Lecture 9

Topics in Development Economics: Health

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Contents

Motivation

There are many reasons why the relationship between **health** and **labor market outcomes** in developing economies should be of special interest.

1. There is a long tradition of theoretical models of nutrition-based efficiency wages in the development literature. However, these models have been subjected to little direct empirical scrutiny.
2. The health sector accounts for a sizable fraction of the public purse in most countries. If public investment in health infrastructure and interventions yields benefits in terms of higher productivity and economic growth, then these benefits belong in evaluations of health programs. The possibility that the income-generating capacity of the poorest is enhanced more by some health sector investments relative to others raises issues revolving around the distributional effects of policies.

Health and Income: Channels

Economists have identified several channels through which health affects the level of output in a country.

1. The *proximate* or *direct* effect of health:
   - Healthier people are better workers.
   - They can work harder and longer and also think more clearly.
2. *Indirect* channels:
   - Improvements in health raise the incentive to acquire schooling since investments in schooling can be amortized over a longer working life.
   - Healthier students also have lower absenteeism and higher cognitive functioning and, thus, receive a better education for a given level of schooling.
   - Improvements in mortality may also lead people to save for retirement, thus raising the levels of investment and physical capital per worker.
   - Physical capital per worker may also rise because the increase in labor input from healthier workers will increase capital's marginal product.

Endogeneity of Health

Examining the effect of health on economic growth (or income, labor outcomes, etc.) is difficult because health is *endogenous*:

- *Reversed causality*: People who are richer can afford better food, shelter, and medical treatment. Countries that are richer can afford higher expenditures on public health.
- *Omitted variables:* There are many factors that affect income and productivity that are also correlated with the health status.
- *Measurement error:* How do we measure health?

Health and Labor Outcomes: Correlations

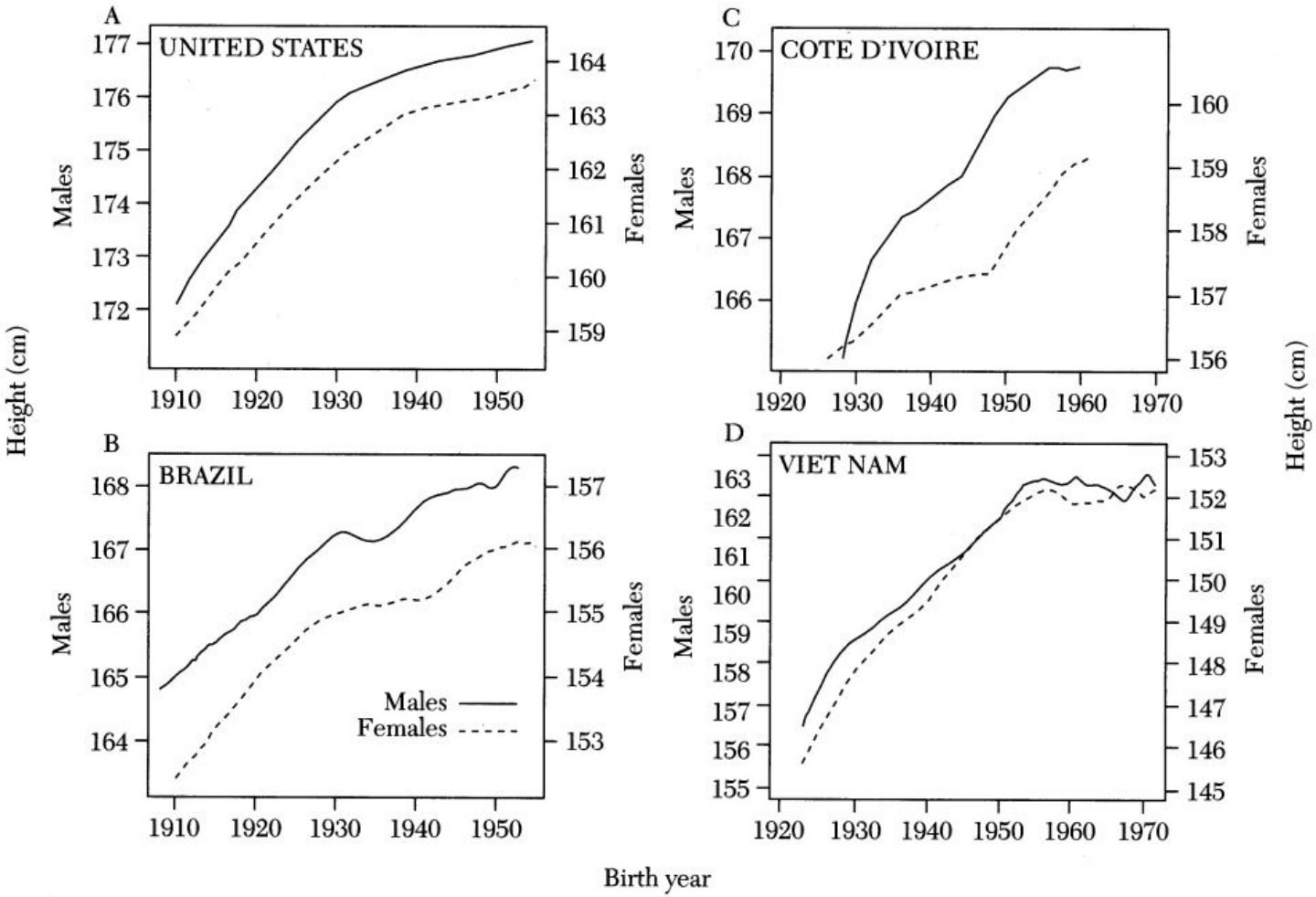

Figure 1. Adult Stature by Birth Cohort

Health and Labor Outcomes: Correlations

- Among these people, American males are the tallest.
  - The average American male born in 1950 is nearly 177 cm tall;
  - His Ivorian counterpart is about 170 cm;
  - A Brazilian male is slightly shorter;
  - A Vietnamese male born that year is almost 15 cm shorter than the American.
    1. *What are the reasons for this difference in height?*

Health and Labor Outcomes: Correlations

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    1. *What are the reasons for this difference in height?*
       - Differences in genotype and standards of living of these people when they were children are the most common explanations.

