

Child-focused state cash transfers and adolescent risk of HIV infection in South Africa: a propensity-score-matched case-control study



Lucie Cluver, Mark Boyes, Mark Orkin, Marija Pantelic, Thembela Molwena, Lorraine Sherr

Summary

Background Effective and scalable HIV prevention for adolescents in sub-Saharan Africa is needed. Cash transfers can reduce HIV incidence through reducing risk behaviours. However, questions remain about their effectiveness within national poverty-alleviation programmes, and their effects on different behaviours in boys and girls.

Methods In this case-control study, we interviewed South African adolescents (aged 10–18 years) between 2009 and 2012. We randomly selected census areas in two urban and two rural districts in two provinces in South Africa, including all homes with a resident adolescent. We assessed household receipt of state-provided child-focused cash transfers, incidence in the past year and prevalence of transactional sex, age-disparate sex, unprotected sex, multiple partners, and sex while drunk or after taking drugs. We used logistic regression after propensity score matching to assess the effect of cash transfers on these risky sexual behaviours.

Findings We interviewed 3515 participants (one per household) at baseline, and interviewed 3401 at follow-up. For adolescent girls (n=1926), receipt of a cash transfer was associated with reduced incidence of transactional sex (odds ratio [OR] 0.49, 95% CI 0.26–0.93; p=0.028), and age-disparate sex (OR 0.29, 95% CI 0.13–0.67; p=0.004), with similar associations for prevalence (for transactional sex, OR 0.47, 95% CI 0.26–0.86; p=0.015; for age-disparate sex, OR 0.37, 95% CI 0.18–0.77; p=0.003). No significant effects were shown for other risk behaviours. For boys (n=1475), no consistent effects were shown for any of the behaviours.

Interpretation National, child-focused cash transfers to alleviate poverty for households in sub-Saharan Africa can substantially reduce unsafe partner selection by adolescent girls. Child-focused cash transfers are of potential importance for effective combination strategies for prevention of HIV.

Funding UK Economic and Social Research Council, South African National Research Foundation, Health Economics and AIDS Research Division at University of KwaZulu-Natal, South African National Department of Social Development, Claude Leon Foundation, John Fell Fund, Nuffield Foundation, and Regional Interagency Task Team for Children affected by AIDS—Eastern and Southern Africa.

Introduction

Effective and scalable HIV-prevention interventions for adolescents in sub-Saharan Africa are urgently needed. Of the subcontinent's 1.8 million new HIV infections in 2011, 41% were in people aged 15–24 years, with up to three-times higher prevalence in girls than in boys.¹ Although many prevention programmes prioritise educational and behavioural approaches, additional interventions that address structural drivers of the epidemic are needed.²

Cash transfers have been a focus of HIV-prevention research in the past few years.³ Several randomised controlled trials have investigated the effects of conditional and unconditional cash transfers on risk behaviour in young people, with further studies underway.^{4,5} In Tanzania, risk reduction has been linked to quarterly cash payments that were conditional on negative results of sexually transmitted infection tests,⁶ and a trial done in Zomba, Malawi,⁷ showed that cash transfers—either unconditional or conditional on school attendance—given to adolescent girls were associated with younger sexual partners and lower prevalence of HIV.

However, almost all the evidence linking cash transfers to HIV-risk behaviour comes from randomised controlled trials that are carefully done by researchers or collaborating non-governmental organisations.⁸ By contrast, national government-administered social protection programmes have wide reach and uneven implementation. At a time when the governments of sub-Saharan Africa are showing increased interest in cash transfers, it is essential to identify whether HIV-prevention benefits operate at such scales.⁹ To date, only two studies have assessed this point: a cross-sectional assessment¹⁰ of the South African child support grant showed that adolescents in households that received grants reported less sexual activity, and a prospective analysis¹¹ of 684 young people in Kenya's Orphans and Vulnerable Children cash transfer programme showed positive indications but no significant overall effects on transactional sex for young women, probably because of the small sample size and rarity of events.

Questions also remain about the exact mechanisms by which cash transfers might affect different risk factors



Lancet Glob Health 2013;
1: e362–70

See [Comment](#) page e315

Copyright © Cluver et al. Open Access article distributed under the terms of CC BY

See Online for an audio interview with Lucie Cluver

Centre for Evidence-Based Intervention, Department of Social Policy and Intervention, University of Oxford, Oxford, UK (L Cluver PhD, M Boyes PhD, M Pantelic MSc); Department of Psychiatry and Mental Health, University of Cape Town, Cape Town, South Africa (L Cluver); School of Public and Development Management, University of the Witwatersrand, Johannesburg, South Africa (M Orkin PhD); Cape Town Child Welfare, Cape Town, South Africa (T Molwena); Royal Free and University College Medical School, University College London, London, UK (L Sherr PhD); and Health Economics and HIV/AIDS Research Division, University of KwaZulu-Natal, Durban, South Africa (L Cluver)

Correspondence to: Lucie Cluver, Centre for Evidence-Based Intervention, Department of Social Policy and Intervention, Oxford University, Oxford OX1 2ER, UK
lucie.cluver@spi.ox.ac.uk

for HIV in countries with mature epidemics and high prevalence.⁸ Evidence from sub-Saharan Africa suggests that the pathways to risky behaviour are diverse—eg, economic need might drive girls to take risks regarding partner selection, such as transactional sex,^{12,13} whereas the influence of peers or low self-esteem might increase behaviours such as having sex after drinking alcohol.¹⁴ Furthermore, mechanisms and intervention effects might differ between boys and girls. Whether cash transfers are effective against only some or all risky sexual behaviours, and any differences or patterns between boys and girls needs to be investigated.¹⁵

South Africa provides two main cash transfers for children, mutually exclusive and both received monthly. The child support grant (ZAR250 per month in 2010, ZAR280 per month in 2012; roughly equivalent to US\$35) is available to all primary caregivers of children who earn less than a means-tested benchmark. The foster child grant (ZAR710 per month in 2010, ZAR770 per month in 2012; US\$96) is available to primary caregivers of a child legally in their care, as a result of being orphaned, abandoned, at risk, abused, or neglected, and is received by only 573 000 children compared with 11.2 million children receiving child support grants.¹⁶ Although outreach programmes have greatly increased coverage in recent years, a 2012 report¹⁶ states that 27% of eligible children were not receiving a child support grant. Furthermore, recent data¹⁷ suggest that only a small proportion of eligible children receive the foster child grant, partly because of backlogs in social services and court proceedings; instead, many receive a child support grant—which does not require a court process—or no grant at all. The maximum age for receipt of child support grants increased from 16 years in 2010 to 18 years in 2011. Foster child grants are generally available until age 18 years (21 years for those attending school). Therefore, South Africa is a suitable place to assess a state-led but not yet universal child cash transfer programme in a country where HIV prevalence is high. The only other state child-focused grant is the care dependency grant, received by roughly 120 000 children who need full-time permanent home care because of mental or physical disability. This grant was excluded from analyses because of confounding effects of severe disability or sickness on HIV risk behaviour.

