



What Good Is Wealth Without Health?

The Effect of Health on the Satisfaction Derived from Consumption

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Introduction

It has long been hypothesized that a person's health status could have an important effect on the satisfaction he derives from the consumption of goods and services. Though this connection between health status and satisfaction from consumption has implications for a wide range of important economic behaviors, there has been relatively little empirical work on how the satisfaction from additional consumption depends on the state of a person's health. Standard practice in applied work is to assume that the satisfaction a person derives from consumption is not dependent on the state of his health, or, in other words, to assume that the satisfaction from consumption is "state independent." For example, state independence is routinely assumed by papers that estimate the demand for (or value of) health-related insurance products such as acute health insurance, long term care insurance, annuities, or disability insurance, despite the fact that even a moderate amount of state dependence can have a substantial effect on the outcomes of these calculations.

Moreover, the direction of any potential state dependence is ambiguous, so it is unclear whether one's satisfaction from additional

consumption, otherwise known as one's marginal utility of consumption, decreases or increases depending on the state of one's health. On the one hand, a person could value consumption less with deteriorating health, as many consumption goods – such as travel – are complements to good health. On the other hand, a person could value consumption more with deteriorating health, as many other consumption goods – such as prepared meals or assistance with self-care – are substitutes for good health.

In our analysis, we adopt an approach in which we compare how the difference between individual satisfaction in healthy and sick states of the world varies with consumption. When consumption increases, if there is an increase in the difference between the satisfaction one derives from goods and services when one is in good health, and the satisfaction one derives from goods and services when one is in poor health (as in Figure 1A below), we infer that the satisfaction from additional consumption declines as health deteriorates, a phenomenon we refer to as negative state dependence. By contrast, if when consumption increases there is a decrease in the difference between the satisfaction one derives from

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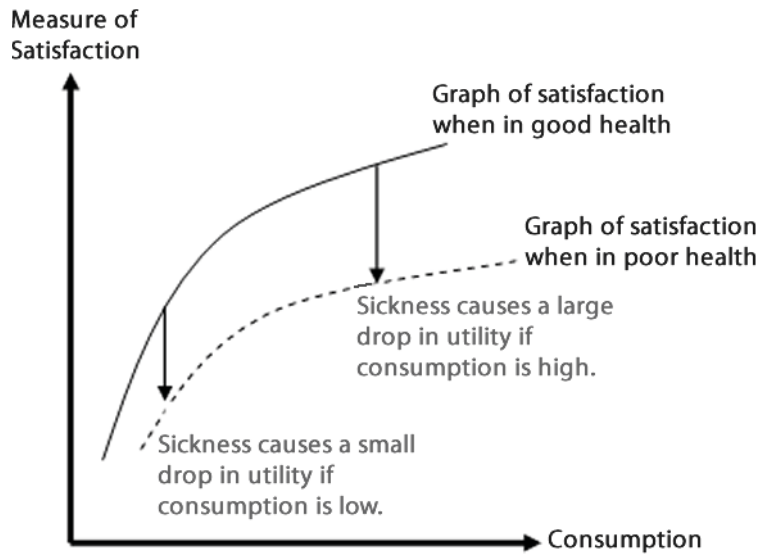
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Figure 1a: Additional Satisfaction Declines with Sickness



goods and services when one is in good health, and the satisfaction one derives from goods and services when one is in poor health (as in Figure 1B), we conclude that the additional satisfaction from consumption increases as health deteriorates, which we refer to as positive state dependence. Moreover, we can quantify the magnitude of any state-dependent satisfaction by measuring the change in the difference in satisfaction across health states at different consumption levels.

