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THE IMPACT OF HEALTH ON POVERTY:

EVIDENCE FROM THE SOUTH AFRICAN INTEGRATED FAMILY SURVEY

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CSSR Working Paper No. 81

SALDRU

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Southern Africa Labour and Development Research Unit

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The Impact of Health on Poverty: Evidence from the South African Integrated Family Survey

This paper examines the impact of health status on poverty status, accounting for the endogeneity of health status. Using exogenous measures of health status from the South African Integrated Health Survey, we instrument for health status while allowing for covariation among the unobservables influencing both health and household poverty status. Health status, as captured by the body mass index, is shown to strongly influence poverty status. Households that contain more unhealthy individuals are 60% more likely to be income poor than households that contain fewer unhealthy individuals, and this finding appears invariant to the choice of poverty line.

1 Introduction

Within and across countries, a significant correlation exists between income levels and health status. This relation, which is present across the distribution of incomes, is clearest when plotting life expectancy against per capita income (Adler *et al*, 1994)). However, the *causal* relationship between income poverty and health is far from clear cut. Arguably, causality can go in either direction. In practice however, income poverty and ill-health are likely to be affected by common (unobservable) determinants, so that a single-equation approach to investigating the effects of income on health or *vice-versa*, would not by itself uncover a causal effect that can be separated from what Manski (1993) terms a "correlated effect" (i.e., the effect generated by a common dependence on some other unobserved variables).

In this study, we examine the impact of health status on poverty status, accounting for the endogeneity of health status. Using exogenous measures of health status from the South African Integrated Health Survey, we instrument for health status while allowing for covariation among the unobservables influencing both outcomes. Health status, as captured by the body mass index, is shown to strongly influence poverty status. Households that contain more unhealthy individuals are 60% more likely to be income poor than households that contain fewer unhealthy individuals.

2 The Poverty-Health Nexus

The key mechanism through which health impacts income generating capacity is through productivity levels. This relationship has been extensively studied by nutritionists and economists (see for example Basta *et al* (1979), Deolalikar (1987), Desai *et al* (1984), Satyanarayana *et al* (1977), Thomas and Straus (1998), and Dasgupta (1993, 1997), and more recently, Thomas and Frankenberg (2002)). Potential channels of influence are: (i) a reduction in the labour supply of sick individuals or of individuals connected to sick individuals; (ii) a decrease in the capacity to work owing to the inadequate supply of energy requirements; (iii) an increase in the required time to complete a task; (iv) reduced activity levels (Shetty and James, 1994; Ghassemi, 1992). A separate strand of research has focused on the intergenerational effects of ill-health on poverty. For example, infant malnutrition (due to poor lactation performance of mothers and/or poor mother nutrition) has been shown to have a negative effect on later development, particularly on scholastic achievement and later labour market opportunities. Bhargava (1998) for example, shows that health significantly impacts scores on both verbal comprehension and arithmetic tests. Pollitt *et al* (1996) presents a useful review of this literature.

Poor school attendance has also been identified as one of the channels through which ill-health affects school performance. Glewwe and Jacoby (1995) explore this channel using height-for-age as the health proxy, postulating that this measure is determined before the decision of school enrollment occurs thus eliminating the possible endogeneity problem of health status and the school enrollment decision. Their results show that stunted growth of children is a significant cause of delayed school enrollment. Similarly, Alderman *et al* (1997) show that height-for-age and incidence of diarrhoea significantly influences school enrollment rates. Finally, good health of children, particularly in the form of adequate nutrition, significantly impacts the desire of children to participate in competitive games, to persist with the completion of complicated tasks, and improves motor impulse control (Barret and Radke-Yarrow 1985, Pollitt *et al*, 1996).

However, it is also reasonable to expect that increases in income levels will positively influence one's health status. Recent work in South Africa suggests that income transfers are positively correlated with improvements in health status. Duflo (2000) for example, shows that receipt of a social pension is positively associated with improvements in child health status, particularly for girl children living with pension-eligible maternal grandmothers. Taken together, this evidence suggests that the poverty-health relationship is most likely a recursive one. Thus, we seek a framework that permits an analysis of the joint process of the determination of poverty and ill health. Below, we outline a bivariate probit model that addresses this concern.

3 Data and Measurement

3.1 The Langeberg Survey

The data used in this study is the South African Integrated Family Survey (SAIFS) of 1999. This survey covers the Langeberg health district in the Western Cape, which consists of Mossel Bay, Heidelberg and Riversdal magisterial districts. The survey incorporates four modules. Individuals were interviewed according to three separate modules depending on their respective ages. The fourth module – a household-level questionnaire – was also completed. The two types of data sets allows for the joint analysis of household and individual level characteristics. Case and Wilson (2000) provide an overview of the research methodology used in the SAIFS as well as a summary of the health indicators captured by the survey.

3.2 Measuring Poverty

Consumption and income are two common measures used to proxy poverty. While consumption is often the preferred measure of welfare, for the SAIFS, income is the preferred measure. Adopting consumption would have severe implications, some of which we now briefly discuss for the case of the SAIFS.

Firstly, household respondents are asked for monthly or annual[1] consumption estimates for various categories. This inconsistency in the recall period could substantially bias our results, quite apart from the often noted tendency of under-reporting of consumption to increase as the recall period increases (Deaton, 1997). This problem is avoided in income responses as the respondent is not given a choice over the recall period. A second problem is that consumption and health cannot be assumed to have a monotonic relationship: whereas a worsening of health might lead to a reduction in consumption generally, some health problems might be positively associated with certain types of consumption (e.g., tobacco).

Although a myriad of income questions were asked in the survey, including explicit questions regarding earnings from self-employment, transfers and incomes in-kind, it must be noted that the income proxy could still be underestimated. However the extent of the possible underestimation is minimised in that incomes taken at an individual level can be reconciled with household incomes, which is not possible for the construction of a consumption estimate. The reconciled income measure allows one to effectively control for measurement error whereas this is not possible with the consumption data. [2]

[1]Except for a few items (food, alcohol, tobacco, rates, electricity, fuel, and telephone costs) the respondent is given the choice of giving an annual or monthly approximation.