We aimed to assess whether the cash transfer programme in South Africa affects risky sexual behaviour in children aged 12–18 years and whether cash transfers have different effects on different risk behaviours.

Methods

Study design and participants

We did a prospective, observational study because we could not randomise allocation to grant receipt in a longstanding national programme. We used propensity score matching, which is recommended by the World Bank¹⁸ for assessment of social programmes in

non-randomised studies. This approach simulates randomisation by matching treatment and control groups for variables that might predict their likelihood of cash transfer receipt,¹⁹ ensuring that these variables will not bias the estimate of the treatment effect.²⁰ This method has been shown to be reliable for assessment of the effects of HIV education on risky sexual behaviour, predictors of HIV testing, and economic effects of HIV.^{21,22}

We selected two urban and two rural health districts with antenatal HIV prevalence of more than 30% according to the national antenatal prevalence survey²³ from two South African provinces: Mpumalanga and the Western Cape. Within each health district, sequentially numbered census enumeration areas were selected by random number generation until we had the required sample size. In each area, every household was visited and included in the study if an adolescent (aged 10–17 years) lived there.

Ethics protocols were approved by the Universities of Oxford, Cape Town, and KwaZulu-Natal, and the Provincial Health and Education Departments of Western Cape and Mpumalanga. Participants and their primary caregivers provided written informed consent. No incentives were given, apart from refreshments and certificates of participation.

Procedures

In each household, one adolescent was randomly selected by drawing names from a bag and interviewed face-to-face for 60–70 min. All measures were assessed from adolescent self-report. All interviewers were trained and experienced in working with vulnerable children. All questionnaires, data, and consent forms were translated into Xhosa, Zulu, Sotho, Swati, and Shangaan and checked by back translation. Participants chose which language to use. Confidentiality was maintained, except if participants were at risk of significant harm or requested assistance. If participants reported recent abuse, rape, or other significant harm, immediate referrals were made to child protection and health services, with follow-up support. For past abuse or rape, referrals were made to support services and to HIV/AIDS services if appropriate.

We recorded risky sexual behaviours at baseline (2009–10) and follow-up 1 year later (2011–12) with scales from the National Survey of HIV and Sexual Behaviour Amongst Young South Africans and the SA Demographic and Health Survey.²⁴ Transactional sexual exploitation was defined as sex in exchange for food, shelter, school fees, transport, or money. Age-disparate sex was defined as having a sexual partner more than 5 years older than the participant.²⁴ Unprotected sex was defined as sometimes, rarely, or never using condoms when having sex (versus always using condoms or no sexual activity). Multiple sexual partners was defined as having had two or more partners in the past year.²⁵ Sex after drinking alcohol or taking drugs was defined as sex while drunk or after

using any drug (eg, crystal methamphetamine, glue, marijuana). We recorded both incidence in the past year (ie, had not done the behaviour at baseline but had by follow-up) and prevalence (ie, ever done the behaviour).

We measured receipt of a child-focused cash transfer by household access to a grant—child-focused grants in South Africa are usually used at the household level and benefits shared between all children in the home.¹⁰ On the basis of evidence that cash transfers need to be sustained and predictable to affect outcomes in adolescents,¹⁰ we recorded a household as having had a cash transfer only if it had received a transfer at both baseline and follow-up.

We measured potential covariates for propensity score matching at baseline and follow-up. We recorded participant age, sex, and location (urban or rural), primary caregiver's sex, maternal orphanhood, paternal orphanhood, biological parent as primary caregiver, and formal or informal housing with items adapted from the South African census. Household unemployment was measured with a household map (the child and interviewer drew an outline of their dwelling, divided into rooms, and drew each person who sleeps in each room, their age, sex, relationship to the child, and employment status). Well-functioning families might be able to more easily access cash transfers, so we used validated Alabama Parenting Questionnaire subscales to measure positive parenting and parent discipline and monitoring.²⁶ We assessed family social support with a standardised scale²⁷ and moving house with a Road of Life qualitative instrument²⁸ both used previously in South Africa. We measured household assets with an index of access to the eight highest socially perceived necessities for children, corroborated by more than 80% of the population in the nationally representative SA Social Attitudes Survey.²⁹

Statistical analysis

We did power analyses with G*Power3 (version 3.1) on the basis of the effect size for age-disparate sex in a previous trial.⁷ The study was powered to detect odds ratios (ORs) ranging between 0.42 or less and 0.58 or less, depending on both sex and the given risk behaviour, using an α of 0.05, power of 0.80, and measured probabilities of both getting a grant and engaging in a sexually risky behaviour between 0.005 and 0.021 with our final propensity-score-matched sample. We used propensity score matching to generate a control group matched to the treatment group for as many variables as possible, except that the control group do not receive the cash transfer.³⁰ We did the analyses in seven stages. First, we did individual regression of 23 potential propensity score matching variables versus the likelihood of household cash transfer receipt, controlling for participant age and sex. We included variables that were significantly associated with receipt at either baseline or follow-up as covariates in the propensity

score matching procedure. Second, we did propensity score matching for the 15 significantly associated variables with SPSS (version 19), using a calliper of 0.20 to exclude bad matches (difference of the logit of the propensity score of >0.20 SD).²⁰ We used nearest-neighbour matching and matching without replacement methods, making the treatment and control group equal sizes by excluding non-matched cases.³¹ Third, after matching, we checked the adequacy of the model to test for any remaining standardised mean differences between treatment and control groups (>0.25 standardised mean difference). Because risky sexual behaviour becomes more common with age, we also controlled for age in all propensity-matched models. Fourth, we assessed the proportions of adolescents reporting any sexual activity. Only nine participants had

