

# Food should not be forgotten: The impact of cash grant receipt and good nutrition on child educational and cognitive outcomes in South Africa and Malawi

Lorraine Sherr<sup>1</sup>, Kathryn J. Roberts<sup>1</sup>, Mark Tomlinson<sup>2</sup>, Sarah Skeen<sup>2</sup>, Helen Mebrahtu<sup>1</sup>, Sarah Gordon<sup>2</sup>, Stefani du Toit<sup>2</sup>, Katharina Hagg<sup>1</sup>, Lucie D. Cluver<sup>3,4</sup>

<sup>1</sup>Institute for Global Health, University College London. London, UK

<sup>2</sup>Stellenbosch University. Stellenbosch, South Africa

<sup>3</sup>Centre for Evidence-Based Intervention, Department of Social Policy & Intervention, University of Oxford. Oxford, UK

<sup>4</sup>Department of Psychiatry and Mental Health, University of Cape Town. Cape Town, South Africa

Word count:

Competing interests: The authors declare no competing interests

Acknowledgements and funding: This study was funded by Sweden Norad through a nesting agreement with HelpAge International. The upcoming child community care study follow-up of these children into adolescence is supported by the UKRI GCRF Hub on Accelerating Achievement for African Adolescents. MT is a lead investigator with the Centre of Excellence in Human Development, University Witwatersrand, South Africa, and is supported by the National Research Foundation, South Africa. KR is supported by an Economic Social Research Council (ESRC) PhD studentship through the UBEL DTP. LC is supported by the European Research Council (ERC) under the European Union's Seventh Framework Programme (FP7/2007-2013)/ ERC grant agreement n°313421 and the Philip Leverhulme Trust (PLP-2014-095). Analyses undertaken within this manuscript were supported by the Positive Action Challenges fund (Reaching All Children) in conjunction with the Coalition for Children Affected by AIDS.

Ethical approvals: Ethical approval was obtained from the ethics boards of University College London (reference number 1478/002) and Stellenbosch University (reference number N10/04/112).

## Abstract

**Introduction.** Social protection can take many forms. Cash transfers and adequate nutrition may have important independent contributions to child cognitive development. This report was set up to examine the potential additive effect of combinations of cash transfers and nutritional standard on child development with a focus on educational outcomes and child cognitive development.

**Methods** Cross-sectional data for 796 HIV-affected children drawn from the Child Community Care study are utilised within these analyses. Children and caregivers completed interview comprised of standardised and study specific items to collect data on socio-demographics, household data, cash grant receipt and nutritional standard. A series of logistic and linear regression models and marginal effects analyses were undertaken to explore the impacts of differing levels of social protection (none; either cash grant receipt and good nutritional standard or both in combination) on child educational and cognitive outcomes.

**Results.** 19.7% of children (157/796) did not live in a household in receipt of a cash grant and did not report good nutrition. 32.5% (258/796) received either intervention and, 47.9% (381/796) received both interventions in combination. Comparative to no intervention, receiving either one intervention was found to be significantly associated with being in the correct class for age, increased scores of non-verbal cognition and, increased working memory scores. Receiving both interventions in combination was found to be associated significantly with reduced educational risk scores, improved odds of being in the correct class for age, regular school attendance, missing less than a week of school in the previous two weeks, increased scores on measures of nonverbal cognition, increased working memory scores, and more often not having difficulty learning new things. Combined provision had enhanced effects for two (2/3) child outcomes comparative to receiving a single intervention alone.

**Discussion.** These data indicate that educational and cognitive outcomes for children can be bolstered by social protection measures (cash grant receipt and good nutrition), particularly when delivered in combination. Such findings support the notion of synergistic social protection responses for children living in environments impact by high levels of HIV burden and deprivation.

**Keywords:** Cash grant receipt; Nutrition; sub-Saharan Africa; Education; Cognition

## Introduction

Children face many obstacles along the developmental pathway. Child survival is contingent on multiple factors including safe birth, avoidance of infections and illnesses, stimulating early environments, access to health, education and nutrition.<sup>1,2</sup> In sub-Saharan Africa, children carry the burden of many deprivations.<sup>3-6</sup> Social protection is a fundamental priority for children. In HIV-endemic countries, parental illness and child infection has compounded the challenge.<sup>3,7</sup>