[2]All incomes earned by each member in the household as well as incomes from social grants

Following standard practice, these household measures of income are then used to construct a menu of poverty lines. We construct five absolute poverty lines so as to test the invariance of these lines to our key results. The cut-off income points relating to these five poverty lines range from a per capita income measure of R185.94 per month to the adult equivalent per month cut off of R380.95. Adult equivalent measures of income are considered better proxies for many reasons, one of which is that it compensates for the number of children within the household by assigning lower weights to children relative to adults in their share of household income. The implicit assumption is that the necessary income required to sustain a child at their base metabolic rate will probably be lower than that for a fully grown adult. The calculation also accounts for economies of scale, as there are certain fixed costs incurred by any household and when there are more individuals over which to share theses costs, the effect per person is substantially reduced. Hence, where a poverty line is based on an income measure that is adult-equivalent adjusted, the calculation is: $y_{Adjusted} = \frac{y}{(A+\alpha C)^{\theta}}$, where y represents total income, A is the number of adults, C is the number of children, α is the adult equivalence of one child, and θ is the economies of scale coefficient. The values adopted for the purpose of this study are those implemented by Carter and May (1999).

3.3 Measuring Health Status

The selected health proxy is the body mass index (BMI). The choice of this more clinical measure in contrast to the self reported measure available in the dataset[3] is due to the difficulties associated with perceptional data. (See Carpenter (2000) for example). The BMI is considered a good indicator of the long term health status of an individual as it uses a combination of both the height and the weight values of the individual.[4] An individual's BMI is calculated by dividing the weight (in kilograms) by the squared height (in metres). While weight is considered to be an accurate measure of one's current nutritional status, height captures

and transfer incomes were aggregated to give the total household income. This income measure was augmented with the estimated value of subsistence agricultural production. This measure was then compared with the income documented in the household questionnaire in order to reconcile any differences between questionnaires and compensate for missing information from individual modules.

[3]For the SAIFS (1999) the respondents are asked to describe their own physical health based on a 5 point scale, where 1 represents excellent health and 5 indicates very poor health.

[4]The significance of the inclusion of both these factors is noted and discussed by Dasgupta (1993, 1997) as well as by Chan and Leung (1999). Chan and Leung (1999) find the BMI to yield the most accurate correlation (0.92) in comparison to a host of other nutritional indicators when measured against total estimated body fat.

past nutritional intakes, thus the BMI is considered a good summary measure of the stock (long term) and flow (short term) of health status. Shetty and James (1994) show that this indicator is not only a measure of nutrition but also of impaired immunocompetence and thus is a sufficient measure of health status.[5] The limitations of the BMI as a composite health measure are discussed by Murray (2003), but these pertain primarily to developed countries.[6]

The ideal BMI value lies between 18.5 and 25.[7] A value that is lower than the 18.5 is an indication of malnutrition, while a value in excess of 25 indicates obesity. Although all values are indicative of an unhealthy lifestyle, the focus for the purposes of this study is on BMI's lower than 18.5. Defining poor health to include obese individuals creates additional problems, one of which is the different origins of malnourishment versus obesity. In addition, the two types affect income in substantially different ways. Obesity ill-health causes 'life-style' diseases impacting income through excessive increased expenditure on specialised health care, treatment and medication. Malnutrition affects the daily activity in terms of the ability of the individual to perform tasks without tiring, as well as the decreased efficiency of their immune systems making them more susceptible to common colds, stomach viruses and diseases.

While health is undoubtedly an individual attribute, our analysis is conducted at the household level. The assumption here is that the presence of *multiple* unhealthy individuals in a household, which is the definition we use, should be positively correlated with whether a household is classified as income poor or not. [8] Specifically, a household is said to be of ill-health if a third or more of its members are malnourished, defined as having a BMI of less than 18.5.

[5]Chan and Leung (1999) analyse the relevance and significance of nutritional/health indicators. They show the BMI to be the best predictor from an array of health proxies of body fat estimation in children, highlighting one aspect in which BMI has proven to be a good proxy.

[6]Murray (2003) notes two key groups of individuals for which the BMI is not a good health measure: bodybuilders and pregnant and nursing women. In both cases, an excessively high BMI need not imply poor health. However, as we discuss below, since we use the BMI to isolate only malnourished individuals in the household, this criticism does not apply to our usage of the concept. A more relevant criticism is that the BMI is not accurate for children but this is refuted by numerous other studies including Chan and Leung (1999).

[7]Shetty and James (1994) provide evidence for the suitability of this range, and emphasise that the lower bound of 18.5 is more relevant than 20 for African countries as they tend towards emaciation.

[8]For example, households that contain more malnourished individuals are less likely to work, or more likely to work less (because of associated illnesses), and are therefore more likely to be in poorer households.

4 Empirical Strategy

The dependent variables used in the analysis are a poverty dummy and a health status dummy. A household is defined as income poor if total household income is below some threshold. Formally, if $y_i < y^*$ then $z_i = 1$ and household i is said to be income poor, and when $z_i = 0$, household i is not income poor. The poverty line is represented by y^*. In what follows we will vary this threshold, thereby effectively relaxing the first-order stochastic dominance assumption implicit in attaching a single parameter to the effect of health. Specifically, y^* is defined using: the household income per capita value of R341.10 for the subsistence living level (SLL); a value of R254.50 for the minimum living level (MLL); the 1$ per day and 2$ per day poverty lines; a value of R380.95 for the household subsistence level (HSL), which is a scaled adult equivalent poverty line.[9]

Household health is captured by a dummy variable that takes a value of 1 if at least a third of the members of a given household are malnourished, each determined by whether the individuals BMI falls below 18.5.

