Point of departure: there is an empirical relation between health status/mortality and economic position.

What is the causality of this relation? Health → Income or Income ⟶ Health?

0.1 Effects of Health Changes on Income and Wealth

Two costs: medical care and loss of income from work.

Smith (1999): Effect of health changes on savings and wealth accumulation.

Reasons to why savings may decrease after a decline in the general health status.

- Out-of-pocket medical expenditures. Table 2 shows surprisingly modest changes in out-of-pocket medical spending for the US.
- Marginal utility of consumption may change as a result of changes in the health status: State dependence in the utility function. Changes in the life expectancy should have an effect in the life cycle model. Identification problems to test this empirically.

Table 3 shows empirical results on wealth accumulation from HRS (Health and Retirement Survey) and AHEAD (Asset and Health Dynamics of the Oldest Old).

Between wave new onsets in chronic health problems on the between wave changes in wealth.

Substantial effects on wealth de-accumulation across different groups. Again, modest changes in OOP medical expenses.

Table 4: Effects on life expectancy, labor supply and earnings.

Puzzle: Changes in wealth are on average larger than what can be explained by changes in out-of-pocket medical expenses and income combined. Two possible explanations:

- State dependence in utility of consumption.
- Qualification rules for Medicaid. Means tested (Wealth test).

Gertler and Gruber (2002): "Insuring Consumption Against Illness" The American Economic Review, 92, 51-70.

Data from Indonesia. Has invested heavily in a government-operated health care delivery system.

Two different measures of health status: indicators of activities of daily living (ADL) and composite health index. The authors are able to measure changes in these measures and analyze how it affects labor supply and consumption.

Analysis in three steps:
First step: Effects of health changes on labor supply, out-of-pocket medical expenses, and household income.
Sam specification for all three outcome variables:

$$\Delta L_{ij} = \boldsymbol{\alpha}_j + \beta \Delta h_{ij} + \sum_k \lambda_k X_{ijk} + \varepsilon_{ij},$$

$\boldsymbol{\alpha}_j$ community fixed effects, controls for community unobserved heterogeneity, X demographic controls.
Results:
Major effect on labor supply from changes in the ADL index.
Trivial effects on medical expenses.
Large effects on household income, again only from changes in the ADL index.

Separate analysis on the labor supply of other household members. No such effects found.

Second step: Effects on consumption spending.

Theory of full insurance tells us that there should be no effects on consumption spending from changes in health status, assuming no state dependence in preferences for consumption.

Reduced form for changes in log per capita consumption spending:

$$\Delta \ln \left(\frac{C_{ij}}{n_{ij}} \right) = \boldsymbol{\alpha}_j + \beta \Delta h_{ij} + \sum_k \lambda_k X_{ijk} + \varepsilon_{ij},$$

Results:
Rejects full insurance. Again, only ADL index results significant.

Key assumption on state dependence in preferences for consumption. Different test for this assumption:

1. Consumption spending for other household members.
2. Workers v/s non-workers.
3. Self-insurance: If a household are not able to self-insure you should see a relatively large decrease in consumption from a health shock if the effect works through the budget constraint. Compares households who have a large labor supply potential of other household members to those who have not.
4. Health status of other family members.

Step 3: How large is effect?

The extent to which households are unable to insure income losses:

$$\Delta \ln \left(\frac{C_{ij}}{n_{ij}} \right) = \boldsymbol{\alpha}_j + \gamma \Delta Y_{ij} + \sum_k \lambda_k X_{ijk} + \varepsilon_{ij},$$

γ / C_{t-1} share of consumption that is not insured.
IV because:

- Income level endogenous: Risk averse households able to insure part of their income losses through labor supply responses.
- Measurement errors in the income change variable.

Health status used as instrument. Valid if:

- No state dependence in utility.
- No feedback in changes in consumption to changes in health.
- Measurement errors in health status are uncorrelated with measurement errors in the income variable.

Result shows that the household is only able to insure on average 65 percent of an income change.

Fehr and Schmidt (1999) model of self centered inequality aversion:

$$u(y) = y - \beta_1 \int_y^{\infty} (x - y)\, dF(x) + \beta_2 \int_0^{y} (y - x)\, dF(x)$$

$\beta_1 > 0$, β_2 captures your views on the income distribution of those who are poorer than yourself. $\beta_1 > \beta_2$, which means that you are more conserned about your own relative position.