Health and Labor Outcomes: Correlations

- There have been substantial increases in attained height by maturity in all four populations during this century.
  - Average growth rates lie between 0.75 cm and 1.5 cm per decade.
  - *Example:* An Ivorian man born in 1950 would be, on average, about 169 cm tall, which is almost 3 cm taller than his father would have been had he been born in 1930.

Health and Labor Outcomes: Correlations

- Underlying these average growth rates, there is considerable heterogeneity over time.
  - In the United States, growth was very rapid for men and women until 1935 birth cohort; growth has substantially slowed down among later cohorts.
  - The pattern is similar for Brazil, with growth in heights of men and women tracking each other closely and slowing down since World War II.
  - There has been no slowdown of growth among post-War cohorts, and changes in female height have not tracked the male profile very closely.
  - Between 1925 and 1955, heights of adult men and women increased rapidly (by between 1.6 and 1.8 cm each decade). But for birth cohorts since the early 1950s, adult stature has remained unchanged.

Health and Labor Outcomes: Correlations

- While the secular increases in heights are sizable in all four countries, the gaps in height between them are even larger.
  - In the 1950 birth cohort, among men, the interquartile range of height is 9.2 cm in the United States, slightly higher in Brazil and lower in the Cote d'Ivoire and Viet Nam.
  - The gap in heights of women is slightly smaller both across countries and within countries.

Health and Labor Outcomes: Correlations

2. *If we would like to disentangle the difference in heights due to change in standards of living (and not the genotype), what kind of data should we look at?*

Health and Labor Outcomes: Correlations

2. *If we would like to disentangle the difference in heights due to change in standards of living (and not the genotype), what kind of data should we look at?*
    - We should look at the variation in changes in adult stature within a country.

Health and Labor Outcomes: Correlations

TABLE 1
ANNUAL RATES OF GROWTH OF ADULT STATURE: VIETNAMESE MALES

Birth Cohort:	1925–55		1956–70	
Birth Place:	North	South	North	South
10th Percentile	0.251*	0.164	–0.086	–0.041
	(0.03)	(0.03)	(0.05)	(0.05)
Mean	0.189*	0.150	–0.008	–0.060
	(0.02)	(0.02)	(0.03)	(0.04)
90th Percentile	0.134	0.129	0.039*	–0.075
	(0.03)	(0.03)	(0.05)	(0.05)

Notes: Coefficients from piecewise-linear regressions of height (in cm) on exact birth date (measured in years) for least squares (Mean) and quantile regressions (at 10th and 90th percentiles). Standard errors in parentheses. Quantile regression standard errors calculated using bootstrap. * Denotes significant difference between North and South at 5 percent level.

Health and Labor Outcomes: Correlations

- Among the 1925-55 cohort, adult stature increased 1.9 cm each decade in the poorer North, which is about 25% faster than in the South.
- The shortest (and the poorest) benefited the most during this period, especially in the North, where average height increased by 2.5 cm each decade:
  - over 50% faster than among the shortest in the South;
  - nearly twice as fast as among those in the top decile of height.

  $\Rightarrow$ This evidence suggests there was improvement in the standard of living of all Vietnamese and a decline in inequality in terms of height (and, perhaps, economic conditions).

Health and Labor Outcomes: Correlations

- In the post-1955 era, however, growth in attained height stopped for the average Vietnamese male in both the North and South.
- But in the North, growth has declined among the shortest while increasing slightly among those at the top of the height distribution, resulting in an increase in height inequality during the period.

  $\Rightarrow$ This evidence suggests that not only did growth falter, but in the North the worst off were hit hardest by the disruption from the war period.

