Education, risk perceptions, and health behaviors

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Abstract

It is acknowledged that there exists an association between education and health behaviors, but channels through which educational gradients resulted are not well investigated. We propose that personal risk perceptions of developing cancers in the future account for part of the gradients. To explore it, we merge two datasets to test causal effects at both individual and MSA levels. Endogeneity is considered and eased. We find that risk perceptions significantly enhance people's smoking decisions, and prostate cancer and colorectal cancer screening. Educational gradients are robust perceived risks. It is suggested to improve health behaviors, health service providers and public health manager should take measures to enhance personal perceived risk toward diseases.

1. Introduction

It is widely acknowledged that individual's education is positively correlated with health. Life expectancy is a recognized health indicator. In 1990, a 25-year-old male college graduate could expect to live 8 years longer than a high school dropout of the same age (Richards and Barry, 1988). In 1999, the age-adjusted mortality rate of some college graduates aged 25 to 64 was less than half of the mortality rate of high school dropouts (National Vital Statistics Reports, 2001). In addition to longer life expectancy, better educated people are less likely to be hypertensive, or suffer from emphysema or diabetes.

Although literature documents substantive amount of facts of positive education-health relationship, it is still unsettled that (1) whether the effect of education on health is causal; and (2) the mechanisms, if any, for the relationship between education and health. There are three possibilities accounting for this correlation: one is that good health results in high levels of schooling; another is that increasing education improves health; and lastly there may exist third factors that increase both schooling and health. The first explanation receives the most attention of health economists in exploration of the association between education and health. In his seminal article, Grossman (1972) hypothesized that educated individuals produce health more efficiently (allocative efficiency hypothesis), thus providing one explanation for the observed gaps in health by education level. Kenkel (1991) and Rosenzweig (1995) proposed that education may teach individuals to convert health inputs into health outcomes more efficiently, or the better educated may employ a more efficient way in mixing health inputs. Moreover, Cutler and Lleras-Muney (2006) offered several other possible channels through which education impacts health: income and access to health care, labor market, value of the future, information and cognitive skills, preferences, rank, and social networks.

A major channel for the positive relationship between education and health outcomes rests on health behaviors. The educated tend to adapt healthier behaviors and lifestyles. For example, they are less likely to smoke, abuse alcohol, be obese, or work in a hazardous profession. Grossman (2006) provided a introduction of nonmarket outcomes, including health, of education.

It is undeniable that health behaviors are simultaneously influenced by determinants other than education among which risk perception is a key factor of our interest. Risk perception is related to cognitive skill and preferences above noted. One's ability to make use of health related information could be reflected by correctness in her risk perception toward diseases; rational personal risk perceptions would lead one to behave appropriately in order to lead a healthy life; people who are more risk averse dislike risk more of suffering from some disease and having poor health conditions in the future. Hence individuals with higher perceived risk of developing are intuitively more likely to take preventive measures against undesired health outcomes.

Beside education and health knowledge, one's risk perceptions on cancer are also formed through social networks, governmental disease prevention policies, medical information dissemination, and etc. Health characteristics of relatives and friends impose an influence on one's judgment of probability of developing cancers. City and community also have educational programs to spread knowledge or statistical facts of cancers. Therefore, it seems that individual's risk perceptions are more likely to be formed through interactions in neighborhood than education.

In this paper we intend to use a simple method to provide evidence on the effects of educational attainments and risk perceptions on health behaviors. Specifically, we merge city level average risk perceptions information from HINTS dataset with SMART-BRFSS dataset to exogenize risk perception, and to capture full education gradient on health behaviors. Our health behavior measures include tobacco smoking, prostate cancer screening (PSA test), and colorectal cancer screening (blood stool test using a home kit).

Risk perceptions are endogenous, and instrumental variables approach is the first choice to deal with it. Previous researches employ "policy" instruments to identify education effects, including college openings (Currie and Moretti, 2003), high school graduation requirements

(Kenkel et al., 2006), and the Vietnam draft (de Walque, 2007b; Grimard and Parent, 2007). Before satisfactory instruments are obtained, we use city level risk perceptions instead in estimation to overcome endogeneity.

