasing as well. Which is consistent with *Cutler & Lleras-Muney (2006)* study that showed that the impact of educational attainment could have a large effect on population health. It is also consistent with *Autor et. al (2005)* who found that more educated people will have higher earning occupations and be able to

invest more in their health. This also led us to investigate whether those who were in a higher income category, would on average rank higher on the health index. Table 4 shows that as the

Table 3

	Summary of HI		
HK	Mean	Std. Dev.	Freq.
0	3.607	1.309	785
1	3.975	1.462	2,156
2	4.091	1.322	433
3	4.081	1.365	7,371
Total	4.025	1.385	10,745

level of income increases, the means of the health index are gradually increasing, which is consistent with the findings in *Autor et. al (2005).* However, we observe that those who reported as less than $20,000 in personal income have a higher health index mean. A possible explanation is that the smaller frequency of respondents, compared to the other income levels, may affect the mean scores from the health index.

Table 4

Personal Income	Summary of HI		
	Mean	Std. dev.	Freq.
less than 20	4.083	1.379	799
20 to 39	3.909	1.349	2,461
40 to 59	3.983	1.377	2,850
60 to 79	4.053	1.410	1,926
80 or more	4.140	1.401	2,709
Total	4.025	1.385	10,745

* Personal income in thousands of dollars

IV. Results

Table 5 reports the results of the estimation of equation *(3)*, focused on personal income of males who hold fulltime employment. In a series of stepwise regressions, explanatory variables are gradually added. Our health index coefficient is positive and statically significant at the 1 percent level across all the specifications, with one exception. The exception is the health coefficient in the first equation, where the coefficient is contrary to expectations, but is statistically insignificant even at the 10 percent level. Barring this equation, all other regressions suggest the direct effects of a 1-unit increase in the health index would increase income by about 3.9 percent. This is consistent with previous literature discussed in *(Hammermesh, 1993)*, that people who are in better health earn more pay, have more success in achieving employment and are more productive.

Table 5 Interval Regression Results

	(1)	(2)	(3)	(4)
HI	-0.01553	0.039334	0.0413834	0.0435478
	(.0110052)	(.0095891)	(.0092325)	(.0094744)
HK	0.120247	0.1412232	0.1147201	0.1207901
	(.0179548)	(.0155246)	(.0150067)	(.0146265)
HI_HK	0.0114577	-0.0006753	-0.0044856	-0.0049301
	(.0043687)	(.0037839)	(.003643)	(.0035466)
Gender	No	Yes	Yes	Yes
Age	No	Yes	Yes	Yes
Occupation	No	No	Yes	Yes
Province	No	No	No	Yes
Observations	10,745	10,745	10,722	10,722

* Standard errors are reported in parentheses

** Yes (No) signifies whether controls for that specific attribute were (were not) included in the regression

Our gender control, a dummy variable for males, returned positive and statistically significant results across all specifications when included in the equations. Comparing columns (2) to (4), our gender control showed returns of roughly 20 percent compared to female respondents. Our age control coefficients were also positive and statistically significant across all the regressions when included in the equation. Our coefficients showed roughly a 10-11 percent return for every 5 years aged. They also showed eventual diminishing marginal returns to older aged categories, which was consistent with our expectations. From Table 5, we see the returns from extra schooling through our human capital index (HK). The results for human capital (educational attainment) returns are positively and statistically significant across all specifications from Column (1) to (4). Comparing all the columns, we see that the corresponding increases resulting from an increase in human capital is about 12-13 percent. However, the direct effects of health and education only then show the marginal returns for an individual with no schooling and a zero score on the health index respectively. To asses the total effect, we need to look also at the coefficient of the interaction variable (HI_HK). As is evident from Table 5, this coefficient has a negative sign in all equations, except the first. However, it is also not statistically significant in all but the first equation, suggesting perhaps that the effects of health (or that of human capital) that matter are the direct effects. Thus, it would seem that health does not have an additional impact on income via its input on the productivity of schooling. An alternative interpretation is that individual's do not benefit as much from increasing their level of health relative to those with a lower level of education. This would be consistent with the idea that those who are more educated tend to invest more into their health (*Autor et. al 2005)*. The insignificant statistical results for our interaction variable may be explained by the possibility that health and human

capital are correlated and thus, only the direct effects are relevant. Only a selection of important coefficients are reported, to save space. The full set of regressions are available upon request.

V. Conclusion

This paper examined the effects of individuals health attributes and educational attainment on earning potential. Specifically, it aimed at testing the relationship between a person's income and their health and human capital levels. Traditional literature has focused on health returns or human capital returns; however, this study contributes to the literature by combining the two and seeing how the interaction between our health and human capital indices effect a person's income. We found that returns to health and human capital were positive and statistically significant, which is consistent with previous literature findings. Our study also found statistically insignificant and negative returns to our interaction variable (HI_HK). This suggests that individuals would have diminishing marginal returns to their income when they increase their level of health at a fixed level of human capital. From our interaction variable we can draw the conclusion that those who are less educated would benefit more from increasing their levels of health compared with those who are more educated. However, after the controls were added, the results for our interaction variable were found to be statistically insignificant. This suggests that health does not have an additional impact on income via its input on the productivity of schooling, and perhaps that the effects of health (or that of human capital) that matter are the direct effects. The data did not allow to examine specific details regarding field of study, length of study period or institution of study. It also did not allow us to observe individual's specific wages, therefore our dependant variable, income, may also include other

