HEALTH INEQUALITIES IN UKRAINE: DOES EDUCATION MATTER?

by

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Abstract

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This paper examines educational gradient in health using the Ukrainian Longitudinal Monitoring Survey in 2003. To estimate the impact of additional year of education on the probability of having no serious illnesses, obese body mass category, and of Self Reported Health status Probit and Ordered Probit Models are employed. Due to the gender differences in health, results are reported separately for males and females. To account for the reverse causality problem from better health to better education, education is instrumented by parental education. While among males the results concerning the health-educational relationship is mixed, among females causal effect of education on health is found to be positive and significant with magnitude varying across different health measures from 1% to 3.7%. This finding implies that more educated females are more efficient producers of health. Thus, policies that aim increasing the general level of education in the population will also accomplish the goal of improved health among females.

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GLOSSARY

Education Gradient in health - represents impact of additional year of education on the probability of having certain health status

Body Mass Index – weight of an individual expressed in kilograms divided by the height squared expressed in metres

INTRODUCTION

During the last couple of decades the issue of health inequalities that are related to the social status has become the subject of increasing concern for many public authorities. The evidence shows that fighting these inequalities through price regulation and information campaigns on damaging health behavior have only small effects on the distribution of health. While the exact processes behind health determination remain unclear, a vast amount of studies, economics as well as sociological, indicate the positive correlation between education and health. For example, Shapiro et al.(2002) find that those who graduate from high school live about 9,2 years longer than high school dropouts. Grossman and Kaestner (1997) in their review of education and health studies indicate that more educated people generally lead a healthier life style: they are less likely to smoke, exercise more, wear seatbelts more often, and are more likely to participate in health screening programs. The evidence for positive correlation between health and education emerges for the wide variety of health measures in many countries and time periods. However, the exact driving mechanism of this relationship still remains to be investigated.

Whether educational effects on health can be interpreted as causal is of tremendous importance from the policy making point of view. Auster et al. (1969) suggest: "The rate of return on increases in health via higher schooling outlays far exceeds the rate of return on increases in health via higher medical care outlays." Assumption behind this statement is that schooling causally effects health. If this assumption is violated then increasing the general level of education in the population will not accomplish the goal of improved health. Prior studies suggest that in order to interpret educational effects on health as

causal, one should account for endogeneity of education that arises either due to the reverse causality from better health to better education or due to the unobserved "third" variables, that can affect both education and health in the same direction. Fuchs (1982) argues that, for example, time-preferences of individuals can be thought to be such "third" variables, because individuals with higher discount rates will tend to invest less in both health and education.

The purpose of this paper is to examine the educational effect on health in Ukraine using data from the Ukrainian Longitudinal Monitoring Survey (ULMS) in 2003. I employ three health variables in this research: a binary variable (No illnesses), that reflects whether a person does not suffer from any serious illnesses, Self Reported Health (SRH), and Body Mass Index (BMI). The Specific questions that my research aims to answer are: whether there exists positive significant relationship between education and health; if there is such, then what is the effect of an additional year of education on the probability of reporting certain status of health and to what extent can this relationship be interpreted causally. Answers to these questions are as much important as, to my best knowledge, there is no other study in Ukraine concerning health inequalities that are related to the educational attainments.

To account for possible endogeneity in estimates of education gradient in health pure educational gradients in health I instrument education by parental education while to disentangle educational effects from "third" variable bias I controll for smoking status which in accordance with Evans and Montgomery (1994) bears information about individuals' time-preferences.

The paper is structured as follows: Chapter 1 sets out the comprehensive analysis of prior studies about health-education nexus. Theoretical as well as empirical framework applied in the study is provided in Chapter 2 followed by the detailed

analysis of the data employed in Chapter 3. Finally, Chapter 4 examines and discusses the linkage between education and health in Ukraine. Major findings of the study are underlined in the Conclusions.

Chapter 1

LITERATURE REVIEW

Prior studies concerning the health-education link indicate three broad explanations of the observed positive correlation between the two. The first explanation suggests that additional level of education improves health. The second argues that these correlation does not necessarily imply causality as unobserved third variable may affect both in the same way. Finally, the third one indicates that causality can take the reverse direction, as health in earlier period of life can affect education. In this section I analyze each of these cases discussing the stream of papers corresponding to each of the three explanations.

First of all I consider the case of direct causality from education to health which can take two forms: technical efficiency and allocative efficiency. Technical efficiency is emphasized by Grossman (1972) in his Health Capital Model. What is interesting in the Grossman's model is that the health is regarded as not only a consumption commodity that directly affects utility, but also as an investment commodity that determines the total amount of time available for market and nonmarket activities. An increase in the stock of health increases the time available to those activities, thus monetary value of this increase should be regarded as the return to health investment. It should also be mentioned that education in this model is regarded as a factor that influence the efficiency of production of health as well as of other commodities. Grossman assumes that education leads to input neutral output shifts in the production functions. He shows that the "shadow price" of health (that depends not only on the process of medical care but also on many other variables) rises with age if the rate of

depreciation of the stock of health rises over the life cycle and falls with education if more educated people produce their health more effectively. It is noteworthy, that education acts in Grossman's model similar to the way the technology acts in firms production functions. Therefore, education-health relationship emphasized by Grossman is often referred in the relevant studies as the technical efficiency theory.

Another theory that also allows for the direct causality from education to health is allocative efficiency theory, that is very closely related to the one described earlier. According to it, people choose healthier life-styles by improving their knowledge of the relationships between various health behaviors and health outcomes. In other words, more educated people obtain health knowledge, that enables them to choose a better mix of health inputs compared to less educated individuals. As Kennedy (2002) states, one way of thinking about the allocative efficiency is to consider the cost effectiveness of different input mixes, producing the same amount of health stock. It should also be mentioned that allocative inefficiency may arise when education enables individuals better understand their budget constraint or the relative prices of different health inputs.

Kenkel (1991) examines allocative efficiency theory by studying how education is related to different health behaviors. Specific hypothesis tested by Kenkel is whether schooling improves allocative efficiency by improving individuals' health knowledge. Respectively, for empirical work he examines the separate effects of health knowledge and schooling on the consumption of cigarettes and alcohol, and exercise. He finds that only small part of the relationship between schooling and health behavior is explained by the differences in health knowledge. Finally, Kenkel reports that both health knowledge and education decrease cigarette smoking and alcohol consumption and increase exercise. He

concludes that while education improves health through a better health knowledge, there still remains significant portion of direct educational effect on health that is not explained by allocative efficiency. Kenkel provides a number of explanations for such a conclusion. He mentions that estimated relationship between schooling and health behavior might represent the unobserved heterogeneity across individuals. Another explanation provided by him is that the pure educational effect on health can be attributed to the production efficiency, explained earlier. Finally, Kenkel states that schooling can be correlated with one or more omitted but potentially observable economic variables generating bias in the estimates of educational effect on health.

