Southern Africa Labour and Development Research Unit

Effects of Household Shocks and Poverty on the Timing of Traditional Male Circumcision and HIV Risk in South Africa

by

Atheendar S. Venkataramani and Brendan Maughan-Brown

Working Paper Series
Number 93

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Sources of Support: The Cape Area Panel Study was supported by the United States National Institute for Child Health and Human Development, the Andrew W. Mellon Foundation, the National Institute on Aging, the Health Economics & HIV/AIDS Research Division (HEARD) at the University of KwaZulu-Natal, and the European Union.

Acknowledgements
We would like to thank Cally Ardington, Murray Leibbrandt, Nicoli Nattrass, Vimal Ranchhod, Jeremy Seekings, and seminar participants at the Center for Social Science Research in Cape Town, South Africa for useful comments and suggestions on an earlier version of this work. Brendan Maughan-Brown is grateful for funding from the NRF Research Chair in Poverty and Inequality Research for his Postdoctoral Research Fellowship. Atheendar Venkataramani is grateful for the Massachusetts General Hospital Department of Medicine Global Primary Care and Center for Global Health for supporting research and travel to South Africa. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. All errors are our own.

Recommended citation

Venkataramani, A.S., Maughan-Brown, B. (2013). Effects of Household Shocks and Poverty on the Timing of Traditional Male Circumcision and HIV risk in South Africa. A Southern Africa Labour and Development Research Unit Working Paper Number 93. Cape Town: SALDRU, University of Cape Town

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ISBN: 978-1-920517-34-2

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SALDRU Working Paper Number 93
University of Cape Town
February 2013

Abstract

Poverty may influence HIV risk by increasing vulnerability to economic shocks and thereby preventing key health investments. We explored this by examining the relationship between household shocks and the timing of traditional male circumcision, a practice associated with considerable expense and whose HIV-prevention benefits are larger when done earlier, even within young adulthood. Using unique data on a sample of Xhosa men, a group that almost universally practice traditional circumcision, we found that respondents in the poorest households delayed circumcision by two years if a household member experienced loss of income or death and/or illness. The impact of these shocks declined with increasing household income. Our findings suggest that interventions that work to mitigate the impact of shocks among the poor may be useful in HIV prevention efforts. More generally, they illustrate that the relationship between HIV and wealth may be more nuanced than assumed in previous work.

Keywords: economic shocks, poverty, male circumcision, HIV, South Africa

Introduction

The relationship between poverty, wealth, and the risk of contracting HIV is complicated and poorly understood (1, 2). There is, however, growing evidence of a link between shocks to wealth, health, and food security and sexual behaviors that increase the risk of HIV infection (3-6). This link is mediated by the fact that individuals may need to rely on the market premium (either in the form of direct payments or access to goods and services) that unprotected transactional sex affords in order to address basic needs during hard times (7, 8).

In the same vein, it is also possible that negative shocks impact other behaviors that influence HIV risk, such as traditional male circumcision. In many Sub-Saharan African cultures, male circumcision is viewed as a 'right to passage' into adulthood, with the procedure generally conducted by a traditional healer during adolescence (9, 10). Traditional circumcision often involves significant expenditures on the part of families, both as a result of costs associated with traditional surgeons and ritual expenses, as well as potential indirect costs stemming from procedure-related complications (9, 11-14). Large expenses on male circumcision may have to be deferred by families faced with sudden, severe financial setbacks, such as job loss and/or lost earnings, or large non-discretionary medical/funeral expenses associated with household member illness or death (15). This could have important implications for HIV prevention, as there is growing evidence that delayed tradition male circumcision, even within the ages of 15-22, can significantly increase the risk of contracting HIV (16, 17).

This study examines the impact of household financial, illness, and death shocks on circumcision age among a sample of Xhosa males living in Cape Town, South Africa, a population group that almost universally engages in traditional circumcision (17). We further examine the relative importance of shocks among poor and rich households, given research suggesting that the former are more vulnerable (7, 18).

