Analyzing the Impact of a CCT on Multidimensional Poverty of Young Girls: Evidence from HPTN 068

Kelly Kilburn[1,2], Lucia Ferrone[3], Audrey Pettifor[1,4,5,6], Ryan Wagner[6,7], Xavier Olive-Gomez[6], and Kathy Kahn[7,8]

[1] Carolina Population Center, University of North Carolina, Chapel Hill, North Carolina, USA
[2] Department of Global Health, School of Public Health, George Washington University, Washington, DC, USA
[3] UNICEF Office of Research Innocenti, Florence, Italy
[4] Department of Epidemiology, University of North Carolina, Chapel Hill, North Carolina, USA
[5] Wits Reproductive Health and HIV Institute, University of the Witwatersrand, Johannesburg, South Africa
[6] MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt), School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa
[7] Umeå Centre for Global Health Research, Division of Epidemiology and Global Health, Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden
[8] INDEPTH Network, Accra, Ghana

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Abstract

While it has long been recognized that poverty goes beyond monetary means, evidence on the impact of social protection programs and interventions on multidimensional poverty remains scarce. In particular, there is virtually no evidence about the impact of such interventions on individual multidimensional poverty. We contribute to building this evidence by analyzing the effect of a randomized, conditional cash transfer intervention for adolescent girls and young women, the HIV Prevention Trials Network (HTPN) protocol 068 (also known as Swa Koteka), on multidimensional poverty in South Africa. Using primary data collected for the evaluation of HPTN 068, we construct an individual level measure that is specific to the context, a major departure from standard indexes of multidimensional poverty. Our measure is defined over six dimensions: education, health and food security, protection, familial and social relationships, economic agency, and psychosocial well-being. We aggregate our indicator using a system of nested weights where each domain is weighted equally and then normalized. We find that the cash transfer consistently reduces multidimensional poverty among young girls, in particular through the domains of protection from violence, economic agency, and food security. These results show that not only can targeted, social protection interventions improve lives in single domains, but there is also the potential for social protection to simultaneously address multiple targets of the SDGs, from reducing poverty, to gender equality.

Introduction

It has long been recognized that poverty goes beyond monetary means, and since the start of the 2000s, the multidimensional nature of poverty has been increasingly acknowledged, and critical advances have been made in its measurement over the past decade (Alkire & Foster, 2011; Alkire et al., 2015; Atkinson, 2003, 2003; Bourguignon & Chakravarty, 2003; Gordon, Nandy, Pantazis, Townsend, & Pemberton, 2003). The conceptual roots of the multidimensional measure of poverty can be traced to Sen's Capability Approach (Sen, 1979, 1981), who first conceptualized poverty as more than lack of monetary means, but rather a lack of realization and fulfillment of one's potential.

Despite some criticism (Ravallion, 2011), the Sustainable Development Goals (SDGs) explicitly recognize the important role of multidimensional measures of poverty, and the fact that poverty affects groups of the population differently. Target 1.2 states: *"By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions."* This target references all dimensions of poverty, and stresses the role of national, tailored definitions of poverty. More recently, the Atkinson commission on Global Poverty endorsed the measurement of multidimensional poverty, along with monetary poverty, to track progress towards this important SDG (World Bank, 2017).

Social protection, part of the Sustainable Development agenda itself (SDG target 1.3), and cash transfers in particular, have been shown to be powerful instruments to simultaneously address several development objectives like poverty, food insecurity, and children's schooling (Bastagli et al., 2016). For instance, the South Africa Child Support Grant has been shown to improve child nutrition, education, and food security of households (Coetzee, 2013); lower risk of mental health disorders for recipients of the CSG (Plagerson, Patel, Harpham, Kielmann, & Mathee, 2011); and to improve school attendances in adolescents in South Africa, through lowering the associated material and psychosocial costs (Adato, Devereux, & Sabates-Wheeler, 2016). Moreover, it is clear that cash transfer programs, which most often are intended as a social safety net program for the poorest households, reduce monetary poverty, especially for the most vulnerable members, children. In a review of the effect of cash transfers on childhood poverty in different settings (SSA, Latin America, and transition economies), Barrientos and DeJong (2006) find that cash transfers generally have a positive impact, regardless of their form: both conditional and unconditional cash transfers (CCT and UCT, respectively) are found to be effective. In particular, the South Africa

CSG is found to be effective in reducing childhood poverty (Barnes, Hall, Sambu, Wright, & Zembe-Mkabile, 2017)

Interventions targeted towards women and girls, in particular, may also contribute to the broader goals of improving gender inequality (SDG 5) through means such as reducing intimate partner violence (SDG 5.2.1) (Buller et al., 2018; Kilburn et al., 2018). In some cases, including the study we report on here, cash transfer interventions have even been designed with the objective of reducing new HIV infections among young women and other vulnerable populations (SDG 3.3.1), although interventions have not shown great promise on this objective (de Walque et al., 2012; Heise, Lutz, Ranganathan, & Watts, 2013; Kohler & Thornton, 2012; Pettifor, MacPhail, Hughes, et al., 2016; Pettifor, MacPhail, Nguyen, & Rosenberg, 2012). Another similar cash transfer program for young women in Malawi, while not designed with the HIV reduction objective, was found effective in lowering the risk of HIV and HSV-2 infection among girls who were attending school at baseline (Baird, Garfein, McIntosh, & Özler, 2012) in addition to reducing psychological distress (Baird, de Hoop, & Özler, 2013) and reducing pregnancy and marriage (S. Baird, Chirwa, McIntosh, & Özler, 2010) .

National social protection, cash transfer schemes across Sub-Saharan Africa have also been effective in improving related health outcomes among young people including sexual risk behaviors, child pregnancy, and early marriage (Owusu-Addo, Renzaho, & Smith, 2018). Evidence from Kenya's national cash transfer scheme shows that it had protective effects for young people, reducing the likelihood of first pregnancy of females 15-25 (Handa et al., 2015), and delaying sexual debut for males and females 12-24 (Handa, Palermo, et al., 2017). Additionally, the program was found to reduce depressive symptoms, especially for young men 20-24 (Kilburn, Thirumurthy, Halpern, Pettifor, & Handa, 2016). The South Africa CSG, has also been shown to help mitigate the risk of HIV infection in adolescents by reducing risky behaviors, such as early sexual debut (Heinrich, Hoddinott, & Samson, 2017)(Cluver et al., 2016).