In the relevant studies omitted variable hypothesis is also known as the "third" variable hypothesis. It provides the second explanation for the health education nexus and argues that the correlation between education and health does not necessarily imply causality as some unobserved omitted variable can affect both schooling and health in the same direction. Arendt (2001) states, that such kind of correlation between education and health can take two forms. On the one hand, "endowment" hypothesis explains that when those with higher ability obtain more education and when those with higher health endowment are more healthy as adults, any positive correlation between health endowment and ability will imply positive correlation between health and education. On the other hand, time preference hypothesis introduced firstly by Fuchs (1982) states that unobserved differences in the rate of time preferences determine both investment in education and investment in health. Investment in health capital such as not smoking and exercising, is similar to the investment in education in the sense that both involve a trade-off between current costs and future benefits. For example, in human capital models and in Grossman's health capital model individuals invest until the rate of return to additional schooling or health inputs equals the discount rate of an individual. Therefore, individuals with higher

discount rates tend to invest less both in education and in health. In order to test his hypothesis Fuchs includes inter-temporal interest rates in his health regression. Interest rates are derived by surveying individuals and asking time-money trade-off questions. He finds little evidence of time-preference effects in this regression. However, Furell and Fuchs (1982) find that between the ages of 17-24 additional year of schooling does not influence smoking behavior. Therefore, based on the result that schooling did not influenced health habits, they attribute health education correlation to a "third" variable - time-preference.

As already stated above, the third explanation of "observed positive correlation between education and health implies reverse causality. As Grossman (2000) states in his review of health-education studies, healthier students may appear more efficient producers of stock of knowledge via formal schooling. What is more important, reverse causality from health to education can have long lasting effects as the past health usually is considered as one of the input into the current health. Ark (2003) provides another explanation for the reverse causality. He argues, that the more the person cares about his health, the more he invests in education merely with the purpose of avoiding hazardous job. Therefore, it is quite reasonable that healthier youth will be more likely to pursue further schooling.

As Kaestner (1997) notes, three explanations of observed positive relationship are not mutually exclusive, that is why the empirical literature on that topic concentrates on the problems of estimation trying to disentangle the effect of education on health. Almost all studies emphasize the endogeneity of health and education.

Accounting for the possible biases in estimating the relationship between education and health Berger and Liegh (1989) use two stage least square

procedure. That procedure implies identification of schooling equation by certain instruments at the first stage and then estimating the health equation by the fitted values of schooling. Berger and Liegh apply their methodology to two data sets. The main idea of their methodology is that they assume that instrumental variables they use are uncorrelated with time preferences but correlated with education. Though the results they got are consistent with the direct causality case and inconsistent with the time-preference hypothesis, the critiques of their estimation (Grossman 2000, Ark 2003) argue that the results are not quite reliable as a number of instruments they use (IQ, parent's education and state school expenditure) are not valid and have their independent effects on health.

Another and more sophisticated way of disentangling education effect on health is provided by Ark (2003). Similar to Berger and Leigh, Ark uses two stage model to estimate effects of education on three measures of health: the probabilities of having work-limiting disability or health condition, of having limited mobility, and of requiring personal care. In order to get rid of the endogeneity bias he uses supply side instrument - within state differences over time in state unemployment rates during a person's teenage years. Ark explains that state unemployment rate is correlated with the number of years of schooling in two ways. "Income effect" arises when under high unemployment rate, teenagers from lower income families are forced to quit schooling and support their families. When labor market conditions improve, more families can afford having their children at school. Therefore, school enrollment and educational attainment decreases under high unemployment. Substitution effect works in the opposite direction causing higher enrollment rates under high unemployment, as the opportunity cost of attending schooling declines. Ark confirms the evidence from other studies that the substitution effect outweighs income effect. Thus high unemployment rates increase educational attainment during a person's teenage years. Estimating health effects of education by two

stage Probit models, the author found that a year of schooling reduces the probability of having a work-limiting health condition by 2.6% and reduces the probability of requiring personal care by 0.5 % . Estimated effect of schooling on the probability of having mobility limitation is found to be statistically insignificant.

Though the Results obtained by Ark is opposed to the unobserved variable hypothesis, Auld and Sidhu (2004) still find the evidence of this while searching for the role of cognitive ability in health-education nexus. They show that cognitive ability accounts for roughly one quarter of the association between schooling and health. Both schooling and health are strongly associated with health at low levels of education but less related or unrelated at high levels. The estimation technique used by Auld and Sidhu that treats schooling as endogenous to health suggests that most of the correlation between schooling and health is attributable to unobserved heterogeneity, except possibly at low levels of schooling for individuals with low cognitive ability. Therefore, the authors draw the conclusion that the policies which increase schooling will only increase health to the extent that they increase the education of poorly educated individuals, subsidies to college education are unlikely to increase population's health.

While Auld and Sidhu declare that increasing the general level of education in the population can not fully accomplish the goal of improved health, Groot (2005) calculates monetary value of the educational effect on health. He explains that Quality Adjusted Life Year (QALY) combines the quality and quantity in one unified measure of quality of life corrected life years. He assumes in his study that one QALY is between Euro 100 000 and Euro 230 000. Further Groot estimates that QALY weight of a year of education is 0.006 for men and 0.003 for women. Taking into account the value of QALY, health gain of a year of education becomes Euro 1380 for men and Euro 690 for

women. Then the author compares this gain to the cost of education and finally concludes that for both men and women health benefits alone seem to be larger then the costs of a year of education.

At the end of my literature review I should mention that the studies that estimate effects of education on health basically are conducted for developed economies. The evidence from transition economies is lacking. To my best knowledge there exists few studies that indicate inequalities in health in Ukraine. For example: Cherednychenko (2004) investigates health inequalities in Ukraine regarding absents rates of Ukrainian employees as an outcome variable. She argues that the dynamics of such an indicator is tightly linked to the changes in health status of employees and is affected by the number of physical economic and social environment factors.

Ivaschenko (2001) investigates the impact of market income on health using individual-level data from the households survey conducted in Ukraine. She finds a strong evidence of positive link from higher income to higher health. It should also be mentioned that Ivaschenko includes in her regression education as one of the explanatory variable and finds that it can not explain health. However, she does not concentrate in her study on different driving mechanisms of education-health relationship, therefore, does not account for reverse causality from health to education.

Considering all the above mentioned I hope my research can make considerable contribution in the literature as I am accounting for the endogeneity problem by instrumenting education using parental education. Moreover, controlling for smoking status I hope to capture time-preferences of individuals and in this way further disentangle educational effects on health.