The poverty and health equations are then estimated jointly. Formally,

$$\begin{aligned}
p(z_i \mid \mathbf{x}_{1i}) &= \mathbf{x}_{1i}^{'}\boldsymbol{\beta_1} + u_i &(1)\\
p(h_i \mid \mathbf{x}_{2i}) &= \mathbf{x}_{2i}^{'}\boldsymbol{\beta_2} + e_i &(2)\\
\rho &= \text{cov}(u_i, e_i) &(3)\\
E(u|\mathbf{x}_{1i}, \mathbf{x}_{2i}) &= E(e|\mathbf{x}_{1i}, \mathbf{x}_{2i}) = 0 &(4)\\
Var(u|\mathbf{x}_{1i}, \mathbf{x}_{2i}) &= Var(e|\mathbf{x}_{1i}, \mathbf{x}_{2i}) = 1 &(5)\\
Cov(u, e|\mathbf{x}_{1i}, \mathbf{x}_{2i}) &= \rho &(6)
\end{aligned}$$

where $\mathbf{x_1}$ and $\mathbf{x_2}$ are household level determinants of poverty and malnutrition respectively, with h_i contained in x_1. The joint density of the errors (without individual subscripts which are dropped to reduce notational clutter) and joint probabilities of a household being poor and of ill-health can be written as:

$$\begin{aligned}
\phi(u, e, \rho) &= \frac{1}{2\pi\sigma_u\sigma_e\sqrt{(1-\rho^2)}} \exp\left(-\frac{1}{2}\frac{(u^2 + e^2 - 2\rho ue)}{1-\rho^2}\right) &(7)\\
P(z = 1, h = 1) &= \int_{-\infty}^{u}\int_{-\infty}^{e} \phi(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}, \hat{\rho})\, du\, de &(8)\\
&= \Phi_{zh}(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}, \hat{\rho}) &(9)
\end{aligned}$$

[9] An alternative approach would be to employ an ordered logit estimator where each discrete outcome corresponds to some position in the income distribution (where these points could be the set of poverty lines considered above). This approach however, is considerably less tractable when one of the right hand side variables (h_i in our case) is endogenous, and is not our preferred method of testing the stability of the model.

Thus, the likelihood function of this model is given by:

$$\begin{aligned}
L(\boldsymbol{\beta_1}, \boldsymbol{\beta_2}, \rho) &= \prod_{i=1}^{n} P_i \\
&= \Phi_{zh}(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \hat{\rho}) \\
&\times \; (\Phi(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}) - \Phi_{zh}(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}, \hat{\rho})) \\
&\times \; (\Phi(\mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}) - \Phi_{zh}(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}, \hat{\rho})) \\
&\times \; (1 - \Phi(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}})\Phi(\mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}) - \Phi_{zh}(\mathbf{x}_1\hat{\boldsymbol{\beta}}_{\mathbf{1}}, \mathbf{x}_2\hat{\boldsymbol{\beta}}_{\mathbf{2}}, \hat{\rho}))
\end{aligned} \tag{10}$$

To examine whether ill-health might operate, in part, through the observed household characteristics, we first define the vector $\mathbf{x} = \mathbf{x}_1 \cup \mathbf{x}_2$. Now let $\boldsymbol{\pi_1}$ refer to the estimated parameter vector associated with the variables only in the poverty equation (with zeros in place of the parameters for variables not in the poverty equation). Similarly, let $\boldsymbol{\pi_2}$ refer to the parameter vector associated with $\mathbf{v}$ that contains only estimates of those variables found in the health equation (with zeros everywhere else). Then the conditional partial derivative can be derived as follows:

$$\begin{aligned}
E\left(z_i | \, h_i = 1, \mathbf{x}\right) &= \Pr\left(z_i = 1 | \, h_i = 1, \mathbf{x}\right) \\
&= \frac{\Pr\left(z_i = 1, h_i = 1 | \, \mathbf{x}\right)}{\Pr\left(z_i = 1 | \, \mathbf{x}\right)}
\end{aligned} \tag{11}$$

$$E\left(z_i | \, h_i = 1, \mathbf{x}\right) = \frac{\Phi_{zh}\left(\mathbf{x}'\boldsymbol{\pi_1}, \mathbf{x}'\boldsymbol{\pi_2}, \rho\right)}{\Phi\left(\mathbf{x}'\boldsymbol{\pi_2}\right)} \tag{12}$$

$$\frac{\partial E\left(z_i | \, h_i = 1, \mathbf{x}\right)}{\partial \mathbf{x}} = \left(\frac{1}{\Phi\left(\mathbf{x}'\boldsymbol{\pi_2}\right)}\right)\left(g_1\boldsymbol{\pi_1} + \left(g_2 - \Phi_{zh}\frac{\phi\left(\mathbf{x}'\boldsymbol{\pi_2}\right)}{\Phi\left(\mathbf{x}'\boldsymbol{\pi_2}\right)}\right)\right) \tag{13}$$

where Φ_{yx} refers to the bivariate normal CDF. Note also that the g_i notation refers to the ρ normalisation of the data (see Maddala, 1983; Greene, 2003) for more details). By simply changing the conditioning to $z_i = 0$, a similar set of marginal effects can be estimated for households not of ill-health. Thus equation 13 presents a useful way of asking how the set of observables jointly influence *both* poverty and health, while still exploiting the additional unobserved information influencing both outcomes, as captured by the cross-equation correlation, ρ. [10]

This model structure represents an improvement over other single-equation approaches as unobservable influences affecting both poverty and health are net-

[10]The marginal effects for the model are evaluated as partial changes measured for quantitative continuous variables at the mean value of the variable. For binary variables, the partial changes evaluated are not expressed at a point but rather as the difference in the measured expected probability of a household being poor and of ill-health when the binary factor is 0 and when equal to 1.

ted out. Under this framework, the effect of malnutrition on the poverty status of a household, specifically income poverty, can be interpreted in a causal manner.

5 Baseline Estimates

We begin by presenting the results of a naive poverty regression under the assumption that health is exogenous (tables 3–7), for the menu of poverty lines discussed above. Similar to the findings of Adler *et al* (1994), these single equation probits suggest that poor health and income poverty are positively related and that this relationship is monotonic in income (i.e., it holds for all 5 mutually exclusive poverty thresholds considered). The coefficient estimate for health status ranges from 0.131 for the HSL to 0.213 for the SLL.

Unsurprisingly, as the number of core members of the household increases, the household is less likely to be poor (a key aspect of the definition of a core member is that member's employment status).[11] The gender effect of core members shows some interesting patterns. At the lowest poverty line (US1), the number of male core members has a greater impact than the number of core females on improving the likelihood that a household is not poor. For all successive poverty lines, the reverse economic effect is found, albeit not statistically significant.

