

Health, Income and Economic Development

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Abstract

There is a strong positive relationship between income and health throughout the world. If part of this association represents a causal effect from income to health, then the maintenance and support of incomes becomes a potential policy instrument for promoting population or group health. Policies for income support, such as transfers to the poor, or pensions for the elderly, are instruments that should be assessed, along with the provision of health services, for their ability to improve health. Whether there is a causal link from income to health, and its size, are important research issues for those interested in health in developing countries. This paper uses data from an integrated survey of health and economic well being in South Africa to examine the impact of the South African old age pension on the health of pensioners, and of the prime aged adults and children who live with pensioners. We find evidence of a large and causal effect of income on health status—one that works at least in part through sanitation and living standards, in part through nutritional status, and in part through the reduction of psychosocial stress. The pension is used to upgrade household facilities, and some of the improvements made have health consequences. We find that the household's water source being on-site and the presence of a flush toilet are both significantly more likely, the greater the number of years of pension receipt in the household. In addition, the presence of a pensioner in the household on average reduces the probability of an adult skipping a meal by 20 percent, and the presence of two pensioners reduces the probability by 40 percent. All adults in the survey were asked a battery of questions of depression, which is inextricably linked to stress and health status. We find that, for households pooling income, the presence of pensioners has a significant effect on reported depression, and that the effect is larger, the greater the number of pensioners. We conclude that governments interested in improving health status may find the provision of cash benefits to be one of the most

effective policy tools available to them. Cash provides a yardstick against which other health interventions should be measured.

Introduction

Other papers in this morning's session focus on health service delivery. It is generally implicit in such a focus that access to health services, and the quality of care administered there, are the central determinants of health outcomes. It is a short step from there to taking improvements in the delivery of health care as a central focus for an organization like the World Bank. Such a focus is consonant with the World Health Organization's World Health Report 2000, which stresses the importance of health delivery in health outcomes, claiming that "numerous studies beginning in the 1970s have consistently found that preventable deaths ... have fallen at a faster rate than other deaths," (page 9). The WHO report claims that where the connection between health delivery and health outcomes is weak, this is due to inefficient delivery.

In this paper, without denying the importance of medical services, we shift the focus to the role of income in the promotion of health status. This is an area largely untouched by economists, although it has long been a focus of public health research. (See Adler and Ostrove 1999 for an overview.) Within countries, income is strongly correlated with health outcomes, and policy recommendations that provide for income transfers to the poor, or the promise of increased earnings capacity, may prove to be as important for health outcomes as those calling for additional funds for service provision, especially in settings where the capacity to deliver health services is weak.

An understanding of whether and how income generates better health is important for public health policy, because the share of resources devoted to different policy options should depend on the relative effectiveness of each. This paper does not argue against the importance of public health campaigns to provide clean water, eradicate malaria, vaccinate children or deliver

AIDS drugs in developing countries. Neither does it argue against improvements in the quality of health services and increased access to these services. However, weak links in the chain of public provision identified by many researchers (see Filmer and others 2000 for an overview) strengthen the case for considering alternatives, and for quantifying the causal impact of income on health outcomes. The efficacy of spending money to improve health delivery should be weighed against that of improving school quality (say) and increasing educational attainment to promote health. The relative merits of a new school or a new clinic should also be weighed against those of increasing the incomes of the poor, as a method of improving health outcomes. Poor people may spend part of this additional income on doctors visits and medical care and, even if they don't, they may spend it on goods associated with better health—on more nutritional food, better housing, or safer places to live, for example. They may also derive health benefits directly from money, for example by relieving the stress and susceptibility to infection associated with the daily trials of coping for oneself and one's family on inadequate income. Health improvement through income redistribution has become a strategy debated in the mainstream: *An Independent Inquiry into Inequalities in Health* (the Acheson Report), commissioned to study health inequalities and to propose changes that would reduce the growing gaps in morbidity and mortality in the UK, recommended “policies which will further reduce income inequalities” as a mechanism to improve the health of the poor (page 36). An understanding of the merits of these different mechanisms is of first-order importance.

This paper provides estimates of the causal impact of income on health outcomes in one transition economy, South Africa. The South African experience is of interest for many reasons. South Africa is a transition economy with both a “developed” country population, and a

“developing” country population. Access to first world medical care, although largely limited by race and wealth, is available to some of South Africa’s poor. (Historically many poor people in Cape Town used Groote Schuur Hospital—home of the world’s first successful heart transplant—as their local clinic, while those in rural areas struggled with poorly provisioned clinics.) South Africa has also witnessed many innovative policy experiments since the change of government in 1994—including the provision of large pensions to all elderly citizens. We will make use of the old age pension to estimate the causal effect of income on health.

We begin by discussing the relationship between income and health outcomes. Section 3 turns to the question of why quantifying the causal effect of income on health is difficult, given the data available at present. Section 4 introduces data from a survey in South Africa in which both income and health status were examined in some detail. Section 5 presents estimates of the causal impact of income on health, and evidence on some of the mechanisms by which income is translated into better health. Section 6 offers concluding comments.

The Health Gradient

People in wealthier countries live longer and have lower morbidity, on average, than do people in poorer countries. Within countries, wealthier people live longer than poorer people and, over time, as countries become more wealthy, average life expectancy increases. This phenomenon is not limited to the bottom end of the income or wealth distribution. Indeed, the *gradient* in health status—the phenomenon that relatively wealthier people have better health and longevity—is evident throughout the income distribution.

Evidence on the relationship between income and health come from historical analyses,

cross-country comparisons, and within-country analyses using microeconomic data. (The literature is vast, and here I touch only on a corner of it in order to provide context for this paper.) Work by McKeown (1976) and Fogel (1994) has argued that improvements in longevity in the 19th century were driven not by advancements in medicine or public health, but by improvements in nutrition, largely driven by higher incomes. However, other researchers—including Preston (1975), (1980), Szreter (1988), and Easterlin (1998), (1999)—present historical and cross-country evidence on shifts in the “health production function,” shifts they attribute less to income or income growth, than to public health efforts—particularly sanitation, vaccination and vector control—and to advances in health technologies, such as antibiotics.

