Sickness and Preventive Medical Behavior

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Abstract: Using data from two sources, the Health and Retirement Study and the Medical Expenditure Panel Survey, I analyze the relationship between health status and the likelihood of engaging in medical screening and other preventive behavior. The results show that individuals who are in poorer health are more likely to get flu shots and cholesterol checks, but less likely to have mammograms, pap smears, breast exams and prostate checks. There is some evidence that suggests that psychological factors such as fear and anxiety may be important reasons why sicker people are less likely to get cancer screens.

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1. Introduction

There exists a fair amount of controversy regarding optimal policies and recommendations for preventive medical behavior (Russell 1994). A large medical and epidemiological literature documents these differences in opinion for screening of diseases such as breast cancer, prostate cancer and a variety of other conditions (Dittus et al. 2000, Gottlieb et al. 1983, Jepson et al. 2000). The potential benefits to prevention and screening are that certain illnesses may be caught early enough to be treated and cured and others may be prevented entirely. The costs to preventive behavior are manifold. First, there are the actual out-of-pocket expenditures involved. In addition, there are opportunity costs to getting tests and receiving shots in terms of time lost on the job or fasting for certain types of blood tests, such as a cholesterol check. Finally, for many types of medical screens, there are psychic costs involved with the anxiety that may be caused in learning whether one has a disease or not (Meystre-Agustoni et al. 2001). These psychic costs are further magnified given the possibility of false positive results and the fact that many recent studies have shown benefits to cancer screening to be extremely uncertain (Miller et al. 2002).

While the theoretical benefits and costs are simple to describe, it is difficult to assess the appropriate recommendations for screening and prevention because the specific benefits and costs are often not well understood. Individual perceptions of risks are often biased (Viscusi 1990), which could lead to too much or too little behavior. And even when there is agreement among physicians and health organizations as to appropriate recommendations for screening and prevention, individuals may not comply with them (Byrne and Thompson 2001). In particular, the likelihood that someone gets

her cholesterol checked or receives a mammogram (even when recommended by a doctor to) may depend on a variety of demographic factors such as age, race, education, income level, or overall health status.

Much research has been done on the predictors of screening and other preventive medical treatment. Theoretical models include those of Giuffrida and Gravelle (1998) and Byrne and Thompson (2001). Jepson et al. (2000) provide a review of the empirical literature on determinants of screening uptake and recommendations for increasing uptake. Other work in this area includes that of Mullahy (2001), who conducts an empirical analysis of the decision to get flu shots and Kahn (1999), who studies dietary habits and other health behaviors of diabetics.

The purpose of this paper is to conduct an empirical analysis of the determinants of who engages in various types of preventive behavior, with a particular emphasis on the effect of health status. I use data from two sources, the Health and Retirement Study (HRS) and the Medical Expenditure Panel Survey (MEPS), to answer the question of who engages in the following types of behavior: flu shots, cholesterol checks, mammograms, pap smears, self-administered breast exams and prostate exams. The results show that people with more education, higher incomes and insurance coverage are more likely to get all of these types of medical treatment. The results with respect to health status are mixed. Those that are in worse health are more likely to get flu shots and cholesterol checks, but less likely to get pap smears, mammograms, breast exams and prostate checks. These results can be partially explained by behavioral effects where individuals who are generally anxious or pessimistic about the future (characteristics that

are related to health status) have a high degree of anxiety about finding out results of certain medical tests.

The remainder of the paper is organized as follows. Section 2 introduces some of the issues in the analysis of medical screening and preventive care. Section 3 describes the data and empirical strategy. Section 4 presents the basic results of the study. Section 5 discusses the role of anxiety and behavioral effects and Section 6 concludes.

2. Screening and Prevention

There are many factors that could affect one's likelihood of getting preventive medical treatment. Risk factors and family history of disease would likely be a strong determinant in getting medical screening or undergoing other preventive behavior. The risks of getting diseases such as various types of cancer increase with age (Shureiqi et al. 2001). The prevalence of many conditions also depends on gender (Kreuzer et al. 2000) and race (Harris et al. 1993). Since expected benefits to screening and prevention would be higher for those that are at greater risk for a medical condition, these individuals might be more likely to engage in this behavior.

Monetary and time costs will also vary depending on an individual's economic status. Health care coverage may affect these decisions since those that are insured for these procedures will pay less out-of-pocket than those whose costs are not fully covered (Friedman et al. 2002). One's employment status may also be a predictor of screening and prevention as those that are working have higher opportunity costs of going to the doctor to get shots or receive medical tests than those that are retired. Of course, those

that are working are also more likely to have higher incomes and will be more able to afford any out-of-pocket costs that are incurred.