Chapter 2

METHODOLOGY

Theoretical Framework:

Theoretical model on which this research will be based is the Grossman's health capital model. In this model individuals maximize their lifetime utility subject to wealth, time and technical constraints. Algebraically, Grossman's Model can be represented in the following way:

$$U = U(\phi_0 H_0 \ .....\phi_n H_n, Z_1 .....Z_n) \quad (1)$$

$$H_i = \phi_i Hi \quad (2)$$

$$H_{i+1} - H_i = I_i - \delta_i H_i \quad (3)$$

$$I_i = I_i(M_i, TH_i : E_i) \quad (4)$$

$$Z_i = Z_i(X_i, T_i : E_i) \quad (5)$$

$$TW_i + TL_i + TH_i + T_i = \Omega \quad (6)$$

$$\sum \frac{P_i M_i + V_i X_i}{(1+r)^t} = \sum \frac{W_i TW_i}{(1+r)^t} + A_0 \quad (7)$$

As can be seen by (1) the utility of an individual depends on the consumption of desired commodities (Z), and on the healthy time (h), as sick days are sources of disutility. Healthy time is defined as a function of health stock of an individual at a time t (h= φH). In other words, health is a durable capital stock

that yields an output of healthy time (2), which depreciates over time, and can be increased through an investment (3). As in any households production model, here also individuals produce certain kinds of commodities, among which two broad groups can be distinguished: consumption commodities (Z) that depend on market goods (X) and on time to produce these commodities (T) for a given level of education (E). As for the second group, this is the health investment (I), production of which depends on such health inputs (M) as medical care utilization, diet, exercise, cigarette smoking, alcohol consumption and on time to produce health investment (TH) for each specific level of education (E). As in any households production model individuals face time and wealth constraints. Time constraint (6) indicates that total amount of available time consists of time spent on working (TW), lost due to sickness (TL), also on TH and T defined earlier. Other Variables, that appear in the wealth constraint are prices of inputs P and V, wage rate (W), initial wealth (A) and market interest rate (r). The last constraint indicates that the present value of outlays on goods equal to the present value of earnings over the lifecycle plus initial wealth.

It is worth underlining that in the Grossman's health capital model health is regarded as not only a consumption commodity that directly affects utility, but also as an investment commodity that determines total amount of time available for market and nonmarket activities. An increase in the stock of health increases time available for those activities. Thus monetary value of this increase should be regarded as a return to health investment. It should also be mentioned that education in this model is regarded as a factor that influences the efficiency of production of health as well as of other commodities. Grossman Assumes that education leads to input neutral output shifts in the production functions. That means that increasing the level of education increases health capital keeping other factor proportions constant.

Considering all the abovementioned an important implication for my estimation is to include education in the health function as an independent variable. We can expect that holding all other factors constant, an increase in education level should lead to an increase in the health stock. In other words, we should anticipate a positive correlation between education and health.

Empirical Framework

Empirical estimation will be based on Probit and Ordered Probit Model approach applied in relevant studies (Ark, 2003; Groot, 2005). Probit model is appropriate for the binary health variable that takes the value 1 when a person reports having no such illnesses as diabetes, myocardial infarction, high blood pressure, stroke, anemia, tuberculosis and zero otherwise. The Probit Model is also estimated for dichotomous health variable, which reflects whether an individual falls in the obese body mass category. The Ordered Probit model will be estimated for the self reported health (SRH) status provided that these variable has the nature of ordered categorized response variable. SRH status ranges from of 1 to 3, conditional on individuals' reports of having good (1), average (2) or bad (3) general health condition. Health regression to be estimated is the following:

$$H^* = \beta_0 + \beta_1 \mathbf{X} + \beta_2 E + \beta_4 S + e$$

where H^* is the latent health variable, $\mathbf{X}$ is a vector of individual characteristics (to be explained shortly), E indicates schooling expressed in number of years studied , S is a matrix of dummy variables each of which represents whether

an individual: (i) is a smoker ; (ii) has smoked but quitted smoking. Finally, e is an error term.

In the Probit model, The latent health variable is related to the observed health variable *H* in the following way:

$$\begin{cases} H = 1 \;\; if \;\; H^* > 0 \\ H = 0 \;\; otherwise \end{cases},$$

while in the Ordered Probit model the relationship observed for the latent and observed health variables can be expressed as:

$$H = i \rightarrow a_{i-1} < H^* \leq a_i \qquad i=0,\ldots n$$

where, i is the number of response categories (that ranges from 1 to 3 in our sample) and a_i is the specific threshold level that demarcates different response categories.

The vector of individual characteristics include the following variables:

Age – age of an individual at the point of interview. As Grossman shows in his health capital model (1972) health depreciates over the life cycle, meaning that commonly, young people are healthier than older ones. Therefore, we should expect negative relationship between health and age.

Marital status - a binary variable that equals to one if a person is married and zero otherwise. Marital status can have some effect on health status of an individual, as much as cohabitants often have similar lifestyle or health habits that can affect their health condition in the same way. The relevant literature indicates that marital status has an insignificant effect on health, though this conclusion is made with regard to such health measure as SRH status. Unfortunately, to my best knowledge, there is no study reporting any effects of marital status on obesity, though it is quite logical to expect positive correlation between them

especially for women since after marriage or giving birth generally, majority of women gain weight. Therefore, I consider marital status as still worth including in the health regression.

Family income - household income net of labor income. Amount of income determines the quality of nutrition and health care that an individual can afford himself. Including this variable enables me to disentangle the impact of education from the income effects and concentrate on pure educational gradient in health. To get consistent estimates, I choose income level, that is purified from labor income. Intuition for this comes from the fact that actually, for some individuals family income coincides with labour income, that is correlated with the level of education person obtain. Labor income may in turn depend on health as healthier individuals are more likely to work more. Thus not purifying family income effect from labor income effects one can get biased estimates.

As already stated in my literature review, education is subject to endogeneity bias that can arise due to the reverse causality from better health to higher education or due to the unobserved "third" variables, that can effect both education and health in the same direction. Such "third" variable can either take the form of "persistent endowments" or time-preferences. Therefore, instrumenting education is necessary to get pure educational gradient in health. Fortunately, the data used in my study allows instrumenting education by parental education. Parental education can serve as a good instrument since it is strongly related to children's education level. (In general, adults that have educated parents are themselves educated). At the same time parental education has no direct effect on health of their children: as Leigh (1998) finds when own education level is not controlled for, health is determined by education level of mother but not by

father's while when education level of the respondent is controlled for, there is no statistically significant relationship between parental education and health.