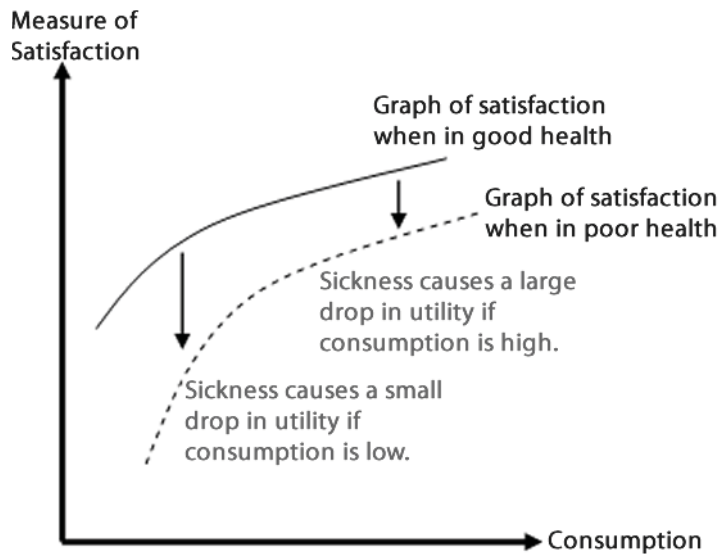
There are two key practical challenges to empirically implementing this conceptually straightforward approach. First, data with broad-based consumption measures are notoriously scarce, and none contains the health and demographic variables also needed for our analysis. We therefore use estimates of how additional satisfaction from *permanent income* (data for which is more widely available) varies with health status to help us determine how additional satisfaction from *consumption* varies with health status. Second, our approach requires a valid estimate for

the satisfaction an individual derives from his consumption. In our context, we use a measure of subjective well-being (SWB), which is determined by whether or not the individual agrees with the statement “much of the time during the past week I was happy.”

Using a wide range of statistical specifications, we find evidence that the satisfaction from additional consumption declines as health deteriorates, or, in other words, the satisfaction one derives from consumption decreases when one is less healthy. Our central estimate is that, relative to satisfaction derived from consumption when the individual has no chronic diseases, a one-standard-deviation increase in an individual’s number of chronic diseases is associated with an 11 percent decline in the satisfaction received from additional consumption.

To illustrate the potential implications of these findings, we examine the impact of our central estimate on simple calculations to determine the optimal level of health insurance

Figure 1b: Additional Satisfaction Increases with Sickness



benefits and of life-cycle savings. Our results suggest that, relative to the standard practice of assuming state independence, accounting for our estimate of state dependence lowers the optimal share of medical expenditures reimbursed by health insurance by about 20 to 45 percentage points, and lowers the optimal fraction of earnings saved for retirement by about 1 percentage point (or 4 percent). These results imply two things. First, because a person's desire for consumption decreases as one becomes less healthy, he will be able to spend more money on health care rather than other goods, which would imply that health insurance companies should cover less medical expenses. Second, since in retirement one might be more likely to be sick, and thus enjoy consumption in later years less, it is better for one to save less for retirement and instead consume more when one is healthy. Of course, considerable caution should be exercised when using the results of our extremely stylized

calculations. Nonetheless, at a qualitative level, they underscore the likely importance of the state dependence that we detect, and call into question calculations which ignore the existence of state dependence.

Empirical Approach

Figures 1A and 1B illustrate the intuition behind our empirical approach: if sickness causes a larger decline in satisfaction for individuals with higher consumption than for individuals with lower consumption, it follows that the satisfaction graph for good health must be steeper than the one for poor health, which means that the satisfaction from additional consumption falls in poor health. In other words, one enjoys additional consumption less when one is sick. Conversely, if the drop in satisfaction is smaller at higher levels of consumption, the satisfaction from additional consumption increases in poor health.

If information on health, consumption, and an estimate of satisfaction were easily observed and readily available in a dataset, we could directly and straightforwardly estimate how the satisfaction from consumption varies with health. We would simply regress the satisfaction variable on consumption, health, and the interaction of consumption and health; the coefficient on the interaction term between consumption and health would give an estimate of state-dependent satisfaction. In practice, however, we know of no panel dataset with a sufficient sample size that contains information on consumption, health, and measures of satisfaction.