On the other hand, the effects of cash transfer schemes on gender relations and women's empowerment is mixed. Earlier evidence from Latin America shows that cash transfers targeted to women do not necessarily increase their power over household resources (Handa, Peterman, Davis, & Stampini, 2009), and a systematic review finds no definitive evidence on whether cash transfers increase women's decision-making power (Yoong, Rabinovich, & Diepeveen, 2012). Evidence from Zambia indicates that a cash transfer program had a modest effect on women's decision-

making power due to strongly held gender norms, while at the same time qualitative evidence form the same evaluation report that women did feel more empowered (Bonilla et al., 2016). Using data on South Africa's CSG, Patel and Hochfeld (2011) find that while the program improved women's ability to control resources, it did not shift the burden of care from women, even in the face of improved opportunity for women outside the household.

Despite the strong evidence that cash transfers can impact many individual aspects of well-being, evidence is lacking on the effect of these social protection interventions on multidimensional poverty, either at the individual or household level, and both in low and higher income settings. Multidimensional poverty measures the simultaneous occurrence, in one individual or household, of multiple deprivations. Therefore, to reduce multidimensional poverty, any intervention would need to improve lives in multiple domains of well-being. It is important to underline that improved impacts of programs and policies in different areas do not yield an automatic impact on multidimensional poverty—they need to impact the same people in multiple ways in order to be effective in reducing multidimensional poverty. In this sense, multidimensional poverty sets a higher bar for effectiveness of interventions. Additionally, any measure of multidimensional poverty ought to capture the correlation of its components, and therefore multidimensional poverty can decrease if the correlation between deprivations diminishes (Duclos & Tiberti, 2016). Successful interventions therefore address multiple deprivations not only by reducing each deprivation on its own, but also lowering the probability of their simultaneous occurrence. For example, an intervention that both increases educational attendance and reduces the need for children to work by providing financial support to families, can break the tie between low school attendance and child labour, which reduces the chances of either event occurring.

Individuals who experience multiple deprivations at the same time are particularly vulnerable, so it is crucial to assess the impacts of interventions, especially social protection policies, on multidimensional poverty. Among the few studies that analyze the impact of interventions on multidimensional poverty, Chowdhury and Mukhopadhaya (2012) use a multidimensional poverty framework to assess the effectiveness of NGOs and governments' microfinance programs in Bangladesh. They find that in in many dimensions, government-based interventions are more efficient than NGO's. Their results, however, are not focused on the reduction of poverty, but rather on what dimensions are impacted by the program. In Bangladesh, Robano and Smith (2014) find that a NGO-run anti-poverty program (involving transfer of physical assets and information) led to a substantial reduction in multidimensional poverty. Additional uses of a multidimensional poverty

measure include Victor and colleagues (2014), who evaluate the targeting of a health program in rural Mozambique using a multidimensional poverty index, and Oyekale (2011), who assesses the impact of poverty reduction interventions in rural Nigeria, finding mixed results. Among the evidence from higher-income settings, Notten and Guio (2016) find considerable effects of cash transfers on household-level material deprivation in five EU countries using income elasticity to indirectly estimate the impacts.

Our paper's main aim is to help fill the evidence gap surrounding the effect of social protection interventions on multidimensional poverty, in particular the effect on an individual-level measure, defined specifically for young women. To our knowledge, no study so far has addressed the impact of an intervention on the multidimensional poverty status of a specific population, in particular that of young women. Analyzing the impact of a conditional cash transfer (CCT) to young women and their families, we seek to understand the impact of the program on a unique multidimensional poverty measure designed to capture different aspect of the young women's life. We use primary data from HIV Prevention Trials Network (HPTN) 068 or Swa Koteka, an experimental intervention designed to test the efficacy of CCTs for HIV prevention among adolescent girls and young women in South Africa.

Data and Methods

Study site

This study took place in a rural, poor area of Mpumalanga province, South Africa near the Mozambique border. Participants for this study were recruited from villages within the Agincourt Health and Socio-Demographic Surveillance Systems (HDSS), a demographic monitoring system that has been ongoing since the early 1990s. The Agincourt study area is characterized by high poverty and unemployment. Temporary migration for work is common not only for young men but increasingly for young women (Kahn et al., 2012). Farming is not a major source of income or food because of the arid landscape. Therefore, many households are food insecure and rely on government support to get by, particularly South Africa's non-contributory grant programs like the Old Age Pension and the Child Support Grant (CSG) (Kahn et al., 2012).

Our study sample comprises some of the most poor and vulnerable households both in South African and in the HDSS. Over 80% of study households were receiving the CSG for at least one of their children. As the CSG is designed to as a social support for children under the age of 18 living

in the poorest households in South Africa, this indicates official recognition of poverty status by the government. Additionally, household consumption of our sample is much lower compared to the rest of South Africa such that most households would be defined as poor by official standards. At the start of baseline data collection in 2011, the official poverty line in South Africa the was 620 Rand per capita/month (Stats SA, 2014) while the average per capita expenditure among our study sample at baseline was 460 Rand, indicating most of the households were well below the poverty line (Kilburn et al., not published). Food consumption among our sample also makes up around half of total consumption signifying most consumption is for basic needs. Moreover, the young women participants reported high levels of food insecurity at baseline with around a third reporting being worried about having enough food in the past 12 months (Kilburn et al., not published) Comparatively, across South Africa at the time of baseline data collection in 2011, 36 percent of households were considered poor and 23 percent were food-poor according to official poverty lines (Stats SA, 2017). Additionally, young people, and particularly females, are at increased risk of poverty in South Africa (*ibidem*).

Our study area is also characterized by high HIV prevalence. Peak prevalence from the most recent HIV prevalence survey in 2010 was 45.3% among men and 46.1% among women, both aged 35-39 (Gómez-Olivé et al., 2013). The same 2010 survey found HIV prevalence at 5.5% among girls aged 15–19 and 27% among young women aged 20–24, highlighting the need to target prevention strategies towards young women, a particularly vulnerable group in SSA (*ibidem*). This evidence was a primary motivation for targeting the prevention intervention to young women in high school before they transitioned to adulthood (Pettifor, MacPhail, Selin, et al., 2016). The HPTN 068 trial found incidence among young women during the trial of around 2% (per person-year) (*ibidem*).