However, if these observed and other unobserved household attributes influence both health and poverty, then these estimates of the impact of malnutrition on poverty are biased and inconsistent. In general, since the direction and strength of the bias will depend on the sign of the relationship between these variables and the health dummy, it becomes important to examine how the estimated parameters in the poverty regression vary by health status. To explore this possibility, we stratify the marginal effects by the health status dummy.

The marginal effects for healthy and unhealthy households differ considerably with respect to the gender of core members. The effects of the number of core members (both female and male) are consistently greater for healthy households, compared to unhealthy households, though these differences are not statistically significant. Notwithstanding this, these differences could be a reflection of households having consistently more employed men and women (i.e. an increased number of core people) thus merely reflecting greater employability of individuals within healthier households. To the extent that employability and malnourishment are determined by a common set of unobservables, one cannot

[11] Core members were selected on the basis that they fitted one of the four characteristics: an individual is: (1) older than 25, (2) employed, (3) referred to as one who has the most say, (4) and/or is a spouse of someone who was referred to as one who has the most say within the household.

infer that these gender differentiated effects of ill-health affect income by affecting productivity *per se*.

The proportion of unemployed individuals living in a household also captures a possible health effect. As expected, an increasing proportion of unemployed individuals within a household will contribute to the probability of such households living below the poverty line. This effect is consistently greater for unhealthy households than for healthy ones. This difference is highly significant for US1[12], but insignificant for the other poverty lines, suggesting that this effect (health or employability) is stronger at the lower end of the income distribution.

The coefficient signs for the maximum likelihood estimates of all capital stock indicators are as expected. Both high capital stock measures: number of highly skilled, and skilled members present in the household, is negatively related to the probability that the household will be poor. The lower capital stock measures represented by the low skilled and unskilled members reflects the opposite relation. That is, an increasing number of individuals living in the household with lower education cause an increase in the chance that the household lives in poverty. As with the proportion of unemployed individuals and core member gender effects, there is an apparent health effect associated with the capital stock measures. The effect of low capital stock increases the probability that healthier households are poor less than for unhealthy ones. These differences are only significant for US1 at the 10 % significance level.

6 Controlling for Endogenous Health Status

6.1 Validity of Exclusion Restrictions

To control for the endogeneity of health status within a bivariate probit framework, we require exogenous variation in health status. Recall that $\mathbf{x_2}$ contained variables not in $\mathbf{x_1}$. These variables are: a dummy for adequate sanitation facilities; a dummy for access to running water within the household; a depression index meant to capture the mental health of household members; a dummy variable indicating the presence of an alcoholic; a dummy variable indicating skipped meals; and a dummy variable classifying the households according to their exposure to the environment. In order to be considered valid instruments, these variables must be significantly correlated with the health indicator, but uncorrelated with poverty. Identification is generally guaranteed through some supply-side innovation. For example, access to running water is usually strongly correlated

[12]The difference is significant at the 5 % significance level, as the associated confidence interval for the estimate is: [0.097 ; 0.347] at this significance level.

with health status. Moreover, since the government free basic water project has ensured full coverage of the Langeberg district[13], this variable is likely to be unrelated to poverty status in Langeberg. Where such supply-side factors cannot be used as an identification strategy, we assume that each of these variables is redundant in the poverty equation, once their effects on health status have been partialled out.

Table 8 shows estimates of the reduced form equation for health. Generally, the effects are as expected. Inadequate sanitation and unclean water are strong predictors of ill-health, as is prolonged exposure to pollution. Somewhat surprising is the positive effect of gender on ill-health. This finding would at first seem inconsistent with existing evidence on the effects of gender on nutritional status. For example, Duflo (2000) shows that when females (grandmothers) receive state pensions, the nutritional status of girls is much better than if males (grandfathers) receive pensions. However, upon closer inspection our result is not surprising. Households in the SAIFS are on average comprised of more adults (2.5) than children (1.769). If more unemployed adult household members (perhaps members of the extended family), join the household in response to becoming ill so as to draw on the income of employed women in the household, then our result would be plausible. Though we do not explictly test this hypothesis, the larger number of adults on average in our sample, and the fact that there are more female decision makers on average in a given household, is suggestive of such an effect.

6.2 Discussion

Table 9 shows the results of a test of exogeneity of health status. The cross-equation error correlatation ρ suggests that regardless of which poverty line is applied, the hypothesis that health is exogenous in the poverty regression should be rejected at the 1% level. This is further verified by a likelihood ratio test (table 10). The likelihood ratio test statistic which is χ^2distributed ranges from 4.04 for US2 to 6.66 for MLL. The hypothesis that ρ is equal to zero can be rejected at the 5 % level of significance (for the single restriction of $\rho = 0$) for all poverty lines. Using the HSL and SLL measures we still reject the null hypothesis that ρ is zero at the 2.5 % significance level.[14] Thus as ρ is clearly not equal to zero, the joint model is our preferred method of estimating the impact of health on poverty.

The results from estimating the joint model (tables 11–12) show clearly that the impact of poor health on poverty is substantial, both from an economic and

[13]For details see www.dwaf.gov.za/FreeBasicWater/

[14]At this significance level, the critical χ^2 value is 5.02 for the single restriction of $\rho = 0$.

a statistical standpoint. The probability that an unhealthy household is income poor ranges from 0.34 to 0.59. Thus a naive approach which treats health status as exogenous will substantially underestimate the effect of health: the true effect, so to speak, is more than double the naive effect in the context of the Langeberg data.

Interestingly, the effect of race appears to be very sensitive to the assumption of exogeneity of health status. In all cases, the coefficient on *African* becomes considerably smaller: it drops from 0.336 to 0.228 in the SLL estimation and from 0.337 to 0.108 in the HSL estimation. While these results do not suggest that race is unimportant as a determinant of poverty in Langeberg (clearly the effect remains sizable, though it is less precisely estimated after controlling for endogenous health), it does suggest that much of what would otherwise be attributed to a race effect in a naive model, might better be attributed to unobserved individual and household level characteristics that affect health.