Risk perceptions are obviously correlated with education. According to Rimal and Juon (2010), younger and better educated women are associated with higher levels of breast cancer anxiety, higher risk perceptions, and stronger efficacy beliefs. Therefore, including personal risk perceptions in regression is expected to reduce education's explanation power of health related behavior. However, city level risk perceptions could enable us to accurately investigate how much risk perceptions can account for the educational gradients on health behaviors.

Our findings are: education and risk perceptions both significantly influence people's smoking decisions, and prostate cancer and colorectal cancer screening. The educational effect is robust to taking into account risk perceptions: risk perceptions can only explain a small portion of the education gradient. We expect to see the same results from City level estimation (using SMART-BRFSS).

This paper proceeds as follows. The next section reviews literature on the effects of education and risk perceptions on health behaviors. Stylized facts of lung cancer, colon cancer, and prostate cancer are presented in section 3. Section 4 and 5 discuss our data and econometric approach. Section 6 presents our results. Section 7 concludes and discusses policy implications.

2. Literature Review

There is a relatively large and persistent association between education and health behaviors in literature: gradients in behavior are biggest at young ages, and decline after age 50 or 60. Cutler and Lleras-Muney (2006) provided a comprehensive review of the relationship between education and health behaviors, so we solely review some more recent researches.

Lange (2011) uses data on real and perceived cancer risks and cancer screening behavior to test the allocative efficiency hypothesis/theory. Findings support for this paper's two main propositions that (1) better informed educated individuals are more likely to incorporate variation in risk factors when reporting their personal cancer risk, and (2) the better educated will react more strongly to risk variation by adopting preventive behaviors such as cancer screening. These two findings lend a large support for the allocative efficiency hypothesis.

Cutler and Lleras-Muney (2010) use a variety of data sets from US and UK to examine the relationship between education and health behaviors. They conclude that income, health insurance, and family background can account for about 30 percent of the education gradient; and knowledge and measures of cognitive ability explain an additional 30 percent. Preferences of time do not account for any of the gradient, and neither do personality factors such as a sense of control of oneself or over one's life. In their findings educational gradients in health behaviors are large; better educated people are less likely to smoke, and more likely to use preventive care controlling for age, gender, and parental background.

It is accepted that education is endogenous due to the possibility that educational attainment is self-selective. Ignoring endogeneity of education would bias estimates of causal relationship or leave this causality spurious. Parka and Kang (2008) instrument education by high school availability and birth order using data of Koreanmen to investigate education induced healthy lifestyle. Their results indicate that an increase in education induces individuals to exercise regularly, and to get regular health checkups. However, they find that education has little effect on smoking or drinking.

Kemptnera, Jurgesb and Reinhold (2010) investigate the causal effect of schooling on health and health-related behavior in West Germany. They applied an IV using as natural experiments several changes in compulsory schooling laws between 1949 and 1969. They discover evidence for a strong and significant causal effect of years of schooling on long-term illness for men but not for women. However, they found little evidence for a causal effect of education on smoking behavior. There also exist a large number of research papers specifically studying the causal effect of education on smoking among which economists frequently reach conflicting conclusions via different econometric approaches and data.

De Walque (2007) employs an instrumental variable approach to account for the endogeneity of smoking based on the fact that during the Vietnam War college attendance provided a strategy to avoid the draft. De Walque reports that education does affect smoking decisions: educated individuals are less likely to smoke and are more likely to have stopped smoking among those who initiated

Published in the same issue of Journal of Health Economics, Grimard and Parent (2007) infer causation from education to smoking using the Vietnam War draft avoidance behavior as a quasi-experiment. They disclose strong evidence that education, whether measured in years of completed schooling or in educational attainment categories, reduces the probability of smoking at the time of the interview.