Study Design and Sampling

To test whether CCTs are an effective HIV prevention strategy, HPTN 068 (or Swa Koteka which means “it is possible”), was designed as an individually randomized conditional cash transfer (CCT) intervention for females attending high school in the Agincourt area. It was hypothesized that the intervention would reduce HIV incidence because it would incentive girls to stay in school and reduce young women’s economic insecurity, both recognized as protective factors for HIV acquisition among young women. Swa Koteka provided monthly cash transfers for up to three academic years to study participants (and their parents or guardians) that were randomized to the treatment group if they attended school at least 80% of school days in the previous month. Attendance was verified with official school records.

Monthly cash transfers amounts were the same for all beneficiaries, 100 Rand for the young women and 200 Rand for the parent or guardian (roughly US$ 10 and US$ 20 using 2012 conversion rates). The total amount, 300 Rand, was chosen as it approximated the amount per child provided by the CSG, the South African social protection program most households in the study were already receiving. Since average per capita monthly consumption for study households was 460 Rand at baseline, the cash transfer represented a significant proportion of household consumption.

Adolescent girls and young women living in the HDSS were recruited to the study beginning in March 2011. Eligibility requirements included being between 13-20 years old, enrolled in a participating high school in the study area, able to read, living with at least one parent or guardian, and not married or pregnant. Additionally, participants had to have the appropriate documents to open a bank or post office account in order to receive their transfers. The most common reason girls were ineligible was because they were either not in school or not enrolled participating school or grade (45%). Only 2% of girls screened did not meet the requirements for documentation (Pettifor, MacPhail, Selin, et al., 2016). After screening procedures were completed within participating high schools in the HDSS, 2,537 girls were found eligible and recruited as study participants.

Written informed consent for study participation was obtained at home visits from both young women (unless younger than 18 years old) and her parent or guardian. Written assent was obtained for female participants under 18 years old and written consent was provided from her parent or guardian. Institutional Review Board approval for this study was obtained from the University of North Carolina at Chapel Hill and the University of the Witwatersrand Human Research Ethics Committee as well as the Provincial Department of Health's Research Ethics Committee.

Once enrolled in the HPTN 068 study, participants completed a baseline survey and were tested for HIV and Herpes Simplex Virus 2 (HSV-2). The survey was self-administered using an Audio Computer-Assisted Self-Interview (ACASI) to elicit more reliable responses to self-reported questions on sensitive topics including sexual behaviors and partner violence. HIV and HSV-2 tests were administered after the ACASI survey and included pre and post-test HIV counselling. Lastly, parents or guardians of the young women also completed a household survey that was administered by a researcher.

After all baseline assessments were completed, the study team individually randomized study participants (including their parent or guardian) 1:1 to the intervention. Participants in the treatment arm would receive the monthly cash transfer (as long as they met the attendance requirement) until either the end of the study or they graduated high school, whichever came first, while the participants in the control arm would not receive any compensation. At annual intervals after baseline (12, 24, and 36 months), study participants completed the same ACASI survey (or household survey for parents/guardians) and HIV and HSV-2 testing if they tested negative at the prior visit. Attrition across rounds was very low outside of the expected loss of young women that graduated high school (Pettifor et al, 2016a).

Impacts of the Program

The impacts of the Swa Koteka intervention on several domains have already been studied, including the main outcomes of HIV incidence and sexual risk behaviors. Conceptually, one could expect the CCT would move through two main channels to impact HIV acquisition: incentivizing young women to stay in school, since the cash was conditional on school attendance, and increasing their economic security, both of which are associated with a decrease in sexual risk behaviors, such as transactional or unprotected sex. Additionally, as the program provided counseling on HIV, there is also a potential direct behavioral effect.

It should also be noted that, the incentive to remain in school could increase economic insecurity due to forgone income and the relative opportunity cost. In reality, school attendance was already quite high as participants were enrolled in school already, and in this region of South Africa youth unemployment is very high (Collinson et al., 2016). Therefore, the opportunity cost of going to school was relatively low. On the other hand, young women often seek out boyfriends or sexual partners that provide them with money and/or gifts, contributing to a power disparity is related to risky sexual behavior and IPV (see Luke, 2003). In this way, the cash transfer might reduce their desire to seek these relationships and thus reduce their sexual activity, lowering the risk of HIV acquisition.

In the main analysis of HPTN 068, Pettifor and coauthors (2016) found that the CCT did not lead to an impact on HIV incidence (or Herpes Simplex Virus-2) among young women, the study's primary objective. In fact, they found HIV incidence was relatively low across the entire sample at 1.8% per year given their expectation of around 3% (*ibidem*). One reasoning suggested for the null findings was that school attendance did not differ across treatment and control groups. Young

women in both groups attended school at unexpectedly high levels of around 95% even though the cash was conditional on school attendance. As increased school attendance was hypothesized a main (protective) pathway that would affect HIV risk, the authors believed the high rates of school attendance contributed to their null findings. This was further supported with evidence that HIV incidence did vary between young women who attended at high levels and those who attended at less than 80% or dropped out. Young women who attended school less than 80% of expected time were at increased risk of HIV acquisition, irrespective of study group (Pettifor, MacPhail, Selin, et al., 2016).

Other impacts of the program on secondary outcomes included reducing the risk of intimate partner violence, having any sexual partners in the last 12 months, and having unprotected sex in the last 3 months (Pettifor, MacPhail, Hughes, et al., 2016). Additional analysis on intimate partner violence revealed that these impacts were consistently strong across all types of physical violence and that reductions in sexual partners was a contributing factor (Kilburn et al., 2018). Further, mixed methods analysis, revealed that the cash transfers themselves were a major benefit for the young women. They spent mostly on personal items such as toiletries and having access to their own money it gave them greater feelings of independence and enhanced peer status (MacPhail et al., 2017). While previous analyses of this intervention have focused on evaluating the impact of the CCT on specific domains focused on health and behavior, we aim at looking at different domains in a holistic way.