Thus, we use the Health and Retirement Study (HRS), a nationally representative panel of the elderly and near-elderly, in which the original HRS cohort was surveyed in 1992 and every two years thereafter. Thus, each observation represents a person for a given year, and we refer to our observations as “person-years.” The HRS contains data on permanent income as well as detailed health measures, such as information about whether the person is suffering from hypertension, diabetes, cancer, heart disease, chronic lung disease, stroke or arthritis. On average, a person in our sample has chronic 1.95 diseases. For our satisfaction estimate variable, we use the response to the question: “Much of the time during the past week I was happy. (Would you say yes or no?),” and we code this as an indicator variable HAPPY in which an affirmative answer is given the value 1. On average, 87 percent of person-years respond in the affirmative.

We then select a baseline sample: individuals (and their spouses) aged 50 and older who are not in the labor force – so that deteriorations in health do not have a direct effect on current income – and individuals who have health insurance, to avoid the direct impact of health on consumption through its effect on medical expenditures. The resulting sample of 45,447

person-years contains an average of about 4 observations from 11,514 unique individuals. The average age of an individual in our sample is 72. The sample is 63 percent female and 87 percent white. About three-fifths of the person-years are married.

Relative to satisfaction derived from consumption when the individual has no chronic diseases, a one standard-deviation increase in an individual’s number of chronic diseases is associated with an 11 percent decline in the satisfaction received from additional consumption.

We use this data to determine whether the probability that an individual is happy depends on his permanent income, number of chronic diseases, and the interaction between permanent income and the number of chronic diseases. The model controls for any time-invariant personal characteristics that are not related to permanent income and also for a number of time varying individual characteristics, such as household size, marital status, and age. If the estimate on the interaction term (number of diseases x permanent income) is negative, this implies that permanent income increases happiness less for individuals who have more diseases. Our model shows that a negative estimate on the interaction term corresponds to a situation in which satisfaction from additional consumption falls with sickness. This result from the model is valid under the assumption that consumption in the sick state is pre-determined; or, in other words, that health shocks do not lead to changes in consumption. We later show empirical evidence that this assumption holds in our data set.

Baseline Analysis

Our regression results show that self-reported happiness decreases with the number of diseases present and increases with permanent income level. In particular, for someone of average permanent income, an increase of one chronic disease is associated with a 1.1 percentage point decline in the probability that the individual is happy. On the other hand, a 10 percent increase in permanent income is associated with a 0.48 percentage point increase in the probability an individual reports that he is happy most of the time in the past week.

The key finding of the regression is that the estimate on the interaction effect between permanent income and the number of diseases is negative and significant. In other words, we find that the satisfaction from additional permanent income declines as health worsens. Under the assumption of pre-determined consumption, this finding implies that the satisfaction from additional consumption falls with declines in health. There are several ways to quantify this finding. For a healthy person (i.e., someone with no diseases), acquiring one chronic disease is associated with a 17.9 percent decline in the satisfaction from additional consumption. Likewise, a one-standard-deviation increase in the number of diseases is associated with an 11.2 percent decline in additional satisfaction for a previously healthy individual; this is the empirical counterpart to the stylized picture in Figure 1A of satisfaction curves “fanning out”.

Additional Analysis

The initial finding of negative state dependence merits several checks for robustness. For example, the results are not sensitive to excluding the demographic controls. We continue to estimate negative and significant state dependence if we replace our permanent income measure with, respectively, education

and wealth, which are other reasonable proxies for consumption opportunities. The magnitude of our estimate of state dependence is slightly larger than in the baseline estimate.

Since three-fifths of our sample is married, our estimates are potentially confounded by correlations in health changes within a couple

Because a person’s desire for consumption decreases as one becomes less healthy, he will be able to spend more money on health care rather than other goods, which would imply that health insurance companies should cover less medical expenses.

and any effects that spousal health has on one’s own satisfaction from additional consumption. When we restrict attention to individuals who are single across the entire time frame, which is only 30 percent of our original sample, the estimate of state dependence is still negative, although no longer significant. Interestingly, the results suggest that while a deterioration in spousal health has a similar impact on your overall satisfaction as a deterioration in own health, a deterioration in spousal health has no detectible effect on your satisfaction from additional consumption.