Health and Labor Outcomes: Correlations

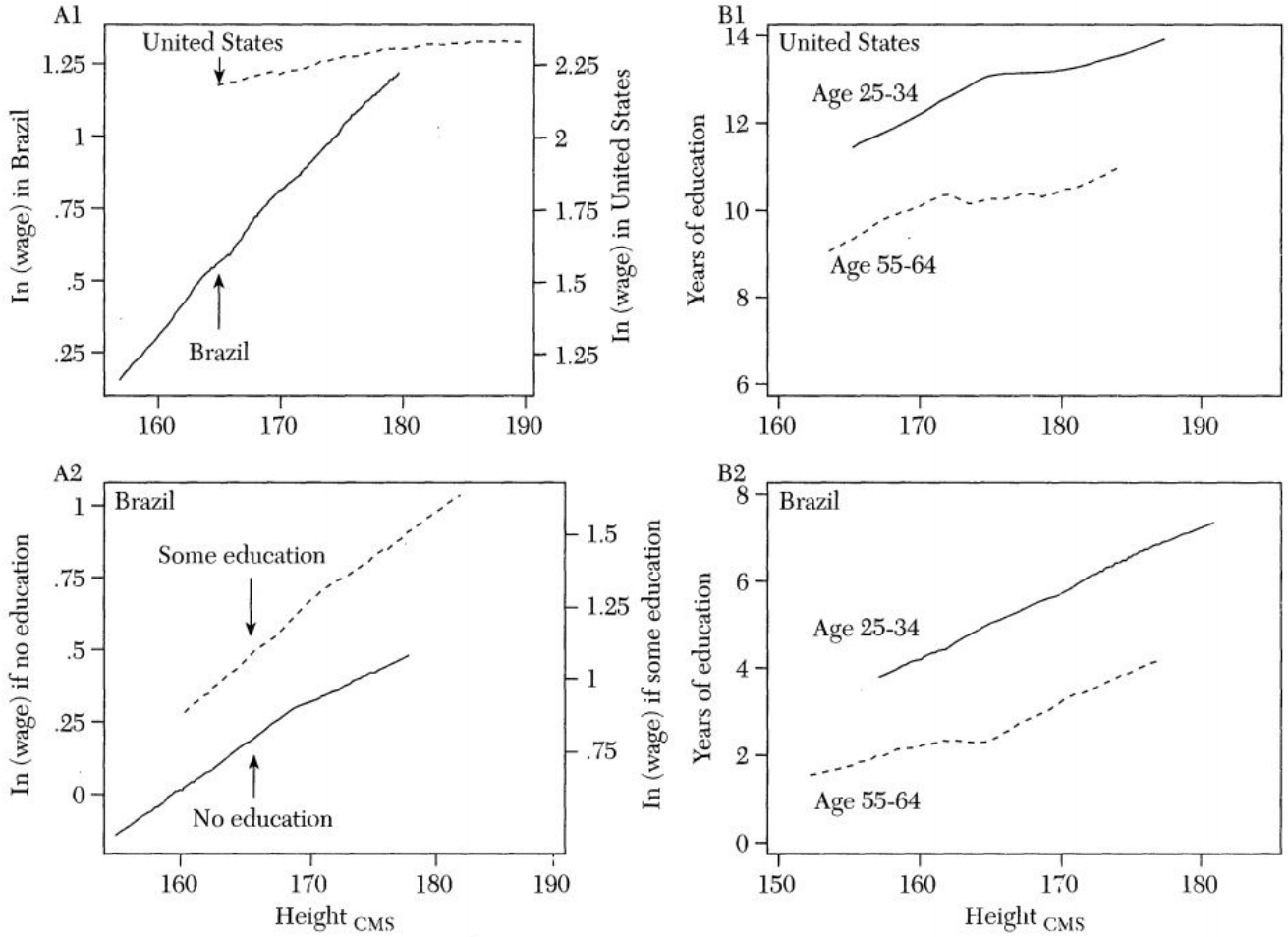

Figure 2. Wages, Education, and Height of Males in Brazil and the United States

Health and Labor Outcomes: Correlations

- There is a powerful association between height and wages in Brazil.
  - Taller men earn more: a 1% increase in height is associated with an almost 8% increase in wages.
- While this dwarfs the magnitude of the correlation in the United States, taller American men also earn higher wages.
3. *What are the reasons behind a stark difference in magnitudes between Brazil and the United States?*

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3. *What are the reasons behind a stark difference in magnitudes between Brazil and the United States?*
   - It probably reflects differences in the extent of poor nutrition in the two countries as well as differences in the nature of work that is commonplace in each society, since manual labor - and thus reliance on physical strength - is far more important in Brazil.

Health and Labor Outcomes: Correlations

- Taller men tend to be better educated in both countries, although the correlation is substantially larger in Brazil.
  - Among 25 to 34 year olds, a 10-cm gap in height is associated with an additional year of schooling in the United States and 1.5 years in Brazil.
  - Because levels of schooling are very different, this translates into an 8 % increase in the U.S. and a 25% increase in Brazil.

4. *Is height simply proxying for education in the wage function in Panel A1?*

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4. *Is height simply proxying for education in the wage function in Panel A1?*
   - While a good part of the observed positive association between height and wages can indeed be attributed to the role of education, even for those with no education the correlation persists and is large in magnitude.
     - For them, a 1% increase in height is associated with a 4% increase in wages.
     - After controlling for education, the elasticity remains large and is largest for men who completed secondary schooling.