At the microeconomic level, using household or individual-level data, researchers have documented a significant positive relationship between income and measures of health status in both developed and developing countries. For developed countries, we expect both a channel from health status to income and feedback from income to health (Smith 1999, Adler and others 1994). For developing countries, much of the research on the connection between income and health has focused on infant mortality, where the role for feedback from health to income is quite limited. (See for example Gwatkin (2000) and Wagstaff (2000).)

Even if one accepts the position that it was public health and health technology that drove down mortality over time in rich countries, and that was responsible for the decline in mortality after World War II in developing countries, and even if one accepts that better delivery of health services is an important goal in poor countries, it is important to explore the possibility of using income transfers as a tool of health policy. If individual income is causally related to individual

health, and if the organizational capacity, political will, or control of corruption hampers service delivery, income transfers may do more for the health of the poor than does committing more money to an ineffective health delivery system.

The Difficulties in Quantifying the Causal Effects of Income

Whether money can be exchanged for better health, and the mechanisms through which this may occur, have proved difficult to quantify, particularly for working aged adults. This is for a number of reasons, not least of which is that pinning down the effect of income on health is difficult when, simultaneously, health is influencing income. In addition, the mechanisms by which money is translated into health may vary with the level of development; there may not be one mechanism (or set of mechanisms) at work everywhere. Finally, until recently there have been few sources of data that contained enough details about both health and income to allow reasonable micro-level examinations of the phenomenon.

Among persons observed only at one point in time, if illness causes people to work fewer hours, they will be observed with low health status and low income. One would not want to conclude from this that the current lack of income caused the illness. In order to quantify the impact of income on health, one must find a tool that allows the correlation working from health to income to be disentangled from that working from income to health. This is not always possible, nor is it always possible to rule out a role for ‘third factors’—that is, for variables that determine both income and health status.

The causes of poor health status in the developing world may have little in common with those in industrialized countries. In the former, the risks may be primarily from infectious disease,

lack of clean drinking water and inadequate diet. In the latter, the risks may be primarily from chronic diseases associated with lifestyle, and reduced physical activity. The mechanisms at work beneath the relationship between health and income may (or may not) be specific to the country's level of industrialization. Transition economies may be especially difficult to quantify: persons living in the same communities, and sometimes in the same households, are struggling both with the 'unfinished agenda' of infectious disease, and the 'emerging agenda' of chronic disease and violence (Kahn and others 1999); obese women may be living near, or living with, malnourished children (Case and Wilson 2001). The challenge of comparing across levels of development may be rewarded, however, if such comparisons bring to light universal mechanisms at work. (Psychosocial stress is apt to be found in every environment, to take one example; see Marmot 1999.)

In many countries, health surveys have focused on reproductive health and, apart from measuring access to health facilities, health authorities often see little need for survey work at all. On the public health side, in developing countries, there has been little appreciation of the need to incorporate direct health measurement into survey methodology. On the economic side, there is still too great a focus on *household* surveys, and too little attention to *individuals*; health is a characteristic of the latter, not the former. Few economic surveys ask questions about health status, and few focus on the whole life-cycle, looking at children, adults, and the elderly. This makes it difficult to look at interactions between the groups or the intergenerational transmission of health, and it makes it difficult to predict the effects of aging. Moreover, because children and the elderly are less likely to work than adults, the lack of attention to them deprives us of a tool for disentangling the links between income, earnings, and health. Two of the most important

sources of data for household or individual level analysis in developing countries, the Demographic and Health Surveys (DHS) and the Living Standards Measurement Surveys (LSMS) were not designed to analyze the interaction between income and health. The DHS surveys contain no information on household income, and focus primarily on reproductive health, while the LSMS surveys generally contain detailed information on consumption and income, but very limited (if any) information on health status. Integrated household surveys that collect individual data on economics and on health can serve to explore the welfare consequences and interactions of different deprivations. Economists, in collaboration with physicians and other social scientists, can do much to find out how poverty and ill health separately and in interaction determine well being.

The South African Integrated Family (Langeberg) Survey

A team of researchers in the US and South Africa developed an instrument to link information on individual and household economic well being with health and mental health status of household members, with an eye toward identifying causal links in the income-health gradient. The instrument includes questions on household resources, control over those resources within households, physical health of adults and children, mental health of adults, access to medical services, as well as a broad set of questions related to other aspects of well being, including social integration, exposure to violence, and the deaths of family members and friends. It was used in 1999 to collect data from a racially-stratified random sample of 300 households (1300 individuals) in the Langeberg health district in the Western Cape, an area that contains a mix of Black, White

and Coloured communities.¹ (See Case and Wilson 2001 for additional details on the survey.)

Table 1 presents summary statistics from the survey, with the upper panel presenting means for all adult respondents by race, and the lower panel presenting means by household by race. Measured along most economic and health dimensions, Blacks are less well off than are Coloureds, and Coloureds are in turn less well off than are Whites. The mean monthly income of adult respondents in our survey are R511 (Rands) for Blacks, R936 for Coloureds, and R2968 for Whites—or roughly a six-fold difference in monthly incomes for Blacks and Whites. The differences are even more stark when calculated as per-person income figures (as shown in the lower panel). Blacks on average live in larger households than Whites (4.4 members versus 2.8 members), with larger numbers of children (1.7 for Blacks versus 0.8 for Whites).

Every adult in the survey was asked to answer the question “How would you describe your health at present? Would you say it is excellent, good, average, poor or very poor?” The respondent’s answer is scored from 1 to 5, with “excellent” equal to 1 and “very poor” equal to 5. Poor self-reported health has been shown to be a powerful predictor of mortality, and remains so even when one controls for current health status and behaviors. Recent work has also found that poor self-ratings of health are a significant predictor of changes in functioning among the elderly. (See Idler and Kasl 1995 for results on changes in functioning, and for extensive references on the studies of self reported health and mortality.)

Blacks report themselves to be in poorer health on average. Nineteen percent of Black adults reported themselves to be in poor or very poor health, true of only 8 percent of Coloureds

¹This paper will use the apartheid classification of people as ‘Black’ and ‘Coloured,’ in part because the labels carry with them information about the long-term deprivation faced during the apartheid era.

and Whites. This is true even though Whites in the Langeberg District are older on average than are Blacks or Coloureds: the mean age of White adult respondents is 48.5 years, compared with a mean age of 37.6 for Black adults and 38.7 for Coloured adults. (The Langeberg district is on the Southern coast of South Africa, and has been a popular retirement area for Whites.)