Finally, we continue to obtain negative and (usually) significant estimates of state dependence if, instead of our baseline measure of the number of chronic diseases, we use other standard measures of health, including limitations to activities of daily living (ADLs), limitations to instrumental activities of daily living (IADLs), other functional limitations (OFLs), and a health index measure in which we sum the three limitation measures and the individual’s reported pain score.

Threats to Validity

Measurement Error in the Estimate of Satisfaction by Permanent Income and Health

There is no doubt that there is considerable measurement error in Subjective Well Being measures when we use them as estimates of satisfaction. It is well documented that answers to these questions can be sensitive to wording, framing, question order, social desirability, or the way the respondent processes the question. At the same time, however, there is growing evidence that measures of self-reported well-being are meaningful: people who rate themselves as happy are more likely to be rated happy by others, self-reports of happiness correlate in the expected direction with objective life circumstances, and so on.

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Random measurement error does not bias our estimate of state dependence. In particular, it is not a problem for our inferences if measurement error in individuals' responses is correlated with observed or unobserved characteristics of the individual. It is also not a problem if any such measurement error is correlated with an individual's health. The key assumption for the validity of our analysis is that a given change in underlying satisfaction associated with a given change in health maps into the same change in the latent variable corresponding to our estimate of satisfaction at different levels of permanent income.

In a similar vein, we explore the sensitivity of our results to a variety of other estimates of satisfaction. In addition to the estimate of satisfaction (the subjective well-being question "Much of the past week I felt happy (yes or no)?") the HRS contains seven other items from the CES-D depression scale. These items have a similar format; but instead of "I felt happy," the items substitute "I enjoyed life," "I felt sad," "I felt lonely," "I felt depressed," "I felt that everything I did was an effort," "My sleep was restless," and "I could not get going." We use two combinations of these individual questions as alternative estimates of satisfaction. These combinations have desirable properties for an estimate of satisfaction in that they both decline with worsening health and increase with permanent income. Both alternative proxies also indicate a decline in the satisfaction from additional permanent income associated with deteriorating health.

We then draw on a similar sample of individuals from a different data set - the British Household Panel Survey (BHPS) - to perform the analysis with subjective life satisfaction (measured on a 7-point scale), a commonly used alternative subjective well-being measure. We are reassured by the fact that we continue to estimate negative state dependent satisfaction with a magnitude of -14.0%, which is quite similar to our baseline estimate of -11.2%, although this result uses different data, from a different country, with a different SWB measure.

Different Trends in Satisfaction over Time by Permanent Income

If the consumption path of the poor increases more (or declines less) than that of the rich, this could show up in our estimates as negative state dependence; since the number of diseases increases over time, it could look like the rich have a greater drop in satisfaction with the onset of a disease simply due to different trends in underlying satisfaction. Reassuringly,

we find that the consumption path of the poor declines (in percentage terms) relative to that of the rich over time. This would in fact bias us against our finding negative state dependence; so if this was the case, it would mean the true results would be even more strongly for the case of negative state dependence. A related issue is that our estimates of the effect of health changes by permanent income may in part capture the effects of other life changes by permanent income. We therefore allowed the effect of permanent income to vary not only with number of diseases but also with marital status and with household size. After controlling for these variables, the estimate of the interaction term of permanent income and number of diseases remains similar in magnitude to our baseline estimate, but is no longer significant.

Different Reporting of Diseases by Permanent Income

If, conditional on reporting a disease, the severity of the disease varies by permanent income, this would violate our identifying assumption and bias our inferences. For example, if, conditional on reporting a disease, severity is greater for the rich than the poor, we would estimate a larger decline in satisfaction for those with higher permanent income, thus biasing us toward finding negative state dependence; the converse would bias us in the opposite direction. The existing evidence in the literature suggests that if any reporting differences by socio-economic status (SES) exist, they would likely bias against our finding of negative state dependence. Our own analysis confirms this. We find that, conditional on reporting a disease, people with lower permanent income are more likely to have a more severe form of the disease (as measured by complications of the disease).