Health and Labor Outcomes: Correlations

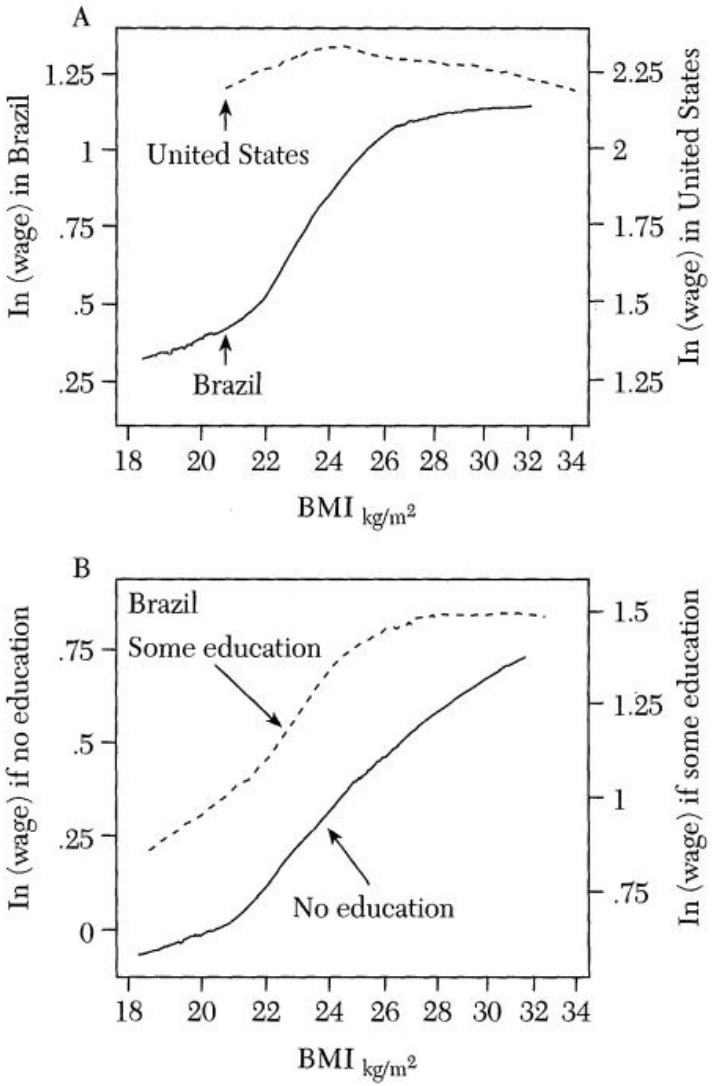


Figure 3. Wages and BMI in Brazil and the United States

In contrast with height, body mass index (BMI) varies over the life course and thus may capture both longer- and shorter-run dimensions of nutritional status and health.

- In the United States, the relationship between wage and BMI is an inverted U with optimal BMI being around 24.
  - This translates into a weight of 80 kg for a man who is 183 cm.
- The magnitudes are much larger in Brazil and the shape is different,
  - Among men whose BMI is less than 27, wages rise dramatically as BMI increases, particularly for those above 22.

Health and Labor Outcomes: Correlations

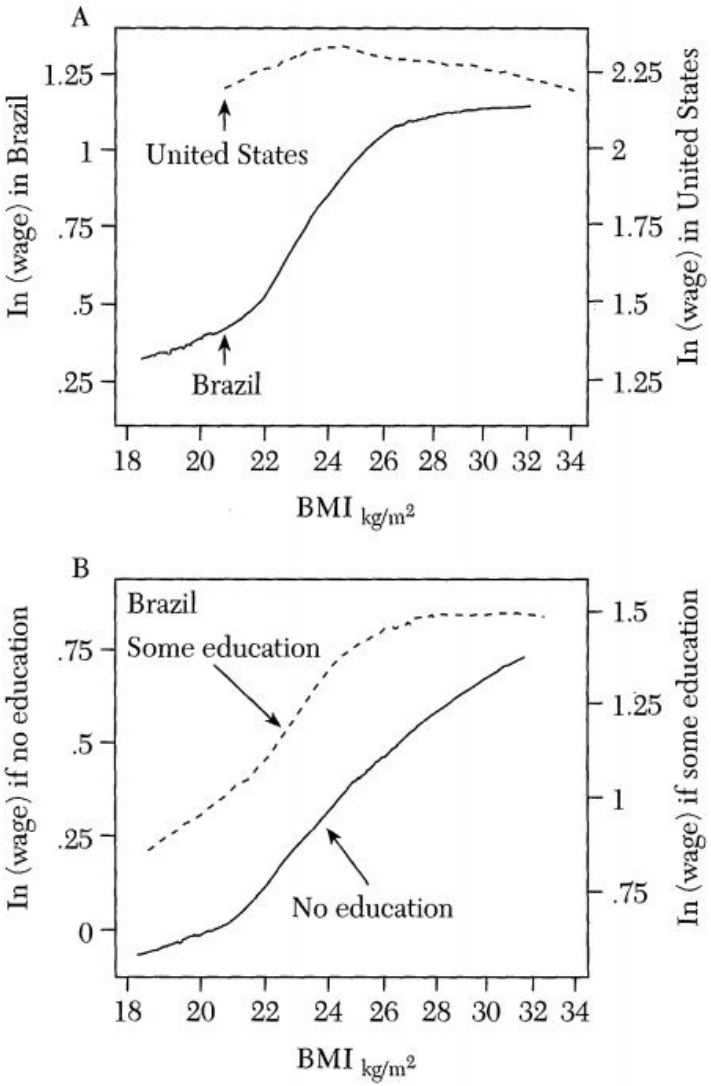


Figure 3. Wages and BMI in Brazil and the United States

- In contrast with height, only a small part of the correlation with BMI is capturing the influence of education.
- The wage-BMI curve flattens at low BMI only for the poorest (those with no education), suggesting that poor nutrition (or poor health) takes its heaviest toll on the most vulnerable.
- The positive correlation between wages and BMI persists for those with no education even at high levels of BMI, but is zero when BMI exceeds 25 among the better educated.