	Household receives grant at both baseline and follow-up		Household does not receive grant at both baseline and follow-up	
	Boys	Girls	Boys	Girls
Baseline	n=779	n=1103	n=744	n=889
Age (years)	12.97 (1.91)	13.03 (2.04)	13.97 (2.21)	13.91 (2.23)
Urban location	397 (51.0%)	561 (50.9%)	392 (45.6%)	428 (48.1%)
Informal housing	232 (29.8%)	346 (31.4%)	234 (31.5%)	305 (34.3%)
Household assets	5.42 (2.23)	5.41 (2.19)	5.34 (2.39)	5.03 (2.51)
No job in the household	192 (24.6%)	300 (27.2%)	166 (22.3%)	189 (21.3%)
Positive parenting	356 (45.7%)	491 (44.5%)	340 (45.7%)	371 (41.7%)
Good parental discipline and monitoring	719 (92.3%)	1009 (91.5%)	670 (90.1%)	798 (89.8%)
Family support	4.91 (1.09)	4.93 (1.09)	4.82 (1.13)	4.93 (1.12)
Number of moves between homes	1.34 (0.65)	1.43 (0.80)	1.42 (0.73)	1.50 (0.72)
Caregiver is a biological parent	629 (80.7%)	812 (73.6%)	515 (69.2%)	597 (67.2%)
Primary caregiver is female	705 (90.5%)	1025 (92.9%)	627 (84.3%)	791 (89.0%)
Maternal orphan	67 (8.6%)	90 (8.2%)	116 (15.6%)	118 (13.3%)
Paternal orphan	123 (15.8%)	232 (21.0%)	166 (22.3%)	200 (22.5%)
Follow-up	n=831	n=1155	n=644	n=771
Age (years)	14.20 (1.99)	14.23 (2.08)	15.19 (2.27)	15.40 (2.32)
Urban location	428 (51.5%)	584 (50.6%)	314 (48.8%)	367 (47.6%)
Informal housing	152 (18.3%)	254 (22.0%)	142 (22.0%)	153 (19.8%)
Household assets	5.52 (2.34)	5.29 (2.30)	5.20 (2.45)	4.88 (2.43)
No job in the household	186 (22.4%)	303 (26.2%)	140 (21.7%)	162 (21.0%)
Positive parenting	431 (51.9%)	584 (50.6%)	292 (45.3%)	381 (49.4%)
Good parental discipline and monitoring	782 (94.1%)	1067 (92.4%)	614 (95.3%)	698 (90.5%)
Family support	5.27 (0.95)	5.20 (0.96)	5.11 (1.03)	5.11 (1.06)
Caregiver is a biological parent	652 (78.5%)	882 (76.4%)	472 (73.3%)	558 (72.4%)
Primary caregiver is female	739 (88.9%)	1049 (90.8%)	564 (87.6%)	669 (86.8%)
Maternal orphan	88 (10.6%)	111 (9.6%)	78 (12.1%)	92 (11.9%)
Paternal orphan	149 (17.9%)	256 (22.2%)	111 (17.2%)	148 (19.2%)

Data are mean (SD) or n (%) unless stated otherwise. At baseline, aside from any effects of age and sex, significant predictors of grant receipt were informal housing, household assets, no job in the household, family support, number of moves between homes, caregiver is a biological parent, and female primary caregiver. For follow-up, additional significant predictors were informal housing, household assets, no job in the household, family support, caregiver is a biological parent, and female primary caregiver. All significantly associated variables were used as covariates in the propensity-score-matching procedures.

Table 1: Participant characteristics at baseline and follow-up

	Boys (n=1475)		Girls (n=1926)	
	Age 12–14 years (n=992)	Age 15–17 years (n=483)	Age 12–14 years (n=1242)	Age 15–17 years (n=684)
Transactional sex	9 (0.9%)	19 (3.9%)	14 (1.1%)	37 (5.4%)
Age-disparate sex	7 (0.7%)	21 (4.3%)	13 (1.0%)	25 (3.7%)
Sex after alcohol or drugs	2 (0.2%)	28 (5.8%)	1 (0.1%)	14 (2.0%)
Unprotected sex	49 (4.9%)	109 (22.6%)	37 (3.0%)	143 (20.9%)
Multiple partners	45 (4.5%)	147 (30.4%)	19 (1.5%)	102 (14.9%)

Data are n (%).

Table 2: Incidence of risky sexual behaviour in the past year, by sex and age

	Household receives grant (n=1986)		Household does not receive grant (n=1415)	
	Boys (n=831)	Girls (n=1155)	Boys (n=644)	Girls (n=771)
Transactional sex	12 (1.4%)	16 (1.4%)	16 (2.5%)	35 (4.5%)
Age-disparate sex	10 (1.3%)	10 (0.9%)	18 (2.8%)	28 (3.6%)
Sex after alcohol or drugs	8 (1.0%)	8 (0.7%)	22 (3.4%)	7 (0.9%)
Unprotected sex	61 (7.3%)	81 (7.0%)	97 (15.1%)	99 (12.8%)
Multiple partners	70 (8.4%)	44 (3.8%)	122 (18.9%)	77 (10.0%)

Data are n (%).

Table 3: Incidence of risky sexual behaviour in the past year, by household grant receipt and sex

sexual debut when aged younger than 12 years, therefore we limited our dataset to adolescents aged 12–18 years, excluding 196 boys and 247 girls from the analysis. Fifth, we assessed the effects of cash transfers on each risk behaviour with logistic regression models for the propensity-score-matched sample. We stratified the analyses by sex and additionally controlled for age. Sixth, cross-tabulations in the propensity-weighted model indicated proportions in respective groups. Last,

as an additional check, because of the number of cases excluded by the propensity score matching procedures and the potential for covariates to act as confounders for risky sexual behaviour, we did multivariate logistic regression models for the whole unmatched sample (for participants aged >11 years, n=2668) with SPSS (version 19), including all potential baseline covariates. All odds ratios [ORs] are adjusted.

Role of the funding source

The sponsors of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

The baseline sample included 3515 households, and retention at follow-up was 96.8%. Our longitudinal sample included 3401 participants aged 10–18 years; 1926 were girls, 1475 were boys. Table 1 shows their descriptive characteristics. Individual regression identified 15 of 23 potential variables as being associated with receipt of cash transfer (table 1). Grant coverage at baseline (71.0%) and follow-up (72.3%) were both similar to the national average (73%).¹⁶

Propensity score matching on the 15 identified variables matched 2560 of 3401 adolescents (75.3%; 1280 per group). 706 participants were excluded from cash-transfer-recipient households and 135 from non-recipient households. The matched groups did not differ significantly on the overall balance test ($\chi^2 [15]=8.19, p=0.916$) and no substantial differences (of more than 0.25) remained for standardised mean differences of any covariates.

	Transactional sex		Age-disparate sex		Sex after drinking alcohol or taking drugs		Unprotected sex		Multiple partners	
	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value
Incidence in the past year										
Girls										
Receipt of household grant	0.49 (0.26–0.93)	0.028	0.29 (0.13–0.67)	0.004	1.97 (0.54–7.12)	0.303	0.91 (0.64–1.30)	0.616	0.77 (0.50–1.19)	0.242
Age	1.41 (1.16–1.72)	0.001	1.30 (1.03–1.64)	0.024	2.62 (1.40–4.91)	0.003	1.79 (1.57–2.04)	<0.0001	1.92 (1.62–2.26)	<0.0001
Boys										
Receipt of household grant	1.10 (0.47–2.66)	0.822	0.67 (0.27–1.63)	0.371	0.69 (0.27–1.77)	0.436	0.77 (0.52–1.15)	0.205	0.67 (0.46–0.97)	0.033
Age	1.37 (1.03–1.80)	0.027	1.60 (1.20–2.13)	0.001	2.41 (1.67–3.44)	<0.0001	1.46 (1.28–1.66)	<0.0001	1.77 (1.55–2.00)	<0.0001
Prevalence										
Girls										
Receipt of household grant	0.47 (0.26–0.86)	0.015	0.37 (0.18–0.77)	0.008	0.80 (0.37–1.70)	0.559	0.90 (0.51–1.59)	0.715	0.58 (0.23–1.47)	0.252
Age	1.49 (1.22–1.81)	<0.0001	1.31 (1.06–1.62)	0.012	1.63 (1.24–2.14)	<0.0001	2.17 (1.70–2.77)	<0.0001	2.58 (1.67–3.97)	<0.0001
Boys										
Receipt of household grant	1.23 (0.53–2.86)	0.627	0.70 (0.30–1.63)	0.403	0.88 (0.46–1.70)	0.706	0.96 (0.48–1.91)	0.897	0.85 (0.47–1.57)	0.609
Age	1.43 (1.09–1.87)	0.011	1.58 (1.20–2.08)	0.001	1.88 (1.49–2.36)	<0.0001	1.48 (1.18–1.85)	0.001	2.08 (1.67–2.60)	<0.0001

For the propensity-matched sample (n=2117). AOR=adjusted odds ratio.