The top panel of Table 1 also presents information on whether a health care professional has told respondents that they have particular chronic diseases. In the part of South Africa where these data were collected, most adults report access to some branch of the health care system, and have been examined by a health care professional. Surveys run in the U.S. to test the reliability of self-reported chronic conditions show a high degree of reliability. (See Brownson and others 1994, for example, for reports on hypertension and diabetes.) Table 1 shows Blacks and Coloureds as more likely to report that a doctor or nurse or health care professional has told them that they have asthma, tuberculosis and diabetes. Roughly 4 percent of all Black and Coloured adults report both tuberculosis *and* a chronic disease (cancer, heart trouble, stroke, diabetes or emphysema), which is true for less than 1 percent of Whites.

The bottom panel of Table 1 presents information on household decision making that will be used in what follows. 12 percent of Black households report that members do not pool their incomes. Roughly two-thirds of all households report that a woman is among those who have “the most say in decisions about spending” in the household. Pooling (or the lack thereof) and the position of women in the decision making hierarchy have both been shown to be important in determining household resource allocation. (See Alderman and others 1995, and references therein.)

Health Status and Income: Evidence From the Langeberg survey

Table 2 presents a preliminary look at the relationship between health status and income from the Langeberg survey, separately for Blacks, Coloureds and Whites, ages 18 to 88. For all three races there is a negative and significant relationship between the respondent's own income (from all sources) and health status, measured using the five-point scale introduced above. For all three races, a doubling of income is associated with a betterment of health status of roughly two-tenths of one point (remembering when looking at the table that lower numbers are associated with better health). That the gradient is strong for all three races, whose levels of income vary markedly, is consistent with results presented by Adler and others 1994, who provide evidence that "the association of SES and health occurs at every level of the SES hierarchy, not simply below the threshold of poverty," (page 15).

The health of Blacks deteriorates more rapidly with each year of age than does the health of Coloureds. Blacks on average report a 0.03 point worsening of health with each year of age, while Coloureds report a 0.02 point worsening. Whites 'age' more slowly than either of the other races: one year of age worsens reported White health by 0.015 points—just half that reported for Blacks. For Blacks, on average a doubling of income (a move, for example, from the median to the 67th percentile of the income distribution) is comparable to turning back the age clock by 7 years: both are associated with an improvement in self-reported health status of 0.2 points.

The gradient seen in adults' health is not eliminated when controls are added for education. In fact, educational attainment is not strongly correlated with health status for Blacks or Coloureds. For Blacks, in some specifications, there is a small and significant relationship between education and health status. For Coloureds, in no specification was there a significant

correlation. For Whites, education and income both appear to be significantly correlated with health status, and the inclusion of education reduces the impact of income on health status by one-third (from 0.3 to 0.2). The differential effects of education between races is difficult to interpret here: the quality of South African schools varied markedly by race in the apartheid years (see Case and Deaton 1999). If school quality improves for Coloured and Black children, in the future one may find a stronger impact of education on health status.

The gradient in health status in South Africa is identical to that found in the United States. The last two columns of Table 2 present results for Blacks and Whites in the U.S., using ten years of data from the National Health Interview Survey (NHIS).² For both Whites and Blacks, a doubling of income is associated with an improvement of 0.2 points in self reported health status. As is true in South Africa, the health status of Blacks in the U.S. deteriorates faster with age than does that of Whites, and education is more protective of health for Whites. (The precision of the U.S. estimates, which allows us to differentiate between the Black and White coefficients, comes from the sample size: there are half a million White observations in the U.S. estimate.)

By itself, the fact that the gradient in health status is identical between the U.S. and South Africa would seem to rule out some factors as an explanation of the relationship. Access to and quality of health services differ markedly between the countries, as do the quality and average levels of education. In what follows this paper will examine, for the South African results, whether the correlation is due to the impact of health on earnings, or due to the impact of money

²In the NHIS, the only measure of income recorded is total household income, which is recorded for 27 income categories. Incomes have been assigned to these income categories using data from the 1986-1995 March Current Population Surveys. See Case, Lubotsky and Paxson 2001 for details.

on health, or potentially due to some third factor that affects both health and income. Some of the mechanisms can be ruled in, and ruled out, using the data collected in the Langeberg survey.

The Impact of Health on Income

Part of the correlation between income and health in South Africa is due to the reduced earnings potential of those South Africans who have been chronically ill. Chronic illnesses have a large and significant effect on reported health status. This is illustrated in column 1 of Table 3, which presents results of one regression of the respondents' self-reported health status on responses about whether a health professional has ever informed them that they have specific chronic conditions. This regression, which also include controls for age, sex and race, shows that asthma, tuberculosis and cancer have large and significant effects on health status, with each worsening the reported status by more than half a point, and conditions associated with obesity (high cholesterol and diabetes) each worsen health status by three-tenths of a point on average.

That these chronic illnesses are related to labor force participation is seen in column 2 of Table 3, which presents results on reasons for retirement. The Langeberg survey asked each older adult (aged 55 and above) whether "as you got older, did you reduce your hours or change the type of work you were doing?" and, if the response was positive, an open-ended follow-up question was asked about why this change occurred. Poor health was the modal response to this question; being old, or old enough to receive a pension, was the second most often heard response. The dependent variable in Column 2 is defined only for those who report retirement. It is an indicator variable that the retirement occurred because of poor health. Column 2 shows that, for the 74 older adults who report retirement, retirement due to poor health is significantly

correlated with the same chronic conditions that led to the largest reduction in health status—asthma, tuberculosis and cancer. The health conditions are jointly significant determinants of reporting that retirement was due to poor health (F-test=10.56, p-value=0.0000). This is (albeit *prima facie*) evidence of a channel from poorer health to lower income, working through the effect of chronic disease on labor force participation.