As for the time-preferences, I will try to capture them by including in my health regression the smoking status of each individual. As Evans and Montgomery (1994) argue smoking status bears the information on individuals time-preferences. If a person smokes he engages in an activity with current benefits (as smoking is a sort of utility for him as he likes to do so) and with future costs (as the smoker actually disinvests in health) like an individual who does not invest in education. So, investments in health capital such as not smoking are similar to investments in education as both decisions involve a trade off between current costs and the discounted value of future benefits. Therefore, smoking status can be used as a factor that helps to disentangle educational effects on health from time-preference bias. To control for different time-preferences across individuals I construct three dummy variables each of which according to my assumption should represent certain kind of time-preference or discount rate. The first one stands for a person who smokes currently, the second one indicates that a person has smoked in his past life but has quitted, omitted category is the status reflecting never being a smoker.

One may argue that occupational variables should be included in the model to capture the effect of specific job position on an individual's health condition. However, including occupational variables may cause the estimates to be inconsistent. As Arkes (2003) indicates people's occupation could be endogenous to both their educational attainment and health. A person with higher education is more likely to have white-collar job than the one with lower educational attainment. Furthermore, health problems may limit individuals to work to a lesser extent for white-collar jobs as well as more educated individuals under the

hypothesis by which education effects health, are more likely to avoid dangerous job.

As a drawback of my methodology it should be mentioned that I do not control for initial health endowment of an individual that, in fact, is one of the determinants of the current health status. Genetic markers as well as parental health status bear substantial piece of information about the initial health endowment thus can be successfully used a proxy of this variable. However, data set used in my study does not provide information about these variable, that is why initial health endowments is not incorporated in my health regression.

Chapter 3

DATA DESCRIPTION

Data used in my research comes from the Ukrainian Longitudinal Monitoring Survey (ULMS) conducted in years 2003 and 2004. The ULMS is the first nationally representative longitudinal survey of Ukrainian households, that also comprises questionnaire for individuals. The data set is sufficiently rich and provides detailed information on individuals' family, personal and socio-economic characteristics like: income, employment, education, health, etc.. Although the ULMS is a panel data, for the wide majority of the individuals in the samples 2003 and 2004 education does not change over time. For that reason, I will use the data only for the year 2003 since compared to the year 2004 it contains statistics for the larger sample (8641 compared to 7200).[1] The representative sample is drawn out from working age population between 15 and 72 years old.

The main drawback of the data for my research is that it does not provide direct information on individuals' years of schooling as well as of their parents. Therefore, I have constructed years of schooling using the reports about individual's highest level of education and years studied at this level.[2]

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[1] I have also examined educational effects on health in 2004. Since the results from two separate cross – sections are basically the same, I present here only the ones from 2003.

[2] There are 12 categories of education in our data. The values assigned to each categories are the following: For the people with 1 to 6 years and 7 to 9 year of schooling I assigned the mean value of 3,5 and 8 years of schooling, respectively For those completed 10 or 11 years of education without diploma – 10; Diploma of high school -11, Diploma of PTU, FZO and FZO without general secondary education - 11; Diploma of PTU with a secondary education – 12; Diploma of technical, medical music, pedagogical, art school =14; Incomplete professional higher education=14 (11+ plus the mean value of studying at a

The health status is defined by the response to the following question: "how would you evaluate your general health condition: very good (1), good (2), average, not bad not good (3), bad (4)."

The first binary dependent variable in my study is defined from the answer to the question: "have you suffered from any of the following diseases: diabetes, myocardial infarction, high blood pressure, stroke, anemia, tuberculosis? No (1), Yes (0)." The second binary variable that reflects whether an individual falls in the obese body mass category is constructed in the following way: at first I calculate BMI using the following formula: $BMI=weight(kg)/(height(m))^2$. Based on BMI I construct dichotomous variable that takes on the value 1 when a person has BMI in the obese range (above 29.9) and zero otherwise. It should be mentioned here while there is no general agreement on optimal BMI for good health, obesity in particular is seen as a large health threat, which besides implying possible physical restriction, stigmas and psychological pains, increases the risk of e.g. cardiovascular diseases and diabetes, etc. Therefore, like other health-educational studies, I consider evaluating educational effects only on obesity.

Summary statistics for the sample used in the study is provided below in Table 1. The sample under investigation includes more females (56%) compared to males (44%). Average age in the whole sample equals to about 41 years, 6.8% is under the age 18, while 21% are in the age range 18-30, 37.6% between years 30 and 50, 16% respectively in the age range 50-60 and finally, 18.5% reports to be older

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university ((1+5)/2=3), Bachelor's degree from a university -15; Diploma of a specialist – 16, Master's degree from a university - 17; Candidate of sciences - 22.

It should be also noted that while calculating final years of schooling I have also accounted for the years studied at highest level of education reported by individuals. This kind of techniques makes possible exact calculation of years of schooling especially for those who have reported incomplete general secondary or higher education.

that 60 years. Majority of the sample is married (62%) and has never smoked in his/her life, 7.8% has smoked in the past life but quitted smoking, while 29% of individuals are current smokers.

Majority of the individuals (40.3%) report having vocational/professional secondary education, while 22.6% have not graduated from high school, 18.7 % received a diploma of general secondary education, only 16.1 % have high education (bachelor's degree and above) and finally 2.3% reports having incomplete high education.

The distribution of illnesses, obesity, and SRH condition across the population is the following: 73,1% of respondents report having no such illnesses as diabetes, myocardial infarction, high blood pressure, stroke, anemia, tuberculosis. 21.79% of the whole sample has BMI in the Obese category, Majority of the sample has average (53.8%) or a good (23.9%) general health condition, 20.4% indicates having a bad general health condition and finally, Only 1.9 % affirms having very good health. Since there is such a small portion of individuals indicating very good health condition, for estimation purposes I merge them to Good health category.

Women experience worse general health condition compared to their male counterparts. 33.1 % of females report having no illnesses compared to 19,1% of males who dos so. In the same way, 24% of females versus 15,9% of males report having a bad health condition, while proportion of females having very good or good health condition is much less than those of males. Correspondingly the issue of obesity is twice severe for females (27.88%) compared to males (13.63%).

Table 1. Descriptive statistics for the sample used in the study

	Female col %	Male col%	Total col%
Whole sample	56%	44%	100%
Age			
Under 18	6,60%	7,00%	6.80%
18-30	20,40%	21,90%	21.0%
30-50	38,10%	37,00%	37.6%
50-60	16,40%	15,50%	16.0%
Above 60	18,40%	18,50%	18.5%
Education			
Below general secondary	22,50%	22,70%	22,60%
General secondary	18,40%	19,00%	18,70%
(Vocational/professional)	39,40%	41,40%	40,30%
Incomplete higher education	2,70%	1,80%	2,30%
Higher Education	16,90%	15,10%	16,10%
Married	58%	66,10%	38.00%
Smoking status			
Smokes	9,30%	54,10%	29%
Smoked	4,50%	12,10%	7.8%
Never smoked	86,20%	33.80%	63,20%
No serious illnesses	66,90%	80,90%	73,10%
Obesity	27.88	13.63	21.79
Self Reported Health			
1 (very good)	1,20%	2,80%	1,90%
2 (good)	18,30%	31,10%	23,90%
3 (average)	56,60%	50,20%	53,80%
4 (bad)	24,00%	15,90%	20,40%

Groot (2005) provides a kind of explanation for the health status differences between woman and men. He argues that on average, women experience themselves to be less healthy than man. However, it is found that the life expectancy of women is longer than that of men's. Because of these difference in life expectancy, on average, women are older than men. Considering that the health status deteriorates with age, Groot suggests to ascribe gender differences in health status to the age differences between males and females. We can test for Groot's suggestion in our sample by analyzing SRH by gender in different age categories.