Table 4: Logistic regression of risky sexual behaviours in the past year and ever, by sex and receipt of household grant

Tables 2 and 3 show risky sexual behaviours in the past year in the longitudinal sample. All types of risky behaviour were associated with each other (ten comparisons). Transactional sex was more common in participants who had age-disparate sex than those who did not (8/76 [10.5%] vs 80/2592 [3.1%]; $p=0.003$). Transactional sex was also more common in those who had multiple partners (17/183 [9.3%] vs 71/2484 [2.9%]; $p<0.0001$). Among participants who had transactional sex, unprotected sex was more common than in those who did not have transactional sex (44/88 [50%] vs 285/2580 [11.0%]; $p<0.0001$). Participants who had transactional sex were also more likely to have had sex while drunk or after taking drugs than those who did not have transactional sex (8/88 [9.1%] vs 58/2580 [2.2%]; $p=0.001$). Participants who had age-disparate sex were more likely to have had multiple partners (42/76 [55.3%] vs 263/2592 [10.1%]; $p<0.0001$) and were more likely to have had unprotected sex than participants who did not have age-disparate sex (45/76 [59.2%] vs 284/2592 [11.0%]; $p<0.0001$). Participants who had age-disparate sex were also more likely to have had sex while drunk or after taking drugs (14/76 [18.4%] vs 52/2592 [2.0%]; $p<0.0001$) than those who did not have age-disparate sex. Participants with multiple partners more often had unprotected sex (161/305 [52.8%] vs 168/2363 [7.1%]; $p<0.0001$) and sex while drunk or after taking drugs (37/305 [12.1%] vs 29/2363 [1.2%]; $p<0.0001$) than participants who did not. All risky behaviours increased with age, for both girls and boys.

Logistic regressions for the propensity-score-matched sample additionally controlled for age (and subsequently checked by multivariate regression models controlling for all baseline covariates) showed that receipt of a cash transfer was associated with reductions in some risky sexual behaviours, varying by sex (table 4, figure).

For girls, receipt of a household cash transfer was associated with reduced incidence of transactional sex (table 4). In households that had not received a grant, 5.5% of girls had transactional sex in the past year, compared with 2.5% in recipient households. Cash transfer receipt was also associated with lower prevalence of transactional sex (table 4). At follow-up, in households that had not received a grant, 6.2% of girls had had transactional sex, compared with 2.7% of girls in recipient households. Multivariate regression models using the full longitudinal unmatched sample confirmed associations with reduced incidence and prevalence of transactional sex (tables 5, 6).

Cash transfers were also associated with reduced incidence in the past year of age-disparate sex for girls (table 4). For households that had not received a cash transfer, 4.3% of girls began an age-disparate sexual relationship in the previous year, compared to 1.2% in recipient households. Cash transfer receipt was also associated with lower prevalence of age-disparate sex (table 4). At follow-up, in non-recipient households, 4.8% of girls had age-disparate sex versus 1.7% of girls in

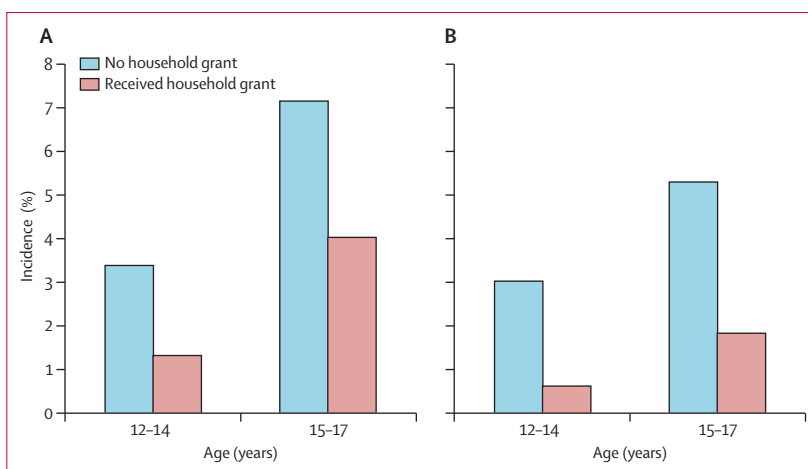


Figure: Incidence in the past year of risky sexual behaviours by adolescent girls For transactional sex (A) and age-disparate sex (B).

recipient households. Multivariate regression models confirmed associations with reduced age-disparate sex (tables 5, 6). Cash transfers did not significantly affect girls' likelihood of having had unprotected sex, multiple sexual partners, or sex while drunk or after taking drugs, either in the past year, or ever (tables 4–6).

For boys, cash transfers were associated with reduced incidence in the past year of multiple partners in the propensity-matched model (table 4), but were not associated with sustained prevalence, with the same findings in the multivariate regression model (table 5). We found no other significant effects of a child-focused cash transfer for boys.

Discussion

Our findings provide evidence that government-administered cash transfers are associated with reduced incidence in the past year and lower prevalence of risky sexual behaviours in adolescent girls, but no consistent associations for boys. These results support those of the trial in Zomba,⁷ where reduced HIV incidence among girls receiving cash transfers was linked to younger age of sexual partners. Both of these studies suggest that child-focused cash transfers target specific—rather than all—risky sexual behaviours, and that a possible mechanism of change might be interruption of risks driven by economic necessity.²³ This finding is especially important because transactional and age-disparate relationships are linked and major vectors of HIV infection, via power inequalities and higher infection rates in older male partners and male partners who provide financial support.³²

Child-focused cash transfers did not reduce girls' risk behaviours related to sexual practices: unprotected sex, multiple partners, or sex after drinking alcohol or taking drugs. This result also accords with the findings in Zomba, as well as models suggesting that other drivers of these behaviours might be more pertinent for