Measure of Multidimensional Poverty

Using data from the ACASI questionnaire, we construct an individual measure of multidimensional poverty for the young women. We focus on individual indicators, which are more specific to our adolescent sample and less dependent on assumptions about household sharing rules and assets.

The measure is derived from Alkire & Foster (2011) methodology: it comprises six dimensions of deprivation and fifteen indicators (Table 1). The six dimensions of deprivation include education, health and food security, protection, family and social relationships, economic agency, and psychosocial well-being. Dimensions are based on the multidimensional poverty literature, using a mixed rights and basic needs framework: we focus on lack of access to services and lack of realization of young girls' rights to security and agency, such as the protection from violence, the right to food security, and to economic agency. The indicators were chosen to be age and gender-relevant, among those that that were available to us in the dataset. Dimensions are weighted equally,

and indicators within dimension are also weighted equally, using a system of so called "nested weights". Indicators are defined as binary variables, taking value 1 if the individual is deprived, 0 otherwise.

Table 1. MDP Index Components and Weights

Dimensions	Indicator	Definition of deprivation (1=yes)	Weight (total=1)
Education			**0.167**
	Educational achievement	Repeated any grades during main trial	0.056
	Attendance	Attended less than 80% of school days during previous month	0.056
	Dropout	Not enrolled or has dropped out during current term	0.056
Health and food security			**0.167**
	Food secure	Worry about food in past 12 months	0.056
	Access to health services	No access to birth control. Reasons for no access include: too expensive, don't know where to find, denied from health worker	0.056
	Reproductive health	Was pregnant and/or gave birth before 20	0.056
Protection			**0.167**
	Violence	Reported any physical intimate partner violence	0.083
	Sexual violence	Reported any sexual violence by anyone	0.083
Family and social relationships			**0.167**
	Parental relationships	Parenting monitoring scale. Scored below median on the scale.	0.056
	Sexual empowerment	Sexual Relationship Power Scale (SRPS). Scored in bottom tercile on scale.	0.056
	Gender attitudes	Gender Equitable Men's Scale (GEMS). Scored in bottom tercile on scale.	0.056
Economic agency			**0.167**
	Employment and work	One or more of the following applies: 1) Engages in paid work if <15 years old 2) Engages in paid work that puts young women in unsafe or vulnerable position (sex work, selling drugs, working at tavern, and mining) 3) Does housework/chores for >15 hours a week	0.083
	Economic empowerment	Has none of the following: spending money, savings, or bank account	0.083
Psychosocial well-being			**0.167**
	Mental Health	Measured using the Center for Epidemiological Studies-Depression Scale (CES-D). Depressed mood is a score of 16 or higher*	0.083
	Future outlooks/ Hopefulness	Hope score is in bottom quartile	0.083

*The CES-D scale was not available at baseline so the Children's Depression Index (CDI) was used to compare baseline balance across T and C for mental health.

As an additional sensitivity test of the measure, we replicated the analysis with different aggregation process of the multidimensional poverty index, using an approach based on the Multiple Overlapping Deprivation Analysis (MODA). MODA is a tool developed by UNICEF to measure multidimensional child poverty (de Neubourg, Chai, de Milliano, & Plavgo, 2012), based on the previous work of Gordon et al. (2003) and Roelen (Roelen, Gassmann, & de Neubourg, 2009). MODA is a counting measure of multidimensional poverty, where dimensions of deprivation are simply added using equal weighting. Given the defined number of dimensions of deprivation, *D*, the headcount of deprived individuals at any cut-off *k* is defined as follows:

$$H_k = \frac{\sum_i^{N_k} y_i}{N}$$

Where *N* is the total of individuals in a given population or group; y_i are the individuals deprived in a number of dimensions, *d*, more or equal to *k*; and N_k is the total of individuals who are deprived in *k* or more dimensions.

The main difference from an Alkire-Foster type of multidimensional index is that MODA uses a triple cut-off. First, each dimension is constructed starting from indicators, and individuals are assigned a deprivation status based on indicators. Second, they are classified as either deprived or not in each dimension. Lastly, dimensions are counted and individuals are defined as multidimensionally poor based on the chosen cut-off. The second difference comes from the aggregation process of indicators in dimensions. Instead of using a nested-weights system, individuals are classified as deprived in a dimension if they are deprived in any give indicators of that dimension, using what is known as the union approach. The reasons for this choice is twofold and rooted in the rights-based framework that underlies MODA: if indicators reflect a right of the individual, we cannot allow them to be substitute, but they will necessarily be complements. For the same reasons, this approach minimizes exclusion error.

The consequence is a measure of multidimensional poverty that sets a stricter bar, and which is more difficult to influence. We apply this feature to our measure, aggregating indicators into each dimension using the union approach. We use the same indicators and dimensions as before and weight dimensions equally. We argue that finding impacts of the program on this measure

constitutes a strong robustness test for the effect of the program on the multidimensional poverty of young women. We find consistent results, confirming our findings.

Empirical Strategy

To measure the impact of the program, we used both the MDP index, and the multidimensional score derived (using the Alkire-Foster aggregation method) as continuous variables. We also used the poverty headcount resulting from two different cut-offs: above 1/3 (0.33) and above 1/6 (0.66) on the deprivation index where lower scores indicate greater deprivation. The first is the same as the cut-off used for the Multidimensional Poverty Index, while 1/6 identifies a more severe poverty line, that we could identify as acute deprivation. Deprivation in each dimension is defined as deprivation in at *1/H* indicators, where *H* is the number of indicators in the dimension.

We estimated the total effect of the CCT intervention on our outcomes using an intent-to-treat (ITT) estimator. The linear model displayed in Equation (1) shows the basic specification, where CCT_i is the indicator for treatment, Y_{it} is the outcome of interest and ε_{it} is the error.

(1) $Y_{it} = \beta_0 + \beta_1 CCT_i + \varepsilon_{it}$

In addition to Equation (1), which gives us the total ITT effect, we also estimated Equation (2) to test for moderation of the treatment effect by (monetary) baseline poverty status where P_i is represents quartiles of per capita household consumption at baseline and $CCT_i P_i$ is an interaction term between indicators for treatment and baseline consumption quartiles.