Cash transfers have been seen as a potential pathway to ameliorate such conditions.<sup>8,9</sup> The provision of such transfers has been evaluated<sup>10</sup> with a solid evidence base across many geographical settings.<sup>11</sup> The early interventions considered conditional cash transfers where parents were eligible for the transfer based on meeting conditions. These were often child health related, so included items such as proven birth certification, immunisation, school enrolment, educational and parenting inputs to mention the major ones.<sup>11</sup> As the intervention evolved, the concept of unconditional transfers was introduced with similar benefit.<sup>12</sup> In depth analysis identified that when conditions were not attached, parents still spent the transfers on health, welfare and educational provision for the children.<sup>13</sup> This obviated the problems associated with conditional cash transfers where supply of interventions (such as school places, or parental training places) may have been a limiting factor, as well as the dilemma around withholding transfers to those who did not adhere to conditions (i.e. those who did not adhere to antiretroviral therapy) – who may well be the most needy. The type of recipient and the circumstances around the transfer are also seen as important factors.<sup>14</sup> The next phase of the cash transfer evaluation related to the concept of combination approaches. In adolescents, there is solid literature that cash transfers could reduce adolescent risk behaviours and promote adolescent wellbeing.<sup>15,16</sup> However, when cash was combined with care in the form of parenting support, the effects were boosted. In some populations where cash transfers alone had no effect, combinations of cash plus care were effective. A detailed study found that when cash, safe schools and parenting were considered, specific benefits were recorded for adolescents.<sup>17</sup> There has been less evidence for younger children. One study of primary school age children found that like the interventions for adolescents, cash plus good parenting was associated with better cognitive development and educational outcomes.<sup>18</sup>

Evaluations of cash transfer programmes focus on a number of outcomes, such as use of health services and health related outcomes,<sup>9,19,20</sup> HIV infection and sexual risk related to HIV,<sup>21-23</sup> nutrition<sup>24</sup> or education.<sup>13</sup> However, to focus on child development benefit it is important to examine the impact of cash transfers on child cognitive development.<sup>25-28</sup> The majority of studies in this area are concentrated in Central and South America, with fewer insights from Africa.<sup>29</sup>

The sustainable development goals call for child thriving rather than the first step aims of the Millennium development goals, which concentrated on child survival. This step forward allows for calls for attention on programmes that deliver quality child outcomes. Although there has been a call for novel approaches and novel interventions, it may be important not to neglect the older established interventions. Nutrition related insufficiencies have been associated with poor child outcomes and even contributed to preventable child deaths.<sup>30</sup> Food insecurity is widespread in sub-Saharan Africa<sup>31</sup> and cash transfer programmes have often included nutritional components.<sup>32</sup> However, some policymakers are seeking guidance on whether they should abandon some interventions and substitute others – such as moving from nutritional support to cash transfer. It is therefore important to examine the impact of a combined approach where cash transfers are combined with nutritional input to potential booster effect.<sup>33</sup>

The literature thus suggests that both cash transfers and adequate nutrition have important independent contributions to child cognitive development. This report was set up to examine the effect of a combination of cash transfers and nutritional standard on child development outcomes – operationalised as educational outcomes and child cognitive development.

## Methods

### Participants

Eight hundred and fifty-four children (5-15 years) and their caregivers were considered for inclusion within these analyses. Data collection was undertaken as part of the Child Community Care study (2013-2014), which tracked psychosocial outcomes of children and families accessing community-based organisations (CBOs) in South Africa and Malawi. Data was drawn from consecutive attenders of 28 CBOs (24 in South Africa, 4 in Malawi). CBOs were randomly selected (stratified by funding organisation and geographical location) from a list of 588 community based organisations working within South Africa and/or Malawi drawn from the complete lists of 11 funders. Participants were only included within the proceeding analyses if they responded to all measures of interest which resulted in 796 usable cases (93.2%)

### Procedure

Consecutive child attenders (aged 5-15 years) of CBOs and their primary caregivers completed interviews consisting of a battery of standardised and study specific questionnaires inclusive of measures of health, wellbeing, cognition, nutrition and socio-demographic information. Questionnaires were administered by specifically trained data collectors using mobile phone technology.<sup>34</sup> All participants received detailed study information. Informed written consent (caregivers) and assent (children) was obtained from all participants within the study. Participants completed all questionnaires and consent forms in the language of their choice. All study information, consent forms and questionnaires were translated into Zulu, Xhosa and Chewe as appropriate and, back translated into English. Ethical approvals for the Child Community Care study were obtained from both University College London (1478/002) and Stellenbosch University (N10/04/112). Within country approvals from community-based organisations included within the study were also obtained. The analyses presented within this manuscript utilise cross-sectional data.

### Measures

#### *Child characteristics*

Socio-demographic information (measured by parental report) was gathered on child biological sex, child age, child HIV status, country of residence and exposure to wealth/poverty; using an inventory of household assets drawn from the Child Status index tool (as a proxy indicator).<sup>35,36</sup> Caregivers indicated which, from a list of ten, material assets (i.e. a television) a child had access to in their household. Scores ranged from 0-10 with a greater number of assets indicative of greater wealth/less poverty.<sup>35,36</sup>

#### *Cash grant receipt*

Grant receipt was determined by caregiver reports. Caregivers were asked whether they received any of the following six available grants; state pension, retirement pension, disability grant, child support grant, foster care grant or care dependency grant or any other cash transfer support. Grant receipt was dichotomised regarding whether any grant was received versus no grants received (yes/no).