	Transactional sex		Age-disparate sex		Sex after drinking alcohol or taking drugs		Unprotected sex		Multiple partners	
	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value
Girls										
Receipt of household grant	0.42 (0.22-0.79)	0.008	0.28 (0.13-0.62)	0.002	1.76 (0.59-5.32)	0.314	0.84 (0.59-1.19)	0.330	0.68 (0.44-1.03)	0.066
Age	1.41 (1.16-1.71)	<0.001	1.34 (1.08-1.68)	0.009	2.60 (1.57-4.30)	<0.001	1.80 (1.60-2.04)	<0.001	1.95 (1.67-2.28)	<0.001
Urban location	1.34 (0.74-2.45)	0.335	0.42 (0.21-0.87)	0.020	0.96 (0.33-2.80)	0.935	1.10 (0.78-1.56)	0.579	1.17 (0.78-1.77)	0.439
Informal housing	1.37 (0.69-2.69)	0.365	1.28 (0.60-2.74)	0.525	1.08 (0.31-3.76)	0.902	0.56 (0.37-0.84)	0.006	1.30 (0.82-2.06)	0.269
Household assets	1.02 (0.89-1.17)	0.756	1.02 (0.89-1.18)	0.750	1.07 (0.84-1.37)	0.567	0.95 (0.88-1.02)	0.173	1.03 (0.94-1.13)	0.531
No job in the household	1.06 (0.54-2.07)	0.874	1.34 (0.62-2.87)	0.456	1.22 (0.36-4.19)	0.749	1.48 (1.02-2.14)	0.040	0.99 (0.62-1.58)	0.958
Positive parenting	1.45 (0.78-2.67)	0.237	1.21 (0.59-2.50)	0.604	0.24 (0.05-1.15)	0.075	1.07 (0.74-1.54)	0.715	0.89 (0.57-1.39)	0.619
Good parental discipline	1.12 (0.42-2.96)	0.823	1.25 (0.42-3.70)	0.690	1.94 (0.40-9.53)	0.413	0.70 (0.36-1.35)	0.285	1.32 (0.68-2.55)	0.407
Family support	0.92 (0.71-1.19)	0.514	0.90 (0.67-1.20)	0.455	0.98 (0.62-1.56)	0.942	0.91 (0.78-1.05)	0.189	0.95 (0.79-1.13)	0.543
Number of moves between homes	1.06 (0.71-1.58)	0.769	1.09 (0.73-1.62)	0.668	0.98 (0.45-2.14)	0.964	1.22 (1.00-1.49)	0.050	1.14 (0.88-1.48)	0.317
Female primary caregiver	1.56 (0.54-4.55)	0.412	1.03 (0.34-3.13)	0.953	2.85 (0.33-24.45)	0.339	1.09 (0.61-1.94)	0.775	1.22 (0.62-2.39)	0.561
Maternal orphan	2.29 (0.96-5.44)	0.061	0.54 (0.15-1.99)	0.352	1.47 (0.24-9.13)	0.679	1.13 (0.64-1.98)	0.677	1.18 (0.62-2.26)	0.605
Paternal orphan	1.09 (0.56-2.12)	0.794	1.35 (0.64-2.83)	0.432	0.34 (0.07-1.62)	0.177	1.36 (0.93-1.98)	0.109	1.43 (0.92-2.22)	0.111
Biological parent caregiver	1.05 (0.49-2.22)	0.906	0.93 (0.42-2.07)	0.865	1.45 (0.36-5.87)	0.603	1.20 (0.78-1.85)	0.405	1.02 (0.62-1.68)	0.942
Boys										
Receipt of household grant	0.93 (0.41-2.11)	0.871	0.69 (0.30-1.59)	0.381	0.55 (0.21-1.44)	0.224	0.74 (0.51-1.09)	0.127	0.66 (0.46-0.95)	0.027
Age	1.44 (1.12-1.85)	0.005	1.64 (1.26-2.15)	<0.001	3.04 (2.05-4.52)	<0.001	1.59 (1.41-1.79)	<0.001	1.85 (1.64-2.09)	<0.001
Urban location	1.05 (0.48-2.30)	0.900	0.93 (0.42-2.05)	0.858	0.94 (0.41-2.18)	0.885	1.50 (1.04-2.18)	0.032	1.18 (0.83-1.68)	0.366
Informal housing	0.98 (0.40-2.42)	0.967	1.05 (0.43-2.56)	0.916	6.74 (2.59-17.56)	<0.001	1.54 (1.02-2.32)	0.038	1.66 (1.12-2.47)	0.011
Household assets	0.98 (0.82-1.17)	0.816	0.93 (0.78-1.10)	0.399	1.20 (0.98-1.47)	0.075	0.94 (0.87-1.02)	0.133	1.00 (0.92-1.08)	0.979
No job in the household	0.63 (0.21-1.93)	0.419	0.95 (0.35-2.53)	0.915	2.21 (0.87-5.62)	0.097	1.24 (0.80-1.91)	0.341	1.47 (0.96-2.24)	0.076
Positive parenting	1.50 (0.69-3.27)	0.307	1.69 (0.78-3.69)	0.185	1.30 (0.54-3.13)	0.553	1.12 (0.78-1.62)	0.534	0.92 (0.64-1.30)	0.626
Good parental discipline	0.88 (0.20-3.91)	0.866	NA*	NA	0.76 (0.20-2.92)	0.684	0.63 (0.30-1.30)	0.210	0.68 (0.35-1.35)	0.271
Family support	0.78 (0.55-1.09)	0.145	0.96 (0.68-1.37)	0.835	1.04 (0.72-1.51)	0.830	0.89 (0.76-1.05)	0.164	0.96 (0.82-1.12)	0.597
Number of moves between homes	0.63 (0.29-1.34)	0.230	1.11 (0.60-2.03)	0.743	1.09 (0.59-2.00)	0.783	1.24 (0.92-1.65)	0.153	1.25 (0.93-1.66)	0.134
Female primary caregiver	0.38 (0.16-0.93)	0.034	2.84 (0.64-12.61)	0.169	1.78 (0.59-5.38)	0.310	1.16 (0.69-1.95)	0.572	1.43 (0.86-2.39)	0.172
Maternal orphan	0.21 (0.03-1.75)	0.148	0.66 (0.16-2.80)	0.573	1.22 (0.39-3.76)	0.736	0.68 (0.36-1.30)	0.243	0.54 (0.27-1.07)	0.076
Paternal orphan	0.78 (0.26-2.36)	0.659	0.53 (0.18-1.60)	0.262	0.82 (0.31-2.21)	0.698	0.93 (0.58-1.47)	0.742	0.88 (0.56-1.38)	0.581
Biological parent caregiver	1.04 (0.35-3.08)	0.939	0.70 (0.25-1.95)	0.497	0.27 (0.10-0.74)	0.011	0.84 (0.52-1.35)	0.461	1.27 (0.78-2.07)	0.333

For the full longitudinal sample (n=2668). AOR=adjusted odds ratio. NA=not applicable. *n<5.

Table 5: Multivariate logistic regression of risky sexual behaviour in the past year for all potential covariates

adolescents than material deprivation. Although we report some evidence of a protective effect for boys—for multiple partners—no consistent reductions occurred. These preventive, sex-specific effects strongly support the use of cash transfers as part of a combination prevention approach that targets structural, behavioural, and biomedical drivers of infection.² Our findings also suggest that specific consideration of risk reduction for boys is still needed.