What if Consumption is Not Predetermined?

We discuss the effect of relaxing our key modeling assumption that consumption in

the sick state is pre-determined. Consumption would not be pre-determined if health has a mechanical effect on the resources available to consume; for example, health may affect labor income, out-of-pocket medical expenditures, household production, and longevity. In addition, consumption would not be pre-determined if optimizing individuals are able to re-allocate consumption in response to their state-dependent preferences, which might occur if health shocks are anticipated or transitory, relatives provide informal insurance, or there is an outside and future consumption good whose effect on satisfaction is state independent, such as bequests.

If the additional satisfaction from more consumption varies with health, a number of well-studied economic problems, including the value of insurance and the optimal profile of life-cycle savings, will be affected.

In any standard economic model, the satisfaction received from additional consumption declines as consumption increases (known as diminishing marginal utility); people value additional consumption less if they already have a high level of consumption. This means that when consumption is not pre-determined, health can affect an individual's satisfaction from additional consumption for two distinct reasons: its direct effect on the slope of the satisfaction curve (which we try to measure) and its indirect effect through its influence on the level consumption (which creates bias in our estimates). By examining the Consumption and Activities Mail Survey (CAMS) - a small topical module administered to about 30% of households in the HRS for only three waves - we are able to test whether our assumption that consumption is predetermined is valid.

We find no significant effects of health shocks on consumption or income. In other words, we do not reject our assumption of predetermined consumption. Moreover, we find that neither the income nor the consumption response differs significantly by level of permanent income. If anything, a health shock leads to a relative consumption increase for the rich, which would generate a positive bias in the estimate of state dependence, thus once again biasing against our finding of negative state dependence.

The Potential Importance of State-Dependent Satisfaction

Our finding of negative state dependence implies that the optimal level of health insurance and the optimal fraction of earnings saved for retirement are lower than indicated by the standard formula that assumes no state dependence. Using stylized models of optimal insurance, we find that the optimal level of health insurance is roughly 20 to 45 percentage points lower than it would be in the absence of state dependence. Likewise, we find that the optimal fraction of earnings saved for retirement is about 1 percentage point lower (or about 4 percent lower) than it would be with a state-independent measure of satisfaction. While these calculations should be viewed as merely illustrative, they suggest that the magnitude of state dependence we have detected may have a non-trivial effect on important economic phenomena.

Conclusion

If the additional satisfaction from more consumption varies with health, a number of well-studied economic problems, including the value of insurance and the optimal profile of life-cycle savings, will be affected. Yet the sign of any such state dependence is *a priori* ambiguous, and there are relatively few empirical estimates of state dependence. Our central estimate is that a one-standard-

deviation increase in the number of chronic diseases of an individual is associated with an 11 percent decline in satisfaction received from additional consumption relative to satisfaction received from additional consumption when the individual has no chronic diseases. The results from two highly stylized calibration exercises suggest that the magnitude of this state dependence can have a substantial effect on important economic behaviors, and has important policy implications especially for public health insurance, which should be further explored.

Our findings raise several important questions for future work. We estimate the average effect on additional satisfaction from the onset of different chronic diseases in a population of older individuals. While the average effect is the relevant one for many economic questions (such as the optimal level of savings), it would nonetheless be interesting to explore whether different chronic diseases have the same effect on satisfaction; unfortunately we lack the statistical power to do so. Likewise, the data do not permit us to estimate the effect of acute diseases on satisfaction nor do they permit analysis of state dependence in a prime-age population. In a similar vein, our analysis has focused on the possibility that satisfaction varies with health while leaving unexplored the possibility of other types of state dependence, such as how satisfaction from additional consumption is affected by leisure relative to labor. We hope that our paper serves as a point of departure for further work on these important topics.

RELATED PUBLICATIONS

Finkelstein, Amy N., Erzo F.P. Luttmer, and Matthew J. Notowidigdo. "What Good is Wealth Without Health? The Effect of Health on the Marginal Utility of Consumption." *NBER Working Paper 14089*, June 2008. <http://www.nber.org/papers/w14089>