Methods

Setting and Data

We used data from the Cape Area Panel Study (CAPS). The first wave of CAPS (in 2002) surveyed a representative sample of 4,752 young adults aged 14–22 years living in Cape Town. For the first wave of the study, a 2-stage sample was used, stratified by the 3 main racial groups: African (black), colored, and white ('colored' is a common and socially acceptable term in South Africa for individuals of mixed race. In the first stage, clusters were selected from the full list of enumeration areas for the Cape Town metropolitan area used in

the 1996 South African Census. The Probability Proportional to Size method was used to select clusters, using the number of households enumerated in the aforementioned census to serve as the measure of size. In the second stage, households were randomly selected from clusters (specifically, 25 from each cluster) to achieve a representative sample. Selected households were then informed in detail about the content and goals of the CAPS survey. Written consent was then obtained from all respondents, with parental consent obtained for interviews for all individuals under the age of 18. Thereafter, individuals were resurveyed up to four times, most recently in 2009 (Wave 5).

Relevant to our work, the African male sample initially comprised of 930 men, all Xhosa speaking, with 582 reinterviewed in 2009. African respondents were interviewed by Xhosa-speaking field workers in all waves. In Wave 5, where respondents were asked about circumcision status and beliefs, fieldworkers and respondents were additionally matched by gender given expected discomfort in discussing issues related to male circumcision with the opposite gender. Ethical approval for CAPS was granted by the University of Cape Town and the University of Michigan. Full details regarding CAPS, including sampling strategy, consent, ethical approval, and access to data and questionnaires can be found at http://www.caps.uct.ac.za.

General Research Strategy and Model

It is useful to outline our general research design before providing the specifics of the variables and measures. Broadly, in terms of the CAPS data, Wave 1 (2002) serves as the baseline, with data on shocks available in Waves 1, 3 (2005), and 4 (2006), and circumcision data in Wave 5 (2009). Given this data structure, we focused the analysis on those African men who were not circumcised in Wave 1, and considered the impact of shocks in the ensuing 3-year period (i.e., those reported in Wave 3) on circumcision age. Since, at baseline, all respondents fell within or around the typical age range for traditional male circumcision (age 15-22), examining shocks during this time period was appropriate as they corresponded to the time when households were probably considering circumcising the young adult and saving money for this purpose.

To assess the effects of shocks, we estimated the following Ordinary Least Squares (OLS) regression model:

(1) $Circumcision\ age_i = \alpha_0 + \alpha_1 * Any\ Shocks_h + \alpha_2 * Baseline\ Income_h + \boldsymbol{\alpha} * \boldsymbol{X_{ih}} + \varepsilon_i$

where *i* indexes the respondent and *h* his household, $Any\ Shocks_h$ is a binary variable = 1 if the individual's household reported a shock in Wave 3 and = 0 otherwise, $Baseline\ Income_h$ refers to household income in Wave 1, each α is a regression coefficient, and $\boldsymbol{X_{ih}}$ a vector of

various other individual and household controls, including respondent age at baseline, schooling, and baseline household characteristics.

We expected that the estimate on α_1 would be positive: experiencing any shock would lead to circumcision at a later age. We also estimated model (1) replacing *Any Shocks*$_h$ with binary indicators for shocks in the form of death or illness of a household member and whether an adult in the household lost their job, government grant or experienced business failure. Regarding *Baseline Income*$_h$, we hypothesized that poorer people would circumcise at later ages as they may require more time to accumulate the requisite funds (i.e., a negative α_2). Our variables are discussed in greater detail below.

To examine whether the impact of shocks on the timing of circumcision varied by household socioeconomic status, we estimated:

(2) $Circumcision\ age_i = \alpha_0 + \alpha_1 * Any\ Shocks_h + \alpha_2 * Baseline\ Income_h + \alpha_3 * Any\ Shocks_h * Baseline\ Income_h + \boldsymbol{\alpha * X_{ih}} + \varepsilon_i$

Here, we introduce the interaction term, *Any Shocks*$_h$ * *Baseline Income*$_h$. We hypothesized a negative coefficient on α_3, since poorer households are likely to have less financial reserves and less access to risk-smoothing instruments such as insurance or credit facilities to help tide over bad times.

Variables

Data for the age of circumcision were taken from the Wave 5 (2009) self-administered module that included questions regarding personal experience of male circumcision. Those individuals who reported being circumcised were asked "About how old were you [in years] when you were circumcised?" The option to answer "Don't know but very young" was provided. All those who reported an age of circumcision greater than their age in Wave 1 were included in the analysis.