There are several other factors that are likely to predict screening and preventive care. Those with more education may be better informed about the potential benefits to prevention and early detection of diseases (Zubarik et al. 2000). Another factor is how much prior health care one has used. Some individuals are simply "high users" of medical care, while others may choose not to utilize health care, even when it is readily available and affordable. The disutility associated with receiving medical treatment may also vary according to characteristics such as age and gender. Finally, there may be a characteristic of people who are more inclined to engage in generally good health habits. There is some evidence that these behaviors may be highly correlated with one another so that an individual who avoids smoking, is conscious of her diet and exercises regularly will also be more likely to comply with a doctor's recommendations for medical screening and other preventive services (Fukunaga 1997 and Macrae 1984).

Of particular interest for this paper is the relationship between health status and likelihood of receiving preventive care and medical screens. Those that are generally sicker and more debilitated have a potentially higher cost to getting other diseases for several reasons. Rehabilitation and treatment will be more difficult for those who are already sick than for those who are otherwise in good health (Nordin et al. 2002). There is some evidence that there may be interaction effects such that the marginal effect of new illnesses, in terms of pain and severity, may be greater for those who are already in poor initial health (Türp et al. 2000). These factors would presumably predict more screening or preventive behavior for sicker individuals. On the other hand, it may be the

case that those that are sicker have less time to receive treatment or screens given their physical limitations.

One important distinction should be made regarding the nature of different types of medical screening and preventive care. A flu shot is quite different than a screen for cancer in the sense that the former procedure is a measure taken to prevent an illness from occurring whereas the latter is done to determine whether an individual has already developed the disease. For something like the flu, there is no need to actually test whether one has developed the illness, and the flu shot is merely preventive. A screen for cancer can be seen as both a preventive measure and a way to learn information about one's health condition, though in some cases where the cancer has progressed to advanced stages, the screen really has no preventive value. The different nature of these procedures suggests that the magnitude and/or direction of the health effects may vary according to the type of medical intervention.

3. Data and Empirical Strategy

I use two independent data sets to analyze the determinants of preventive behavior. The first is the Health and Retirement Study (HRS), conducted by the University of Michigan's Institute for Social Research. The second is the Medical Expenditures Panel Survey (MEPS), the third in a series of national probability surveys conducted by the Agency for Health Research and Quality (AHRQ). The HRS focuses on households entering retirement years, while respondents in the MEPS represent a broader age range.

The HRS is a nationally representative panel of approximately 7,000 households with a primary respondent between the ages of 51 and 61 during the first year of the survey. The first wave of the study was conducted in 1992, with subsequent waves conducted every two years, so the primary respondents represent cohorts born between 1931-1941. I use the third wave of the survey to study the predictors of usage of preventive care. Since not all years of the study contain questions regarding preventive medical care, I use a single cross-section, as opposed to implementing the full panel.[1] The survey includes detailed information on health and cognitive status, as well as a variety of economic and demographic variables.

The MEPS is another recent survey that the Agency for Healthcare Research and Quality (AHRQ) began fielding in March of 1996. The MEPS collects data on the specific health services people use, how frequently they use them, the costs of these services and the ways these costs are shared by individuals and insurance agencies. I analyze one cross section of the MEPS (the first round), which contains information on preventive medical behavior similar to the HRS.

For the sake of comparison across the two data sets, I restrict both samples to individuals between the ages of 40 and 70 and I use the same set of explanatory variables for the two sets of regressions.[2] I estimate probit regression models for both samples, where the dependent variables are dichotomous variables equal to one if an individual has had a specific type of medical procedure in the last two years. The types of procedures include pap smears and mammograms for women, prostate exams for men and flu shots

[1] Specifically, Wave 3 is the first wave that asks respondents questions about preventive medical care.
[2] The HRS is mostly comprised of people in this age range. The participants of the MEPS represent a broader age range, but for the sake of comparison across the two data sets, I focus on individuals between 40 and 70. Nonetheless, the results are similar when analyzing the full samples of each survey.

and cholesterol checks for all respondents. In addition, both surveys ask female respondents whether they undergo self-administered breast exams at least monthly. A series of standard demographic characteristics such as age, education, race, sex (for flu shots and cholesterol checks), health insurance status, and income are also included as independent variables. As discussed earlier, there may be reasons to believe that there are certain types of "high utilization" patients that are more prone to seek medical care. To account for this, I also include controls for the number of doctor's office visits and hospital stays in the past year, and dichotomous variables for whether the individual has seen a dentist in the past year and whether he or she regularly takes prescription drugs.