7 Conclusion

Identifying the impact of health on poverty is a notoriously difficult task. While a considerable body of international evidence shows a strong positive correlation between poor health and various socio-economic outcomes, identifying the causal pathways through which this effect might operate is difficult in the absence of good ways of establishing the various dimensions of health status that can reasonably be assumed to be exogenous. Randomised evaluations of health interventions such as the treatment of iron deficiency anaemia in Indonesia (Thomas and Frakenberg, 2002), or school deworming programmes in Kenya (Miguel and Kramer, 2004) provide a much cleaner method of determining causality. However, such large-scale randomised treatment evaluations are not yet present in South Africa, and probably will not feature on the radar screen of policy makers for some time to come, given political and other imperatives.

In the absence of such initiatives, policy can only be guided by the evidence that can be gleaned from existing non-experimental data made available through the various health and demographic surveys that are available. In this study, we presented evidence from one such survey conducted in the Langeberg Magisterial District of the Western Cape province of South Africa. The survey is unique in that it provides health information that permits the use of exogenous measures of health status to instrument for the effect of health on poverty. Our analysis suggests that failure to take account of the influence of unobserved individual and household level attributes will substantially bias estimates of the effect of malnutrition on household poverty by an order of magnitude equal to or greater than the naive estimate itself. However, this finding depends crucially on several identifying assumptions which are difficult to test even if the researcher had at her disposal, supply-side interventions that are highly correlated with health outcomes but not with other socio-economic outcomes. Moreover, introducing exogenous variation in health outcomes through use of supply-side innovations is obviously opportunistic and requires further restrictive assumptions in model specification (see for example Rosenzweig and Wolpin, 2000).

When combined with the results of this study, these difficulties suggest a strong case to be made for greater government investment (and academic involvement) in conducting *randomised* evaluations of the many health interventions (such as the various school feeding programmes and the many health interventions) currently underway across the country. If the biases introduced through correlated unobservables are indeed as large as this study finds, a necessary next step is to verify this finding in more controlled settings where the only source of variation allowed is the actual health intervention. Knowing this kind of information would prove invaluable in development planning.

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Table 1. Poverty Lines and associated Poverty Rates

Poverty Line	Poverty measure	Cut-off income level per month	Poverty measure for Langeberg District
Subsistence Living Level (SLL)	Head Count	R 341.10	47.30%
	Poverty Gap Ratio		0.58
	Income Gap Ratio		872.58
Minimum Living Level (MLL)	Head Count	R 254.50	35%
	Poverty Gap Ratio		0.69
	Income Gap Ratio		1864.77
Household Subsistence Level (HSL)	Head Count	R 380.95	37.10%
	Poverty Gap Ratio		0.63
	Income Gap Ratio		1363.58
US 1$ Equivalent (US1)	Head Count	R 185.94	27.55%
	Poverty Gap Ratio		0.62
	Income Gap Ratio		1120.51
US 2$ Equivalent (US2)	Head Count	R 371.88	48.97%
	Poverty Gap Ratio		0.24
	Income Gap Ratio		138.80

Notes:
The SLL cut-off is the Bureau of Market Research figure of R220.10 for 1993, inflated by a mid-1999 estimate of the Statistics South Africa Consumer Price Index. The MLL is based on the Bureau of Market Research cut-off of R164.20 for 1993, similarly inflated. The HSL is based on the 1993 measure of R251.10 calculated by the Institute for Planning and Research at the University of Port Elizabeth and adjusted for inflation using a mid-year estimate based on the CPI figures from Statistics South Africa. The World Bank 1$ and 2$ poverty lines are calculated using an average R:$ exchange rate for 1999 of R6.113.

Table 2. Mean Sample Characteristics

Variable	Mean	Standard Deviation
Number of Individuals in household with BMI < 18.5	1.565	1.661
Proportion of household members with a BMI < 18.5	0.305	0.277
Household is of poor health	0.507	0.501
Total monthly household income	2757.37	4462.89
Number of children	1.769	1.695
Number of adults	2.5	1.165
Household size	4.269	2.379
Household income measured in Rands per capita	813.243	1410.93
Household income measured in Rands per adult equivalent	1036.01	1713.39
Number of core females	1.139	0.714
Number of core males	1.037	0.586
Number of core household members	2.177	0.933
Coloured	0.429	0.496
African	0.35	0.478
Rural	0.259	0.439
Number of unemployed adults	0.932	0.887
Proportion of adults unemployed	0.607	0.38
Number of Individuals in household with 5 or less years of schooling	1.765	1.682
Number of Individuals in household with 5 - 10 years of schooling	1.585	1.523
Number of Individuals in household with 10 - 12 years of schooling	0.398	0.657
Number of Individuals in household with Matric and some tertiary education	0.52	0.896
At least one individual in household under 25, not in school and unemployed	0.102	0.303
Contains a member that regularly skips meals	0.384	0.487
Environmental exposure dummy	0.272	0.446
Presence of alcoholic in household	0.163	0.37
Number of individuals who smoke more than 10 cigarettes a day	0.262	0.525
Presence of heavy smoker in household	0.224	0.418
Depression index for household	0.673	1.33
Inadequate sanitation facilities	0.136	0.343
Availability of running water on site	0.864	0.343

Notes:

1. The household health indicator is constructed such that households in which more than a third of the member s are unhealthy (BMI <18.5) it is classified as unhealthy – denoted by 1, otherwise it is considered healthy coded with 0.
2. An individual is a “core” person if they fulfil one of the following criteria: (1) Over 25, (2) Employed, (3) Referred to as the one who has the most say and/or (4) the spouse of one referred to as the one with the most say.
3. Rural is defined as those households located on a farm.
4. Unemployed is defined as all individuals over 18, not in full time wage employment and includes those who are so-called “discouraged”.
5. Individuals in the younger adult module (including persons aged 18 -55) were asked numerous questions about emotions such as: being sad, being miserable, worrying most of the time, crying most of the time, depression, feeling everything was an effort, loss of appetite, inability to get going. If an individual responded that they felt these symptoms most of the time they were coded with a 1, otherwise a zero. The individual’s “depression index” is then a simple summation of responses to the symptoms.
6. Inadequate sanitation facilities coded by 1, are defined as no access to onsite facilities, or onsite facilities such as a bucket or pit, as these can be considered hygienic.
7. Onsite water is denoted by 1, otherwise 0.