Data on shocks were taken from CAPS Wave 3 (2005). A household adult (preferably the head) was asked whether any household member had any of the following experiences in the 24 months prior to the survey: (1) death, (2) illness or injury that prevented work, (3) job loss, (4) loss of government grant, (5) abandonment/divorce, (6) theft, (7) property loss, and (8) business failure. They were asked to provide up to three instances for each and to report whether the financial impact was "none, small, medium, or large." We created three binary variables from these data. The first was whether or not the household experienced any shock, which was set = 1 if they reported any of the aforementioned shocks. The second was an indicator for shocks due to either death or illness, and the third integrated reported job loss, government grant loss, and business failure among household members. Of note,

the creation of separate indicators for job loss and business failure and death and illness was meaningful: only 9% of respondent households experienced both a death or illness shock and a job loss or business failure. This is consistent with the idea that these are fundamentally different types of shocks, with death or illness likely associated with sudden increases in non-discretionary expenditures and job loss, grant loss, and/or business failure with sudden drops in income. We did not attempt to isolate effects of shocks classified as moderate or severe as greater than 80% of African households reported the shocks they faced as being so.

For household income, several CAPS waves asked participants to provide an estimate of the amount of money accruing from earnings, grants, pensions, transfers, and so forth, collectively received by all households in a typical month. Those who were not sure were asked to identify an income range from 29 different options starting from no income and going up to greater than 30,000 South African Rand (USD 3,500) per month. As discussed above, we used household data from Wave 1 as it serves as a baseline measure, with households reporting income ranges assigned the mean of the range as their household income.

We used a number of control variables, all taken from the baseline survey wave, in order to account for drivers of circumcision age that could also influence susceptibility to shocks. Specifically, we used data on the years of schooling of the household head, to control for the impact of education on preferences regarding circumcision and also the ability to ward off or mitigate shocks more successfully. We included a binary indicator for whether or not the head of the household was a male, to control for any differences between men and women in circumcision preferences and bargaining within the household over financial expenditures. Age of the household head (in years) was included, as well. We also included continuous variables for total household size, the number of children in the household, and the number of pension eligible men and women in the household, to capture differences in household structure that could drive resource allocation decisions.

For individual level controls, as mentioned previously, we included respondent age at baseline. In addition, we also control for respondent years of schooling. We did not utilize data on preferences and attitudes regarding male circumcision given the near uniformity in responses to these questions (17).

Results

Overall, 480 African men provided information on circumcision in Wave 5 and shocks in Wave 3. Among these men, 93% reported being circumcised and 257 reported an age of

circumcision greater than their reported age during the baseline age. This latter group formed our final study sample.

Descriptive statistics for the main outcomes, shock variables, and controls are presented in *Table I*. The average age of circumcision was about 20 years, with 90% circumcised between 17 and 23 years. Forty-two percent of respondents lived in households that experienced shocks in the two years preceding Wave 3, with 28% experiencing the death or illness of a household member and 24% a job loss or business failure within the household. Our sample showed a wide dispersion in terms of household income, with a mean of around 1900 South African Rand (approximately 190 USD in June 2002 and 214 USD at 21 January, 2013 exchange rates) and a range from R50 to R11500. In terms of other control variables, the sample respondents were, on average, nearly 17 years old at baseline and completed 10.5 years of schooling. Roughly equal proportions of household heads at baseline were male and female and household heads had completed, on average, just over 7 years of schooling.

Table II presents descriptive statistics stratified by whether or not the respondent's household experienced a shock. We found no statistically significant difference between respondents who experienced household shocks and those that did not in terms of circumcision age. Households at baseline who went on to experience a shock had a greater number of dependents ($p=0.05$), pension eligible members ($p=0.09$), and slightly older household heads ($p=0.07$). These differences were substantively small and there were no significant differences in the other household or individual characteristics.