Of particular interest in this study is the relationship between health status and preventive care. Are sicker people more or less likely to get medical screens and seek preventive care than generally healthier people? This is an important question since getting the flu or having a new incidence of cancer may be more debilitating to people who are already in poor health. To address this question, I use several different measures of health status – self-reported health (excellent, very good, good, fair, or poor), an index of limitations in activities of daily living (ADLs) and specific medical conditions such as heart disease, lung disease and diabetes. The HRS contains information for all three of these health status measures, though the MEPS does not ask questions about specific medical conditions.

4. Basic Results

Table 1 summarizes the basic demographic information for both samples, with the HRS in column 1 and the MEPS in column 2. Even though I have restricted both

samples to individuals between the ages of 40 and 70, the HRS is more heavily represented by older people. The proportions of people engaging in various types of medical behavior are listed at the bottom of Table 1. The numbers are close across the two data sets. A little over a third of the respondents have had a flu shot in the last two years and about 70 percent have recently had their cholesterol checked. 65 percent of men in the HRS have recently had a prostate exam, while the analogous number in the MEPS is 54 percent. A slightly higher percentage of women in the MEPS have had a pap smear in the last two years relative to the women in the HRS (75 percent vs. 69 percent), while for mammograms, the reverse is true (69 percent in the MEPS vs. 71 percent in the HRS).

As a first look at the relationship between sickness and preventive behavior, Tables 2a and 2b present cross-tabs between health status and the likelihood of engaging in different types of behavior in the HRS and MEPS, respectively. Health status is measured along a self-reported scale, ranging from the best category of excellent to the worst category of poor. The general finding is that those who report to be in poorer health are more likely to get flu shots and have their cholesterol checked, but less likely to get mammograms, pap smears, breast exams and prostate exams. Though not all of the relationships are monotonic, it is interesting to note that sicker people are more likely to engage in certain types of medical behavior, but less likely to engage in other types. These results are consistent across the two surveys.

What accounts for the differences in the relationships between health and these various types of behavior? To further explore this question, I turn to a regression framework and control for various demographic characteristics, including age, education,

race, insurance status and an individual's propensity to receive medical care. Table 3a presents the results for the HRS. In general, more educated people and those with health insurance and higher incomes are more likely to have each of these procedures done (coefficients not shown in the table). Preventive behavior is also positively related to the number of doctor's office visits in the last year, as well as the likelihood of regularly seeing a dentist or taking prescription drugs. Older people are more likely to get cholesterol checks, prostate exams, mammograms and pap smears. Meanwhile, blacks are less likely to get flu shots, but more likely to have pap smears, mammograms and breast exams.[3]

Those that are classified as "sick" (being in either fair or poor self-reported health) are more likely to receive flu shots and less likely to get pap smears, breast exams, mammograms and prostate checks, ceteris paribus. All of these coefficients are statistically significant at the 5% level. Sicker people are not more or less likely to get their cholesterol checked. The probit coefficients imply that being in fair or poor health increases the probability of getting a flu shot by 5 percentage points and decreases the probability of getting a pap smear, mammogram, breast exam or prostate exam by 8, 4, 7 and 7 percentage points, respectively. The magnitudes of these effects are large and imply that even after controlling for a series of other characteristics, health status is a significant predictor of screening and preventive behavior.

I report results of the same analysis using data from the MEPS in Table 3b. The results with respect to age, income, insurance status and general health care utilization (coefficients not shown) are similar to those using the HRS data. Although those in fair or poor self-reported health are significantly more likely to get flu shots and cholesterol

[3] The full tables, with all regression coefficients, are available from the author upon request.

checks, health status is not significantly related to the likelihood of getting various cancer screens. Specifically, the calculated marginal effects (not shown in the tables) imply that being sick increases one's likelihood of getting a flu shot by 7.3 percentage points and getting a cholesterol check by 7.4 percentage points. While the results are not exactly the same across the two samples, they strongly suggest that the relationships between health status and the likelihood of receiving screening and preventive care are different for different types of procedures.

While the validity of self-reported general health measures has been well documented (Idler and Benyamini 1997), I have tested whether the relationships hold for other measures of health status. I construct an index to measure the number of limitations for basic activities of daily living (ADLs) that a person reports having. An individual is classified as having a limitation if he or she reports having at least some difficulty performing the specific activity. The index is then computed by adding up the number of limitations.[4] The second panel of Table 3a presents the results of regressions using an index of limitations of ADLs as the independent variable of interest. Consistent with the results of the top panel of Table 3a, those with a higher index (more limitations) are more likely to get flu shots and less likely to get pap smears, breast exams, mammograms and prostate checks, with each of these coefficients significant at the 5% level. The ADL coefficient in the regression for cholesterol checks is not statistically significant. The probit coefficients imply that a one standard deviation increase in the ADL index increases the probability of getting a flu shot by 1.5 percentage points but decreases the

[4] I have experimented with several different ways of constructing the index and the results are not sensitive to the way it is defined.

probability of getting a mammogram by 3.1 percentage points. The same pattern of results hold for the MEPS sample in Table 3b.