(2) $Y_{it} = \beta_0 + \beta_1 CCT_i\, P_i + \beta_2 CCT_i + \beta_3 P_i + \varepsilon_{it}$

We used the results from Equation (2) to estimate marginal impacts of the CCT across each quartile. Using the p-value on the interaction term from Equation (2), we can also test for significant differential treatment effects by baseline poverty status. We used General Estimating Equation (GEE) models with robust standard errors to account for repeated observations on participants over three follow-up study visits. All models additionally were controlled for a young women's age and household per capita consumption at baseline.

Additional analysis also included quantile regression to assess impacts of the intervention across deciles of scores (Y_{it}) and two sensitivity analyses. One sensitivity analysis applied Equation (1) on

different versions of the index, and the second estimated the impact of the CCT on MODA deprivation measures (as described above). All analyses were performed using Stata 14.2.

Results

Table 2 reports prevalence rates of indicators and MDP measure for treatment and control groups, the difference between treatment and control, and the *p*-value of the difference test. Indicators are balanced between treatment and control across all measures (no significant differences. The two groups are therefore balanced in deprivation at baseline.

Table 2. Mean values of deprivation indicators among young women at baseline

	Treatment	Control	Difference (T-C)	P-value
	% (unless otherwise stated)			
Schooling				
Any repeated grades	34.75	35.32	-0.57	0.76
Low attendance (<80%)	6.67	6.44	-0.23	0.83
Food and Health				
Food worry	35.38	32.67	2.70	0.15
No birth control access	15.72	16.18	-0.45	0.75
Early pregnant	8.33	8.17	0.17	0.88
Protection				
Physical partner violence	10.06	11.18	-1.12	0.36
Sex violence	3.38	2.62	0.76	0.26
Relationships				
Low perceived sexual empowerment	11.24	12.53	-1.29	0.32
Low gender equity attitudes	42.37	42.43	-0.05	0.98
Low parental monitoring	46.38	47.98	-1.59	0.42
Psychosocial				
Depressed mood (CDI at baseline)	25.79	25.61	0.17	0.92
Low hope	33.81	36.56	-2.75	0.15
Economic Agency				
No resources	31.76	32.51	-0.75	0.69
Poor working conditions	16.35	14.59	1.76	0.22
Multidimensional Poverty Measures				
Multi-dimensional poverty				
MDP Index (score between 1-6)	1.02	1.05	-0.03	0.35
MDP score (0-1)	0.17	0.17	0.00	0.35
Score>1/3 (%)	10.06	11.02	-0.96	0.43
Score>1/6 (%)	51.81	50.44	1.37	0.49
Dimensions of Deprivation (MODA)				
Education	35.85	37.83	-1.98	0.30
Food/health	49.76	48.69	1.07	0.59
Protection	12.62	12.81	-0.19	0.89
Relationships	72.17	73.12	-0.95	0.59

Psychosocial	46.78	49.80	-3.03	0.13
Economic agency	43.90	43.30	0.60	0.76

Notes: N=2,533

The ITT estimates for the CCT impact on MDP measures show a clear pattern of reduced deprivation for the young women in the treatment group (Table 3). The MDP Index (range of 1 to 6) was reduced by 0.17 points ($p<0.01$), a 16% change from baseline levels of deprivation. Similarly, the standardized MDP score (range between 0 to 1), was reduced a similar amount, 17 %. The number of young women falling above defined thresholds of the MDP scores (1/3 and 1/6) was correspondingly impacted by the CCT—participants in the treatment group were significantly less likely to have scores above 1/3 (effect size: -3 percentage-points (pp), $p<0.01$) and 1/6 (effect size: -10 pp, $p<0.01$).

Table 3. ITT Estimates of the Effect of CCT on MDP Measures

	(1) MDP Index	(2) MDP Score	(3) Score>1/3	(4) Score>1/6
	(0-6)	(0-1)	(yes/no)	(yes/no)
Intervention	-0.17***	-0.03***	-0.03***	-0.10***
	(0.03)	(0.00)	(0.01)	(0.02)
Control mean	1.171	0.195	0.179	0.539

Notes: Estimates from linear GEE models. Robust standard errors in parentheses. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

While results Table 3 demonstrate the total impact of the CCT on multi-dimensional poverty, it is not clear whether the effect is driven by certain dimensions or if all dimensions were impacted in the same way. Therefore, we provide impacts on each dimension that comprises our MDP index in Table 4. All impacts on individual dimensions are in the expected direction (reduction of deprivation), but economic agency (effect size: -9 pp, $p<0.01$), followed by protection (effect size: -4 pp, $p<0.01$) and relationships (effect size: -2 pp, $p<0.05$) were the primary dimensions that were impacted by the program[1]. Economic agency includes indicators of financial inclusion as well as reduction of hours worked—aspects that would predictably be affected by the cash itself. Reductions of deprivations across relationships and protection also suggest that individual empowerment was improved. As previously mentioned, while attendance was a condition for receipt of the cash transfer, the CCT did not impact the schooling dimension. In fact, young women in the control group attended school at the same high levels as the treatment group (around 95% attending at least 80% of the time).

[1] Among the indicators, impacts were found mostly on deprivation in economic resources, and reduction of physical violence from partner (results shown in Appendix, table A1).

Table 4. ITT Estimates of the Effect of CCT on Dimensions

	(1) Schooling	(2) Food/Health	(3) Protection	(4) Relationships	(5) Psychosocial	(6) Economic agency
	Scores range from 0-1					
Intervention	-0.01	-0.01	-0.04***	-0.02**	-0.01	-0.09***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Control mean	0.107	0.153	0.204	0.229	0.297	0.181

Notes: Estimates from linear GEE models. Robust standard errors in parentheses. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Additional Analysis

It is likely that the impact of the program is not equally spread across sample's subgroups. To understand if there was heterogeneity of impacts, we examined the distribution of impacts across the sample. Across deciles of scores, we find that impacts of the CCT were relatively stable, with a range of -0.21 to -0.10. At the bottom decile of scores (least deprived) effect sizes were smallest (-0.10) indicating that the CCT did not have as large of an effect on MDP on those relatively better off. Nevertheless, impacts of the CCT hovered around -0.20 for deciles 40 to 90, indicating a mostly constant impact of the CCT across the relatively more deprived girls, with a small peak around the 6^{th} decile.