Table III presents the results for regressions of the age of circumcision on the shock variables. Column (A) presents the results of model (1) above. Here, experiencing any shock between Wave 1 and Wave 3 was associated with a 0.14 year increase in the age of circumcision. As with the bivariate analysis in *Table II,* this estimate was not statistically significant. Also as expected, respondents from wealthier households were more likely to circumcise earlier, though this estimate, too, was not substantively or statistically significant. In terms of the individual control variables, respondent age at baseline was positively associated with circumcision age and respondent completed years of schooling negatively so, with both estimates statistically significant ($p<0.05$). In terms of household control variables, the estimated associations between circumcision age and household head education, age, gender, and the number of dependents and pension eligible elderly are small and not significantly different from zero.

Column (B) of *Table III* presents results for model (2) above, where the shock and household income variables were interacted. (Of note, we rescaled the household income variable so that the coefficient for the shock variable would reflect the effect of shocks on age of circumcision for respondents living in households in the 5th percentile of the baseline

income distribution. Without this, the coefficient for the shock variable would reflect the effect for respondents living in households with no income, which carries less meaning since such households do not exist in our data). Strikingly, respondents living in the poorest households were circumcised more than 2 years later if their household faced a shock as compared to individuals that did not ($p<0.05$). The impact of shocks decreased strongly with income ($p<0.05$): for respondents who lived in households that reported the average household income, the association between circumcision age and shocks is only slightly positive and not significantly different from zero.

Columns (C) and (D) of *Table III* are similar to (A) and (B) except the combined shocks variable is now replaced with separate indicators for death or illness and income shocks. A similar pattern of results was seen. The estimates for each type of shock were positive but small and statistically insignificant in column (C), which does not take into account the interactions between shocks and baseline income. When the interactions were added to the model (column D), large and statistically significant estimates were found for both shock variables for respondents who lived in poorer families at baseline, with the impact of each shock declining with increasing baseline wealth. The estimates for the death or illness shock were slightly larger (uninteracted: 2.18, $p<0.05$; interacted with log household income: -0.63, $p<0.05$) than those for income shocks (uninteracted: 1.76, $p<0.05$; interacted with log household income: -0.52, $p<0.10$). However, these differences were not statistically significant.

Discussion

The relationship between poverty and HIV risk remains an area of great research and policy interest. In particular, the mechanisms by which poverty may influence HIV risk have not been well elucidated. Some recent work has demonstrated a robust relationship between economic shocks and engagement in sexual behaviors that increase the risk of contracting HIV. This work is couched within a larger line of research that demonstrates the impacts of shocks on health behaviors and outcomes, more generally (19-22). Collectively, this evidence suggests that one way that poverty may influence HIV risk is by increasing vulnerability to socioeconomic shocks, which in turns hampers the ability to make key health investments that reduce the risk of acquiring HIV.

The results of our study support the plausibility of this mechanism in driving a link between poverty and HIV. Using data from a sample of Xhosa men in Cape Town, we demonstrate a relationship between death or illness and income shocks faced by household members and delayed age of traditional circumcision. The association with shocks was larger for respondents in poorer households, consistent with our prior expectation that these households would be unable to see through hard times without having to cut into

immediately non-essential purchases. In terms of HIV risk, our earlier work suggests that a 2 year delay in the age of circumcision, which is what respondents in the poorest households in our sample experienced in the face of household shocks, was associated with a 2 percentage point increase in probability of testing positive for HIV, which represents 20% increase from baseline HIV prevalence (roughly 10%) for African men in the CAPS sample (17).

Our results have a number of important implications for policy. Focusing first on circumcision, providing information to traditionally circumcising groups regarding the importance of early circumcision or improving access to financial instruments that help households better plan for and tide over shocks could be efficacious in reducing HIV risk. Policies that address access to savings and credit, and perhaps those that seek to promote economic development more generally, will provide additional positive benefits that extend beyond enabling timely circumcision (for example, increasing a household's ability to purchase nutritious foods, pay school fees, and obtain quality health care) (18).