As a final check for the robustness of the results, I use chronic medical conditions as the relevant measure of health status. The MEPS does not provide information on specific diseases, so only HRS data is used for this specification. The specific conditions used include lung disease, heart disease and diabetes. The bottom panel of Table 3a shows these regression results. Once again, the main results are similar to what was found earlier.

5. Anxiety and Behavioral Effects

Taken together, these results show that sicker individuals are more likely to undergo certain types of medical behavior, but less likely to undergo others. The reasons for this are unclear. The intuition that sicker people have more to lose when getting another condition leads one to believe that they would be more likely to engage in screening and preventive behavior. Why should those in poorer health be less inclined to engage in cancer screening? One possibility is that when a sick person comes into a doctor's office for a specific reason, the physician may wish to address that particular problem, and cancer screening becomes less of a pressing issue. The expected benefits to other types of medical intervention for those that already have other conditions may be much higher than the benefits to cancer screening. In particular, some recent studies have shown that breast and prostate cancer screening do not significantly reduce mortality (Miller et al. 2002 and Paci et al. 2002), so the uncertainty of the benefits makes screening even less attractive.

Another possibility is that people's discount rates vary according to health status. Carrillo and Mariotti (2000) present a model of "strategic ignorance", where they argue that in some situations, "people may prefer to stay away from available information, fearing the impact that a change of belief could have on their behavior." In their model, a consumer is viewed as a collection of several different "incarnations" with conflicting goals. Consumption in a specific period increases one's instantaneous utility, but causes negative externalities on the utility of future incarnations. Individuals are assumed to have preferences that are dynamically inconsistent such that current payoffs are overweighted relative to future rewards. In this setting, flu shots, which have an immediate benefit, are relatively more valued than cancer screens, which on average help in the future. If sicker individuals discount the future more than healthy people, this may explain why they are more willing to get a flu shot, but less willing to get a cancer screen.

An alternative possibility deals with the issue of non-compliance due to fear or anxiety associated with learning information. It is well known that many patients do not adhere to the recommendations of their physicians, in particular with regards to medical screening. Perhaps sicker people are less likely to comply with their physician's recommendation for cancer screening because they are more afraid of learning about their condition. Many studies have shown that not all individuals want or even benefit from medical information. Miller and Mangan (1983) show that for individuals about to undergo a colonoscopy, more information about this medical procedure actually raises their level of anxiety. In a study by Lerman et al. (1998), subjects were given a blood test that was analyzed for the presence of genetic mutations that indicate higher likelihood of developing breast cancer. Only 60% of the participants in the study chose to receive the

information, while the remainder of the individuals declined. There is additional evidence that suggests that high levels of anxiety may be associated with lower levels of compliance with self-examination guidelines in women with a family history of breast cancer (see Kash et al. 1992 and Kash and Dabney 2001). Hailey et al. (2000) show that relative to a comparison group, women with a family history of breast cancer have more negative attitudes and much higher levels of anxiety about the disease.

Caplin and Leahy (2001) present a theoretical extension to expected utility theory to model situations where agents experience feelings of anticipation prior to the resolution of uncertainty. In this setting, patients may be reluctant to go to the doctor or undergo medical screens to avoid information that makes them anxious. In the context of this model, there is more anxiety associated with greater uncertainty. In particular, sicker people may be more pessimistic about their chances of survival and may even "choose" to remain ignorant about whether they have developed a condition or not. Individuals who believe that getting cancer will severely limit their ability to function on a daily basis may be fearful of getting a cancer screen. This model may help explain why there is anxiety associated with cancer screens, but not with flu shots. Receiving a flu shot does not reveal information in the same way a cancer screen does. A flu shot is purely a preventive measure and does not yield any information about one's current health condition, while a cancer screen can viewed as providing both prevention and information. As mentioned earlier in the paper, when cancer has advanced to later stages, there may actually be little or no preventive value of the screen, as it merely provides information about one's health status. Thus a flu shot offers the value of prevention, which presumably yields a relatively higher marginal benefit for sicker people, without

causing any anxiety. Meanwhile, cancer screens may induce a high amount of anxiety, yet provide very little preventive benefit.