The Impact of Income on Health

That a channel exists from health to income does not imply the absence of a channel from income to health. However, it does caution for care to be taken when separating out the effects. To investigate whether income has a causal effect on health, we need to identify a source of income that is not itself determined by a respondent's health status. For South Africa, this challenge is easily met by the state old age pension. In South Africa, women aged 60 and above and men aged 65 and above are eligible for a monthly cash transfer, if they do not have an employer-based pension. Take-up rates for the state pension among Blacks and Coloureds are on the order of 80 percent (Case and Deaton 1998). In many communities in South Africa, where unemployment is as high as 40 percent, the state pension is the only stable source of income. It is also a large sum of money. At the time of the Langeberg survey, the old age pension was R520 per month, which is equal to the median income for adult Coloured respondents in the Langeberg survey, and is more than twice the median for Blacks (R220). We restrict our attention here to Coloured and Black respondents; Whites are generally precluded from taking-up the state old age pension, because of their access to private pensions. (White participation in the state old age pension is roughly 10 percent.) We use the presence in the household of an age-eligible member as our

marker for the pension, rather than pension receipt itself, in order to avoid modeling the timing of pension take-up.

In what follows, we also use the fact that not all households in South Africa pool the incomes of their members. In the Langeberg survey, 16 percent of Black and Coloured households (20 percent of adult respondents) report that income is not pooled in their households. Pooling of income is not correlated with total household income, or household size, or with the presence of pensioners in the household, or the sex of the pensioner. However, pooling is significantly more likely, the smaller the age difference between the oldest and youngest adults in the household, and the fewer the number of generations living under one roof. Pooling is significantly less likely if a young adult in the household (male or female) reports working for money. Pilot surveys in South Africa between 1996 and 1998 showed that younger working household members in many cases were reluctant to pool resources with older members, and chose instead to make their own way (even while living under the same roof with their kin). This is consistent with what we find in the Langeberg data.

We use information both on pension receipt and on income pooling to identify a causal effect of income on health status. Pension income should benefit prime-aged adults and children living in a pensioner household, but only if incomes are pooled. We examine this in Figure 1, where we plot the conditional expectation of health status, given age, for Black and Coloured adults living in households that pool income. The conditional expectations are calculated using a Fan (1992) locally weighted regression smoother, which allows the data to determine the shape of the function, rather than imposing (for example) a linear or quadratic form. We present health status by age separately for respondents who are currently living with a pensioner, and for those

who are not. For both groups, we see that self-reported health status generally worsens with age. (The improvement observed in self-reported health status between ages 20 and 35 for respondents living with pensioners is due in part to the higher probability of there being multiple pensioners in households with respondents aged 35 relative to those aged 25. This will be explored in Table 4 below.)

Figure 1 shows that pension income protects the health of *all* adult members in households who pool income. A gap in self-reported health status develops in favor of respondents living with a pensioner for respondents in their 20s, and continues through adulthood. We have drawn a vertical line at age 60, the age at which women become eligible for the pension. For pensioners in households that pool income, health continues to worsen with age at roughly the same rate it does for its members between the ages of 40 and 60. This does not imply that the pension does not improve the health of pensioners: if a woman were the first person in her household to become age-eligible for the pension, at age 59 we would expect to observe her on the upper curve (marked “without pensioners”). At age 60, upon receipt of the pension, we would expect her health to improve, and on average move to the lower curve (marked “with pensioners”) in Figure 1. Not only would we expect to see her health improve; we would also anticipate improvement in the health of members of her household.

The results in Figure 1 are in sharp contrast to those for non-pooling households, which we present in Figure 2. Again we see a pronounced worsening of health with age. However, here we find much less of a difference in the health status of respondents, at any given age, with and without pensioners in their households. In contrast to the results for pooling households, the self-reported health status of respondents not living with a pensioner is slightly better. Once a

respondent reaches pension age in a non-pooling household, health status stops declining altogether, and begins to improve. Results presented in Figures 1 and 2, then, suggest that the pension protects the health of all members, when the household pools income, and protects the health of pensioners only, when the household does not pool.

Would pensioners in pooling-households be in better health on average if they lived in non-pooling households? To answer that question, we present health status for all respondents living with a pensioner, in households that pool income and those that do not. These results, presented in Figure 3, again show the protective effect of pension income on the health of all members of a pooling household. At age 60, women coming into their pensions from a pooling household start life as a pensioner with better health than do those coming into their pensions from a non-pooling household. It is not until age 70 that the ameliorating effect of the pension for pensioners in non-pooling households brings their health status into line with that observed for pensioners from pooling households.

Figures 1 through 3 provide evidence that pension income is protective of health status. For pensioners living in non-pooling households, the beneficial effects of the pension accrue only to the pensioners, and only upon receipt of the pension. However, for pensioners living in income pooling households, the beneficial effects of the pension accrue to all members.

We quantify the size of this effect, and control for other characteristics of the household and its members, in regressions presented in Table 4. We present results for Black and Coloured respondents who pool income (the first set of columns), and those that do not (the second set). In those households in which resources are pooled, the presence of a pensioner improves health status on average by 0.4 points (column 1). No additional protection of the pension income

accrues to the pensioner: in column 2, while the presence of a pensioner in a pooling household again improves self-reported health status for all household members by 0.4 points, an indicator that the respondent is a pensioner has a small coefficient (-0.015) that is insignificantly different from zero. In contrast, in non-pooling households, being the pensioner has a large effect on self-reported health status (column 5). This difference in outcomes, between pensioners in households that pool and those that do not, appears in many of the results presented below.

The last column in each panel breaks the pensioner households into two types: those with one pensioner, and those with two or more pensioners in the household. (Each pensioner receives R520 per month.) We find that the coefficient on having two or more pensioners in a pooling household is more than twice as large as that observed for one pensioner households. Again, being the pensioner provides no extra protection in households that pool. In households that do not pool, having pensioners is associated with worse health status, except for the pensioners themselves, whose health is 0.7 points better than that of other members of non-pooling households.

There may be unobservable differences between pooling and non-pooling households that are correlated with health status, and with the presence of pensioners. If so, these may bias the estimated impact of pension income on health status. We examine whether this is driving our results in the last two columns of Table 4, where we report results for all Black and Coloured respondents, from both pooling and non-pooling households. We continue to find a significant effect of pension income on outcomes for all members, and one that is larger, the greater the number of pensioners in the household. The results are attenuated relative to those in the first set of columns. This is to be expected, given that we have grouped together households in which the

pension helps all members (pooling households) and those in which the pension protects only the elderly.