However, Tenn, Herman and Wendling (2010) do not come with significant causality between education and smoking behavior. To investigate it, they difference out the impact of unobserved characteristics correlated with education. They conclude that an additional year of education does not have a causal effect on smoking and it is the unobserved factors correlated with education that entirely explain their relationship.

Despite that educational gradients on health behaviors especially smoking behavior have received much attention the causality of risk perceptions and health behaviors is not equally deeply investigated in health economics. Research papers on this topic are rare.

Viscusi (1990, 1991) analyzes the results of a national survey of smoking risks and smoking behavior. Viscusi finds that risk perceptions are greater as one ages, and risk perceptions in turn have a negative effect on smoking decisions. Viscusi and Hakes (2006) again analyze smoking risk beliefs and smoking behavior using individual data. They reach the similar results: higher risk beliefs decrease the probability of smoking initiation and increase the probability of cessation among those who begin.

Lundborg and Anderson (2008) use a Swedish adolescent sample to account for gender differences in smoking behavior, within the concept of Bayesian updating process. They discover that a greater perceived mortality risk is associated with a reduction in the probability of smoking. The effect is significant for both boys and girls, but girls perceive the addictiveness risk of cigarette less than boys.

Gerking and Khaddaria (2011) find that perceived risk deters smoking among persons aged 14–22 years who think that it is relatively difficult to quit smoking. Perceived health risk, however, does not affect the smoking status of young people who hold the opposite beliefs. Using the Annenberg Perception of Tobacco Risk Survey 2,

It is worth to note that not only relatively few papers explored the impacts of risk perceptions on health behaviors, but the definitions of risk perceptions in different researches differ. For instance, in Viscusi (1990, 1991) risk perceptions questions posed actually serve to elicit knowledge of respondents on lung cancer risk-the probability to develop lung cancer for smokers or the mortality of lung cancer patients. In this paper, however, we intend to explore the individual's subjective beliefs on developing cancers her/himself and detect the effects of beliefs on smoking behaviors and physical checkups.

3. Facts

In this section, we present some medical facts of lung cancer, prostate cancer, and colorectal cancer as well as public awareness of relevant healthy behavior in preventing these diseases in order to put empirical analysis in a context.*

Worldwide, lung cancer is the most common cause of cancer-related death, and is responsible for 1.3 million deaths annually (2004). In the United States, smoking is the leading cause of preventable death, resulting in deaths one out of five each year. The most common symptoms of lung cancer are shortness of breath, coughing, and weight loss. It is not surprising that the leading cause of lung cancer is long-term exposure to tobacco smoke, because,

*Data come from CDC and Wikipedia, NCI.

nonsmokers merely account for 15% of lung cancer cases.

Americans overestimate the survival rates for lung cancer: few (17%) are aware that only a small minority of individuals diagnosed with lung cancer will survive 5 years beyond diagnosis. Lung cancer screening by low-dose computerized tomography, chest x-ray, or sputum cytology is not recommended by experts as there is inadequate evidence to suggest that these screenings save lives. As a result, the bet way to reduce the risk of developing lung cancer is to keep away from smoking and secondhand smoke.

Colorectal cancer, the cancer of the colon or rectum, is the fourth most common cancer in men and women in the United States. Colon cancer is not as dangerous as lung cancer: the lifetime risk of developing colon cancer is about 7%, and 50% to 75% of people who develop colon cancer will survive at least 5 years. Two thirds of U.S. citizens have knowledge of this science-based evidence.

The risk of developing colon cancer can be reduced with physical exercise, diet, and removal of adenomatous polyps. Experts strongly recommend colorectal cancer screening for men and women 50 and older with a fecal occult blood test (FOBT), or with sigmoidoscopy alone or in combination with FOBT. Colon cancer is highly treatable and often curable.