To determine whether there are psychological reasons for not getting screens (e.g. fear of learning about having a disease), I explore potential linkages between screening and expectations about the future. The HRS asks a series of questions that attempt to ascertain the degree of pessimism of an individual. Some of these questions include, "What do you think the chances are that the U.S. economy will exhibit a major depression sometime in the next 10 years or so?", "How about the chances that Congress will change Social Security so that it becomes less generous than now?", and "How about the chances that the U.S. economy will experience double-digit inflation in the next 10 years or so?" While an index for pessimism in the economy is merely a proxy for one's expectations of health status, there is some evidence that shows high correlations between various types of indices of pessimism.[5] I generate an index of pessimism from these questions and test to see whether the effect of poor health is different according to the measure of the index.[6] I use two different dichotomous variables for poor self-reported health. The first variable, *sick1* is equal to one if an individual reports being in fair or poor health and is pessimistic (the index is greater than the median value). The second variable, *sick2* is equal to one if an individual is in fair or poor health and the pessimism index is below the median. If poor health causes one to be afraid of getting cancer screens primarily through the effect that this has on expectations about the future, then

[5] Early studies that document strong relationships between different types of indices for pessimism (such as ones for health and economic conditions) include Youmans (1961) and Neugarten (1962).

[6] The results are not sensitive to the way the index is generated. An alternative strategy would be to simply enter health and the index of pessimism as separate regressors to see the extent that the health status effect is reduced or eliminated. However, it is plausible that one's degree of pessimism would not only affect the probability of engaging in certain types of medical behavior, but also be related to the slope of the health coefficient.

these two coefficients should be statistically different from one another, with only the *sick1* coefficients being significant. However, there should not be significant differences between these coefficients for flu shots and cholesterol checks. Table 4 presents the results of these regressions. For both flu shots and cholesterol checks, one cannot reject the hypothesis that the two coefficients, (*sick1* and *sick2*) are the same. The corresponding p-values of these t-tests are 0.135 and 0.323.

For three of the four regressions regarding cancer screening (breast exam, mammogram and prostate exam), the coefficients on *sick1* are more negative than the coefficients on the *sick2* variable. And for two of the regressions (breast exam and prostate exam), I reject the hypothesis that the coefficients on *sick1* and *sick2* are equal (p-values of 0.016 and 0.006, respectively). Poor health decreases the likelihood of women having monthly breast exams and men having prostate checks only for those individuals who have pessimistic expectations about the future. These results suggest that psychological factors may be an important channel through which sickness affects the probability of engaging in certain types of preventive behavior. That anxiety affects the likelihood of obtaining cancer screens but not other types of preventive behavior is consistent with a psychological expected utility model in the spirit of Caplin and Leahy (2001). The prospect of learning about having cancer is presumably more stress inducing than learning about the potential of high cholesterol. The associated uncertainty and negative consequences are much greater for cancer. In addition, pessimistic people will have a relative preference for procedures that have preventive value, without providing stressful information about one's current or future health status. Of course, the constructed index is only a proxy for one's pessimism and expectations and cannot truly

measure the entire extent of this phenomenon. Perhaps there are other factors involved that are difficult to measure, but at the very least, the evidence suggests that there are behavioral effects involved in the decision to get cancer screens.

6. Conclusions

This paper has shown health status to be a strong determinant in who undergoes screening and preventive medical behavior, but the direction of these effects vary according to the type of behavior. Controlling for a series of demographic characteristics, insurance status, and propensity to utilize medical care, generally sicker people are more likely to receive flu shots and cholesterol checks, but less likely to have mammograms, pap smears, breast exams and prostate exams. These results are consistent across two different data sets, the Health and Retirement Study and the Medical Expenditure Panel Survey. The results hold for a variety of measures of health status.

These results may stem from the difference in the various procedures. Flu shots are purely preventive, and do not yield information about one's present or expected future health status, whereas a cancer screen gives information about whether one has the disease or not. There may be fear and anxiety associated with learning whether one has cancer, whereas with the flu, one is merely hoping to prevent a fairly routine illness. Some theoretical models and empirical evidence support this notion. This type of avoidant behavior has implications for health policy and health care costs. Recently, there have been attempts to develop alternative formats for supplying medical information to the general population (Kahn 1999). Jepson et al. (2000) review the

literature on screening and uptake and find that certain interventions such as invitation appointments, letters and telephone calls are effective at increasing uptake. This may prove useful given some of the anxiety associated with medical screening. Specifically, these efforts to increase uptake should be focused on the types of behavior (such as cancer screens) that are most prone to these types of avoidance and less on routine procedures such as flu shots and cholesterol checks, which do not seem to present the same problems.

References

Byrne, M.M. and Thompson, P. (2001), "Screening and Preventable Illness," *Journal of Health Economics* 20(6): 1077-1088.

Caplin, A. and Leahy, J. (2001), "Psychological Expected Utility Theory and Anticipatory Feelings," *Quarterly Journal of Economics* 116(1): 55-79.

Carrillo, J.D. and Mariotti, T. (2000), "Strategic Ignorance as a Self-Disciplining Device," *Review of Economic Studies* 67(3): 529-544.