Also of note is the fact that, in pooling households, women's health is significantly worse than men's health. However, if a woman is reported to have the 'most say' in how money in the household is spent, this provides some protection for women's health. For pooling households, the variables indicating that a woman has the most say in spending, and that indicator interacted with whether the respondent is a woman, are jointly significant in all specifications.

We test for the impact of income on children's health using data on their heights and weights; the former is an indicator of long-run nutritional status, and the latter is an indicator of short-run status. We explore the extent to which pension income influences children's anthropometric measures in Table 5, where we present regression results of heights and weights for Black and Coloured children separately. (We conduct the analysis by race because of possible differences in growth patterns.) We restrict the sample here to children born after the old age pension system was fully implemented (January 1, 1994), and we include a complete set of quarter-since-birth indicators to control for age. Table 5 shows that, for both Blacks and Coloureds, the presence of a pensioner is positively and significantly correlated with children's height: the presence of one pensioner is associated with an additional 3 to 4 centimeters of height. On average in the Langeberg data, Black and Coloured children are 8 centimeters taller with each year of age from ages 0 to 6, so the additional height associated with the presence of a pensioner is roughly that associated with an additional half year of age. For Blacks, we find that the presence of two pensioners has an effect on height that is more than twice the effect of one pensioner. (There are no young Coloured children in two-pensioner households.) The presence of

a pensioner is also associated with increased weight (1 kilogram) for Coloured children, but is not a significant predictor of weight for Black children. That the pension is protective of children's height, and thus of children's long-run nutritional status, may prove important in a country where many AIDS orphans will live with elderly relatives in the next decade.³

Turning Money into Health

The results of the previous section provide evidence that pension income protects health status. This leads us to ask whether we can identify some of the mechanisms by which money is used to generate health. Here we turn our attention to four channels: medical care, water and sanitation, nutrition, and psychosocial stress.

One way in which money might generate health is through its effects on health care. Higher incomes may allow respondents to spend more time and money seeking out health services. A pensioner may be able to afford a consultation with a private doctor, for example, or a longer taxi ride to a better equipped clinic. We looked for evidence of such a mechanism at work by examining whether Black and Coloured respondents reported that, in the past three months, they had been to any of a number of health services for medical care. These included: a day hospital or community clinic; a mobile clinic; a government hospital or outpatient clinic at a hospital; a private hospital or clinic; a private doctor; a chemist shop; a traditional healer; or a community nurse who visits at home. Specifically, we regressed the respondent's answer to each of these questions on an indicator that there is a pensioner in the household, and whether the

³These findings are broadly consistent with those of Duflo (2000), who finds the South African pension protective of children's heights, using data collected in 1993 (before the pension was fully implemented).

respondent is a pensioner, together with the respondent's age, an indicator the respondent is Coloured, age interacted with the Coloured indicator, and indicators that the respondent is female, and that the respondent lives in an urban area. We found that neither having a pensioner in the household nor being a pensioner was a significant positive determinant of going to a clinic or doctor, whether government-run or private. (These results are available upon request.)

In addition, we tested whether pensioners had an effect on choice of health care provider in pooling households by adding indicators that the household pools income, and that the household has a pensioner and pools income. We found that the coefficients for respondents living with pensioners in pooling households were never positive, significant determinants of health care usage. (In fact it appeared these respondents were significantly less likely to have been to a day clinic, a government hospital, or a private doctor.) The results for pensioners themselves were small, and insignificantly different from zero. These results were robust to analyzing respondents separately by race, and to restricting the sample to only those respondents who reported themselves to be in poor health.

There may be many reasons why we found no effects of pension income on health services. We did not control for the quality of the health care available, which may be uniformly poor. The three month window may be too short to capture health care usage adequately. But we conclude from this analysis that, if income is protecting health status through the health care system, more work will be needed to find it. Our results provide no evidence that pension income has a significant effect on doctor and clinic visits, or that the protective effect of income on the health status of people living with pensioners is working through health care utilization.

A second way in which money may influence health is through better sanitation. The

pension may be used to upgrade household facilities, and some of the improvements made may have health consequences. We find the presence of a pensioner in the household is positively and significantly correlated with a flush toilet in the dwelling, and positively correlated with an indicator that the household's source of water is on-site (Case 2001). Roughly 40 percent of the Black and Coloured households in our sample have a flush toilet; 10 percent do not have water on-site. Obtaining water on-site, or a flush toilet, may take time to accomplish. These water-related variables are both significantly correlated with the number of years the pensioner should have been receiving his or her pension (based on age), together with an indicator that a pensioner is present. We find that the household's water source being on-site and the presence of a flush toilet are both significantly more likely, the greater the number of years of pension receipt in the household.

A third way in which money may influence health is through its effect on nutrition. Results presented in Tables 6 suggest that this can explain some of the relationship we find between pension income in the household and health status. Table 6 presents regression results on whether a "knowledgeable" household member reported that an adult in the household had skipped a meal or had the size of a meal reduced in the last year because there wasn't enough money for food. Roughly 45 percent of all Black and Coloured households reported an adult skipping a meal. The presence of a pensioner in the household on average reduces the probability of an adult skipping a meal by 20 percent. In pooling households, the presence of two pensioners reduces the probability by 40 percent. Skipping meals is associated with poorer health. In a pooling household, when an adult is reported to have skipped a meal, health status of respondents is 0.14 points worse (Case 2001). In non-pooling households, when an adult has missed a meal, on average this has no

significant effect on the health reported for household members. Perhaps in the pooling household if one adult missed meal it is more likely that they all did, leading to the significant effect for pooling households. (Alternatively, in non-pooling households, perhaps it is less likely that the “knowledgeable” household member knows whether meals were skipped, leading to noise in this variable.) Adding the information on meal skipping reduces the pensioner coefficients in pooling households by roughly 5 percent (Case 2001). With enough information on how pension income is spent, we may be able to parse out the effect of having a pensioner on household health into its component parts.

Finally, we turn to the impact of income on psychosocial stress. Some of the biological pathways through which stress erodes health are now well understood (Sapolsky 1994), and the field is moving apace. The ways in which income may be useful in reducing stress are infinite. When a woman has enough money to feed her children, or a household head knows where the money to pay school fees will come from, stress is reduced.