Table 3. Poverty Regression: z = SLL (Marginal Effects)

Variable	Equation 1 (SLL - Dependent Variable): P(z = 1)								
	ILL-HEALTH = 0			ILL-HEALTH =1			All Observations		
Constant	-0.334	***	(0.119)	-0.358	***	(0.134)	-0.372	***	(0.138)
African	0.319	***	(0.104)	0.31	***	(0.093)	0.336	***	(0.104)
Coloured	0.105		(0.104)	0.111		(0.108)	0.116		(0.113)
Number of Core Females	-0.178	***	(0.062)	-0.191	***	(0.066)	-0.199	***	(0.068)
Number of Core Males	-0.157	***	(0.059)	-0.168	***	(0.062)	-0.175	***	(0.065)
Rural	0.077		(0.084)	0.079		(0.083)	0.084		(0.090)
Unemployed Young Adult	0.147		(0.117)	0.14		(0.099)	0.155		(0.116)
Proportion of Adults Unemployed	0.259	***	(0.086)	0.278	***	(0.092)	0.289	***	(0.095)
Ill-Health	0.194	***	(0.060)	0.208	***	(0.068)	0.213	***	(0.072)
Number Highly Skilled	-0.051		(0.049)	-0.054		(0.053)	-0.057		(0.055)
Number Skilled	-0.042		(0.051)	-0.045		(0.055)	-0.047		(0.057)
Number Low Skilled	0.081	***	(0.027)	0.087	***	(0.028)	0.09	***	(0.029)
Number unskilled	0.081	***	(0.027)	0.086	***	(0.028)	0.09	***	(0.029)
n	155						294		
McFadden R^2							0.258		
Proportion of Correct Predictions							0.779		

Notes:
A single asterisk indicates significance at the 10 percent level, a double asterisk indicates significance at the 5 percent level, and three asterisks indicate significance at the 1 percent level. Standard errors are given in parentheses. The dependent variable is the poverty indicator when the SLL poverty line is applied. The reported coefficients represent the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 0 in the first column; the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 1 in the second column; and the last column represents the marginal effects measured at the mean value of all covariates.

Table 4. Poverty Regression: z = MLL (Marginal Effects)

Variable	Equation 1 (MLL - Dependent Variable): P(z = 1)								
	ILL-HEALTH = 0			ILL-HEALTH =1			All Observations		
Constant	-0.41	***	(0.095)	-0.56	***	(0.142)	-0.507	***	(0.123)
African	0.218	***	(0.096)	0.275	**	(0.110)	0.258	**	(0.107)
Coloured	0.018		(0.087)	0.024		(0.118)	0.022		(0.107)
Number of Core Females	-0.103	**	(0.049)	-0.141	**	(0.066)	-0.128	**	(0.059)
Number of Core Males	-0.096	**	(0.048)	-0.131	**	(0.065)	-0.119	**	(0.059)
Rural	0.045		(0.071)	0.06		(0.094)	0.055		(0.087)
Unemployed Young Adult	0.097		(0.095)	0.122		(0.111)	0.115		(0.109)
Proportion of Adults Unemployed	0.235	***	(0.073)	0.321	***	(0.097)	0.29	***	(0.088)
Ill-Health	0.13	***	(0.046)	0.178	**	(0.076)	0.16	**	(0.065)
Number Highly Skilled	-0.017		(0.040)	-0.023		(0.055)	-0.021		(0.049)
Number Skilled	-0.003		(0.042)	-0.004		(0.057)	-0.004		(0.051)
Number Low Skilled	0.054	**	(0.021)	0.074	***	(0.028)	0.067	***	(0.026)
Number unskilled	0.061	***	(0.021)	0.083	***	(0.028)	0.075	***	(0.026)
n	191			103			294		
McFadden R^2							0.211		
Proportion of Correct Predictions							0.762		

Notes:
A single asterisk indicates significance at the 10 percent level, a double asterisk indicates significance at the 5 percent level, and three asterisks indicate significance at the 1 percent level. Standard errors are given in parentheses. The dependent variable is the poverty indicator when the MLL poverty line is applied. The reported coefficients represent the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 0 in the first column; the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 1 in the second column; and the last column represents the marginal effects measured at the mean value of all covariates.

Table 5. Poverty Regression: z = HSL (Marginal Effects)

Variable	Equation 1 (HSL - Dependent Variable): P(z = 1)								
	ILL-HEALTH = 0			ILL-HEALTH =1			All Observations		
Constant	-0.508	***	(0.106)	-0.616	***	(0.140)	-0.575	***	(0.126)
African	0.31	***	(0.102)	0.348	***	(0.105)	0.337	***	(0.105)
Coloured	0.12		(0.099)	0.142		(0.114)	0.134		(0.108)
Number of Core Females	-0.079		(0.053)	-0.096		(0.064)	-0.089		(0.059)
Number of Core Males	-0.072		(0.052)	-0.087		(0.063)	-0.081		(0.059)
Rural	0.02		(0.077)	0.024		(0.092)	0.023		(0.086)
Unemployed Young Adult	0.11		(0.101)	0.126		(0.109)	0.122		(0.108)
Proportion of Adults Unemployed	0.374	***	(0.082)	0.453	***	(0.097)	0.423	***	(0.090)
Ill-Health	0.116	**	(0.054)	0.141	*	(0.074)	0.131	**	(0.067)
Number Highly Skilled	-0.031		(0.044)	-0.037		(0.053)	-0.035		(0.050)
Number Skilled	-0.054		(0.047)	-0.065		(0.057)	-0.061		(0.053)
Number Low Skilled	0.03		(0.023)	0.037		(0.028)	0.034		(0.026)
Number unskilled	0.042	*	(0.023)	0.051	*	(0.028)	0.048	*	(0.026)
n	185			109			294		
McFadden R^2							0.202		
Proportion of Correct Predictions							0.741		

Notes:
A single asterisk indicates significance at the 10 percent level, a double asterisk indicates significance at the 5 percent level, and three asterisks indicate significance at the 1 percent level. Standard errors are given in parentheses. The dependent variable is the poverty indicator when the HSL poverty line is applied. The reported coefficients represent the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 0 in the first column; the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 1 in the second column; and the last column represents the marginal effects measured at the mean value of all covariates.