Dittus, R.S., Ness, R.M., Klein, R.W., and Holmes, A.M. (2000), "Cost Effectiveness of Colorectal Cancer Screening in the Elderly," in: Proceedings of the Annual Meetings on Society of General Internal Medicine.

Friedman, C., Ahmed, F., Franks, A., Weatherup, T., Manning, M., Vance, A., Thompson, B.L., "Association Between Health Insurance Coverage of Office Visit and Cancer Screening Among Women," *Medical Care* 40(11): 1060-1067.

Fukunaga, I., Jitsunari, F., Takeda, N., Asakawa, F., Maruyama, Y. (1997), "A Study of Health Behavior of the Elderly – Correlation Between Participation in Health Examinations and Health Behavior," *Japanese Journal of Hygiene* 52(2): 490-503.

Giuffrida, A. and Gravelle, H. (1998), "Paying Patients to Comply: An Economic Analysis," *Health Economics* 7(7): 569-579.

Gottlieb, L.K., Schwartz, B. and Pauker, S.G. (1983), "Glaucoma Screening: A Cost Effectiveness Analysis," *Survey of Ophthalmology* 28(3): 206-226.

Hailey, B.J., Carter C.L. and Burnett, D.R. (2000), "Breast Cancer Attitudes, Knowledge, and Screening Behavior in Women With and Without a Family History of Breast Cancer," *Health Care for Women International* 21(8): 701-715.

Harris, R.E., Zang, E.A., Anderson, J.I., Wynder, E.L. (1993), "Race and Sex Differences in Lung Cancer Risk Associated with Cigarette Smoking," *International Journal of Epidemiology* 22(4): 592-599.

Idler, E.L. and Benyamini, Y. (1997), "Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies," *Journal of Health and Social Behavior* 38(1): 21-37.

Jepson, R., Clegg, A., Forbes, C., Lewis, R., Snowden, A. and Kleijnen, J. (2000), "The Determinants of Screening Uptake and Interventions for Increasing Uptake: A Systematic Review," *Health Technology Assessment* 4(14): i-vii, 1-133.

Kahn, M. (1999), "Diabetic Risk Taking: The Role of Information, Education, and Medication," *Journal of Risk and Uncertainty* 18(2): 147-164.

Kash, K.M. and Dabney, M.K. (2001), "Psychological Aspects of Cancer Screening in High-Risk Populations," *Medical and Pediatric Oncology* 36(5): 519-524.

Kash K.M., Holland, J.C., Halper M.S. and Miller D.G. (1992), "Psychological Distress and Surveillance Behaviors of Women with a Family History of Breast Cancer," *Journal of the National Cancer Institute* 84(1): 24-30.

Kreuzer, M., Boffetta, P., Whitley, E. (2000), "Gender Differences in Lung Cancer Risk by Smoking: A Multicentre Case-Control Study in Germany and Italy," *British Journal of Cancer* 82(1): 227-233.

Macrae, F.A., Hill, D.J., St. John, D.J., Ambikapathy, A., Garner, J.F. (1984), "Predicting Colon Cancer Screening Behavior from Health Beliefs," *Preventive Medicine* 13(1): 115-126.

Meystre-Agustoni, G., Paccaud, F., Jeannin, A., and others (2001) "Anxiety in a Cohort of Swiss Women Participating in a Mammographic Screening Programme" *Journal of Medical Screening* 8(4): 213-219.

Miller, A.B., To, T., Baines, C.J. (2002), "The Canadian National Breast Screening Study-1: Breast Cancer Mortality After 11 to 16 years of Follow-up. A Randomized Screening Trial of Mammography in Women Age 40 to 49 Years," *Annals of Internal Medicine* 137(5): 305-312.

Mullahy, J. (1999), "It'll Only Hurt a Second? Microeconomic Determinants of Who Gets Flu Shots," *Health Economics* 8(1): 9-24.

Neugarten, B.L. (1962), "A Measure of Mental Health In Old Age," *Hygiene Mentale* 51(2): 65-69.

Nordin, M., Hiebert, R., Pietrek, M., Alexander, M., Crane, M., Lewis, S. (2002), "Association of Comorbidity and Outcome in Episodes of Nonspecific Low Back Pain in Occupational Populations," *Journal of Occupational and Environmental Medicine* 44(7): 677-684.

Paci, E., Giorgi, D., Bianchi, S., Vezzosi, V., Zappa, M., Crocetti, E., Rosselli del Turco, M. (2002), "Assessment of the Early Impact of the Population-Based Breast Cancer Screening Programme in Florence (Italy) Using Mortality and Surrogate Measures," *European Journal of Cancer* 38(4): 568-573.