In the Langeberg survey, all adults were asked a battery of questions of depression, which is inextricably linked to stress. (As noted by Sapolsky, “it is impossible to understand either the biology or psychology of major depressions without recognizing the critical role played in the disease by stress,” page 197.) Respondents in the Langeberg survey were asked how often in the past week they felt:

that they could not stop feeling miserable
depressed
sad
they cried a lot
they did not feel like eating
that everything was an effort
their sleep was restless
they could not get going.

We create a depression index from the answers to these questions. Specifically, for each, if the respondent reported that they felt this way “most of the time” we coded their answer as a “1,” and otherwise coded it as a “0.” We then sum these responses, and use the sum as a depression index. (The mean index is 0.54, with 10 percent of the sample reporting 2 or more depression-related behaviors.) We test whether depression is correlated with income, in the form of pension income, by regressing the depression index on the presence of pensioners in the household, and report the results in Table 7. We see that, for households pooling income, the presence of pensioners has a significant effect on reported depression, and that the effect is larger, the greater the number of pensioners. (Results in Table 7 are very similar if we estimate ordered probits in place of OLS regressions.) The presence of pensioners in non-pooling households is insignificant. Pensioners in non-pooling household attract a large coefficient, but one with a large standard error. Grouping the pooling and non-pooling households together, we again find a large and significant effect of the presence of pensioners on the depression index.

An alternative explanation for the benefits associated with the presence of a pensioner is simply that the presence of older people in the household leads all members to be less depressed. We test for this by including in these regressions controls for household size, the number of children in the household, and the number of members aged 55 and above. For pensioner households, we find no significant effect of having older members, unless those members are pension-eligible.

Conclusions

We find evidence in the Langeberg survey that income has a causal effect on health status—one that works at least in part through sanitation and living standards, in part through nutritional status, and in part through the reduction of psychosocial stress.

Our results demonstrate that information collected at the household level is not by itself adequate to assess the causal effects of income on the well being of individual household members. In the case of South Africa (and it seems likely to be true elsewhere), such data need to be augmented with additional information on household sharing rules, if accurate readings are to be taken.

Our results also demonstrate that governments interested in improving health status may find the provision of cash benefits to be one of the most effective policy tools in their kits. Children dying of infectious diseases brought on by HIV/AIDS are often dying of the very same diseases that are killing children whose immune systems have been weakened by malnutrition. While we do not yet have adequate protocols for treating children with HIV/AIDS, we know how to treat malnutrition—very simply, by providing income to the children’s primary care givers.

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Table 1. Summary Statistics for The Langeberg Survey 1999

	Black	Coloured	White
<i>Individual data, ages 18 and above:</i>	nobs=224	nobs=336	nobs=128
Respondent's income (Rand per month)	511	936	2968
Indicator: respondent works for money	0.397	0.608	0.529
Self-reported health status (1=excellent, 5=very poor)	2.83	2.31	2.23
Indicator: asthma	0.087	0.085	0.048
Indicator: tuberculosis	0.091	0.099	0.034
Indicator: cancer	0.008	0.005	0.047
Indicator: heart trouble	0.072	0.064	0.146
Indicator: stroke	0.021	0.029	0.058
Indicator: high cholesterol	0.162	0.160	0.220
Indicator: diabetes	0.035	0.075	0.071
Indicator: emphysema	0.041	0.064	0.067
Indicator: both chronic and infectious disease	0.039	0.035	0.008
Age	37.6	38.7	49.5
Indicator: female	0.508	0.528	0.539
<i>Household level data:</i>	nobs=100	nobs=125	nobs=63
Total household income per member	326.8	572.8	2141.8
Indicator: no income pooling	0.127	0.174	0.077
Indicator: woman has a say	0.679	0.756	0.717
Household size	4.44	4.85	2.84
Number members aged 0-17	1.73	1.89	0.78
Number members aged 18-54	2.20	2.51	1.23
Number members aged 55+	0.38	0.40	0.83

Sample means are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). "Indicator: woman has a say" =1 if a woman is reported to have a say in the way the household spends its resources. Source: The Langeberg Survey 1999.

Table 2. Income and Health Status
 Dependent Variable: Health Status (1=Excellent, 5=Very Poor)
 (Standard errors in parentheses)

	Black		Coloured		White		Black US	White US
Log(own income)	-0.175 (0.068)	-0.163 (0.065)	-0.147 (0.037)	-0.157 (0.036)	-0.324 (0.072)	-0.205 (0.061)	-0.193 (0.004)	-0.200 (0.002)
Age	0.029 (0.005)	0.025 (0.004)	0.021 (0.002)	0.022 (0.002)	0.015 (0.006)	0.013 (0.006)	0.019 (0.0002)	0.017 (0.00008)
Education	-	-0.036 (0.018)	-	0.010 (0.012)	-	-0.095 (0.035)	-0.052 (0.001)	-0.072 (0.0005)
Number of obs	122	122	250	250	86	86	83427	544256

South African regressions are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). Income for the NHIS is total household income. Both the U.S. and South African samples restricted to adults aged 18 and older. Source: The Langeberg Survey 1999 (columns 1-6) and the U.S. National Health Interview Survey 1986-95 (columns 7-8).

Table 3. Health Conditions and Employment
(Standard errors in parentheses)

Controls:	For all adults: Dependent Var: Self reported health status	For retirees only: Dependent Var: =1 if retirement was due to poor health
Asthma	0.582 (0.129)	0.212 (0.127)
Tuberculosis	0.538 (0.186)	0.306 (0.227)
Cancer	0.811 (0.219)	0.780 (0.213)
Heart Trouble	0.177 (0.120)	-0.106 (0.097)
Stroke	0.076 (0.219)	-0.242 (0.104)
High Cholesterol	0.342 (0.118)	0.019 (0.111)
Diabetes	0.288 (0.124)	-0.153 (0.120)
Emphysema	0.162 (0.162)	-0.148 (0.121)
Black	0.782 (0.142)	0.275 (0.188)
Coloured	0.249 (0.119)	0.427 (0.146)
Age in Years	0.014 (0.003)	-0.003 (0.004)
Female	0.100 (0.051)	-0.212 (0.082)
Number of obs	632	74

Regressions also include a constant term. Both regressions are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). Source: The Langeberg Survey 1999.