Table2. Distribution of SRH by age

SRH / Age	Good	Average	Bad	Good	Average	Bad
	Males			Females		
Under 18	64.64	32.7	2.66	52.35	42.95	4.7
18-30	57.53	37.58	4.89	39.57	54.26	6.17
30-50	30.97	56.83	12.2	16.27	65.68	18.04
50-60	19.73	57.09	23.18	6.00	58.58	35.42
Above 60	9.77	50.62	39.61	3.06	38.81	58.12

Table 2 shows that though health deteriorates when age increases in each age categories proportion of males who have good health condition exceeds the similar proportion for females in each age categories. Thus, gender differences in health can not be explained by age differences alone.

Due to the gender differences in health we should analyze health-education nexus in our sample separately for males and females. Table 3 provides statistics for

analyzing distribution of educational attainment by different health measure, separately for males and females.

Table 3. Distribution of Education By Health					
	SRH			BMI	No Illnesses
Health / Education	Good	Average	Bad	Obese	
Row%	Male				
Below General Secondary	32.1	44.00	23.91	14.33	21.78
General secondary	33.57	51.83	14.61	11.90	16.81
Vocational/professional	30.72	53.65	15.63	13.57	18.94
Incomplete higher	43.08	47.69	9.23	9.23	13.85
Higher	39.45	46.15	14.40	15.43	19.34
	Female				
Below General Secondary	18.68	41.66	39.66	31.76	39.23
General secondary	16.94	53.07	29.99	32.08	35.74
vocational/professional	16.28	62.45	21.26	27.31	31.85
Incomplete higher	40.68	54.24	5.08	7.63	28.81
Higher	21.95	60.98	17.07	20.86	30.15

One can easily notice that for each educational group majority of individuals have average health condition. However, for such health measure as SRH, it is evident that proportion of those, who has incomplete higher or higher education and indicate good health condition far exceeds the proportion of those with lower educational attainment and good health condition. In the same way, for higher educational groups fraction of males as well as females indicating the bad health condition is much less than the same fraction for lower educational groups. This should definitely point to the positive linkage from higher education to better health condition. Table 3 also demonstrates that for males it is difficult to capture any pattern of relationship between education and having no illnesses, while for females up to the higher education group, as educational attainment

increases proportion of people reporting having no illnesses decreases, implying that there is a negative relationship between education and health. It should be mentioned that the same trend is observed with respect to obesity: for incomplete higher and higher educational attainments proportion of individuals falling in the Obese BM category is much lower than for lower educational groups.

Proceeding from the above mentioned, we can conclude that data description part of the study by the following predictions. Although, for the SRH status positive linkage from higher education to better health outcome is obvious both for males and females., a priory expectations differ across gender for such health measures as having no illnesses and obesity. Specifically, for females we should expect negative correlation between education and health, while for males the pattern of relationship is not obvious.

Chapter 4

EMPIRICAL RESULTS

As already stated in the previous sections, the variable of interest in our study is subject to the endogeneity bias. Therefore, in order to report unbiased estimates, one should use instrumental variable approach. However, at the first stage of the estimation we assume that there is no problem of endogeneity and run simple Probit and Ordered Probit regressions respectively for no illnesses, obesity and SRH. Due to the health differences across gender I present results separately for males and females. Estimates of marginal effects for each particular regression are provided in the tables 4 and 5, respectively for males and females.

First I report results for males. As it was expected, for males an extra year of education does not affect the likelihood of having no illnesses: marginal effect of education on the probability of having no illnesses is found to be zero and statistically insignificant. Thus joint absence of serious illnesses for an individual can not be explained by his education, nevertheless in fact this results does not exclude the presence of educational effects on certain particular disease. However, investigation of these impacts goes beyond the scope of this study.

Individual characteristics that have negative and significant impact on health at 1% of significance level are age and past smoking status. One additional year reduces the probability of having no illnesses by 0.007, confirming the fact that health deteriorates by age. Past smoking status is also found to have negative and significant effect on having no illnesses with marginal effects equal to -0.084. This result may imply that those who quitted smoking in their past period of life

should have done so because of their worsened general health condition due to the smoking. Further, it is found that marital status has no statistically significant effect on having no illnesses. Thus, family life style has no statistically significant effect on this measure of health. Quite unexpectedly, at 10% current smoking status positively (0.03) and significantly determines health while at 5% of significance level net family income is found to have negative impact on health with marginal effect equal to -0.022. One implication of such an evidence could be the following: in general, male's family income that is net of his labor income is either the income of his spouse (if he is married) or the income of his parents. In accordance with economic theory, income increase generally is related to the increase in time devoted to the job activities and decrease in time devoted to leisure that should include personal as well as family care. Therefore, marginal effect of family income on males' health can be divided into desirable and undesirable effects: positive impact comes from the pure income effects that allows individuals to consume more expensive products and services effecting in its turn on health condition, while negative part should be related to the less cautiousness about the true effects of this inputs caused by reduction of time available to spend on personal care. The sign of the final impact reflects the component which dominates in absolute measure. Thus for this particular case negative impact dominates positive one, causing income gradient to take negative sign.

Table 4. Marginal effect of education on health for males (standard errors in parenthesis)					
Model / Variables	Probit Model	Ordered Probit Model for SRH			Probit Model
	No illnesses	Good(1)	Average (2)	Bad (3)	Obese
Years of education	0.0001	0.011*	-0.004*	-0.007*	0.0001
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Age	-0.007*	-0.012*	0.004*	0.008*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
Married	0.022	0.048*	-0.020*	-0.028*	0.023
	(0.018)	(0.018)	(0.008)	(0.011)	(0.015)
Total Family Income	-0.022**	0.016***	-0.006***	-0.010***	0.007
	(0.010)	(0.009)	(0.003)	(0.006)	(0.007)
Current smoker	0.030***	-0.044*	0.013**	0.032*	-0.018
	(0.016)	(0.015)	(0.005)	(0.011)	(0.012)
Past Smoker	-0.084*	-0.058*	0.015*	0.043*	0.037***
	(0.026)	(0.022)	(0.006)	(0.017)	(0.020)
observations	**4575**	**3247**			**3269**
Pseudo R2	**0.09**	**0.12**			**0.04**
*** significant at 1%; ** significant at 5%; *** significant at 10%**					

Running the Ordered Probit regression for SRH has shown that with additional year of schooling the probability of having good health condition increases by 0.011. Furthermore, an extra year of education reduces the likelihood of having average health condition by 0.004, while it decreases the chance of having a bad health condition by 0.007. All these results are significant at 1 % of significance level. Thus, there is definitely positive linkage from higher education to better health condition with regard to this health condition, implying that education enhances males' ability to produce health.

