The Cost of Bad Mental and Physical Health

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Introduction

Health has been widely studied, and its impacts are many:

- Earnings
- Labor supply
- Wealth accumulation
- Retirement
- Life expectancy

However, the economic literature has traditionally treated "health" as a unidimensional object, usually associated with **physical** health.

How important is this?

- According to the 2021 National Survey of Drug Use and Health, more than 20 percent of adults live with mental illness, and approximately 5.5 percent experience serious mental illness.
- Policymakers are increasingly implementing policies to improve mental health in the population.

Research Questions

- Q1: How do the dynamics of **mental** health differs from those of **physical** health?
- Q2: How do they affect savings?

Literature

1. Health Dynamics over the life-cycle and their impacts
   - Palumbo (1999): Introduce health-dependent preferences and their importance in understanding savings.
   - French (2005): Models how health affects labor supply, retirement, wealth, and wages.
   - Russo (2023): Study the effect of bad health on preferences and their consequences on consumption, savings, self-insurance, and household valuation of government insurance.
   - De Nardi et al. (2024): Emphasizes the complex nature of health dynamics and the role of multidimensional ex-ante differences across individuals.
2. Mental health measurement and impact
   - Abramson et al. (2025): Builds a structural life-cycle model to evaluate the welfare costs of mental illness and the effects of mental health policies.
   - Jolivet and Postel Vinay (2023): A structural model of the joint dynamics of individual careers and mental health trajectories using UK microdata.
3. Wealth accumulation over the life-cycle
   - Cagetti (2003): Assess the importance of precautionary savings for wealth accumulation.
   - Mahler and Yum (2024): Develop an endogenous health model to explain wealth-health gaps in Germany.

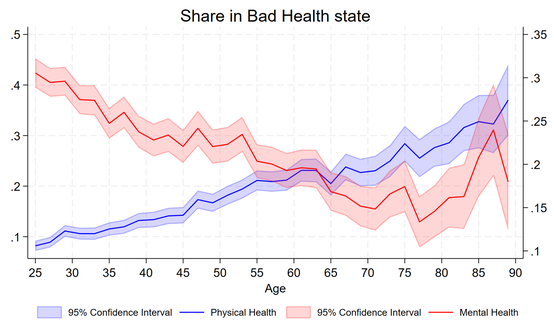
This paper's contribution:

1. Distinguish between mental and physical health and document their dynamics.
2. Document channels where mental and physical health interact and include both in a life-cycle model.

Data

- Data source: Panel Study of Income Dynamics (PSID)
  - Waves: From 2001 to 2021, excluding 2005, which do not include mental health variables.
  - Sample: Head of households that respond to the survey between the ages of 25 and 90.
- Physical health: *Would you say your health in general is Excellent, Very Good, Good, Fair, or Poor?*
- Mental health: K-6 Non-Specific Psychological Distress Scale: *During the last 30 days, how often did you feel...*
  - hopeless?
  - restless or fidgety?
  - that everything was an effort?
  - worthless?
  - nervous?
  - so tired nothing could cheer you up?

Figure 1. Health dynamics over the life-cycle



While **Physical Health worsens** over the life-cycle, **Mental Health is non-decreasing** in age.

Model

- Demographics
  - Agents enter the model at age 25 and die with certainty at 90.
  - Individuals are endowed with mental and physical health $h_t = (m_t, p_t)$
  - Uncertain lifespan: $\phi_t(h_t)$ is the unconditional survival probability up to age t. While $\xi_t(h_t) = \frac{\phi_t(h_t)}{\phi_{t-1}(h_{t-1})}$ is the conditional survival probability.
- Health-Dependent Preferences
  - Time-separable preferences
  - Constant discount factor β
  - Following Palumbo (1999), De Nardi, French, and Jones (2010), and Russo (2023), I model preferences as:

$$u(c_t, h_t) = \delta(p_t)\psi(m_t)\frac{c_t^{1-\sigma}}{1-\sigma}$$

Where $\delta(p_t)$ and $\psi(m_t)$ correspond to marginal utility shifters due to physical and mental health, respectively.