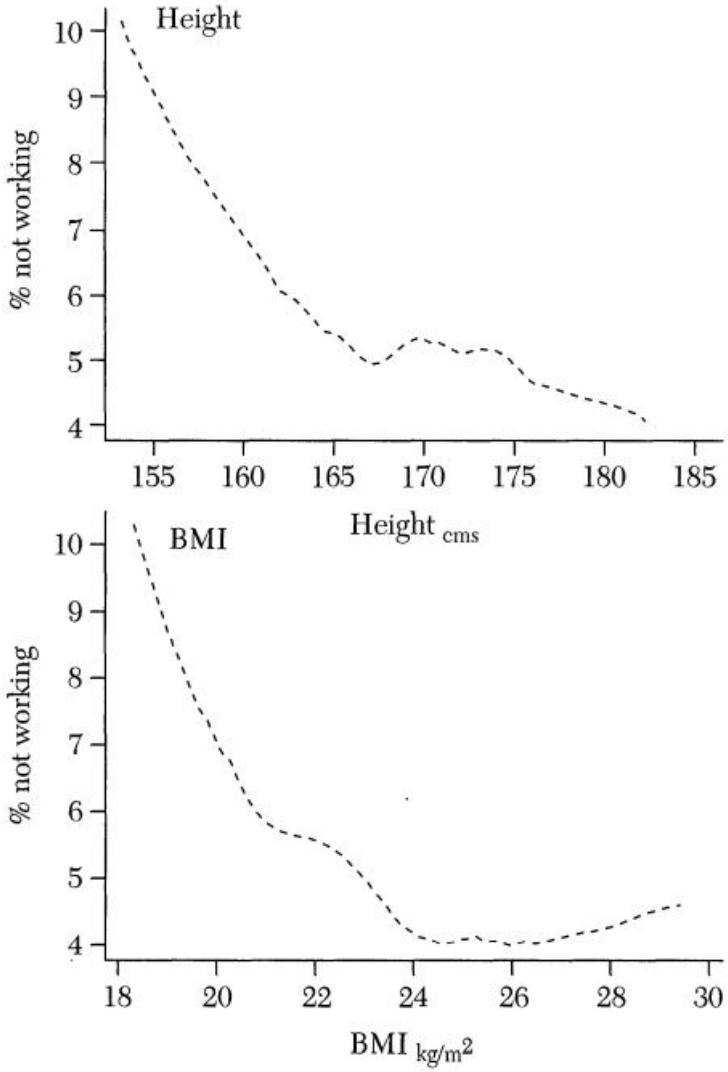
Health and Labor Outcomes: Correlations

5. *What is the explanation behind the fact that BMI seems to play a much higher role for men with no education as opposed to educated men?*

Health and Labor Outcomes: Correlations

5. *What is the explanation behind the fact that BMI seems to play a much higher role for men with no education as opposed to educated men?*
    - It is plausible that among men with no education, elevated BMI is associated with greater physical strength, which is of value for manual labor, but that strength is of less value among the better educated (who are more likely to have sedentary occupations).

Health and Labor Outcomes: Correlations



- Shorter men not only earn less, they are also less likely to be working.
- Over 10% of men who are 154 cm tall were not working at the date of the survey, but among those who are about 167 cm tall, the fraction is only 5%.
- The probability that a man is not working decreases with BMI until around 24, at which point it is essentially flat.

Health and Labor Outcomes: Correlations

Other dimensions of nutritional status are also correlated with labor outcomes in the Brazilian data.

- Wages rise as calorie intakes increase (until around 2400 calories per day).
- Wages rise as diet quality increases (as measured by the fraction of calories from protein sources).

Measurement of Health

There are two aspects of health that set it apart from other indicators of human capital like education:

1. It is multidimensional;
   - Different dimensions of health are likely to have different effects on one's productivity or labor supply.
   - These effects may well vary over the life course or wage distribution.

   $\Rightarrow$ It makes good sense to examine the relationship between labor outcomes and multiple health indicators simultaneously.
2. Measurement error in health is likely to be related to income and labor market outcomes.
   - This complicates interpretation of empirical relationships between health and labor outcomes and seriously compromises the value of standard fix-ups, such as instrumental variables.
   - The extent and nature of errors are likely to vary from measure to measure.

Measurement of Health

There are two types of health measures: **inputs** into health and health **outcomes**.

- Inputs into health are the physical factors that influence an individual's health.
  - nutrition at various points in life (in utero, in childhood, and in adulthood);
  - exposure to pathogens;
  - availability of medical care.
- Health outcomes are characteristics that are determined both by an individual's health inputs and by his genetic endowment.
  - life expectancy;
  - height;
  - the ability to work hard;
  - cognitive functioning.

Measurement of Health

General Health Status

A respondent is typically asked to rate his health in one of four or five discrete categories ranging from excellent to poor health.

6. *What are the potential problems with this measure of health?*

Measurement of Health

General Health Status (GHS)

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6. *What are the potential problems with this measure of health?*
   - Relying on such a small number of discrete categories cannot possibly do justice to the complexity and diversity of health status of individuals.
   - "Good" health may not mean the same thing to all people, and respondents are not provided with an established metric against which to compare their own health.
   - Because questions about GHS are typically vague, we have no idea whether the respondent is rating his health relative to the national average, to his neighbor, or to whom.
   - Self-evaluations reflect perceptions of health. While important, perceptions are likely related to values, background, beliefs, and information, all of which are systematically related to socioeconomic characteristics, including wages and income.

General Health Status (GHS)

Correlation with labor outcomes

- Information about own health is almost surely correlated with the extent of concurrent and prior use of health care, because people who have used the health care system are likely to be better informed.
- Since most people assume they are in good health unless they have information to the contrary, it is plausible that, conditional on a level of health status, those who have little exposure to the health system are likely to report themselves as being in better health.
- Given that lower-income people are less likely to use health care, especially in poor societies, measurement error in GHS will be systematically related to income (and wages).