Russell, L.B. (1994) *Educated Guesses: Making Policy About Medical Screening Tests* (University of California Press, Berkeley, CA).

Shureiqi, I., Cooksley, C.D., Morris, J., Soliman, A.S., Levin, B., Lippman, S.M. (2001), "Effect of Age on Risk of Second Primary Colorectal Cancer," *Journal of the National Cancer Institute* 93(16): 1264-1266.

Türp, J.C., Kowalski, C.J., Stohler, C.S. (2000), "Generic Pain Intensity Scores are Affected by Painful Comorbidity," *Journal of Orofacial Pain* 14(1): 47-51.

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

Youmans, E. (1961), " Pessimism Among Older Rural and Urban Persons," *Journal of Health and Human Behavior* 2: 132-137.

Zubarik, R., Eisen, G., Zubarik, J., Teal, C., Benjamin, S., Glaser, M., Jack, M. (2000), "Education Improves Colorectal Cancer Screening by Flexible Sigmoidoscopy in an Inner City Population," *The American Journal of Gastroenterology* 95(2): 509-512.

Table 1: Summary Statistics

Variable	HRS	MEPS
Age	59.13	52.21
Education	12.19	12.56
Proportion Black	0.16	0.12
Proportion Female	0.56	0.53
Median Household Income	37,483	36,241
Proportion Engaging in Preventive Behavior (last 2 years)		
Flu Shot	0.37	0.35
Cholesterol Check	0.70	0.70
Pap Smear	0.69	0.75
Breast Exam	0.63	0.79
Mammogram	0.71	0.69
Prostate Exam	0.65	0.54
N	10,332	6,995

Notes: Data source in first column is Wave 3 of the Health and Retirement Study. Data source in second column is round 1 of the Medical Expenditure Panel Survey.

Table 2a: Self-Reported Health Status and Preventive Behavior (HRS)

	Self-Reported Health Status				
	Excellent	Very Good	Good	Fair	Poor
Proportion Engaging in Preventative Behavior					
Flu Shot	0.30	0.36	0.36	0.41	0.49
	(0.46)	(0.48)	(0.48)	(0.49)	(0.50)
Cholesterol Check	0.65	0.69	0.70	0.74	0.73
	(0.48)	(0.46)	(0.46)	(0.44)	(0.44)
Pap Smear	0.76	0.71	0.68	0.62	0.59
	(0.42)	(0.46)	(0.47)	(0.48)	(0.49)
Breast Exam	0.63	0.63	0.63	0.63	0.63
	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)
Mammogram	0.77	0.73	0.71	0.67	0.62
	(0.42)	(0.45)	(0.48)	(0.47)	(0.49)
Prostate Exam	0.66	0.67	0.66	0.64	0.58
	(0.48)	(0.47)	(0.48)	(0.48)	(0.50)

Note: Data source is Wave 3 of the Health and Retirement Study.
Standard errors are in parentheses.

Table 2b: Self-Reported Health Status and Preventive Behavior (MEPS)

	Self-Reported Health Status				
	Excellent	Very Good	Good	Fair	Poor
Proportion Engaging in Preventative Behavior					
Flu Shot	0.30	0.33	0.35	0.44	0.45
	(0.46)	(0.47)	(0.48)	(0.50)	(0.50)
Cholesterol Check	0.65	0.71	0.72	0.77	0.81
	(0.48)	(0.46)	(0.45)	(0.42)	(0.39)
Pap Smear	0.79	0.78	0.70	0.71	0.67
	(0.40)	(0.42)	(0.46)	(0.45)	(0.47)
Breast Exam	0.83	0.81	0.76	0.79	0.74
	(0.38)	(0.39)	(0.42)	(0.41)	(0.44)
Mammogram	0.73	0.71	0.66	0.68	0.62
	(0.44)	(0.45)	(0.47)	(0.47)	(0.49)
Prostate Exam	0.51	0.55	0.55	0.57	0.54
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)

Note: Data source is round 1 of the Medical Expenditure Panel Survey
Standard errors are in parentheses.