Table 5. Quantile Regression

	MDP score distribution across deciles								
	10	20	30	40	50	60	70	80	90
Intervention	-0.10***	-0.16***	-0.16***	-0.19***	-0.18***	-0.21***	-0.21***	-0.20***	-0.19***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.06)

Notes: Estimates from linear quantile regression models. Bootstrapped standard errors in parentheses. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Additional analysis included an examination of heterogeneity of impacts across different socio-economic characteristics: household consumption level at baseline, parents' education, and the reception of additional grants beside this particular one. Since the transfer was not a poverty-targeted program (although all young women were of low socio-economic status), we first examined heterogeneity by relative poverty based on baseline consumption levels (per capita household expenditures).

We found no significant effect on the interaction term between the CCT and consumption quartiles.

However, we find that marginal effects of the transfer, estimated at each quartile of baseline consumption, get steadily larger starting from the top quartile (greatest baseline consumption) going to the bottom quartile (lowest baseline consumption) (Table 6). The effects are largest for the bottom consumption quartile (-0.23 MDP index, -4pp MDP score, -14pp for score >1/6) demonstrating that young women who came from the least well-off households benefited the most from the CCT. Although we do not find a significant interaction effect in the model, these results suggest a relationship between multidimensional and monetary poverty whereby there are increasing returns from the intervention as household monetary poverty increases. Such relationships have already been observed in static simulations, where multidimensional poverty measures are found to be more reactive to an increase in consumption for lower level of consumption/expenditures (see UNICEF Tanzania, 2016; or UNICEF Malawi, 2016).

Table 6. Marginal Effect of CCT on MDP Measures by Quartiles of baseline PCE

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
MDP Index	-0.23***	-0.20***	-0.15***	-0.11**
	(0.06)	(0.06)	(0.05)	(0.05)
MDP Score	-0.04***	-0.03***	-0.03***	-0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Score>1/3	-0.05*	-0.05*	-0.02	-0.02
	(0.03)	(0.02)	(0.02)	(0.02)
Score>1/6	-0.14***	-0.07**	-0.08***	-0.10***
	(0.03)	(0.03)	(0.03)	(0.03)

Notes: Marginal effects estimated from GEE models. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

We also investigated the possibility of additional interactions, including parents' level of education on the assumption that parental education is found to be one of the strongest correlates with multidimensional child poverty across sub-Saharan Africa (de Milliano & Plavgo, 2017). In this case, however, it does not seem to perform a relevant role as we find no interaction effects (see Table A2).

Finally, we did not find any strong interaction of the CCT with social grant receipt in the household. Results show that the effect of the combination of the two is statistically significant only for high number of grants, both general and specifically for CSG grants (see Appendix: Table A3 and A4) . The combined effect of the treatment and additional grants is found to be strongly positive from over three grants, reducing the multidimensional poverty score[2] by a factor ranging from 27 % with

[2] We are here reporting only the first multidimensional poverty score, ranging from 1 to 6

4 other grants, to almost 97% with 11 additional grants[3]. The effect of additional CSG grants is even stronger, ranging from 35% at 4 CSG grants to almost 100% for over 11 grants. Similar results are found for the probability to be MD poor for at both cut-offs. Overall, while the interaction is significantly strong at some points of the distribution, it does not seem that additional grants in the household play a major role in reducing the multidimensional poverty of young women.

Sensitivity analysis

As a robustness check, we performed the ITT analysis on different versions of the index to further assess the sensitivity of the measure to its specifications. In each column in Table 7, we estimated Equation (1) on three different versions of the MDP Index, each one constructed by taking out a particular dimension that was most impacted by the program (Economic agency, Protection, or Relationships). Results are shown to be consistent, with a positive impact of the CCT in reducing multidimensional poverty of young girls (Table 7). The weaker impact on the iteration of the index without economic agency suggests, again, that economic empowerment of young girls is a major pathway of the program's effect.

Table 7. Effect of CCT on MDP – Sensitivity tests

	(1) without economic agency	(2) without protection	(3) without relationships
Intervention	-0.08***	-0.13***	-0.16***
	(0.03)	(0.02)	(0.02)
Control mean	0.990	0.966	0.942

Notes: Estimates from linear GEE models. Each column shows the effect of CCT on the MDP Index after adjusting the index by removing the specified dimension and reweighting. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

We also find that results are generally robust to the MODA specification of multidimensional poverty (Table 8). The transfer has a consistent effect in reducing both the number of dimensions and the proportion of girls deprived in more than 1 dimensions and in more than 2 dimensions.

Table 8. Effect of CCT on MODA Measures

	(1) N dimensions	(2) Deprived>1	(3) Deprived>2
Intervention	-0.31***	-0.10***	-0.09***

[3] However, the effect is not consistent for each subsequent number of additional grants.

	(0.05)	(0.02)	(0.02)
Control mean	2.362	0.688	0.439

Notes: Estimates from linear GEE models. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Discussion

Recently, a considerable body of evidence from sub-Saharan Africa has shown how cash-transfer schemes can substantially reduce monetary poverty (Daidone, Davis, Handa, & Winters, 2017; Handa, Natali, Seidenfeld, Tembo, & Davis, 2018), even generating a multiplier effect in the local economy (Handa, Daidone, et al., 2017). Previous evidence, mainly from Latin America, has stressed the role of conditional cash transfer in reducing monetary poverty (Stampini & Tornarolli, 2012; World Bank, 2009). Other bodies of evidence has focused on the impact of alternative poverty alleviation interventions, such as workfare (Dutta, Murgai, Ravallion, & van de Walle, 2014) training schemes (Galasso, Ravallion, & Salvia, 2004) , and microfinance (Khandker & Samad, 2014), although the effectiveness of these interventions on poverty is more mixed. There is also substantial evidence that social protection schemes can have impacts on different domains of economic and human development outcomes: from increases in household production, agricultural investments, school enrollment, and decreases in food insecurity (see for example Davies et al.(2016)) to intimate partner violence (Buller et al., 2018). However, these outcomes are usually analyzed separately rather than as a multiple deprivation or multidimensional poverty index, even when they are analyzed simultaneously.