Likewise the results from Probit regression, here also age is negatively correlated with SRH. Additional year of education decreases the likelihood of having good

health condition while it increases the chance of falling respectively, in average or bad health category. Other variables negatively determining man's health condition is smoking status, both present and past: compared to nonsmokers, being a current smoker, good health deteriorates by 0.044, while the chance of having the average or the bad health condition increases by 0.013 and 0.032, correspondingly. Results are qualitatively the same for the past smokers, while in absolute rates marginal effects are a bit higher for them. Thus, taking into account that smoking status reflects individuals time-preferences, we get consistent results: on average, a person with high discount rate for future, compared to the one with low discount rates has worse health condition. Another interesting finding is that man's health is positively correlated with marital status: married males are 0.048 more likely to have a good health condition. Equally important, married individuals are and 0.02 and 0.028 less likely to be in an average or bad health condition compared to unmarried individuals. This finding should indicate that family life-style has undeniably positive impact on man's health condition. The last explicative variable that affects man's health condition positively and significantly at 10% of significance level is family income that is net of individual's labor income. Increasing the family income by 1% rises the chance of keeping the good health condition by 0.016, while the likelihood of falling in average or bad health category reduces by 0.006 and 0.02, respectively for average and bad health condition. Thus, overall effect of family income on one's health condition is positive for this health measure.

Further, it is found that for males education is statistically insignificant determinant of obesity as well as marital status, total family income and current smoking status. Age, in accordance with previous results, is negatively correlated with good health outcome, additional year increases the probability of falling in the obese BM category by 3%, implying that, health deteriorates when age

increases. At the same time, at 10% of the significance level past smoking status increases the probability of being obese by 3.7%, that seems quite reasonable: on average, smoking status affects individual's weight negatively, while shortly after quitting smoking individual gains weight.

Table 5 demonstrates that for females we get slightly different results. In Probit regression, at 1 % of significance level age is found to be the only significant variable determining the chance of having no serious illnesses. Marginal effect of additional year on the probability of having no illnesses is 0.03. All other variables, including education appears to be highly insignificant.

As for the Ordered Probit regression, similar to the results for males, education is found to be positively correlated with health. Extra year of schooling rises the chance of having a good health category by 0.011. What concerns to average and bad health condition, while additional year of schooling increases the likelihood of possessing average health condition by 0.005, it decreases the chance of having the bad health condition by 0.016. Another variable positively determining the health condition at 1% of significance level is the family noon-labor income, with the marginal effect equal to 0.013, 0.006 and -0.018 respectively for good, average and bad health condition. As usual, age is found to be negatively correlated with health. Additional year deteriorates good and average health by 0.008, while rises the likelihood of keeping bad health condition by 0.012. Unlike to the results for males, marital status as well as smoking status are found to be highly insignificant determinants of health though it should be noted that their impact on health are qualitatively the same as for males. Taking into consideration that only a small part of females smoke in our sample these results seem quite reasonable.

Concerning obesity, results for females are quite different from those for males: at 1% of significance level , education, age, marital status and current smoking status are found to be significant, while past smoking status and total family income have no statistically significant effect on the obesity. Results show that with one more year of education a woman is 0.8% less like to be obese, thus, is positively related to better health outcome, while an increase in age probability of being obese declines. Unlike the results for males, being married rises the probability of obesity, implying that marital status further deteriorates females' bad health condition. As for the current smoking status results are quite consistent with the ones explained for males: being a smoker decreases the chance of obesity for females, indicating once more the fact that smoking on average is negatively related to one's weight.

Table 5. marginal effect of education on health for females (standard errors in Parenthesis)					
Model / Variables	Probit Model	Ordered Probit Model for SRH			Probit Model
	No illnesses	Good(1)	Average (2)	Bad (3)	Obese
Years of education	0.008	0.011*	0.005*	-0.016*	-0.008*
	(0.007)	(0.001)	(0.001)	(0.002)	(0.002)
Age	-0.031*	-0.008*	-0.004*	0.012*	0.008*
	(0.001)	(0.0003)	(0.001)	(0.0004)	(0.0004)
Married	0.035	0.002	0.001	-0.003	0.035*
	(0.042)	(0.008)	(0.003)	(0.011)	(0.014)
Total Family Income	-0.006	0.013*	0.006*	-0.019*	-0.012
	(0.026)	(0.005)	(0.002)	(0.007)	(0.008)
Current smoker	0.021	-0.011	-0.005	0.016	-0.084*
	(0.076)	(0.012)	(0.007)	(0.019)	(0.022)
Past Smoker	-0.122	0.011	-0.008	0.022	0.030
	(0.106)	(0.012)	(0.011)	(0.028)	(0.037)
observation	**4575**	**4548**			**4575**
Pseudo R2	**0.11**	**0.17**			**0.09**
*** significant at 1%; ** significant at 5%; + significant at 10%**					

Once we have examined educational effects on health using simple Probit and Ordered Probit Models, now we introduce instrumental variable approach. we concentrate on the results for having no illnesses, a good health condition and being obese and follow instrumental variable approach instrumenting education with parental education. We run Instrumental Variable Probit Model separately for each of these health measures and compare the results to the ones from the simple Probit and Ordered Probit Models correspondingly for having no illnesses, having a good health condition and being obese.

Table 6 below presents parameter estimates for both approaches as well as some important statistics separately for males and females. Before accepting results, we should check whether it is necessary to use instruments and whether the

instruments we use are of good quality (relevant) and finally, if instruments are valid.

First we examine whether it is necessary to use instrumental variable approach, or, in other words, whether the problem of endogeneity of education is present in our sample. Wald test of exogeneity indicates that the problem of endogeneity of education exists, depending on gender and particular health measure. Specifically, at 10% of significance level for males the null hypothesis of zero correlation between the error terms from the reduced form and structural form equations can be rejected in the equation of no illnesses as well as in the equation of good health condition. Thus, for these measures of health education is found to be endogenous. However, according to the Wald test education is highly exogenous to obesity with p-value equal to 0.83. As for the females we get slightly different results: education is endogenous to having no illnesses at 5 % of significance level, while it is highly endogenous to obesity. What concerns to good health measure, education is found to be exogenous with this health measure. Thus we can conclude that while for some measure of health, education is endogenous it is exogenous for others.