Table 6. Poverty Regression: z = US1 (Marginal Effects)

Variable	Equation 1 (US1 - Dependent Variable): P(z = 1)								
	ILL-HEALTH = 0			ILL-HEALTH =1			All Observations		
Constant	-0.406	***	(0.082)	-0.654	***	(0.141)	-0.544	***	(0.108)
African	0.173	**	(0.086)	0.256	**	(0.113)	0.222	**	(0.102)
Coloured	-0.029		(0.069)	-0.048		(0.114)	-0.04		(0.094)
Number of Core Females	-0.053		(0.039)	-0.085		(0.062)	-0.071		(0.052)
Number of Core Males	-0.059		(0.040)	-0.094		(0.063)	-0.079		(0.052)
Rural	0.034		(0.062)	0.053		(0.096)	0.045		(0.082)
Unemployed Young Adult	0.061		(0.078)	0.093		(0.111)	0.079		(0.098)
Proportion of Adults Unemployed	0.222	***	(0.064)	0.358	***	(0.097)	0.298	***	(0.079)
Ill-Health	0.105	***	(0.036)	0.169	**	(0.077)	0.14	**	(0.058)
Number Highly Skilled	-0.01		(0.033)	-0.016		(0.053)	-0.013		(0.044)
Number Skilled	0.001		(0.034)	0.002		(0.056)	0.001		(0.046)
Number Low Skilled	0.019		(0.017)	0.031		(0.027)	0.026		(0.023)
Number unskilled	0.051	***	(0.018)	0.082	***	(0.027)	0.068	***	(0.023)
n	213			81			294		
McFadden R^2							0.223		
Proportion of Correct Predictions							0.793		

Notes:
A single asterisk indicates significance at the 10 percent level, a double asterisk indicates significance at the 5 percent level, and three asterisks indicate significance at the 1 percent level. Standard errors are given in parentheses. The dependent variable is the poverty indicator when the US1 poverty line is applied. The reported coefficients represent the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 0 in the first column; the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 1 in the second column; and the last column represents the marginal effects measured at the mean value of all covariates.

Table 7. Poverty Regression: z = US2 (Marginal Effects)

Variable	Equation 1 (US2 - Dependent Variable): P(z = 1)								
	ILL-HEALTH = 0			ILL-HEALTH =1			All Observations		
Constant	-0.335	***	(0.124)	-0.342	***	(0.132)	-0.361	***	(0.139)
African	0.341	***	(0.104)	0.318	***	(0.090)	0.349	***	(0.101)
Coloured	0.106		(0.108)	0.106		(0.107)	0.113		(0.114)
Number of Core Females	-0.197	***	(0.065)	-0.201	***	(0.065)	-0.212	***	(0.069)
Number of Core Males	-0.154	**	(0.061)	-0.157	**	(0.062)	-0.166	**	(0.066)
Rural	0.088		(0.087)	0.086		(0.082)	0.093		(0.090)
Unemployed Young Adult	0.118		(0.118)	0.111		(0.101)	0.122		(0.117)
Proportion of Adults Unemployed	0.249	***	(0.089)	0.254	***	(0.091)	0.269	***	(0.096)
Ill-Health	0.153	**	(0.065)	0.156	**	(0.067)	0.163	**	(0.073)
Number Highly Skilled	-0.043		(0.050)	-0.044		(0.052)	-0.046		(0.055)
Number Skilled	-0.047		(0.053)	-0.048		(0.055)	-0.051		(0.058)
Number Low Skilled	0.08	***	(0.028)	0.082	***	(0.028)	0.087	***	(0.030)
Number unskilled	0.112	***	(0.030)	0.114	**	(0.030)	0.121	***	(0.032)
n	150			144			294		
McFadden R^2							0.265		
Proportion of Correct Predictions							0.765		

Notes:

A single asterisk indicates significance at the 10 percent level, a double asterisk indicates significance at the 5 percent level, and three asterisks indicate significance at the 1 percent level. Standard errors are given in parentheses. The dependent variable is the poverty indicator when the US2 poverty line is applied. The reported coefficients represent the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 0 in the first column; the marginal effects measured at the mean value of all covariates conditional upon the health status indicator being set to 1 in the second column; and the last column represents the marginal effects measured at the mean value of all covariates.

Table 8. Reduced Form for the Ill-Health Regression (Marginal Effects)

Variable	Equation 2 (Health Status Indicator - Dependent Variable): P(h = 1)											
	1			2			3			4		
	Measured at the Mean Value			Measured at the Mean Value			Measured at the Mean Value			Measured at the Mean Value		
Constant	-0.222	***	(0.082)	-0.224	***	(0.081)	-0.222	***	(0.081)	-0.226	***	(0.069)
African	-0.010		(0.095)	-0.009		(0.094)	-0.006		(0.094)			
Coloured	0.000		(0.085)	0.000		(0.085)	0.006		(0.084)			
Number of Core Females	0.120	**	(0.047)	0.119	**	(0.047)	0.120	**	(0.047)	0.119	**	(0.047)
Presence of an Alcoholic	0.143	**	(0.086)	0.141	*	(0.085)	0.150	*	(0.083)	0.141	*	(0.084)
Presence of a Heavy Smoker	-0.011		(0.076)									
Depression Index	0.015		(0.024)	0.015		(0.024)				0.015		(0.024)
Environmental Exposure	0.124	*	(0.076)	0.125	*	(0.076)	0.129	*	(0.075)	0.121	*	(0.069)
Skipped Meals	0.046		(0.069)	0.045		(0.069)	0.049		(0.069)	0.043		(0.065)
Inadequate Sanitation	0.239	**	(0.108)	0.240	**	(0.108)	0.238	**	(0.108)	0.243	**	(0.101)
Availability of Running Water	-0.210	*	(0.117)	-0.210	*	(0.117)	-0.208	*	(0.117)	-0.209	*	(0.116)
n	294			294			294			294		
McFadden R^2	0.056			0.056			0.055			0.056		
Proportion of Correct Predictions	0.616			0.616			0.605			0.616		