General Health Status (GHS)

Correlation with labor outcomes

- *Example:* There is evidence from the RAND Health Insurance Experiment (HIE) for the people who, in the baseline, were in poor health and in the bottom quintile of the income distribution.
  - Those randomly assigned to receive free care used more health care and were, at the end of the experiment, in better health as measured by clinically evaluated outcomes (such as blood pressure) and risk of subsequent health.
  - But, according to their own evaluation of their health, measured by GHS, it actually *worsened*.
- *Example:* In a health price experiment in Indonesia people used more care in those places where prices were lower; their health improved, but their self-reported GHS was worse.

Measurement of Health

Self-Reported Morbidity, Illness and "Normal" Activity

Several surveys have asked questions about illness or specific symptoms (such as fevers, diarrhea, respiratory problems) during a reference period.

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Measurement of Health

Self-Reported Morbidity, Illness and "Normal" Activity

Several surveys have asked questions about illness or specific symptoms (such as fevers, diarrhea, respiratory problems) during a reference period.

7. *What are the potential problems with this measure of health?*
    - These self-evaluations are difficult to interpret if what is deemed an illness or a symptom is not the same thing for all respondents.
    - As with GHS, these indicators are likely to be measured with error that is correlated with use of the health system (and thus with income and the price of health services).
    - Other price incentives may influence self-reported morbidity.
        - *Example:* an individual may claim to suffer from an illness in order to become eligible for health-related benefits.

Measurement of Health

Self-Reported Morbidity, Illness and "Normal" Activity

Another commonly used variant of self-reported illness is to ask whether any days of **"normal" activity** were lost to ill health.

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Measurement of Health

Self-Reported Morbidity, Illness and "Normal" Activity

Another commonly used variant of self-reported illness is to ask whether any days of **"normal" activity** were lost to ill health.

8. *What are the potential problems with this measure of health?*
   - "Normal" is not well defined.
   - People whose opportunity cost of time is high (the better educated, for example) will have less incentive to miss activities.
   - By this metric, they will appear to be in *better* health than people with a lower value of time (conditional on a particular "true" health status).
   - People with acute health problems are likely to make lifestyle and occupation choices in response to these problems, making it very difficult to interpret "normal".

Measurement of Health

Self-Reported Physical Functioning

Several household surveys have collected information on difficulties with physical functioning that are considered normal activities for people in good health. These might include:

- walking a specified distance;
- lifting a particular weight;
- bending;
- climbing stairs.

While the notion of "difficulty" is subjective, questions about specific activities of daily living (ADLs) are more precisely defined than "being ill" or "normal activities".

9. *What are the potential problems with this measure of health?*

Measurement of Health

Self-Reported Physical Functioning

Several household surveys have collected information on difficulties with physical functioning that are considered normal activities for people in good health.

9. *What are the potential problems with this measure of health?*
    - The limitations in physical activities that ADLs typically capture are frequently due to physical health problems such as shortness of breath, joint problems, or back problems.
    - Few prime-age adults have difficulty with these activities, and so ADLs may not be as useful in studies of health and labor outcomes.

Measurement of Health

Nutrition-Based Indicators: Nutrient Intakes

Calorie **availability** is computed by converting food quantities (purchases and consumption from own production) into nutrient intakes, using standard food composition tables.

This has the advantage of being relatively easily calculated using data commonly collected in many household expenditure and farm production surveys.

10. *What are the potential problems with this measure of health?*

Measurement of Health

Nutrition-Based Indicators: Nutrient Intakes

Calorie **availability** is computed by converting food quantities (purchases and consumption from own production) into nutrient intakes, using standard food composition tables.

10. *What are the potential problems with this measure of health?*
    - It assumes no food is wasted: everything that is available is converted into nutrients.
        - It is plausible that very low-income (or low-wage) households waste less than those that are better off, in which case nutrient intakes will tend to be upward biased and the bias will increase with income.
    - It is very difficult in consumption and production surveys to take into account all meals that are given to guests or employees and all meals that are received in-kind.

Measurement of Health

Nutrition-Based Indicators: Nutrient Intakes

Calorie **availability** is computed by converting food quantities (purchases and consumption from own production) into nutrient intakes, using standard food composition tables.

10. *What are the potential problems with this measure of health?*
    - If the (net) receipt of in-kind food (including transfers and gifts) declines with income and the probability of having guests rises with income, then nutrient intakes will be biased and the bias will, also, be positively correlated with income and wages.
    - It is very difficult to measure nutrient intakes for meals eaten away from home.
        - Typically, it is assumed that those meals have the same calorie content as meals at home. Clearly, this need not be true.
        - Low-income workers are often given food at work; if it is more nutritious than the food eaten at home, measurement error will be negatively correlated with income.

Measurement of Health

Nutrition-Based Indicators: Nutrient Intakes

An alternative method of collecting nutrient consumption is to obtain information on **intakes** rather than on **availability**.

1. One method weighs ingredients prior to each meal, and wastage after it, and then converts measured consumption into nutrients.
   - Although meals eaten away from home are not captured, this method is probably the most accurate one used to date.
   - But the method is prohibitively expensive to field in large-scale household surveys and has therefore been employed very infrequently.

Measurement of Health

Nutrition-Based Indicators: Nutrient Intakes

An alternative method of collecting nutrient consumption is to obtain information on **intakes** rather than on **availability**.