The Fecal Occult Blood Test (FOBT) is the screening method for average risk people aged 50 and over used by Colon Cancer Check. For this test, you put tiny samples of your stool on a special card or cloth and send it to a lab. The lab uses chemicals to find blood that you can't see with the naked eye. With some test kits, you can add the chemicals yourself at home (home kit). FOBT tests don't cost much. This test should be done every year after age 50.[†]

Prostate cancer is the second most common type of cancer among men in US, following behind skin cancer. Around 240,000 American men mostly aged over 50 will be diagnosed with this disease each year. The U.S. incidence rate for prostate cancer is approximately 166 new cases diagnosed per 100,000 men; the mortality rate is approximately 24 deaths per

[†]http://www.webmd.com/colorectal-cancer/fecal-occult-blood-test-fobt

100,000 men. Although the prostate cancer death rate has declined for both white men and African American men, the disparity in deaths from this disease persists.

Many factors, including genetics and diet, are responsible for the development of prostate cancer. The presence of prostate cancer may be detected by symptoms, physical examination, prostate-specific antigen (PSA), or biopsy. The convenient PSA test increases cancer detection but does not decrease mortality. More than 90 percent of all prostate cancers are diagnosed at an early stage due to the widespread PSA screening in the United States. There is a significant relation between lifestyle (including food consumption) and prostate cancer prevention.

The prostate-specific antigen (PSA) test is one of the best ways to screen for prostate cancer. This blood test measures a protein made by the prostate that normally is present in the blood. The amount of this protein in the blood will increase in men who have prostate cancer. The American Cancer Society recommends that all men beginning at the age of 50 should have a PSA test every year. Those with prostate cancer in their family should start earlier, at age 45. It is important to have regular tests in order to establish a "baseline," so that any increases in PSA levels can be noted immediately.[‡]

More detailed information of lung cancer, colorectal cancer, and prostate cancer can be acquired in the websites of National Cancer Institute, Centers for Diseases Control and Prevention and other sources.

4. Data

Our data come from two separate surveys: Health Information National Trends Survey (HINTS) and the Selected Metropolitan Area Risk Trends in Behavioral Risk Factor Surveillance System (SMART-BRFSS). HINTS, launched by the National Cancer Institute (NCI) in 2002, have three waves of surveys up to now, in 2003, 2005 and 2007.[§] Respondents of

[‡]http://ehealthmd.com/content/how-prostate-cancer-diagnosed
[§]HINTS Brief No.13

HINTS surveys reside in U.S. large cities. The HINTS data collection program was created to monitor rapid changes of health communication. Survey researchers are using the data to understand how adults 18 years and older use different communication channels, including the Internet, to obtain vital health information for themselves and their loved ones.

Since the objective of HINTS is to facilitate health communication research, there are rare economics research papers based on HINTS data. The HINTS data are more used by psychologists and statistician than economists. The latest article on the basis of HINTS is Kiviniemi, Orom, and Giovino (2011) exploring how the relation between psychological distress and smoking behavior differed as a function of race/ethnicity of respondents. Their findings suggest that the often-reported association between psychological distress and smoking is relatively specific to White individuals. The relation does not appear to characterize either Black or Hispanic individuals.

HINTS ask respondents on topics including cancer perceptions and knowledge, patient-provider communication, internet use, numeracy, nutrient and physical activity, tobacco use, and various cancers and protection. HINTS surveyed around 6, 000 individuals in each wave, some questions were asked to one third of them. In consideration of relatively small sample sizes of HINTS data, we solely make analyses of risk perceptions on lung cancer, colon cancer and prostate cancer.

Our another dataset, the BRFSS, is a state-based system of health surveys that collects information on health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury. BRFSS was established in 1984 by the Centers for Disease Control and Prevention (CDC); currently data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam. More than 350,000 adults are interviewed each year, making the BRFSS the largest telephone health survey in the world.

For many states, the BRFSS is the only available source of timely, accurate data on health-related behaviors. States use BRFSS data to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs. The SMART project uses the BRFSS to analyze the data of selected metropolitan and micropolitan statistical areas (MMSAs) with 500 or more respondents.