Quality of instruments is checked by the F-test on the exclusion of the instruments in the years of education equation. According to this test our instruments are found to be relevant: the null hypothesis that the joint instruments do not have a statistically significant effect on years of education is rejected by the F-test, implying that instruments are of good quality.

Table6. Parameter estimates and other statistics for Probit and IV Probit models						
	No illnesses		Good health		Obese	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
	Male					
Years of Education						
Coefficients	0.001	0.05***	0.029*	0.107*	0.0008	-.007
standard errors	0.008	0.03	0.009	0.027	0.009	.033
Marginal effects	0.0001	0.014	0.01	0.038	0.0001	-.001
Pseudo R2	0.09		0.14		0.04	
F statistics		138.32		138.70		138.32
Partial R-square		0.09		0.09		0.09
Sargan Statistics chi2(1)		3.766		6.93		4.786
Prob>chi2		0.052		0.008		0.028
Exogeneity test Wald chi2(1)		2.78		8.5		0.05
Prob > chi2		0.0957		0.0035		0.8298
	Female					
Years of Education						
Coefficients	0.008	0.049**	0.038*	0.073***	-.026*	-.122*
standard errors	0.007	0.021	0.01	0.028	.007	.019
Marginal effects	0.003	0.017	0.009	0.018	-.008	-.037
Pseudo R2	0.11		0.19		0.09	
F statistics		241.82		236.92		241.82
Partial R-square		0.1		0.1		0.1
Sargan Statistics chi2(1)		0.901		1.367		0.003
Prob>chi2		0.342		0.242		0.956
Exogeneity test Wald chi2(1)		4.23		1.91		23.67
Prob > chi2		0.04		0.17		0.00
*** significant at 1%; ** significant at 5%; ***significant at 10%**						

Finally, we examine the validity of instruments using Sargan overidentification test. This test checks whether parental education aside from their effect on the year of education, have their separate impact on the health condition of an individual. We get opposite results for males and females. Table 6 indicates that for females our instruments are found to be valid: null that they have no separate effect on the certain health condition can not be rejected, while for males results differ. Specifically, for good health condition p-value at which the null hypothesis can be rejected is almost zero, implying that our instruments are highly invalid. For having no illnesses and being obese results depend on the chosen significance level. At 5% of significance level null hypothesis that our instruments have no separate effect on the having no illnesses can not be rejected, while for obesity validity of instruments can be confirmed only at 1% of significance level.

Proceeding from the abovementioned we conclude that we use good quality instruments though the validity of them depends on the significance level and the gender, we concern. We interpret results conditional on the existence of endogeneity problem. Specifically, if education is found to be endogenous to health, we report results from IV Probit Model, while for the opposite case we use simple Probit Model . It has to be underlined that we should be cautious while interpreting results for males for having good health condition as well as no serious illnesses, since though the issue of endogeneity presents here, we can not rely on the parameter estimates from IV Probit Model because of the invalidity of our instruments for these particular cases. Therefore, the best thing we can do is to compare results IV Probit to the ones from Probit and leave up to the reader to choose which one is more precise estimate.

Thus final interpretation is as follows: if we are to accept results from IV Probit, additional year of education increases the chance of having no serious illnesses by 1.4% with parameter estimates being significant at 10% of significance level.

However, assuming exogeneity one more year of schooling has no statistically significant effect on having no illnesses. As shown in appendix 1, in IV Probit regression all other explicative variable have qualitatively the same effect on the probability of having no serious illnesses as in the Probit Model. Results from two model differ only quantitatively.

Similarly, accepting results from IV Probit regression for good health condition, with an additional year of education males are almost 3.8% more like to have good health condition. At the same time not using instrumental variable approach this magnitude reduces to 1%. Unlike the previous case, parameter estimates for Probit and IV Probit Model are no longer comparable to each other: while in Probit regression all explicative variables are found to be statistically significant, the only explanatory variables found significant in IV probit regression are: education, age and current smoking status. It should also be noted that though in general, the parameters' estimates for explicative variables other than education reduces after instrumenting, signs of the marginal effects remains the same. (see appendix 1)

As stated previously, education is found to be exogenous to obesity, Therefore, we accept results as well interpretation from the simple Probit model discussed already above.

Since for females instrumental variables are found to be valid, we can accept results here in accordance with endogeneity issue. Specifically, for no illnesses and obesity marginal effects are interpreted from IV estimation, while for good health condition we rely on Probit estimates.

IV estimation shows that unlike to Probit Model extra year of education statistically significantly determines the chance of having no illnesses with

marginal effect equal to 1.7% . As for the other explicative variables, though their magnitudes reduces slightly , qualitatively results remain the same as for the Probit model, described earlier. (see appendix 2)

Taking into account that education is exogeneous to good health condition for this measure of health we base our interpretation to the Probit estimation. It appears that at 1% of significance level, an extra year of education makes females 0.9% more like to be healthy. Age deteriorates the likelihood of having good health condition by 0.9% , while married individuals have 2.1% less chance of having good health condition. Finally, at 10% of significance level with an unit percentage increase in the total family chance of being healthy rises by 1.1%. It should be noted that underling results are quite consistent with the one estimated from Order Probit Model. The only difference is the sign of marital status, which is positive in the latter case. Intuitively, negative marital status is more consistent with reality as, on average, women after marriage or after giving birth devotes less and less time to self care, engage more and more actively in family life.

Finally, we present results for obesity. Since education is found to be endogenous to obesity, we report results from IV Probit. Unlike to the outcomes for males education is found to be negatively and significantly related to the obesity with marginal effect equals to 3.7%. Thus there is clear positive link from higher education to a better health outcome with respect to this health measure. What concerns to other explanatory variables, it is found that age and marital status and past smoking status positively and significantly effects the probability of being obese with marginal effects equal to 0.6%, 5.7% and 5.9% respectively, while 1% increase in total family income reduces the chance of being obese by 0.3%. The last finding is quite intuitive taking into account that obesity is often related to the not correct way of nutrition. Basic components of food may consist with inferior products, affecting health negatively. Once income

increases, individual substitutes good quality products to the inferior ones, attaining higher health outcome in this way. More general reason of positive linkage from higher family income to better health outcome can be explained in the following way: higher income endowment enables person to choose a better mix of health inputs, results of which is a again a better health outcome. It should be underlined here these explanation does not contradict to the one given above to explain negative impact of family income on prevalence of serious illnesses for males. Since family income that in net of labor income represents an income of spouse or parents, it is not maintained by an increase in time devoted to females' self -job activities. Thus females have the same time but much higher income endowment for personal as well as family care, that is reflected positively on their health through the choice of better health inputs.

Taking into account all the above mentioned I provide the main conclusions of the study in the last section.