2. Another method, which is also the most common strategy used to collect nutrient intakes is to ask respondents to recall ingredients that went into meals consumed, usually over the previous 24 hours. This approach has the advantage of potentially excluding leakages (such as meals for guests, transfers of food, and wastage of food).

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11. *What are the potential problems with this measure of health?*
    - It comes at a substantial cost in terms of survey time.
    - Since there is considerable variation in eating habits, 24-hour recalls are likely to be very noisy.
    - Extending the recall period raises concerns about recall bias (which is thought to rise rapidly in this context), and multiple visits further raise the cost of collecting these data.

Measurement of Health

Nutrition-Based Indicators: Anthropometrics

- Height;
- Weight;
- BMI.

Adult **height** is a good indicator of the health environment in which a person grew up. Factors such as malnutrition and illness, both in utero and during childhood, result in diminished adult stature.

Measurement of Health

Nutrition-Based Indicators: Anthropometrics

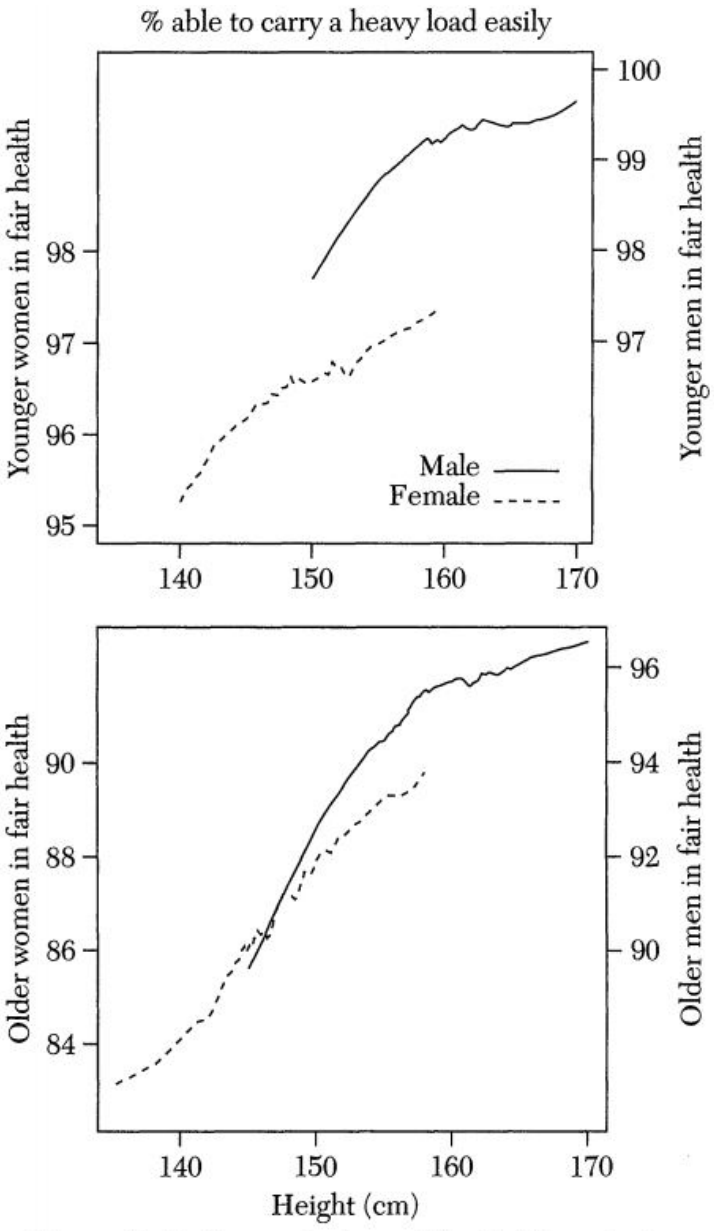
Whereas height is predetermined by adulthood, **weight** varies in the short run and so provides a more current indicator of nutritional status.

Since a light person may also be small, and thus not underweight given height (and, conversely, a heavy, tall person may not be overweight), nutritionists have found it convenient to analyze weight given height.

There are many potential ways of expressing this ratio; one that has been commonly used for adults is **body mass index (BMI)**, the ratio of weight (in kilograms) to height (in meters) squared.

- Because they are relatively inexpensive to collect, in many surveys, height, weight, and sometimes arm circumference have been measured in the field by an anthropometrist.
- While the measures may be subject to random error, a key virtue of these health indicators is the absence of measurement error that is systematically correlated with respondent characteristics.

Measurement of Health



Multidimensionality of Health Status

- There is heterogeneity in both height and functional limitations even within the group of people in fair health; relying only on GHS is throwing away information.
- The positive slopes in the figure indicate that taller people have less difficulty carrying a heavy load.
- Comparing the two panels, younger adults (aged 25 to 40) have less difficulty than older adults (40-55), and comparisons within panels indicate that men have less difficulty than women.

Measurement of Health

Empirical Implications of Measurement Error in Health Status

- *Random measurement error* in health will bias estimated effects towards zero; this is a case of classical errors-in-variables.
  - Repeated measures can ameliorate the impact of random error in regression models.
- *Systematic measurement error* poses bigger problems.
  - *Example:* Poor health is more likely to be reported if the respondent has more contact with a modern health practitioner. If health care utilization rises with income, then higher-wage individuals are more likely to report themselves as ill, given a particular level of underlying health status: the impact of health on wages will be negatively biased.