We combine BRFSS-SMART with HINTS to obtain a comprehensive dataset which contains abundant information on education, risk perceptions and health behaviors as well as socio-economic and demographic factors for our research purposes. Although only part of data provide information on lung cancer, prostate cancer, or colon cancer, we have enough observations (over 10,000) in each cancer study.

5. Methodology

Individual's risk perceptions are endogenous. Endogeneity may come from reverse causality between risk perceptions and health behaviors or third factors that affect both variables simultaneously. Not only personal risk perceptions play a role in deciding tobacco consumption and physical checkups, knowledge from physical examinations is very likely to be used in upgrading risk perceptions of developing cancers. It is equally possible that there exist omitted variables such as parents' educational attainments that have influences on individual's risk perceptions and health behaviors. For example, higher educated parents impart to their children more precise information on physical constitution, genetic diseases and cultivate them to lead a healthy life. Without accounting for endogeneity, our estimates would be bias, contaminating the predicted explanation power of risk perceptions on health behaviors.

In order to ease the endogeneity of risk perceptions, we take a two-step approach. First, we compute the weighted averages of risk perceptions of residents within the same MSA in HINTS datasets, and merge this information with SMART-BRFSS datasets according to MSA. Averaging risk perceptions eliminates the source of endogeneity. Although individual heterogeneity information is lost after taking average, the effects of risk perceptions are still identifiable because we have a rich number of MSAs in the combined datasets. The second step is to regress all models with 1-year lag of risk perceptions averages, that is, regress health behaviors on individuals background characteristics and 1-year lag of risk perceptions. We also do regression with current independent variables of risk perceptions for robustness checking, the results of which are not reported. Coefficients on variables of interests are not significant, suggesting that endogeneity has been partly addressed.

To be more specific, we calculate weighted average of city level cancer risk perceptions from HINTS, and merge it with corresponding individual data of BRFSS-SMART by MSA to exogenize risk perceptions. We have several reasons to adopt city level average risk perceptions. First, some previous papers use this method. For example, Mellor and Freeborn (2010) use a county-level measure of religious market density as an instrument to study how adolescent religious participation is associated with risky health. Second, cancer information is disseminated trough television news and daily newspapers and journals. And city and community have educational programs to spread knowledge or statistical facts of cancers. Residents in the same MSA consequently may have similar risk perceptions of developing cancer in future. Third, Respondents in a MSA can be regarded as a group, and they share attitudes toward cancers. A typical MSA has a population of several hundreds of thousand. Within it any two persons are statistically connected through other one or two acquaintances. Via this link one shares another's view on the probability of developing cancers easily, and their opinions might converge. We keep MSAs who contain more than 30 observations in HINTS to compute weighted average. Observations in BRFSS-SMART with no corresponding MSA average risk perceptions in our HINTS sample are of course dropped. As a result, average risk perceptions of those MSA residents are acceptable measures in our research.

After this preparation, we have three samples, each for lung cancer, for prostate cancer, and for colorectal cancer. Smoking is an addictive behavior. Smokers lack of self-control face difficulties in quitting. For smokers, not to smoke everyday is an easier task to prevent lung cancer. Smoking heaviness is more likely to be affected by education and lung cancer risk perceptions than whether to smoke considering its addictive property. As for prostate cancer we study impacts of people's risk perceptions in 2003 and education on whether they have PSA test one year after, so we merge 2003 HINTS prostate cancer risk perceptions with 2004 BRFSS-SMART. The same is for colorectal cancer; we merge 2003 HINTS to 2004 BRFSS-SMART, 2005 HINTS to 2006 BRFSS-SMART and pool these two waves of colorectal cancer survey in regression, which makes this sample larger than the other two.

The HINTS datasets are created with statistical weights of respondents derived from selection probabilities, response rates, and post-stratification adjustment in sampling. HINTS 2003 and 2005 were administered by telephone using a random-digit-dial (RDD) sample frame. So there is a final statistical weight assigning to every respondents. Statistical weight refers to the number of people in the population that the sampled person represents. Unweighted HINTS analyses would include too many African Americans and Hispanics, too many respondents over 45 years old and too few 18-34 year olds and too many females.