Of course, any policy that targets traditional circumcisions should take into account the higher risk of complications (such as infections, infertility, and/or death) associated with this procedure (9). In addition, they should also take into account the increasing availability of free medical MC, which may lead some to substitute costly traditional rituals for heavily subsidized surgeries by allopathic physicians. However, for the foreseeable future, there will remain a sizeable proportion of men in sub-Saharan Africa who will continue to prefer traditional circumcision over medical alternatives (23, 24). Indeed, in the 2009 wave of CAPS, over 90% of men expressed a strong preference for traditional circumcision over medical alternatives (17). Moreover, data from a field experiment in Malawi suggests that, even with heavy subsidies for medical male circumcision, demand for the procedure remained quite low (<4% offered free circumcisions took up the procedure) (25). Thus, in this setting, addressing delays in costly ritualistic circumcision due to household shocks will likely remain important for HIV prevention for some time to come.

More central to the motivating question behind our study, our results also have implications for research examining the relationship between wealth and HIV risk. Most previous work estimates gradients in HIV risk by income or household wealth. However, few studies have attempted to examine the explicit factors that generate these gradients, in particular the different factors that increase the risk of contracting HIV for the poor vis-à-vis rich (1, 2). As discussed earlier, our results illustrate that one way poverty may contribute to HIV is by increasing the negative effect of shocks on health investments. These results complement both the aforementioned work on the relationship between shocks and sexual behavior as well as recent work illustrating how cash transfers to young women can reduce their HIV risk, ostensibly via liberating them from having to depend on older men who offer financial support in exchange for risky sex (26). These studies in addition to ours support the

key insight that the relationship between poverty and HIV risk is more nuanced than can be appreciated in studies of HIV-wealth gradients alone.

There are several limitations in our study. First, we cannot exclude the potential of unmeasured confounders correlated both with the shock variables and age of circumcision, such as financial literacy or the presence of informal savings or risk-sharing networks. Although there were few differences in individuals and household characteristics across respondents whose households did or did not experience shocks and a rich set of controls were included in our models, the presence of such confounders could have biased our results. Second, while we retrieve precise estimates of the impacts of shocks by income status, the small sample size precludes us from exploring interesting extensions, such as whether the impact of shocks among the poor varies by access to credit, information about the protective benefits of circumcision, and household preferences over circumcision. Third, it is possible that our age of circumcision (and the implicit self-reported circumcision status that this is based on) variable is measured with error. Measurement error in self-reports of circumcision status is well described in the literature (27). To the extent that errors are correlated with respondent characteristics, this may introduce bias in our coefficient estimates. Finally, it is unclear whether our results can be generalized beyond the Xhosa to other traditionally circumcising population groups across Africa, though the role of shocks in reducing economic well-being and increasing the probability of risky behaviors have been observed in a number of different settings.

Ultimately, our findings demonstrate the importance of economic shocks on the timing of traditional male circumcision, an investment that is strongly linked to HIV risk. Further research is needed to understand what sorts of interventions can be taken to mitigate the impact of such shocks on health and well-being, particularly among the poor.

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Table I – Descriptive Statistics

	Mean	Standard Dev.
Outcome		
Circumcision Age (Years)	19.92	1.98
Shocks and Income		
Any Shock in Wave 3 (=1)	0.42	0.50
Death and Illness Shock in Wave 3 (=1)	0.28	0.45
Income Shock in Wave 3 (=1)	0.24	0.43
HH Income at Baseline (Rand)	1917.88	1810.91
Respondent and Household Controls		
Respondent Age at Baseline (Years)	16.66	2.06
Respondent Schooling (Years in 2009)	10.54	1.94
HH Head Schooling at Baseline (Years)	7.35	3.24
HH Head Age at Baseline (Years)	47.48	12.73
HH Head Gender at Baseline (0 = female, 1 = male)	0.48	0.50
HH Number of Dependents at Baseline	1.37	1.23
HH Pension Eligible Member at Baseline (=1)	0.14	0.35

Notes:
-N = 257, sample reflects African men who were circumcised after CAPS Wave 1 in 2002
-Circumcision Age taken from CAPS Wave 5 question "About how old were you when you were circumcised." This was asked of all respondents who reported being circumcised.
-Shock is a binary variable equal to 1 if an adult in the respondent's household reported any death, illness, job loss, government grant loss, business failure, property damage or theft of a household member in the 2 years prior to the Wave 3 (2005) interview date. Income shock refers to job loss, government grant loss or business failure.
-HH Income at Baseline refers to household income (in South African Rand) reported in Wave 1.
-HH Head Schooling, Age, and Gender all refer to the characteristics of the head of the household the respondent was living in in CAPS Wave 1.
-HH Number of Dependents refers to the number of individuals under the age of 15 living in the respondent's household in Wave 1.
-HH Pension Eligible Member is a binary variable = 1 if the respondent's household in Wave 1 included either a man 65 or older or a female 60 or older.