Table 4. Pension Income, Income Pooling and Health Status
 Dependent Variable: Health Status (1=Excellent, 5=Very Poor)
 Black and Coloured Adults Respondents

	Household Income Pooled			Household Income Not Pooled			All Households	
Someone in household is eligible for a state pension	-.395 (.145)	-.389 (.186)	--	.261 (.161)	.351 (.132)	--	-.264 (.086)	
One person in household is eligible for a state pension	--	--	-.320 (.145)	--	--	.339 (.134)	-.146 (.080)	
Two or more in household are eligible for a state pension	--	--	-.725 (.214)	--	--	1.418 (.275)	-.534 (.227)	
Respondent is eligible for an old age pension	--	-.015 (.300)	.102 (.303)	--	-.618 (.419)	-.710 (.433)	-.113 (.305)	
Female	.358 (.104)	.358 (.110)	.347 (.116)	.066 (.196)	.069 (.203)	.066 (.204)	.315 (.089)	.314 (.098)
A woman has the most say in household spending	-.076 (.110)	-.076 (.112)	-.078 (.115)	-.269 (.207)	-.206 (.199)	-.215 (.202)	-.101 (.111)	-.098 (.115)
Female* woman has the most say in spending	-.218 (.113)	-.219 (.117)	-.208 (.128)	.169 (.367)	.168 (.362)	.181 (.363)	-.175 (.075)	-.169 (.078)
Household does not pool	--	--	--	--	--	--	.051 (.087)	.025 (.089)
Number of obs	416	416	416	88	88	88	504	504

Standard errors in parentheses. All regressions are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). Included in all regressions but not shown in the table are respondent's age, an indicator that respondent is Coloured, and age interacted with an indicator that respondent is Coloured. Source: The Langeberg Survey 1999.

Table 5. Children's Heights and Weights
(Children Born After January 1, 1994)

Controls:	Height in centimeters				Weight in kilograms			
	Black		Coloured		Black		Coloured	
Someone in household is eligible for a state pension	8.07 (4.35)		4.54 (2.21)		-.055 (2.44)		1.10 (.316)	
One person in household is eligible for a state pension		3.21 (1.89)		4.54 (2.21)		.074 (4.35)		1.10 (.316)
Two or more in household are eligible for a state pension		13.9 (6.20)		--		-.211 (.498)		--
Female	-7.83 (2.87)	-7.12 (2.97)	-1.10 (1.34)	-1.10 (1.34)	2.67 (9.86)	2.65 (10.42)	-.584 (.316)	-.584 (.316)
Number of obs	37	37	44	44	37	37	44	44

Standard errors in parentheses. All regressions include a complete set of quarter of birth indicators (Quarter 1, 1994 through Quarter 2, 1999). Regressions are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). Source: The Langeberg Survey 1999.

Table 6. Pension Income, Income Pooling, and Hunger

	Household level variable: =1 if an adult in household skipped a meal					
	Pooled		Not Pooled		All	
Indicator: household has a pensioner	-.234 (.073)	--	-.164 (.151)	--	-.224 (.052)	--
One person in household is eligible for a state pension	--	-.166 (.079)	--	-.195 (.143)	--	-.183 (.045)
Two or more in household are eligible for a state pension	--	-.397 (.079)	--	.491 (.239)	--	-.354 (.087)
<i>F</i> -test: Joint significance of the number of pensioner variables	--	15.28 (.0000)	--	4.05 (.0428)	--	14.82 (.0001)
Household size	.024 (.013)	.024 (.013)	.030 (.042)	.026 (.040)	.023 (.014)	.023 (.014)
Household does not pool income	--	--	--	--	-.010 (.077)	-.018 (.076)
Number of obs	187	187	33	33	220	220

Standard errors in parentheses. Sample restricted to Black and Coloured households. All regressions are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). Dependent variable is equal to 1 if a knowledgeable household member answered that “in the last 12 months [an adult] in the household ever cut the size of a meal or skipped meals because there wasn’t enough money for food.” This variable is a household-level variable, and the regressions in Table 6 include one observation per household. The Langeberg Survey 1999.

Table 7. Pension Income, Income Pooling and Depression
 Dependent Variable: Depression Index (0 to 8) Black and Coloured Adults Respondents

	Household Income Pooled		Household Income Not Pooled		All Households	
Someone in household is eligible for a state pension	-.531 (.353)	--	-.054 (.364)	--	-.499 (.267)	--
One person in household is eligible for a state pension	--	-.498 (.282)	--	-.066 (.367)	--	-.492 (.237)
Two or more in household are eligible for a state pension	--	-1.01 (.568)	--	-1.44 (1.14)	--	-.932 (.533)
Respondent is eligible for an old age pension	-.316 (.413)	-.165 (.458)	-.517 (.467)	-.385 (.505)	-.334 (.296)	-.198 (.356)
Number of members aged 55+	.150 (.159)	.203 (.186)	-.525 (.290)	-.494 (.297)	.063 (.178)	.107 (.206)
Female	.263 (.128)	.261 (.132)	.405 (.395)	.392 (.396)	.286 (.082)	.286 (.084)
Household does not pool	--	--	--	--	.049 (.307)	.034 (.322)
Number of obs	432	432	96	96	528	528

Standard errors in parentheses. The dependent variable is the number of times the respondent answered that 'most of the time' he or she: was miserable; depressed; sad; cried a lot; did not feel like eating; felt everything was an effort; sleep was restless; could not get going.

All regressions are weighted using weights based on the 1996 South African census, taking into account the stratification of the sample (by race), and the clustering of observations (by enumerator area). Included in all regressions but not shown in the table are respondent's age, an indicator that respondent is Coloured, age interacted with an indicator that respondent is Coloured, household size, and the number of members aged 0 to 17.

Source: The Langeberg Survey 1999.