We showed no adverse effects of cash transfers for adolescents, contrasting with short-term increases in risky sex in men given cash transfers in a Malawian trial.³³ Indeed, all ORs for boys in this study were less than 1, suggesting a trend towards a protective effect (tables 4-6). Given the strong evidence of nutritional, educational, and other benefits of child-focused cash transfers,⁹ it is encouraging to identify no harmful effects on risky sexual behaviours in this sample. However,

further research is needed to identify differences between boys and girls for HIV infection rates associated with behaviours such as transactional sex, and mechanisms of sex differences in the effects of cash transfer. Future research could also assess whether delayed debut might be a mechanism by which cash transfers affect sexual risk behaviours in adolescents, and why associations with cash transfers vary between strongly linked HIV-risk behaviours, such as age-disparate sex and sex after drinking alcohol or taking drugs.

These findings could also inform debates about whether cash transfers should be conditional or unconditional. The child support grant is de facto unconditional and means-tested. By contrast, the foster child grant has many conditions—requiring a court-hearing with assessment by a social worker, proof of medical care, school attendance, and biannual re-assessment. These conditions—combined with severe

	Transactional sex		Age-disparate sex		Sex after drinking alcohol or taking drugs		Unprotected sex		Multiple partners	
	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value	AOR (95% CI)	p value
Girls										
Household grant receipt	0.43 (0.23–0.78)	0.006	0.36 (0.18–0.70)	0.003	0.75 (0.36–1.53)	0.426	0.98 (0.55–1.72)	0.929	0.58 (0.23–1.49)	0.258
Age	1.48 (1.23–1.79)	<0.001	1.34 (1.10–1.64)	0.004	1.72 (1.34–2.21)	<0.001	2.10 (1.67–2.63)	<0.001	2.29 (1.55–3.38)	<0.001
Urban location	1.59 (0.89–2.84)	0.117	0.40 (0.21–0.78)	0.007	0.98 (0.49–1.98)	0.960	1.72 (0.96–3.10)	0.070	3.76 (1.35–10.49)	0.011
Informal housing	1.23 (0.64–2.37)	0.531	1.15 (0.57–2.31)	0.701	0.86 (0.39–1.87)	0.698	0.93 (0.49–1.80)	0.839	1.24 (0.45–3.39)	0.674
Household assets	0.99 (0.87–1.13)	0.903	1.04 (0.91–1.20)	0.526	1.05 (0.90–1.23)	0.538	0.89 (0.79–1.01)	0.076	1.11 (0.91–1.36)	0.316
No job in the household	1.09 (0.58–2.03)	0.795	1.29 (0.64–2.60)	0.473	2.00 (0.96–4.14)	0.063	1.68 (0.94–3.02)	0.081	0.71 (0.26–1.99)	0.518
Positive parenting	1.27 (0.71–2.28)	0.423	1.14 (0.59–2.21)	0.700	1.07 (0.51–2.23)	0.854	1.01 (0.55–1.86)	0.970	0.36 (0.12–1.12)	0.079
Good parental discipline	0.96 (0.36–2.54)	0.934	0.97 (0.33–2.83)	0.950	1.01 (0.29–3.48)	0.986	0.81 (0.28–2.41)	0.709	0.82 (0.17–3.95)	0.806
Family support	0.89 (0.70–1.14)	0.365	0.90 (0.69–1.17)	0.438	1.08 (0.79–1.46)	0.638	1.03 (0.81–1.32)	0.801	0.93 (0.64–1.34)	0.695
Number of moves between homes	0.99 (0.66–1.48)	0.947	1.07 (0.75–1.54)	0.703	1.41 (1.05–1.90)	0.022	1.13 (0.76–1.68)	0.547	0.72 (0.34–1.52)	0.386
Female primary caregiver	1.82 (0.63–5.27)	0.272	0.94 (0.34–2.55)	0.900	1.56 (0.45–5.46)	0.487	2.12 (0.63–7.14)	0.225	0.52 (0.17–1.53)	0.234
Maternal orphan	2.46 (1.10–5.52)	0.029	0.40 (0.11–1.45)	0.164	0.65 (0.17–2.48)	0.531	0.88 (0.32–2.41)	0.802	0.85 (0.24–2.96)	0.799
Paternal orphan	1.18 (0.64–2.19)	0.595	1.47 (0.75–2.87)	0.259	0.52 (0.21–1.28)	0.154	1.70 (0.95–3.03)	0.073	1.86 (0.75–4.62)	0.180
Biological parent caregiver	0.98 (0.48–2.00)	0.951	0.83 (0.41–1.69)	0.615	1.12 (0.48–2.62)	0.798	1.24 (0.59–2.61)	0.576	0.73 (0.27–1.94)	0.522
Boys										
Household grant receipt	1.00 (0.45–2.20)	0.995	0.68 (0.31–1.52)	0.348	0.95 (0.50–1.81)	0.879	1.07 (0.54–2.15)	0.840	0.85 (0.47–1.54)	0.595
Age	1.53 (1.19–1.96)	0.001	1.68 (1.30–2.17)	<0.001	2.10 (1.67–2.64)	0.000	1.63 (1.31–2.04)	<0.001	2.31 (1.85–2.88)	<0.001
Urban location	1.08 (0.51–2.31)	0.839	1.02 (0.48–2.17)	0.955	1.32 (0.71–2.43)	0.379	1.89 (0.96–3.71)	0.065	1.28 (0.74–2.23)	0.381
Informal housing	0.92 (0.38–2.23)	0.845	1.12 (0.48–2.62)	0.796	3.02 (1.53–5.95)	0.001	2.69 (1.31–5.50)	0.007	1.92 (1.05–3.54)	0.036
Household assets	0.99 (0.83–1.17)	0.874	0.95 (0.81–1.13)	0.574	1.05 (0.91–1.20)	0.511	0.90 (0.78–1.04)	0.137	1.06 (0.93–1.20)	0.383
No job in the household	0.76 (0.27–2.11)	0.599	1.03 (0.41–2.60)	0.949	1.75 (0.88–3.48)	0.109	1.44 (0.67–3.06)	0.348	1.13 (0.57–2.21)	0.728
Positive parenting	1.45 (0.68–3.07)	0.334	1.58 (0.75–3.32)	0.224	0.86 (0.46–1.62)	0.650	1.23 (0.64–2.36)	0.542	1.08 (0.62–1.87)	0.790
Good parental discipline	0.82 (0.19–3.64)	0.798	NA*	NA	0.46 (0.13–1.61)	0.223	1.30 (0.46–3.66)	0.621	0.42 (0.12–1.44)	0.167
Family support	0.81 (0.58–1.13)	0.209	0.90 (0.65–1.24)	0.510	0.95 (0.73–1.24)	0.704	1.22 (0.90–1.66)	0.203	1.03 (0.80–1.32)	0.822
Number of moves between homes	0.60 (0.28–1.29)	0.191	1.07 (0.59–1.92)	0.833	0.94 (0.58–1.52)	0.791	1.23 (0.75–2.00)	0.411	1.15 (0.75–1.76)	0.518
Female primary caregiver	0.41 (0.17–0.99)	0.048	3.26 (0.74–14.41)	0.119	2.10 (0.82–5.35)	0.121	2.37 (0.79–7.07)	0.123	2.79 (1.11–7.05)	0.030
Maternal orphan	0.20 (0.02–1.64)	0.133	0.56 (0.14–2.30)	0.419	0.72 (0.29–1.78)	0.473	0.78 (0.25–2.47)	0.676	0.58 (0.20–1.64)	0.304
Paternal orphan	0.92 (0.33–2.54)	0.872	0.47 (0.16–1.41)	0.179	1.00 (0.49–2.06)	0.999	1.00 (0.45–2.20)	0.993	0.94 (0.48–1.84)	0.856
Biological parent caregiver	1.13 (0.39–3.32)	0.818	0.65 (0.25–1.70)	0.385	0.34 (0.16–0.70)	0.003	0.82 (0.35–1.92)	0.645	0.80 (0.39–1.65)	0.544

For the full longitudinal sample (n=2668). AOR=adjusted odds ratio. NA=not applicable. *n<5.