- Health Process
  - Each component has two possible states: "Good" or "Bad"
  - Health evolves according to a first-order Markov process: $\pi^k_{h,t} = Pr(h_{t+1} = k | h_t, t)$
- Earning dynamics
  - Earnings depend on age, health, and a persistent and transitory component as follows

$$\log y_t = \beta_0 + \alpha(t) + \theta 1\{m_t = bad\} + \gamma 1\{p_t = bad\} + \mu 1\{m_t = bad \wedge p_t = bad\} + \log \varepsilon_t$$

  - $\log \varepsilon_t$ follows an AR(1) process:

$$\log \varepsilon_t = \rho \log \varepsilon_{t-1} + \eta_t, \qquad \eta_t \sim \mathbf{N}\left(0, \sigma^2_\eta\right)$$

- Individual's Decision problem
  - State variables: $(a_t, h_t, \varepsilon_t)$
  - Choice variables: Consumption c_t, savings a_{t+1}
  - Value function:

$$V_t(a_t, h_t, \varepsilon_t) = \max_{c_t, a_{t+1}} \{u(c_t, h_t) + \beta\xi_t(h_t)E_t\{V_{t+1}(c_{t+1}, h_{t+1}, \varepsilon_{t+1}\}\}$$

  - Constraints:

$$c_t + a_{t+1} \leq (1+r)a_t + y_t(h_t, \varepsilon_t)$$
$$a_t + 1 \geq 0$$

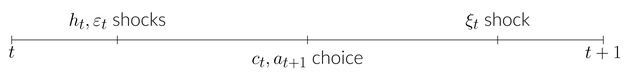


Figure 2. Model Timing

Estimation

- Fix some parameters:
  - $\beta = 0.96$
  - $r = 0.03$
- Estimate parameters identified outside of the structural model:
  - Health transitions and mortality
  - Income dynamics
- Estimate the remaining parameter using the Simulated Method of Moments
  - Match wealth accumulation by age groups (10-year groups) and health status (4 groups).

Preliminary results

Table 1: Income Process Estimates

	(1)	(2)	(3)	(4)
	dependent variable: $\log(y)$			
$1\{p_{t-1} = bad\}$	-0.119***		-0.113***	-0.0515
	(0.0368)		(0.0366)	(0.0407)
$1\{m_{t-1} = bad\}$		-0.0916***	-0.0847***	-0.0579**
		(0.0219)	(0.0216)	(0.0223)
$1\{p_{t-1} = bad\} \times 1\{m_{t-1} = bad\}$				-0.164**
				(0.0678)
Age	0.0737	0.0698	0.0682	0.0684
	(0.0565)	(0.0563)	(0.0562)	(0.0562)
Age^2	0.000758	0.000803	0.000840	0.000843
	(0.00120)	(0.00120)	(0.00120)	(0.00120)
Age^3	-0.0000171*	-0.0000173*	-0.0000176*	-0.0000176**
	(0.00000893)	(0.00000892)	(0.00000891)	(0.00000892)
Constant	7.418***	7.533***	7.565***	7.546***
	(1.268)	(1.258)	(1.255)	(1.252)
Observations	20,172	20,120	20,116	20,116

Clustered standard errors in parentheses at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

$\Longrightarrow$ The most significant decrease in income happens when individuals are in bad mental and physical health state simultaneously.

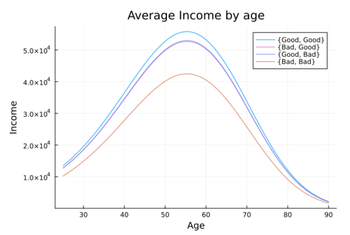


Figure 3. Predicted income by health state

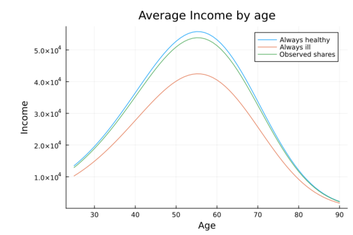


Figure 4. Predicted income using observed shares

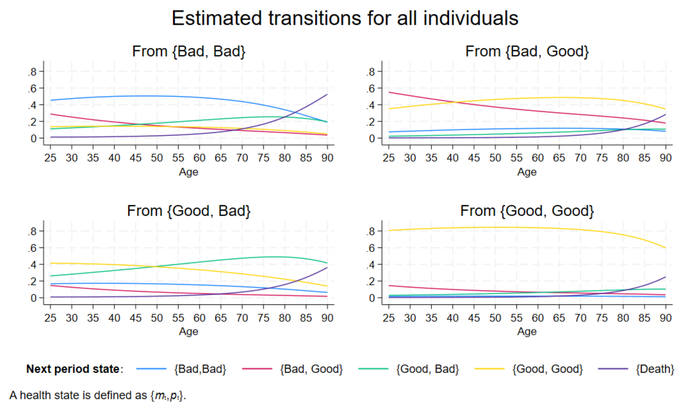


Figure 5. Predicted health transition by initial health state

$\Longrightarrow$ Disentangling physical and mental health is important for understanding health dynamics.

- i.e., Conditional on being physically ill, being mentally ill increases the probability of dying in the next period, particularly at later stages of life.
- These differences will matter for the wealth accumulation decision.

Next Steps

1. Estimate the proposed model
   - Compare its results with a life-cycle model where health enters only in income and mortality.
2. Make the model more complex by
   - Including bequest motives
   - Differentiating earnings dynamics between people before and after retirement.