Figure 1. Self-reported health status and age for respondents in households that pool income, with and without pensioners

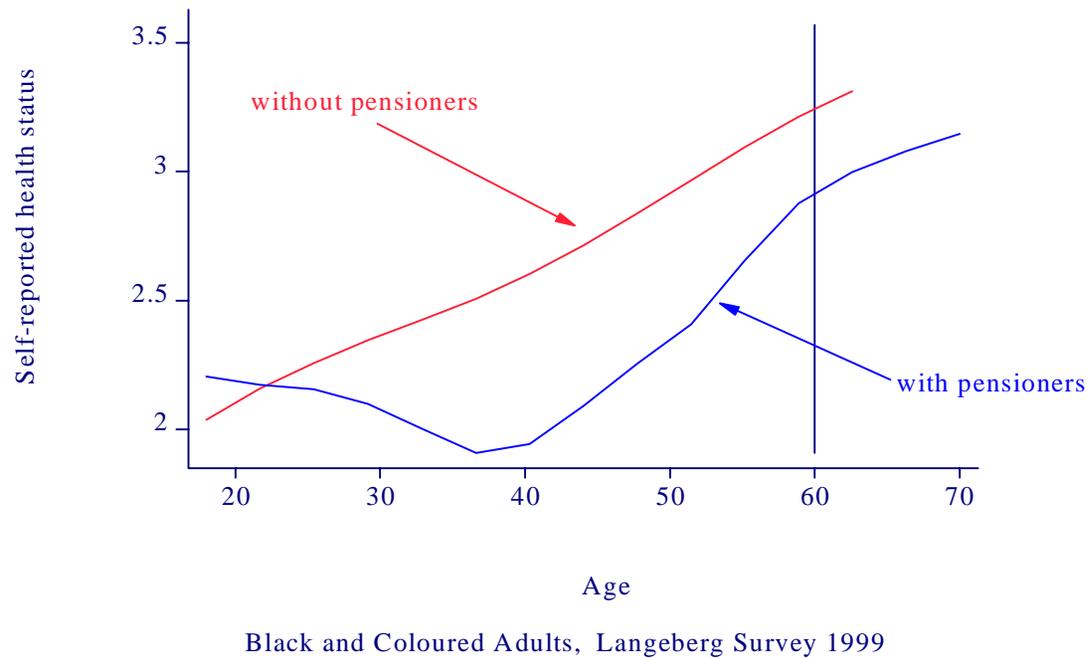
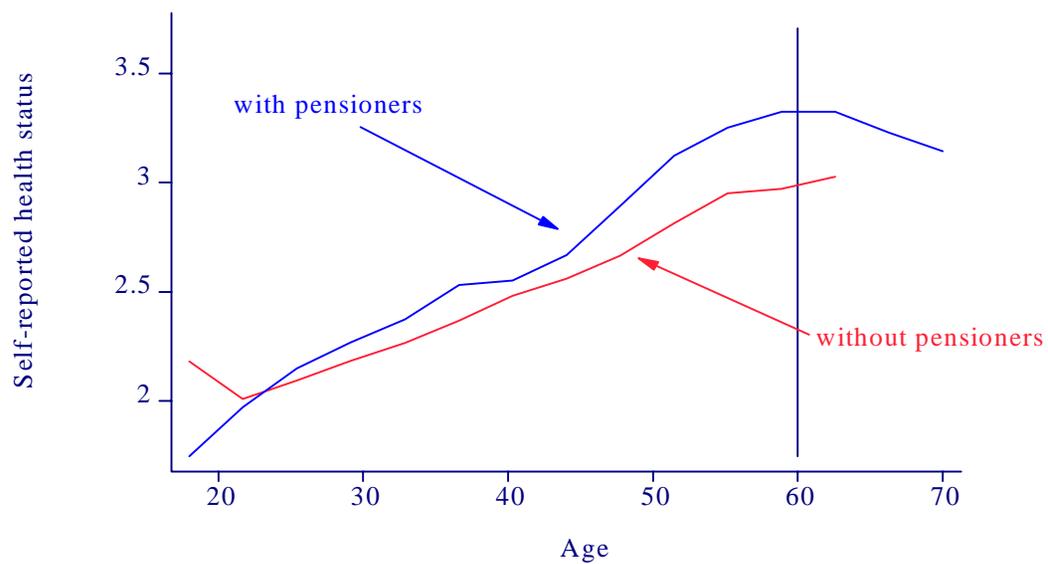
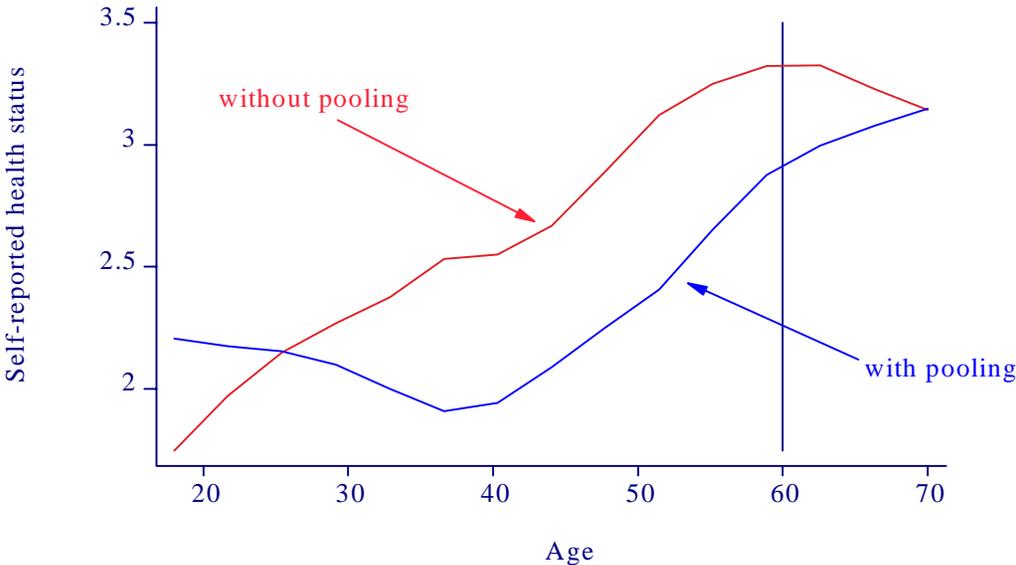


Figure 2. Self-reported health status and age for respondents in households that do not pool income, with and without pensioners



Black and Coloured Adults, Langeberg Survey 1999

Figure 3. Self-reported health status in pensioner households, with and without income pooling



Black and Coloured Adults, Langeberg Survey 1999