Table 3a: Self-Reported Health Status and Preventive Behavior
Dependent Variable is Probability of Engaging in Preventive Behavior (HRS)

Explanatory Variable for Illness	Flu Shot		Cholesterol Check		Pap Smear		Breast Exam		Mammogram		Prostate Exam	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Self-Reported Measure												
Sick	0.223	0.139	0.163	0.016	-0.266	-0.229	-0.005	-0.112	-0.223	-0.220	-0.122	-0.193
	(0.030)	(0.037)	(0.032)	(0.041)	(0.041)	(0.052)	(0.041)	(0.050)	(0.041)	(0.053)	(0.046)	(0.057)
Controls for Individual Characteristics and Utilization?	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
Limitations on ADLs												
ADL index	0.047	0.020	0.037	-0.005	-0.040	-0.038	0.005	-0.016	-0.033	-0.045	-0.001	-0.024
	(0.005)	(0.007)	(0.006)	(0.007)	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.009)	(0.009)	(0.011)
Controls for Individual Characteristics and Utilization?	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
Specific Chronic Conditions												
Diabetes	0.233	0.150	0.341	0.170	-0.179	-0.211	0.098	0.027	-0.079	-0.124	0.257	0.104
	(0.037)	(0.041)	(0.042)	(0.047)	(0.053)	(0.059)	(0.054)	(0.058)	(0.054)	(0.061)	(0.056)	(0.064)
Heart Disease	0.287	0.158	0.489	0.327	-0.051	-0.074	0.123	0.060	0.071	-0.007	0.153	-0.083
	(0.035)	(0.037)	(0.040)	(0.044)	(0.052)	(0.057)	(0.052)	(0.055)	(0.053)	(0.059)	(0.050)	(0.056)
Lung Disease	0.381	0.324	0.040	-0.061	-0.155	-0.155	-0.011	-0.035	-0.164	-0.215	0.115	0.159
	(0.044)	(0.047)	(0.048)	(0.052)	(0.060)	(0.066)	(0.060)	(0.064)	(0.061)	(0.067)	(0.069)	(0.076)
Controls for Individual Characteristics and Utilization?	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
N	10,316	10,090	10,303	10,076	5,737	5,581	5,736	5,581	5,737	5,581	4,582	4,508

Notes: Coefficients are obtained using probit estimation. The variable "sick" is equal to one if an individual reports being in fair or poor health. The ADL index is obtained by adding the number of activities of daily living a person reports having trouble performing. The ADLs from the HRS include walking several blocks, sitting for two hours, getting up from a chair, climbing stairs, stooping, reaching above the shoulders, pushing large objects and lifting heavy objects. Standard errors are in parentheses.

Table 3b: Self-Reported Health Status and Preventive Behavior
Dependent Variable is Probability of Engaging in Preventive Behavior (MEPS)

Explanatory Variable for Illness	Flu Shot		Cholesterol Check		Pap Smear		Breast Exam		Mammogram		Prostate Exam	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Self-Reported Measure												
Sick	0.306	0.197	0.285	0.240	-0.168	-0.052	-0.084	0.056	-0.095	0.001	0.059	-0.001
	(0.040)	(0.049)	(0.045)	(0.055)	(0.057)	(0.070)	(0.060)	(0.075)	(0.056)	(0.069)	(0.061)	(0.077)
Controls for Individual Characteristics and Utilization?	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
Limitations on ADLs												
ADL index	0.076	0.017	0.084	0.033	-0.022	-0.024	-0.006	-0.021	-0.005	-0.031	0.036	-0.009
	(0.010)	(0.012)	(0.011)	(0.014)	(0.013)	(0.016)	(0.014)	(0.017)	(0.013)	(0.016)	(0.016)	(0.020)
Controls for Individual Characteristics and Utilization?	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
N	6,810	6,721	6,624	6,546	3,531	3,497	3,548	3,512	3,538	3,500	3,029	2,998

Notes: Coefficients are obtained using probit estimation. The variable "sick" is equal to one if an individual reports being in fair or poor health. The ADL index is obtained by minutes, climbing stairs, stooping, reaching above the shoulders, and using fingers to grasp things. Standard errors are in parentheses.

Table 4: Self-Reported Health, Pessimism and Preventive Behavior (HRS)
Dependent Variable is Probability of Engaging in Preventive Behavior

Explanatory Variable	Flu Shot	Cholesterol	Pap Smear	Breast Exam	Mammogram	Prostate
Sick 1	0.061	0.000	-0.079	-0.059	-0.081	-0.095
	(0.015)	(0.015)	(0.020)	(0.021)	(0.020)	(0.023)
Sick 2	0.020	0.026	-0.098	0.031	-0.047	0.016
	(0.026)	(0.024)	(0.036)	(0.036)	(0.035)	(0.037)
Controls for Individual Characteristics and Utilization?	Yes	Yes	Yes	Yes	Yes	Yes
p-value of t-test that sick1 = sick2	0.135	0.323	0.630	0.017	0.333	0.006
N	10,057	10,043	5,571	5,571	5,570	4,486

Notes: The "Sick 1" variable is equal to one if the self-reported health is fair or poor and the index of pessimism is greater than the median. The "Sick 2" variable is equal to one if the self-reported health is fair or poor and the index of pessimism is less than the median. Coefficients are obtained using probit estimation. Standard errors are in parentheses.