Measurement of Health

Empirical Implications of Measurement Error in Health Status
Measurement error in health status or inputs is likely to be partly random and partly systematic. The best way to reduce measurement error is to pay more attention to measurement.

- In some cases this involves taking averages across repeated measures (to reduce random noise);
- examining differences (to reduce systematic error);
- taking special care in fieldwork to avoid systematic errors (by carefully measuring "leakages" when collecting nutrient intake data, for example);
- avoiding certain indicators that are especially prone to error.

Measurement of Health

Empirical Implications of Measurement Error in Health Status

Recent innovations in survey methodology offer some potentially exciting opportunities in this regard.

- A small number of household surveys have experimented with greater reliance on direct observation, assessing the incidence of:
  - anemia (based on hemoglobin counts),
  - tuberculosis (using sputum),
  - hypertension (based on blood pressure).
- Studies have sought to measure:
  - glucose levels (with saliva);
  - net energy intake (with labeled water);
  - lung capacity (using peak flow meters).
- Studies also directly observe functional limitations through timed moves:
  - walking a particular distance;
  - standing from a sitting position, etc.

Health and Productivity

Height and Labor Outcomes

- Taller men earn higher wages.
- Taller women also earn higher wages.
- Both taller men and women are more likely to participate in the labor force.

More generally, height reflects investments made in the worker during childhood, and so we might interpret it as an indicator of human capital much along the lines of education.

Health and Productivity

Morbidities, ADLs, Health Limitations, GHS and Labor Outcomes

- In the experiment in Tanzania sugarcane workers infected by schistosomiasis were randomly divided into two groups:
  - The treatment group members were given chemotherapy, and their earnings increased but did not fully make up the gap with the uninfected group.
  - There was no change in the earnings of the control group, the infected workers who were not given chemotherapy.
  - The study clearly suggests that schistosomiasis does affect productivity (Fenwick and Figenschou 1972).
- In contrast, a similar experimental study of sugarcane workers in Cameroon found no effect of the same illness on output (Gateff et al. 1971).

Morbidities, ADLs, Health Limitations, GHS and Labor Outcomes

- A study of Ivorian males reported that those who missed a day of work in the four weeks prior to the survey earned 18% lower wages than those who were not absent.
- But in a companion analysis using comparable data from Ghana, there is no link between wages of men and days ill.
- Women's wages are unaffected by days ill in both countries (Schultz and Tansel 1997).

Morbidities, ADLs, Health Limitations, GHS and Labor Outcomes

- In the Indonesia study, men who reported being ill the previous week worked 70 hours less than other men (Pitt and Rosenzweig 1986).
- In the social experiment in Indonesia, the Indonesian Resource Mobilization Study (IRMS) user fees at public health centers were raised in randomly selected "treatment" districts, while prices were held constant in neighboring "control" districts.
  - Utilization declined in the treatment areas, relative to controls.
  - Labor force participation also declined in the treatment areas, relative to controls (Gertler and Jack Molyneaux 1996).
  - ADLs and days of limited activity changed for the worse among individuals in treatment areas, relative to controls.
  - But GHS and morbidities actually improved for treatments relative to controls.

Morbidities, ADLs, Health Limitations, GHS and Labor Outcomes

In sum, poor health, as measured by the indicators discussed here, does appear to reduce labor supply.

However, the evidence that it affects productivity and wages is more ambiguous.

Nutrient Intakes and Labor Market Outcomes

- In a longitudinal study of 302 male rubber tree tappers and weeders in Indonesia (Samir Basta et al. 1979) half of the men were anemic. Their baseline productivity was 20% lower than the productivity of nonanemic workers. In the experiment, workers were randomly assigned to one of two groups (irrespective of their anemia status).
  - The treatments were given a special iron supplement for 60 days.
  - The controls were given a placebo.
  - At the end of the period, blood hemoglobin, aerobic capacity and output of those who were initially anemic and received the treatment increased to nearly the levels of the nonanemic workers.
  - Among those in the control group who were anemic, productivity and blood hemoglobin levels also rose, although the increase was substantially smaller than among those in the treatment group.

Nutrient Intakes and Labor Market Outcomes

- In a study of 47 Kenyan road construction workers who were randomly assigned to calorie supplementation or placebo (June Wolgemuth et al. 1982) calorie supplementation has a small positive impact on dirt dug per hour.
- Several studies indicate that per capita household calorie availability has a powerful impact on farm output and on wages (Strauss 1986; Sahn and Alderman 1988).

Nutrient Intakes and Labor Market Outcomes

- Measurement error in nutrient intakes has important implications for understanding the links between intakes and labor outcomes.
- Whereas the magnitudes of the effects of calorie availability on wages may be upward biased (because of systematic measurement error), estimates based on intake recalls for the previous 24 hours seem to be downward biased (because of random error).
- Taking this into account, the balance of evidence points to a positive effect of elevated nutrient intakes on wages, at least among those who are malnourished.

Body Size and Labor Outcomes

- Height does seem to have an impact on market wages, although whether this represents health, strength or family background is not clear.
- Body mass seems to positively impact the productivity of men, at least those active in physically demanding jobs.

Conclusion

- Studying the relationship between health and labor outcomes has proved to be very difficult.
- Health and income clearly affect each other and are related to many factors that are hard to measure.
- In the nonexperimental literature, interpretations of associations between health, wages, and income are ambiguous.
- Investments in improved data, particularly longitudinal surveys with good measures of health status, are likely to yield large returns.

References

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