Table 6: Multivariate logistic regression of risky sexual behaviour at any time for all potential covariates

understaffing of social services—result in very low uptake.¹⁷ In our study, only 23 (0.7%) of 3401 participants received a foster child grant, suggesting that preventive effects were probably driven by the unconditional child support grant. Two ongoing South African randomised controlled trials of conditional cash transfers will provide further evidence.^{4,5} Future research should also assess associations between adolescent risk behaviour and other household-level cash transfers such as pensions, multiple cash transfer receipt within households, children's age at cash transfer initiation, and differences in immediate recipient (parent or guardian, child, or both).

Additionally, our findings might be relevant to the particularly high-risk group of orphaned adolescents. Studies have shown younger age of sexual debut in orphans³⁴—especially for maternally orphaned girls and paternally orphaned boys^{35,36}—and higher HIV-infection rates for orphaned adolescents.³⁷ Future studies should

investigate the effects of foster child grants and other child-focused grants on risks for orphans.

Our study has several limitations. First, we studied a pre-existing national cash transfer system—it was not possible to do a randomised controlled trial. However, the huge scale and government-administered nature of the South African system also provides a unique opportunity to assess the effects of cash transfers in real-world conditions. We used a conservative matching-without-replacement method, a 0.20 calliper, and additionally controlled for child age in regression models.¹⁹ However, causality cannot be proven by propensity score matching; introductions of national cash transfer systems in other sub-Saharan African countries could provide valuable opportunities for randomised controlled trials, as shown with Mexico's PROGRESA-Oportunidades programme.³⁸

Second, our findings cannot be generalised to high-income areas or to other ethnic groups. However, the

Panel: Research in context**Systematic review**

The rationale for this study was based on three reviews, by Pettifor and colleagues,⁵ Heise and colleagues,¹⁵ and Lutz and Small.⁸ We also searched published studies, grey literature, and ongoing trials with a focus on resource-poor nations. We searched PubMed, Cochrane, and Campbell collaboration trials, PEPFAR-USAID, DFID, and UN policy documents, Medline, and ISI Web of Science from 1981 to present. Search terms included "cash transfer", "grant*", "social protection", "sex*", "HIV*", and "adolescen*". Cash transfers for HIV prevention have shown promise in a few randomised controlled trials by addressing structural drivers of HIV infection, but further research is required. The UNDP⁸ reports the need to test effectiveness of national-level cash transfer systems in resource-poor countries.

Interpretation

Our study complements the available evidence from randomised controlled trials, by assessing the effects of a national, government-administered cash transfer programme in a country with high prevalence of HIV. We report that, compared with adolescent girls in households not receiving a child-focused cash transfer, those in households that receive such transfers are significantly less likely to take partner-selection-related HIV risks (by half for transactional sex and by two-thirds for age-disparate sex). We showed no reductions for other risk behaviours for girls, and no consistent reductions for any risk behaviours for boys. These findings suggest that national cash transfer programmes might have an important role in HIV prevention. However, evidence from both this and other studies suggests that cash transfers might be of greater value for girls than boys, and are best used as part of combination prevention approaches.

study benefited from within-sample variation, including urban and rural areas in two provinces, and five language groups. Further studies are needed to assess the effects of government cash transfers in other sub-Saharan African countries. Third, we followed up participants after only 1 year; monitoring associations between cash transfers and risky sexual behaviours over an extended period would be of great value. Fourth, no validated measures were available to assess risk behaviours in South Africa. Although we used scales that have previously been used in national surveys, self-reported risk behaviour should ideally be validated with additional data. Finally, although transactional sex and age-disparate sex are reliable indicators of HIV-infection risk in sub-Saharan Africa,³⁹ future studies could include biological measures of adolescent HIV incidence.

Despite these limitations, our study has important implications for HIV prevention efforts. Within South Africa, our results strongly support the continued scale-up of child-focused grants and show the importance of identification of and support for eligible non-recipients. According to our findings, full coverage of child-focused cash transfers for the country's 2.76 million girls aged 12–18 could prevent roughly 77 000 new incidences of transactional sex each year. Additionally, risk behaviours increased throughout adolescence, suggesting the importance of providing transfers not only to younger but also to older adolescents.

For the region, this study provides evidence of feasibility and scalability of child-focused cash transfers as an HIV prevention method: effects that have been

reported in randomised controlled trials are also shown in a national-scale programme. Finally, our results accord with those of the recent Zomba trial in Malawi, with both studies showing reductions in deprivation-driven but not other risky sexual behaviours, suggesting that cash transfers might be most effective as part of a combination of prevention methods. To date, reviews have concluded that cash transfers show promise for HIV prevention (panel).^{5,8} Our findings suggest that—in sub-Saharan Africa—this promise can become a reality.

Contributors

LC conceptualised the study. LC and MB designed the study. LC, MO, MB, MP, and LS analysed and interpreted data. TM supported fieldwork. All authors reviewed and approved the final version of the report.

Acknowledgments

This study was funded by the UK Economic and Social Research Council, the South African National Research Foundation, the Health Economics and HIV/AIDS Research Division at the University of KwaZulu-Natal, the South African National Department of Social Development, the Claude Leon Foundation, the John Fell Fund, and the Nuffield Foundation. The analyses and writing were supported by the Regional Interagency Task Team for Children affected by AIDS Eastern and Southern Africa. We thank Rachel Yates for an inspirational discussion in Addis Ababa, Felix Thoemmes for his help with propensity score matching, and Melissa Pancoast, Franziska Meinck, and our fieldwork teams in the Western Cape and Mpumalanga. We also thank all the participants and their families.