In this analysis, we analyzed the effect of a conditional cash transfer intervention, Swa Koteka, on the multidimensional poverty status of young women in a poor area of South Africa. We find evidence that this targeted cash transfer program can have wide-ranging impacts on the life of beneficiaries beyond the intended scope as a HIV prevention intervention. Our results demonstrate that the transfer was successful in reducing multidimensional poverty of the young women and that these effects were robust to different definitions of multidimensional poverty. We also find that the transfer operates mainly through the channel of increased economic agency, a decrease in experienced physical violence, and an improvement of relationships. While not the traditional domains of poverty analysis, these are all important domains in the life of young women, and contribute to her broader sense of well-being. Therefore, we demonstrate that even a specifically targeted intervention was able to improve the well-being of the beneficiaries beyond the scope of HIV prevention by decreasing the likelihood of being multidimensionally poor.

Although Swa Koteka included HIV/HSV-2 testing and educational components, its main operating influence on participants was through the monthly cash payments (allocated in accordance with the attendance requirement). Behind this intervention design was the theory that women's economic security and empowerment are strongly interconnected, a link that was even demonstrated at baseline among young women enrolled in this study (Jennings et al, 2017). In particular, the findings from this study showed that among sexually active young women, having greater economic resources in the form of individual-level resources, like savings and spending money, was associated with safer sexual behaviors (Jennings et al, 2017). In South Africa, HIV-risk behaviors are tightly related to experiences of IPV and power imbalances in sexual relationships (Teitelman et al., 2016). Economic imbalances between men and women play a major role in these conditions, and therefore, the importance of economic empowerment for young women is key in addressing risk behavior and reducing HIV infections in young people (Luke, 2003).

Our findings align with that theory that individual economic empowerment, provided through mechanisms such as cash transfers, can lead to increased well-being for young women across a range of outcomes. Similar to our results here, findings from previous studies have shown that interventions that improve the individual economic opportunities available to poor young women, can have positive impacts on beneficiaries economic agency, behavior, and sense of empowerment. This includes evidence from the Zomba cash transfer program, a similar cash transfer intervention for adolescent girls in Malawi, which found improvements across a wide range of outcomes. In particular, the intervention led to increased levels of schooling, reduced HIV prevalence and other sexual risk behaviors, and improved mental health (Baird et al, 2010; 2012; 2013). By examining outcomes of the intervention together as part of measure of multidimensional poverty, this analysis helps build on this evidence to establish a causal link between targeted social protection programs and young women's holistic well-being.

We also find that there is no effect on the multidimensional poverty status of the young women when the program is interacted with other grants received by the household: this speaks to the fact that the structure and targeting of the transfer was more important than the amount. Since the program was targeted to young women and transfers were allocated directly to the women every month, this likely had a greater impact on participants well-being than a generic increase in the household disposable income. This shows how household-level measures of poverty, both monetary

and multidimensional, are likely to hide intra-household dynamics and inequalities and also how a targeted transfer can make a difference, empowering individuals.

This analysis is strengthened by its strong experimental study design, longitudinal data, and range of unique individual measures. Due to data limitations, however, our measure of multidimensional poverty necessarily does not include every dimension of deprivation nor do the dimensions we examine exhaust all of the potential deprivations in that category. Since the observed effect of any intervention or policy is crucially related to the construction of the measure itself, it is critical to perform sensitivity and robustness tests. In this work, we performed different robustness checks to test the validity of the results. First, we used two alternative ways to aggregate indicators into the final measure of multidimensional poverty, and then for each, we defined two different poverty cut-offs points. Second, we modified the original measure by separately excluding dimensions of economic agency, protection, and relationships. We performed the analysis again on each of these adjusted measures and found consistent results.

The results observed here are relevant for policy-makers. Social development ministries could use this evidence to design multidimensional poverty measures that are specific to young people, and can capture their vulnerabilities. However, it will be important to take care when deciding what to include in these measures across different contexts. The dimensions that compose a multidimensional poverty measure can be more or less sensitive to households' monetary resources, while they can also depend on a vast array of factors, including supply-side constraints (e.g. schooling, healthcare, housing, water and sanitation, or telecommunications infrastructure). A broader definition of poverty that includes non-material dimensions of deprivation, such as the one included here on psychosocial well-being, violence, and others, will depend on social norms, culture, and institutions, more than monetary means.

Given this context, detecting impacts of cash transfers and other social protection policies on multidimensional poverty will be harder to detect than impacts on 'conventional' outcomes, such increased schooling of children or increased spending on productive activities. While cash transfers are not the only tools to reduce multidimensional poverty, our results clearly show that they can provide a viable option. Policies that combine cash transfers with other interventions that address non-material components of well-being, will have the greatest potential to reduce multidimensional poverty, and can be a strategic tool to address the needs of adolescent girls and young women.

Conclusions

The numbers of youth will continue increasing in the African continent throughout the century, with the population of 15-24 years old expected to double by 2055 from its 2015 levels[4] . This analysis shows how a cash transfer intervention reduced multidimensional poverty for one of the poorest, most vulnerable youth populations—adolescent girls and young women—suggesting important implications for policy makers at both national and global levels. To harness their potential, countries need to implement policies that best address their needs and support their safe transition to adulthood. Our results show that social protection and targeted interventions have the potential to significantly improve the well-being of beneficiaries in a complex way, that takes into account different dimensions of well-being, possibly resulting in long lasting effects.

Our study indicates that even individual interventions targeted towards vulnerable populations can help achieve target 1.2 of the SDG. While this type of intervention is not likely to be enough on its own, we provide strong evidence that cash transfers can be a route towards the reduction of multidimensional poverty at the individual level. As the scope of social protection programs widens in sub-Saharan Africa, and especially the use of cash transfer, assessing the impacts of the latter on a wider range of outcomes, including multidimensional poverty and well-being, is an essential tool for future policy programming.

