Health and Wealth in a Life-Cycle Model

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Health and consumption decisions are interlinked, yet the ways that consumption and health interact are hard to untangle. Our paper examines the links between health, consumption and wealth, starting from ideas dating back at least to Grossman (1972), who argued that health is the cumulative result of investment and choices (along with randomness) that begin in utero. We formulate a life-cycle model that we solve household-by-household, where health investments (including time-use decisions) can affect longevity. Household utility is a function of consumption and health. By modeling investments in health, longevity becomes an endogenous outcome, which allows us to study the effects of changes in safety net policy, for example, on mortality as well as wealth.

Our preliminary work makes three contributions relative to prior insightful related papers. First, we model the process of health production starting at the beginning of the working life. Forward-looking households will respond to income shocks, health shocks, or to changes in institutions by altering their health investments and consumption during their working lives. Second, the contribution of out-of-pocket medical expenditures on health, particularly late in life, are likely minimal. Yet even in the United States, there is a strong, positive gradient between income/ wealth and health/mortality. It is possible that broadly defined health expenditures, such as smoking decisions, exercise, diet, and preventative medical care (such as consumption of beta-blockers and cholesterol drugs) indeed affect health and longevity. While our approach is stylized, we take a more expansive view than prior work on health investments. Third, we develop a model of wealth and longevity in order to study how health shocks affect consumption plans, as done by others in the literature, and we study investments in "health capital." If death occurs when health falls below a given threshold, households may respond to policy or exogenous shocks by reducing or increasing consumption and hence altering longevity relative to a world where health is not an argument in preferences. Studying the tradeoff between consumption and health investments on longevity (and health status) offers new insights into household behavior.

In our current draft, we simplify the household's intertemporal problem by treating labor supply and retirement as being exogenous. Nevertheless, the expectations households have about annual earnings realizations have important effects on optimal consumption and health investment. We assume that the household possesses a health stock and investments in the health stock prolong life. Health capital is produced using time and money, and health is subject to a constant rate of depreciation. Households also face age-dependent health shocks that affect health status and survival. Households face budget constraints and constraints on the evolution of resources available for consumption.

A set of underlying parameters are chosen based on estimates from the existing literature and from empirical analyses based on data from the Health and Retirement Study (HRS). We use moments from the HRS data to calibrate the

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remaining parameters, including the elasticity of substitution between consumption/leisure and health, the coefficient of relative risk aversion, parameters of the health technology (including the depreciation rate) and survival function, and the probabilities of age-dependent adverse health shocks. Like a handful of existing studies, we find health and the consumption/leisure composite are complements: the marginal utility of consumption is higher when health is good, for example, when households are younger. The preliminary model does a good job matching the distribution of wealth, total medical expenditures and survival patterns in the HRS data.

We use the preliminary model to examine the effects on health and wealth of removing Medicare, the universal social insurance program that was established in 1965 to provide health insurance to the elderly. In the first specification we suppose that Medicare was instantly eliminated and the change was not anticipated. The short-run effects on mortality of eliminating Medicare are trivially small. Since most accumulation of health capital and wealth occurs well before retirement, health status is largely fixed by age 60-65. Eliminating Medicare, therefore, has little effect on health in the years immediately following its repeal. While Medicare provides insurance against adverse health shocks, our model yields results consistent with earlier empirical findings of Finkelstein and McKnight.

In the long run, however, Medicare repeal has a large effect on survival probabilities, particularly in the lowest lifetime income quintile. In the long run, a forward-looking household with low lifetime income will recognize they have no government-provided health insurance program in retirement. They also correctly anticipate the life-cycle pattern of health shocks and the cumulative effects of health depreciation, so old-age health status will be worse than health status at younger ages. Because health and consumption are complements, the life-cycle pattern of consumption mirrors the life-cycle pattern of health. Low lifetime income households will therefore invest less in health, trading off a shorter expected lifespan for greater consumption in younger ages when the marginal utility of consumption is high relative to later in life. High lifetime income households can mitigate these effects by self-insuring: they engage in buffer stock saving and invest in health capital.

The model results illustrate a central insight into the life-cycle model with endogenous health. Long-run adjustments to changes in the institutional environment will be made on two margins: households will consume less (doing more buffer stock saving), and invest less in health. The result is that households will both consume less and die earlier in a world without Medicare. But relative to a standard life-cycle model of consumption without endogenous health production, the consumption responses will be smaller, since a portion of the response occurs through a diminution of health capital. With less health capital, households correctly anticipate that they will die younger and hence they need to accumulate less wealth to finance consumption in retirement. Thus, the model with endogenous health mitigates the effects of changes in social insurance on consumption relative to standard life-cycle models.