References

- UNAIDS. Report on the global AIDS epidemic 2012. Geneva: UNAIDS, 2012.
- Seeley J, Watts CH, Kippax S, Russell S, Heise L, Whiteside A. Addressing the structural drivers of HIV: a luxury or necessity for programmes? *J Int AIDS Soc* 2012; 15 (suppl 1): 1–4.
- Temin M. HIV-sensitive social protection: what does the evidence say? Geneva: UNAIDS, 2010.
- Karim Q. A proof of concept cluster randomised controlled trial to evaluate the impact of a cash-incentivised prevention intervention to reduce HIV infection in high school learners in rural KwaZulu-Natal, South Africa. <http://apps.who.int/trialsearch/trial.aspx?trialid=NCT01187979> (accessed Nov 2, 2013).
- Pettifor A, MacPhail C, Nguyen N, Rosenberg M. Can money prevent the spread of HIV? A review of cash payments for HIV prevention. *AIDS Behav* 2012; 16: 1729–38.
- de Walque D, Dow WH, Nathan R, et al. Incentivising safe sex: a randomised trial of conditional cash transfers for HIV and sexually transmitted infection prevention in rural Tanzania. *BMJ Open* 2012; 2: e000747.
- Baird SJ, Garfein RS, McIntosh CT, Ozler B. Effect of a cash transfer programme for schooling on prevalence of HIV and herpes simplex type 2 in Malawi: a cluster randomised trial. *Lancet* 2012; 379: 1320–29.
- Lutz B, Small R. Cash transfers and HIV prevention: evidence and implications. New York: United Nations Development Programme, in press.
- Robertson L, Mushati P, Eaton JW, et al. Effects of unconditional and conditional cash transfers on child health and development in Zimbabwe: a cluster-randomised trial. *Lancet* 2013; 381: 1283–92.
- National Department of Social Development, South African Social Security Agency, UNICEF. The South African child support grant impact assessment: evidence from a survey of children, adolescents and their households. Pretoria, 2012.
- Rosenberg M, Pettifor A, Thirumurthy H, Halpern CT, Handa S. The impact of a national poverty reduction program on the characteristics of sex partners among Kenyan adolescents. *AIDS Behav* 2013; published online April. DOI: 10.1007/s10461-013-0487-z.
- Miller CL, Bangsberg DR, Tuller DM, et al. Food insecurity and sexual risk in an HIV endemic community in Uganda. *AIDS Behav* 2011; 15: 1512–19.

- 13 Cluver L, Orkin M, Boyes M, Gardner F, Meinck F. Transactional sex amongst AIDS-orphaned and AIDS-affected adolescents predicted by abuse and extreme poverty. *J Acquir Immune Defic Syndr* 2011; **58**: 336–43.
- 14 Jackson C, Geddes R, Haw S, Frank J. Interventions to prevent substance use and risky sexual behaviour in young people: a systematic review. *Addiction* 2012; **107**: 733–47.
- 15 Heise L, Lutz B, Ranganathan M, Watts C. Cash transfers for HIV prevention: considering their potential. *J Int AIDS Soc* 2013; **16**: 18615.
- 16 Hall K, Woolard I, Lake L, Smith C. South African child gauge 2012. Cape Town: Children's Institute, 2012.
- 17 Hall K, Proudlock P. Orphaning and the foster child grant: a return to the 'care or cash' debate. Cape Town: Children's Institute, University of Cape Town, 2011.
- 18 Baker J. Evaluating the impact of development projects on poverty: a handbook for practitioners. The World Bank, 2000.
- 19 Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behav Res* 2011; **46**: 399–424.
- 20 Thoemmes F. Propensity score matching in SPSS. University of Tubingen, 2012. <http://arxiv.org/ftp/arxiv/papers/1201/1201.6385.pdf> (accessed Nov 2, 2013).
- 21 Mahal A, Canning D, Odumoso K, Okonkwo P. Assessing the economic impact of HIV/AIDS on Nigerian households: a propensity score matching approach. *AIDS* 2008; **22** (suppl 1): S95–101.
- 22 Anderson DM. The impact of HIV education on behavior among youths: a propensity score matching approach. *Contemp Econ Policy* 2013; **31**: 503–27.
- 23 Department of Health. 2008 national antenatal sentinel HIV & syphilis prevalence survey. Pretoria, 2009.
- 24 Pettifor A, Rees H, Kleinschmidt I, et al. Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. *AIDS* 2003; **19**: 1525–34.
- 25 Shisana O, Rehle T, Simbayi L, et al. South African national HIV prevalence, HIV incidence, behaviour and communication survey 2005. Pretoria: HSRC Press, 2005.
- 26 Elgar F, Waschbusch D, Dadds M, Sigvaldason N. Development and validation of a short form of the Alabama parenting questionnaire. *J Child Fam Stud* 2007; **16**: 243–59.
- 27 Van der Merwe A, Dawes A. Prosocial and antisocial tendencies in children exposed to community violence. *J Child Adolesc Ment Health* 2000; **12**: 19–37.
- 28 Cluver L, Gardner F, Operario D. Psychological distress amongst AIDS-orphaned children in urban South Africa. *J Child Psychol Psychiatry* 2007; **48**: 755–63.
- 29 Pillay U, Roberts B, Rule S, eds. South African social attitudes: changing times, diverse voices. Cape Town: HSRC Press, 2006.
- 30 Heckman J, Ichimura H, Todd Y. Matching as an econometric evaluation estimator: evidence from evaluating a job training programme. *Rev Econ Stud* 1997; **64**: 605–54.
- 31 Thoemmes F, Kim E. A systematic review of propensity score methods in the social sciences. *Multivariate Behav Res* 2011; **46**: 90–118.
- 32 Dunkle K, Jewkes R, Brown H, Gray G, McIntyre J, Harlow S. Transactional sex among women in Soweto, South Africa: prevalence, risk factors and association with HIV infection. *Soc Sci Med* 2004; **59**: 1581–92.
- 33 Kohler H, Thornton R. Conditional cash transfers and HIV/AIDS prevention: unconditionally promising? *World Bank Econ Rev* 2012; **26**: 165–90.
- 34 Thurman T, Brown L, Richter L, Maharaj P, Magnani R. Sexual risk behavior among South African adolescents: is orphan status a factor? *AIDS Behav* 2006; **10**: 627–35.
- 35 Nyirenda M, McGrath N, Newell ML. Gender differentials in the impact of parental death: adolescent's sexual behaviour and risk of HIV infection in rural South Africa. *Vulnerable Child Youth Stud* 2010; **5**: 284–96.
- 36 Mmbaga EJ, Leonard F, Leyna GH. Incidence and predictors of adolescent's early sexual debut after three decades of HIV interventions in Tanzania: a time to debut analysis. *PLoS One* 2012; **7**: e41700.
- 37 Operario D, Underhill K, Chuong C, Cluver L. HIV infection and sexual risk behaviour among youth who have experienced orphanhood: systematic review and meta-analysis. *J Int AIDS Soc* 2011; **14**: 25.
- 38 Gertler P. Do conditional cash transfers improve child health? Evidence from PROGRESA's control randomised experiment. *Am Econ Rev* 2004; **94**: 336–41.
- 39 Chen L, Jha P, Stirling B, et al. Sexual risk factors for HIV infection in early and advanced HIV epidemics in sub-Saharan Africa: systematic overview of 68 epidemiological studies. *PLoS One* 2007; **2**: e1001.