In this paper, we take advice from HINTS to employ jackknife resampling method to calculate weighted averages of risk perceptions of individuals in the same city. Jackknife is used to estimate the variance of estimates obtained from the full sample – for example a mean or a regression coefficient estimate of variance. The type of jackknife replication is JK1; the number of jackknife replicates is 50.

HINTS has three questions for risk perceptions of each cancer: (1) "How likely do you think it is that you will develop ___ cancer in the future?"; (2) "Compared to the average person your age, would you say that you are: more likely or about as likely or less likely to develop ___ cancer in the future."; and (3) "How often do you worry about getting ___ cancer?" We construct dummies variables based on whether respondents' risk perceptions are more likely or less likely to develop cancer. Respondents' educational attainments are divided into four categories: education1: did not graduate High School; education2: graduated High School; education3: attended College or Technical School; and education4: graduated from

College or Technical School. Following existant literature, our control variables include age, race, marital status, number of children in family, annual income, sex, health care access, etc.

Linear probability Model is employed in estimations, and marginal effects from probit/logit models are similar. We use robust option of OLS to allow for heteroskedasticity.

6. Results

In this section, we present our findings relating health behaviors to cancer risk perceptions and educational attainments. Reported in Table 1, we have nearly 20,000 observations in lung cancer prevention sample and prostate cancer screening sample. The colorectal cancer screening regression consists of over 50,000 observations due to pooling. 28 percent of smokers consume cigarette everyday. A quarter of males take PSA test frequently. 19.2% of adults aged above 45 take blood stool test using a home kit during the year before interview. Interestingly, more than nine tenths MSA residents believe they are less likely to develop cancer compared to average people (risk2). Even fewer people worry about getting cancer. The majority of people have access to health insurances. Health insurance enters estimation equations because pecuniary compensation increases participation in screening for colorectal cancer (Aas, 2009).

In regressions reported in columns 1, 5, and 9 of Table 2, we exclude cancer risk perceptions in regressions. Significance of coefficients on education categories reveals that less educated smokers are more likely to be heavy smokers, and people with more years of completed schooling have larger probability to take cancer screenings advised by medical professionals. Graduating from college reduces the likelihood to be heavy smokers by 15 percentage points compared to less than 12 years of schooling. An average college graduate has significant 6 more percentage points in taking PSA in the last year, and 3 more percentage points in home kit blood test than a second school graduate.

In the other columns of Table 2, we add different cancer risk perceptions measures. Except one anomaly, higher cancer risk perceptions significantly cause persons to adopt healthier behaviors. Particularly, more worry of developing lung cancer than average would reduce heavy smoking by 21.5 percentage points; worry of prostate/colon cancer increases the probability of taking PSA test/home kit blood stool test every year by 25.9/27.6 percentage points. Incorporating risk perceptions into regression equations does not change much the magnitude and significance of coefficients on educational attainments. Therefore, the effects of education on health behaviors are robust against risk perceptions.

Note that the coefficients on risk perceptions are greater than those on education; it is likely that individual's cancer risk assessment has larger impact on healthy behaviors. However, since the variation of city level risk perceptions are around one magnitude smaller than education, we can not readily conclude that which possess more explanation power for healthy behaviors.

7. Conclusion

In this paper we investigate the separate effects of education and risk perceptions of developing cancers on health behaviors. We find that people do take perceived risks into account when deciding upon smoking and physical checkups. Due to the limitation of data employed in this paper, we are unable to include as many as control variables, such as individual's preference, in regressions. Since the role of time preference in health behaviors decision-making is likely to be correlated with risk attitude, magnitudes of our estimates may be vulnerable to robust checks. However, qualitative conclusions hold.