forms of income (e.g. rental properties or investment income). Another limitation mentioned earlier was the reverse causality between income and health. Since health is considered a normal good, when people become wealthier they also invest more in their health. There is a correlation between health and income, where income affects your health and health affects your income. Understanding the instrument by which education affects health is important for policy. “If all of the education effect operated through income, and income improved health, then it would possibly be cheaper to transfer income directly, rather than to subsidize schooling” (*Cutler & Lleras-Muney 2006)*. However, if there is no alternative method to acquire the skills that affect health, then subsidies for education might be the correct response. Further research is needed in this area to understand how cognitive and non-cognitive skills are developed in school. Our health index also included one variable for respondents self-perceived mental health status, however, the effects of mental health issues on educational attainment and earning potential should also be investigated further. Hammermesh *(1993),* found that healthier people will be more motivated and productive towards their educational attainment and finding gainful employment. However, due to mental health issues this could affect an individual’s motivation towards their productivity of education or finding gainful employment. Likewise, someone suffering from mental health issues might also be in upstanding health physically, but the effects of education are minimized by their mental health issue.

References

Autor, David, Lawrence F. Katz, and Melissa S. Kearney. 2005. "Trends in U.S. Wage Inequality: ReAssessing the Revisionists." NBER Working Paper No. 11627.

Bleakley, Hoyt. 2002. "Disease and Development: Evidence from Hookworm Eradication in the American South." Mimeo, Population Research Center, NORC and the University of Chicago.

Bleakley Hoyt, Lange Fabian. Chronic Disease Burden and the Interaction of Education, Fertility and Growth. Review of Economics and Statistics. 2009 Feb;91(1):52–65. [PMC free article][PubMed]

Brunello, G. and Cappellari, L. (2008) 'The labour market effects of Alma Mater: Evidence from Italy' Economics of Education Review, vol 27, no. 5, pp. 564-574

Burgess, S. (n.d.). Human Capital and Education: The State of the Art in the Economics of Education. *Institute of Labour Economics*. Retrieved April 2016, from http://ftp.iza.org/dp9885.pdf

Card, D. (1999) 'The causal effects of education on earnings.' In: Ashenfelter, O., Card, D. (eds.), Handbook of Labor Economics, vol. 5. North-Holland, New York, pp. 1801–1863.

Caudill SB (1992) More on grouping coarseness in linear normal regression models. J Econ 52(3):407–417.

Cutler, David M. and Edward Glaeser, "What Explains Differences in Smoking, Drinking, and Other Health Related Behaviors?", 95(2), May 2005.

Cutler, David, Angus Deaton and Adriana Lleras-Muney (forthcoming), "The Determinants of Mortality," Journal of Economic Perspectives.

Hammermesh, D. (1994). Beauty and the Labor Market. *American Economic Review, 84*, 1174-1194. Retrieved from http://www.nber.org/papers/w4518

Hammermesh, D. (1999) 'Changing Inequality in Markets for Workplace Amenities.' Quarterly Journal of Economics, vol. 114 (4), pp. 1085–1123.

Heckman, J., Lochner, L. and Todd, P. (2006) 'Earnings functions, rates of return and treatment effects: The Mincer equation and beyond.' In Handbook of the Economics of Education, vol. 1. Elsevier, pp. 307-458.

Mincer, J. (1974) Schooling, Experience and Earnings. Columbia University Press for National Bureau of Economic Research, New York

Naylor, R., Smith, J. and Telhaj, S. (2015) 'Graduate returns, degree class premia and higher education expansion in the UK' mimeo, University of Warwick

Nelson FD (1976) On a general computer algorithm for the analysis of models with limited dependent variables. Ann Econ Soc Meas 5(4):493–509

Oreopoulos, P. and Petronijevic, U. (2013) 'Making College Worth It: A Review of Research on the Returns to Higher Education.' NBER Working Paper No. 19053

Oreopoulos, P. (2007) 'Do Dropouts Drop Out Too Soon? Wealth, Health, and Happiness from Compulsory Schooling.' Journal of Public Economics, vol. 91 (11–12), pp. 2213-2229

Oreopoulos, P. and Salvanes, K. (2011) 'Priceless: The Nonpecuniary Benefits of Schooling. ' Journal of Economic Perspectives, vol. 25 (1), pp. 159–184.

Schapiro Louis. The Physical and Economic Benefits of Treatment for Hookworm Disease. Journal of the American Medical Association. 1919;73(20):1507–1509.

Schoeni, R., House, J., Kaplan, G., & Pollack, H. (2008). Making Americans Healthier: Social and Economic Policy as Health Policy. *The National Poverty Center Series on Poverty and Public Policy*. Retrieved from http://www.npc.umich.edu/publications/policy_ briefs/brief20/policy_brief_20_web.pdf

Walker, I. and Zhu, Y (2011) 'Differences by Degree: Evidence of the net financial rates of return to undergraduate study for England and Wales.' Economics of Education Review, vol.30, pp.1177-1186.

Zimmerman, S. (2014) 'The Returns to College Admission for Academically Marginal Students.' Journal of Labor Economics, vol. 32 (4), pp. 711 – 754.