[4] See United Nation Population Division: https://www.un.org/esa/socdev/documents/youth/fact-sheets/YouthPOP.pdf

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Appendix

Table A1. Effect of CCT on Individual Indicators

	CCT	Control mean
Any repeated grades	-0.01	0.21
	(0.01)	
Low attendance (<80%)	0.00	0.05
	(0.01)	
Not in school	-0.01	0.06
	(0.01)	
Food worry	-0.01	0.25
	(0.01)	
No access to birth control	-0.00	0.06
	(0.01)	
Early pregnancy	-0.02	0.15
	(0.01)	
Physical partner violence	-0.09***	0.27
	(0.01)	
Sex violence	0.01	0.14
	(0.01)	
Low power	-0.02	0.17
	(0.01)	
Low gems	-0.01	0.10
	(0.01)	
Low parenting	-0.02	0.42
	(0.02)	
Depressed	-0.02	0.29
	(0.01)	
Low hope	0.00	0.30
	(0.02)	
No resources	-0.18***	0.26
	(0.01)	
Poor working conditions	-0.00	0.10
	(0.01)	

Notes: Estimates from linear GEE models. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A2. Interaction of CCT with Parents' Education

VARIABLES	MDP Score Father	Mother	MD Poor>0.33 Father	Mother
Treatment	-0.05***	-0.05***	-0.10***	-0.05*
	(0.01)	(0.01)	(0.03)	(0.03)
Education: Some primary	-0.02**	-0.00	-0.07**	0.02
	(0.01)	(0.01)	(0.03)	(0.03)
Education: Completed Primary	-0.02*	-0.03**	-0.05	-0.03
	(0.01)	(0.01)	(0.03)	(0.03)
Treat# Some primary	0.03**	0.02	0.08**	0.01
	(0.01)	(0.01)	(0.04)	(0.04)
Treat# Completed primary	0.02	0.03*	0.06	0.04
	(0.02)	(0.01)	(0.04)	(0.04)

Notes: Estimates from linear GEE models. Adjusted for baseline age and log household PCE. Total of 5,301 observations collected from three rounds of data (N=2,364). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A3. Interaction of CCT and Number of Grants Received by the Household

	(1) MDP index	(2) MDP score	(3) MD Poor: >0.33	(3) MD Poor: >0.66
Treatment	-0.10*	-0.02*	-0.01	-0.07**
	(0.06)	(0.01)	(0.03)	(0.04)
Treat#1.Grant	-0.06	-0.01	-0.02	-0.02
	(0.06)	(0.01)	(0.03)	(0.04)
Treat#2.Grant	-0.08	-0.01	-0.02	-0.01
	(0.08)	(0.01)	(0.04)	(0.05)
Treat#3.Grant	-0.12	-0.02	-0.06	-0.05
	(0.09)	(0.02)	(0.04)	(0.06)
Treat#4.Grant	-0.24*	-0.04*	-0.08	-0.10
	(0.13)	(0.02)	(0.06)	(0.07)
Treat#5.Grant	-0.30*	-0.05*	0.00	-0.17*
	(0.16)	(0.03)	(0.08)	(0.10)
Treat#6.Grant	-0.17	-0.03	0.03	-0.31**
	(0.18)	(0.03)	(0.10)	(0.13)
Treat#7.Grant	-0.28	-0.05	-0.05	-0.34*
	(0.32)	(0.05)	(0.18)	(0.18)
Treat#8.Grant	0.25	0.04	0.30	-0.23
	(0.37)	(0.06)	(0.19)	(0.25)
Treat#9.Grant	-0.86***	-0.14***	-0.01	-0.71***
	(0.22)	(0.04)	(0.03)	(0.05)
Treat#10.Grant	-1.15***	-0.19***	-0.15**	-0.55*
	(0.17)	(0.03)	(0.07)	(0.29)
Treat#11.Grant	-0.99***	-0.17***	-0.06**	-0.07*
	(0.07)	(0.01)	(0.03)	(0.04)
Treat#12.Grant	-	-	-	-
Treat#13.Grant	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Treat#14.Grant	-0.05	-0.01	0.25***	-0.52***
	(0.09)	(0.01)	(0.04)	(0.05)

Notes: Estimates from linear GEE models. Adjusted for baseline age and log household PCE. Total of 5,031 observations collected from three rounds of data (N=1,677). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A4. Interaction of CCT and Number of CSGs (Child Support Grants) Received by the Household

	(1) MDP index	(2) MDP score	(3) MD Poor: >0.33	(3) MD Poor: >0.66
Treatment	-0.14**	-0.02**	-0.03	-0.07*
	(0.07)	(0.01)	(0.03)	(0.04)
Treat#1.CSGrant	-0.02	-0.00	0.00	-0.02
	(0.08)	(0.01)	(0.03)	(0.05)
Treat#2.CSGrant	-0.05	-0.01	-0.02	-0.00
	(0.09)	(0.02)	(0.04)	(0.06)
Treat#3.CSGrant	-0.15	-0.03	-0.05	-0.09
	(0.11)	(0.02)	(0.05)	(0.07)
Treat#4.CSGrant	-0.35**	-0.06**	-0.14**	-0.21**
	(0.14)	(0.02)	(0.07)	(0.09)
Treat#5.CSGrant	-0.31*	-0.05*	-0.01	-0.24**
	(0.18)	(0.03)	(0.10)	(0.11)
Treat#6.CSGrant	0.11	0.02	0.12	-0.14
	(0.22)	(0.04)	(0.10)	(0.18)
Treat#7.CSGrant	0.18	0.03	0.29	-0.33
	(0.37)	(0.06)	(0.20)	(0.25)
Treat#8.CSGrant	-1.09***	-0.18***	0.04	-0.67***
	(0.10)	(0.02)	(0.04)	(0.07)
Treat#9.CSGrant	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Treat#10.CSGrant	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Treat#11.CSGrant	-0.97***	-0.16***	-0.05	-0.08
	(0.09)	(0.01)	(0.04)	(0.05)
Treat#12.CSGrant	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Treat#13.CSGrant	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)

Notes: Estimates from linear GEE models. Adjusted for baseline age and log household PCE. Total of 4,200 observations collected from three rounds of data (N=1,400). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.