Our primary findings suggest policy implications whether educational effects on health behavior outperform risk perceptions effects or not. The return of education on health and health behavior is a long-standing topic in health economics; the role of risk perceptions, however, has not been adequately utilized. In light of results of this paper that higher risk perceptions give rise to healthier behaviors, health care providers and regulators are supposed to leave individuals with accurate risk perceptions of developing cancers. To achieve it, medical knowledge should be spread through public lectures, media, internet, and most importantly, communications between patients and health care providers. Providers are responsible for guiding patients to consume appropriate health services and products—treatment and prescription drugs, in two ways—making decisions in the interests of patients or let patients have enough information on health and make decisions themselves. Public health interventions are also indispensable in enhancing individual perceived risks. Next task is to identify determinants of patients' risk perceptions.

References

Aas, E., 2009. Pecuniary compensation increases participation in screening for colorectal cancer. Health Economics 18 (3), 337-354.

Berkman, L. F., 1995. The role of social relations in health promotion. Psychosomatic Medicine 57 (3), 245-254.

Cutler, D., Lleras-Muney, A., 2010. Understanding differences in health behaviors by education. Journal of Health Economics 29 (1), 1-28.

De Walque, D., 2007. Does education affect smoking behaviors? Evidence using the Vietnam draft as an instrument for college education. Journal of Health Economics 26, 877-895.

Gerking, S., Khaddaria, R., 2011, Perceptions of health risk and smoking decisions of young people. Health Economics doi: 10.1002/hec.1760.

Grimard, F., Parent, D., 2007. Education and smoking: Were Vietnam war draft avoiders also more likely to avoid smoking? Journal of Health Economics 26 (5), 896-926.

Grossman, M., 1972. On the concept of health capital and the demand for health. Journal of Political Economy 80, 223-255.

Grossman, M., 2006. Education and nonmarket outcomes. In: Hanushek, E.,Welch,F. (Eds.), Handbook of the Economics of Education, vol. 2. North-Holland, Amsterdam.

Kemptner, D., Jurges, H., Reinhold, S., 2011. Changes in compulsory schooling and the causal effect of education on health. Journal of Health Economics 30 (2), 340-354.

Kiviniemi, M.T., Orom, H., Giovino, G.A., 2011. Psychological distress and smoking behavior: the nature of the relation differs by race/ethnicity. Nicotine and Tobacco Research 13(2), 113-119.

Lange, F., 2011. The role of education in complex health decisions: Evidence from cancer screening. Journal of Health Economics 30 (1), 43-54.

Lundborg. P., Anderson H., 2008. Gender, risk perceptions, and smoking behavior. Journal of Health Economics 27, 1299-1311.

Mellor, J. M. and Freeborn, B. A. 2010. Religious participation and risky health behaviors among adolescents. Health Economics 20 (10), 1226-1240.

Nortona, E. C., Lindroothb, R. C., Ennett, S. T., 2003. How measures of perception from survey data lead to inconsistent regression results: evidence from adolescent and peer substance use. Health Economics 12, 139-148.

Rimal, R.N and Juon, H., 2010. Use of the Risk Perception Attitude Framework for Promoting Breast Cancer Prevention. Journal of Applied Social Psychology 40 (2), 287-310.

Rimal, R.N., and Real, K., 2003. Perceived Risk and Efficacy Beliefs as Motivators of Change: Use of the Risk Perception Attitude (RPA) Framework to Understand Health Behaviors. Human Communication Research 29 (3), 370-399.

Parka, G., Kang, C., 2008. Does education induce healthy lifestyle? Journal of Health Economics 27, 1516-1531.

Philips, Z., Mark Avis, M., 2007. Why do women participate in the English cervical cancer screening programme? Journal of Health Economics 26 (2), 306-325.

Tenn, S., Herman, D. A., Wendling, B., 2009. The role of education in the production of health: An empirical analysis of smoking behavior, Journal of Health Economics 29 (3), 404-417.

Viscusi, W. K., 1990. Do Smokers Underestimate Risks?. Journal of Political Economy 98 (6), 1253-1269.

