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# The Interaction between Consumption and Health in Retirement

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In this paper, we further our understanding of the process through which consumption and health interact and how this affects the well-being of the elderly. In particular, we integrate health capital into a life-cycle model of consumption to better understand the inter-relationship between health, health investments, mortality risk, and wealth in retirement.

Incorporating health into a life-cycle model of wealth accumulation is, in our view, very important. Existing models of consumption behavior for working households largely ignore health production, at least for working-age households. But one potentially important response to adverse income or health shocks or to changes in government policy is for individuals to adjust health investment in addition to consumption. Changes in health investment can alter individual's health and have longer-run implications for mortality. Our innovation is not just to incorporate health as an investment that increases an individual's stock of health, but also to incorporate health in the utility function. This allows health to affect the marginal utility of consumption and the allocation of consumption over the life cycle.

Health and consumption decisions are intertwined, yet the ways that consumption and health interact are hard to untangle. Health changes, such as disability or illness, affect labor market decisions and, hence, income and consumption possibilities. But causality also operates in the other direction, where consumption decisions such as smoking or exercise affect health. There are also unobserved differences between people in their ability to produce and maintain health and human capital, leading to correlations between health and lifetime income and wealth. This paper examines links between health, consumption, and wealth. Surprisingly, given the centrality of health to economic decision-making and well-being, numerical models of life-cycle consumption choices generally treat health in a highly stylized fashion. Authors commonly do not model health as being an argument of utility and do not allow health to affect longevity (see, for example, Hubbard, Skinner, and Zeldes, 1995; Engen, Gale, Uccello, 1999; Palumbo, 1999; and Scholz, Seshadri, Khitatrakun, 2006). Instead, medical expense shocks that proxy for health shocks affect the lifetime budget constraint. Households in these papers respond to exogenous medical expense shocks by decreasing consumption, saving for precautionary reasons.

In the life-cycle consumption papers noted above, households will respond to cuts in safety net programs by

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increasing precautionary saving. In the real world, households might maintain consumption at the cost of activities that degrade health and consequently affect longevity. In practice, these health-reducing activities might include working an additional job (and foregoing sleep); foregoing exercise; or eating high-calorie, inexpensive fast food rather than healthier, home-cooked meals. Over the long run, the consequences of these decisions can be large. Depending on lifetime earnings or the economic environment, other households may sharply increase precautionary saving in a world without health-related social insurance. Our model provides quantitative insight about these responses. We are not the first to examine the links between health, consumption, and wealth. Since we have a fully specified optimizing model with data on consumption, health status, and lifetime earnings, we can get around the issue of having to measure utility.

Our prior work shows that these links between health, wealth, and mortality are potentially important. For example, we examine the effects of altering the Medicare program — the health care social insurance program for those older than 65. For example, if Medicare were unanticipatedly removed, we show that there would be only negligible effects on mortality rates in the first 10 years following its removal. This is due to the fact that health status at age 65 is largely determined by decisions households made at younger ages.

Our main contribution in this paper is the estimation of a consumption Euler equation taking health into consideration. The Euler equation is derived from a model of consumption in retirement with three important building blocks of health: health shocks, health as an investment, and health as a provider of utility. In our model, a retiree maximizes lifetime utility by making decisions on consumption and health investments in each period. The utility flow in each period depends on both consumption and health capital. Health investments could affect both the probability of surviving to the next period and future health capital conditional on survival. There are health shocks in each period such that both survival and future health capital conditional on survival are stochastic.

We estimate the Euler equation of our model using data from both the core Health and Retirement Study (HRS) and the supplemental Consumption and Activities Mail Survey (CAMS). Our estimation takes two steps. In the first step, we use all respondents in the HRS to estimate inputs into the structural model, including the survival probabilities as a function of current age, health status, and health investments. In the second step, we use respondents at age 65 or older with valid information on consumption and health to estimate the structural parameters of the model, including the coefficient of relative risk aversion and the share of consumption in the consumption-health composite good that produces utility. We estimate the model separately for each gender. Our estimates suggest that health is an important determinant of utility.

We use the estimated model to study the empirical significance of health's three building blocks. We find that health shocks play an important role in slowing down the decline of consumption with age in retirement. Without health shocks, retirees will run down their wealth at a much higher speed. We also find that including health into the utility function provides interesting interactions between health and consumption, and could help explain the heterogeneous consumption-age profiles related to health. Finally, we find that health investments, such as physical exercise, have a significant effect on the evolutions of both health and consumption in retirement. This finding suggests that public programs, such as Medicare and Medicaid, play an important role in shaping the consumption and health behavior of the retirees, as well as the retirement and saving decisions of working people.

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