The FS utility function can be rewritten as:

$$u(y) = y - \beta_2 (y - \mu) - (\beta_1 - \beta_2) \times \int_y^{\infty} (x - y)\, dF(x) = y + \beta_2 (y - \mu) - (\beta_1 - \beta_2)\, \mu R(y).$$

$R(y)$ in a measure of relative deprivation. It can be shown that this utility function is concave in income.

Looking at group health, by averaging the expression above we get

$$u(y) = \int_0^{y} u(y)\, dF(y) = \mu [1 - (\beta_1 - \beta_2)\, g]$$

where g is the Gini coefficient. So, group utility (health) depends positively on group income level and negatively on group income inequality.

There is an effect of the relative income level.

There is an effect on the relative income level within reference groups. Famous Whitehall studies on British civil servants. No effects of income redistributions.

If health depends on relative income within a reference group

$$h_{is} = \overline{h} + \beta \left(y_{is} - y_s \right) + \varepsilon_{is},$$

we will observe an attenuated relation to mean income

$$E \left(h_{is} \mid y_{is} \right) = \overline{h} + \frac{\beta \sigma_w^2}{\sigma_w^2 + \sigma_b^2} y_s.$$

Effects on health during childhood - observed correlation through intergenerational income correlation.

Differences in health status comes from differences in treatment during very early childhood. Correlation in income over generations. No direct effect (in the current generation) of income redistributions.

Case, Lubotsky and Paxton (2002), American Economic Review,

The probability that a child is in poor health:

$$P(H \mid X) = P(H \mid C = 0, X)\, P(C = 0 \mid X) + P(H \mid C = 1, X)\, P(C = 1 \mid X)$$

C - 1 if the child suffers from chronic conditions, 0 otherwise.
H - 1 if the child suffers from bad health, 0 otherwise.

Decomposition:

$$\begin{aligned} \frac{\partial P(H)}{\partial \ln y} &= \frac{\partial P(H \mid C = 0)}{\partial \ln y} + \\ &\left[\frac{\partial P(H \mid C = 1)}{\partial \ln y} - \frac{\partial P(H \mid C = 0)}{\partial \ln y}\right] P(C = 1) + \\ &\left[P(H \mid C = 1) - P(H \mid C = 0)\right] \frac{\partial P(C = 1)}{\partial \ln y} \end{aligned}$$

Three components:

1. The marginal effect of income on bad health given that the child does not suffer from a chronic condition.
2. The additional impact of income if the child suffers from a chronic condition. "Severity effect".
3. The effect of income on poor health that works through the greater that poorer children obtain a chronic condition. "Prevalence effect".

Two different LPM models:

$$\begin{aligned} C &= \alpha_0 + \alpha_1 \ln y + X\delta^C + \varepsilon^C \\ H &= \beta_0 + \beta_1 \left(\ln y - \overline{\ln y}\right) + \beta_2 C + \beta_3 \left(\ln y - \overline{\ln y}\right) C + X\delta^H + \varepsilon^H \end{aligned}$$

Key parameters:
$\alpha_1 = \frac{\partial P(C=1)}{\partial \ln y}$.
$\beta_3 = \left[\frac{\partial P(H|C=1)}{\partial \ln y} - \frac{\partial P(H|C=0)}{\partial \ln y}\right]$
$\alpha_1\beta_2$ = Prevalence effect.
β_2- shows which chronic condition that have the most severe impact.

Results:
α_1 only positive for hay fever and sinusitis (brat diseases!).
β_3 negative throughout. Larger for older children.

Decomposition: The effect on health goes primarily through the severity effect.

Section 5: Understanding the gradient.

1. Health at birth: In general a significant relation between income and health at birth. However, adding controls for health at birth does not alter the original relation.

2. Parental health as a determinant of children's health: Separate analysis. 1. Large effect of parental health on child health. 2. Mother's health most important. 3. Does not account for the entire effect of the previous analysis although the gradients become smaller.

3. Genetic ties: Interactions with indicators on adopted children. No effect of interactions could not be rejected.

4. Health and health insurance: Investment in children's health can go through health care and access to health insurance. Not supported in the empirical analysis since interactions with access to health insurance insignificant.

5. Children's health and maternal labor supply: Parents of children with chronic conditions may work and earn less, which may make up for the observed relation. However, not supported in the empirical analysis.

6. Parent an child health-related behavior: Indicators for different behavioral differences (e.g. does the child have a regular bedtime). Some indicators are significant. Make up for some of the income relation.