CONCLUSIONS:

The purpose of this paper into examine educational gradient in health using Ukrainian Longitudinal Monitoring Survey in 2003. I employ three health measure variables: indicator for having no serious illnesses, Self Reported Health of an individual (SRH) and an indicator for obese body mass category. To account for the reveres causality from better health to better education, I instrument education by parental education, while to disentangle educational effects from time-preference bias I control for smoking status. Due to the gender differences in health, I present results separately for males and females.

I find that for males education is endogenous to health for such health variables as having no ilnesses and good health condition, while exogeneity of education is confirmed for obese Body mass category. As for females, results are different: though for having no illness and obese body mass category education is found to be endogenous, exogeneity of education can not be rejected for good health condition. Testing for relevance and validity of used instruments I find that while parental education is confirmed to be good quality instrument for education, they are not valid for males as hypothesis that parental education has no separate effect on males' health is rejected at 5% of significance level, implying that IV estimates are biased. Since for males endogeneity is not an issue for obese body mass category, we can report results from Probit Model without IV estimation. However, for other health measures presence of endogeneity makes Probit estimates also unreliable. Therefore, for males we can not make strong conclusions about educational gradient in health. Rather we can present results

from Probit as well as IV Probit Model and leave up to the reader to choose one as more reliable. Results, therefore are as follows:

Assuming exogeneity, additional year of education has no statistically significant effect on the probability of having no illnesses, while results from IV estimation suggest that extra year of education increases this chance by 1.4%. However, for females IV estimation suggest that with one more year of education females are 1.7% more like to have no serious ilnesses, implying that there is truly positive causal linkage from education to health for females.

What concerns to another health variable - good health condition I find that marginal effect of a year of education on the probability of having a good health condition is about 1% and 3.8% respectively for Probit and IV Probit models. However, nonexistence of valid instruments for males makes results unreliable. As for females taking into account exogeneity of education an additional year of schooling increases the likelihood of having good health condition by about 1%. Thus, for females there is positive and significant educational gradient in health.

Finally, I present results for obese body mass category. Taking into consideration the exogeneity of education to obesity, for males one more year of schooling has no statistically significant effect on the probability of having obese body mass category while for males IV probit estimation suggests that marginal effects of years of schooling reduces the chance of being obese by about 3.7%. This result implies that while more educated females are more efficient producers of health, higher education is not generally associated with better health outcome for males. Though it should be underlined again that with regard to such health measure variables as having no ilnesses and good health condition, results are mixed for males: while for the former the issue is whether education statistically significantly

determines health, for the latter ambiguity lies in the exact magnitude of this relationship.

Taking into account all the above mentioned the final conclusions of the study is as follows: educated females are more efficient producers of health, magnitude of educational gradient in health varies across different health measure from 1% to 3.7%. As for males, further research using more accurate instruments of education is needed to come to the relevant inference.

Finally, as a policy implication of the study it should be underlined that policies that aim increasing the general level of education in the population will also accomplish the goal of improved health among females.

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Appendix 1. Parameter estimates for Probit and IV Probit models (Males)						
Health / Variable	No illnesses		Good health		Obesity	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Years of education	-0.001	0.050***	0.029*	0.107*	0.001	-0.007
Standard error	(0.009)	(0.030)	(0.009)	(0.028)	(0.009)	(0.033)
Elasticity	**-0.0001**	**0.014**	**0.010**	**0.038**	**0.0001**	**-.001**
Age	-0.025*	-0.023*	-0.036*	-0.034*	0.013*	0.012*
Standard error	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Elasticity	**-.006**	**-0.006**	**-0.013**	**-0.012**	**.002**	**.002**
Married	0.082	0.035	0.120**	0.085	0.112	0.156***
Standard error	(0.067)	(0.074)	(0.062)	(0.070)	(0.073)	(0.082)
Elasticity	**.022**	**0.010**	**0.043**	**0.031**	**.023**	**.032**
Total Family Income	-0.079**	-0.094*	0.077*	0.030	0.034	0.030
Standard error	(0.034)	(0.036)	(0.030)	(0.032)	(0.037)	(0.039)
Elasticity	**-.022**	**-0.026**	**0.027**	**0.011**	**.007**	**.005**
Current smoker	0.112**	0.129**	-0.200*	-0.159*	-0.095	-0.093
Standard error	(0.058)	(0.062)	(0.054)	(0.058)	(0.063)	(0.068)
Elasticity	**.030**	**0.034**	**-0.066**	**-0.054**	**-.017**	**-.016**
Past Smoker	-0.271*	-0.244*	-0.149***	-0.103	0.171**	0.199**
Standard error	(0.080)	(0.085)	(0.086)	(0.089)	(0.086)	(0.091)
Elasticity	**-.084**	**-0.074**	**-0.050**	**-0.036**	**.037**	**.042**
observation	3269	2948	3247	2929	3269	2948
Pseudo R2	0.09		0.15		0.06	
*** significant at 1%; ** significant at 5%; *** significant at 10%**						

Appendix 2. Parameter estimates for Probit and IV Probit models (Females)						
Health / Variable	No illnesses		Good health		Obesity	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Years of education	0.008	0.049*	0.038*	0.074*	-.026*	-.123*
Standard error	(0.007)	(0.021)	(0.009)	(0.028)	(0.007)	(0.019)
Elasticity	**.003**	**.017**	**.009**	**.018**	**-.008**	**-.037**
Age	-0.031*	-0.029*	-0.040*	-0.038*	.025*	.020*
Standard error	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Elasticity	**-.011**	**-.010**	**-.009**	**-.009**	**.008**	**.006**
Married	0.035	0.019	-0.099**	-0.116**	.109*	.180*
Standard error	(0.042)	(0.046)	(0.051)	(0.055)	(0.043)	(0.046)
Elasticity	**.013**	**.006**	**-.021**	**-.027**	**.035**	**.057**
Total Family Income	-0.006	-0.021	0.051***	0.039	-.040	-.009
Standard error	(0.026)	(0.027)	(0.029)	(0.031)	(0.026)	(0.027)
Elasticity	**-.002**	**-.007**	**.011**	**.009**	**-.012**	**-.002**
Current smoker	0.021	-0.002	-0.124	-0.112	-.300*	-.230*
Standard error	(0.076)	(0.080)	(0.078)	(0.082)	(0.086)	(.090)
Elasticity	**.007**	**-.001**	**-.026**	**-.025**	**-.084**	**-.063**
Past Smoker	-0.122	-0.107	-0.081	-0.112	.091	.185***
Standard error	(0.106)	(0.111)	(0.107)	(0.110)	(.111)	(.112)
Elasticity	**-.045**	**-.039**	**-.018**	**-.025**	**.029**	**.060**
observation	4575	4124	4548	4100	4575	4124
Pseudo R2	0.11		0.19		0.09	
*** significant at 1%; ** significant at 5%; *** significant at 10%**						