Table II – Descriptive Statistics by Exposure to Shocks

	No Shocks (N = 148)		Any Shocks (N = 109)		
	Mean	Standard Dev.	Mean	Standard Dev.	Difference (P-value)
Outcome					
Circumcision Age (Years)	19.91	1.96	19.93	2.02	-0.01 (0.95)
Income and Other Controls					
HH Income at Baseline (Rand)	1804.03	1592.9	2072.47	2068.30	-268.43 (0.24)
Respondent Age at Baseline (Years)	16.77	2.07	16.52	2.03	0.25 (0.34)
Respondent Schooling (Years in 2009)	10.54	1.89	10.54	2.02	0.01 (0.98)
HH Head Schooling at Baseline (Years)	7.17	3.47	7.61	2.90	-0.44 (0.28)
HH Head Age at Baseline (Years)	46.22	12.03	49.18	13.49	-2.96 (0.07)
HH Head Gender at Baseline (1 = male)	0.51	0.5	0.45	0.50	0.06 (0.31)
HH Number of Dependents at Baseline	1.24	1.09	1.55	1.40	-0.31 (0.05)
HH Pension Eligible Member at Baseline (=1)	0.11	0.31	0.18	0.38	-0.08 (0.09)

Notes:
-Variable means and standard deviations presented for respondents whose households reported shocks in Wave 3 versus those who did not.
-Final column reflects the difference between respondents who experienced any shocks and those who did not, with the P-value derived from standard difference of means and proportions tests.
-See Table I Notes for variable definitions.

Table III – Regression Models for Circumcision Age

	(A)	(B)	(C)	(D)
Any Shock in Wave 3 (=1)	0.14	2.02**		
	(0.20)	(0.83)		
Death and Illness Shock in Wave 3 (=1)			0.14	2.18**
			(0.23)	(0.86)
Income Shock in Wave 3 (=1)			0.11	1.76**
			(0.22)	(0.89)
Logged HH Income at Baseline (Rand)	-0.11	0.19	-0.11	0.25
	(0.13)	(0.20)	(0.13)	(0.19)
Any Shock*Logged HH Income		-0.57**		
		(0.25)		
Death and Illness Shock*Logged HH Income				-0.63**
				(0.26)
Income Shock*Logged HH Income				-0.52*
				(0.27)
Respondent Age at Baseline (Years)	0.61***	0.61***	0.61***	0.60***
	(0.054)	(0.052)	(0.055)	(0.05)
Respondent Schooling (Years in 2009)	-0.11**	-0.12**	-0.11**	-0.13***
	(0.05)	(0.048)	(0.050)	(0.048)
HH Head Schooling at Baseline (Years)	0.028	0.014	0.026	0.0067
	(0.033)	(0.033)	(0.034)	(0.035)
HH Head Age at Baseline (Years)	0.0079	0.011	0.0073	0.012
	(0.011)	(0.011)	(0.011)	(0.011)
HH Head Gender at Baseline (1 = male)	-0.025	-0.095	-0.031	-0.12
	(0.20)	(0.20)	(0.21)	(0.20)
HH Number of Dependents at Baseline	0.019	0.015	0.018	0.0088
	(0.075)	(0.076)	(0.076)	(0.079)
HH Pension Eligible Member at Baseline (=1)	-0.20	-0.25	-0.20	-0.31
	(0.39)	(0.39)	(0.39)	(0.39)

Notes:
-Robust standard errors in parentheses.
-*** p<0.01, ** p<0.05, * p<0.1
-Dependent variable is age of circumcision.
-All models estimated using Ordinary Least Squares.
-Household income rescaled so that in interacted models, main effect of Shock variables reflect impacts for respondents who lived in poorest 5% of Wave 1 households.
-N = 257
-See Table I Notes for variable definitions.

southern africa labour and development research unit

The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

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