Table 9. Cross Equation Error Correlation

Poverty Line	Rho	p-value
SLL	-0.842	0.000
MLL	-0.927	0.000
HSL	-0.905	0.000
US1	-0.891	0.000
US2	-0.883	0.003

Table 10: Tests of Exogenous Health Status

Poverty Line	Bivariate Probit: Log-likelihood function	Health Probit: Log-likelihood function	Income Probit: Log-likelihood function	Combined: Log-likelihood function	LR Test Statistic Calculated chi2 value
SLL	-340.28	-192.32	-150.83	-343.15	5.74
MLL	-339.14	-192.32	-150.15	-342.47	6.06
HSL	-343.79	-192.32	-154.63	-346.95	6.32
US1	-323.61	-192.32	-134.51	-326.83	6.44
US2	-340	-192.32	-149.72	-342.02	4.04

Table 11. The Impact of Endogenous Health on Poverty (SSL)

Variable	Equation 1 and 2 (Dependent Variables: SLL (Equation 1); Health Status Indicator (Equation 2)): P(z=1|h=1)				
	Marginal Effect - Equation 1	Marginal Effect - Equation 2	Overall Marginal Effect		
Constant	0.000	0.000	0.000		
African	0.228	0.000	0.228	*	(0.117)
Coloured	0.078	0.005	0.083		(0.106)
Number of Core Females	-0.186	0.067	-0.119	*	(0.063)
Number of Core Males	-0.105	0.000	-0.105	**	(0.051)
Rural	0.044	0.000	0.044		(0.075)
Unemployed Young Adult	0.110	0.000	0.110		(0.093)
Proportion of Adults Unemployed	0.425	0.000	0.425	***	(0.147)
Ill-Health	0.595	0.000	0.595	***	(0.114)
Number Highly Skilled	-0.043	0.000	-0.043		(0.047)
Number Skilled	-0.050	0.000	-0.050		(0.049)
Number Low Skilled	0.056	0.000	0.056	***	(0.021)
Number unskilled	0.054	0.000	0.054	**	(0.024)
Presence of Alcoholic	0.000	0.040	0.040		(0.046)
Depression Index	0.000	0.014	0.014		(0.014)
Environmental Exposure	0.000	0.065	0.065		(0.042)
Skipped meals	0.000	0.030	0.030		(0.037)
Inadequate Sanitation	0.000	0.167	0.167	**	(0.083)
Availability of Running Water in Household	0.000	-0.130	-0.130		(0.084)

Table 12. The Impact of Endogenous Health on Poverty (HSL)

Variable	Equation 1 and 2 (Dependent Variables: HSL (Equation 1); Health Status Indicator (Equation 2)): P(y=1|h=1)				
	Marginal Effect - Equation 1	Marginal Effect - Equation 2	Overall Marginal Effect		
Constant	0.000	0.000	0.000		
African	0.111	-0.003	0.108		(0.089)
Coloured	0.033	0.002	0.035		(0.062)
Number of Core Females	-0.077	0.046	-0.031		(0.038)
Number of Core Males	-0.032	0.000	-0.032		(0.031)
Rural	-0.001	0.000	-0.001		(0.040)
Unemployed Young Adult	0.037	0.000	0.037		(0.047)
Proportion of Adults Unemployed	0.188	0.000	0.188	*	(0.108)
Ill-Health	0.342	0.000	0.342	***	(0.118)
Number Highly Skilled	-0.007	0.000	-0.007		(0.025)
Number Skilled	-0.019	0.000	-0.019		(0.028)
Number Low Skilled	0.014	0.000	0.014		(0.013)
Number unskilled	0.023	0.000	0.023		(0.016)
Presence of Alcoholic	0.000	0.022	0.022		(0.028)
Depression Index	0.000	0.005	0.005		(0.010)
Environmental Exposure	0.000	0.045	0.045		(0.028)
Skipped meals	0.000	0.031	0.031		(0.026)
Inadequate Sanitation	0.000	0.127	0.127	**	(0.053)
Availability of Running Water in Household	0.000	-0.107	-0.107	**	(0.054)

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The Centre for Social Science Research

The CSSR is an umbrella organisation comprising five units:

The Aids and Society Research Unit (ASRU) supports quantitative and qualitative research into the social and economic impact of the HIV pandemic in Southern Africa. Focus areas include: the economics of reducing mother to child transmission of HIV, the impact of HIV on firms and households; and psychological aspects of HIV infection and prevention. ASRU operates an outreach programme in Khayelitsha (the Memory Box Project) which provides training and counselling for HIV positive people

The Data First Resource Unit ('Data First') provides training and resources for research. Its main functions are: 1) to provide access to digital data resources and specialised published material; 2) to facilitate the collection, exchange and use of data sets on a collaborative basis; 3) to provide basic and advanced training in data analysis; 4) the ongoing development of a web site to disseminate data and research output.

The Democracy in Africa Research Unit (DARU) supports students and scholars who conduct systematic research in the following three areas: 1) public opinion and political culture in Africa and its role in democratisation and consolidation; 2) elections and voting in Africa; and 3) the impact of the HIV/AIDS pandemic on democratisation in Southern Africa. DARU has developed close working relationships with projects such as the Afrobarometer (a cross national survey of public opinion in fifteen African countries), the Comparative National Elections Project, and the Health Economics and AIDS Research Unit at the University of Natal.

The Social Surveys Unit (SSU) promotes critical analysis of the methodology, ethics and results of South African social science research. One core activity is the Cape Area Panel Study of young adults in Cape Town. This study follows 4800 young people as they move from school into the labour market and adulthood. The SSU is also planning a survey for 2004 on aspects of social capital, crime, and attitudes toward inequality.

The Southern Africa Labour and Development Research Unit (SALDRU) was established in 1975 as part of the School of Economics and joined the CSSR in 2002. SALDRU conducted the first national household survey in 1993 (the Project for Statistics on Living Standards and Development). More recently, SALDRU ran the Langeberg Integrated Family survey (1999) and the Khayelitsha/Mitchell's Plain Survey (2000). Current projects include research on public works programmes, poverty and inequality.