Viscusi, W. K., 1991. Age Variations in Risk Perceptions and Smoking Decisions. The Review of Economics and Statistics 73 (4), 577-588.

Viscusi, W. K., Hakes, J., 2008. Risk Beliefs and Smoking Behavior. Economic Inquiry 46 (1), 45-59.

Table 1. Statistics Summary

Lung cancer		Prostate cancer		Colon cancer	
VARIABLES	**mean**	**VARIABLES**	**mean**	**VARIABLES**	**mean**
- smoke everyday	0.280	- PSA test	0.259	- home kit	0.192
Risk perceptions					
- cancer risk 1	0.111	- cancer risk 1	0.122	- cancer risk 1	0.0740
- cancer risk 2	0.0778	- cancer risk 2	0.0883	- cancer risk 2	0.0856
- cancer risk 3	0.0520	- cancer risk 3	0.0378	- cancer risk 3	0.0275
Education					
- less than high school	0.0905	- less than high school	0.0791	- less than high school	0.0903
- high school	0.279	- high school	0.224	- high school	0.268
- some college	0.278	- some college	0.236	- some college	0.253
- college+	0.352	- college+	0.461	- college+	0.389
Age					
- less than 24	0.0343	- less than 24	0.0658	- 45-54	0.231
- 25-44	0.307	- 25-44	0.396	- 55-64	0.367
- 45-64	0.433	- 45-64	0.373	- 65-74	0.229
- 65+	0.226	- 65+	0.166	- 75+	0.173
Race					
- colored	0.268	- colored	0.273	- colored	0.203
Family					
- married	0.468	- married	0.556	- married	0.500
- number of children	0.560	- number of children	0.642	- number of children	0.173
Employment					
- employed	0.586	- employed	0.715	- employed	0.463
Annual income					
- less than 20k	0.185	- less than 20k	0.127	- less than 20k	0.201
- 20k-35k	0.217	- 20k-35k	0.183	- 20k-35k	0.228
- 35k-50k	0.155	- 35k-50k	0.162	- 35k-50k	0.159
- 50k-75k	0.172	- 50k-75k	0.180	- 50k-75k	0.159
- 75k+	0.271	- 75k+	0.347	- 75k+	0.253
Gender					
- male	0.442	-	-	- male	0.399
- good health	0.806	- good health	0.868	- good health	0.786
- access to health care	0.885	- access to health care	0.870	- access to health care	0.934
Observation	18,373		16,029		54,894

Table 2. Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Smoke everyday				PSA Test				Home kit			
cancer risk1		-0.0582**				0.144*				0.0679***		
		(0.0297)				(0.0761)				(0.0261)		
cancer risk2			-0.0616*				0.276***				-0.0174	
			(0.0374)				(0.0689)				(0.0307)	
cancer risk3				-0.215***				0.259***				0.276***
				(0.0503)				(0.0683)				(0.0602)
high school	-0.00269	-0.00318	-0.00293	-0.00238	0.0289**	0.0286**	0.0291**	0.0294**	0.0120*	0.0121*	0.0119*	0.0121*
	(0.0136)	(0.0136)	(0.0136)	(0.0136)	(0.0125)	(0.0125)	(0.0125)	(0.0125)	(0.00659)	(0.00658)	(0.00659)	(0.00659)
some college	-0.0498***	-0.0497***	-0.0499***	-0.0483***	0.0283**	0.0284**	0.0287**	0.0296**	0.0281***	0.0283***	0.0281***	0.0285***
	(0.0139)	(0.0139)	(0.0139)	(0.0139)	(0.0127)	(0.0127)	(0.0127)	(0.0127)	(0.00688)	(0.00688)	(0.00688)	(0.00689)
college+	-0.152***	-0.152***	-0.152***	-0.151***	0.0603***	0.0603***	0.0604***	0.0603***	0.0329***	0.0332***	0.0328***	0.0331***
	(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0128)	(0.0128)	(0.0128)	(0.0128)	(0.00699)	(0.00699)	(0.00699)	(0.00699)

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1