#### *Nutrition status*

For the purpose of analyses, a composite measure of nutritional status was derived from both child and primary caregiver report items drawn from the Child Status Index tool.<sup>35,36</sup> Children within the study reported whether they went to bed hungry the previous evening (yes; n=720/no; n=76). Caregivers reported whether their child had sufficient food all of the time, regularly, less food than needed or regularly had no food to eat). This item was dichotomised to distinguish sufficient food

all/most of the time (n=515) versus not (n=339). Items were recoded to focus on positive nutritional outcomes i.e. *Did you go to bed hungry last night?* (1=no, 0=yes). The final composite measure used within analyses was dichotomised to reflect good (child did not go to bed hungry and had sufficient food at all/most of the time; n=446) vs. poor (any other combination of items; n=350) nutrition based on both child and caregiver responses to the above mentioned nutrition measures.

### *Educational outcomes*

Questions regarding child educational outcomes were drawn from the Child Status index (CSI) tool.<sup>35,36</sup> Caregivers responded to 5 items relating to child school accessibility and learning outcomes: 1) school attendance ('Does your child go to school?' Responses were dichotomised as 'yes, regularly' or 'no, not regularly'); 2) school non-attendance ('How many days did the child miss school in the past 2 weeks?' Responses were coded as 'missed >1week' or 'missed <1 week'); 3) being in the correct class for age ('Is the child in the correct class for his or her age?' Response 'yes' or 'no'); 4) school performance ('How do teachers report your child is doing in school?' Responses were coded as 'doing as well as or better than most children' or 'he or she struggles at school'); 5) learning progression ('is your child quick to learn when introduced to new chores or things? Response yes or no).

**Number of educational risks** was a composite measure based on the five binary educational outcomes above. Responses were coded to indicate risk i.e. being in the incorrect class, struggling in school, being rated as a slower learner, irregular attendance and missing more than a week of school. Confirmatory responses were coded as 1 for each variable, resulting in a total school ranging from 0-5 with greater scores indicative of greater educational risk.

### *Cognitive outcomes*

**Attention and working memory** were assessed using a sub-test of the Wechsler Intelligence Scale for Children (WISC-IV)<sup>37</sup> in which children completed the digit span task. Children were asked to recall a series of dictated digits in series both forwards and backwards. An age-standardised score was recorded (0-20), with higher scores indicative of better attention and working memory.

**Non-verbal cognitive ability** was measured using the draw-a-person task.<sup>38</sup> This screening task is based on children's ability to draw two human figures which were coded by two researchers independently using a scoring classification system. Age standardised scoring was recorded for each drawing and mean scores were calculated (40-130). Higher scores are indicative of more advanced cognitive ability.

**Cognitive functioning difficulty or disability** was assessed using the Ten Questions screen for childhood disability.<sup>39</sup> Caregivers responded to question relating to differing domains of child development. Questions relating to **learning**, **remembering**, and **comprehension** (questions were formulated 'does your child have difficulty...?' Responses were 'yes' or 'no') were utilised for the purpose of these analyses

### **Statistical analyses**

All analyses were undertaken using Stata v.15.<sup>40</sup> Differences between three groups (i.e. 1. *those who reported receiving both a cash grant and having a good nutritional status*, 2. *reported receiving either a cash grant or having a good nutritional status*, and 3. *those who received neither a cash grant receipt nor had a good nutritional status*) were explored with regard to participant characteristics inclusive of cognitive and educational outcomes using chi-square tests (for categorical outcomes) or ANOVA models (for continuous outcomes). Results are reported using measures of central tendency (mean and standard deviations [SD]) for continuous variables, and frequencies and percentages for categorical variables. Post-hoc tests using Tukey's-Kramer test for multiple comparisons was used to identify group differences in ANOVA models.

A series of logistic and linear regression models were used to examine the associations of cash grant receipt or good nutritional status and, combined cash grant receipt and good nutritional status (represented by indicator variables using no support, cash or nutrition, as the reference category) with child cognitive and educational outcomes (reported separately). For all regression analyses presented, *Model 1* shows the unadjusted univariate associations between cash grant receipt and good nutritional status and, either cognitive or educational outcomes. *Model 2* presents the multivariable associations between exposure variables (cash receipt and good nutritional status) and the outcome variables (cognitive and educational outcomes) inclusive of potential covariates. *Model 3* uses interaction terms to assess the potential multiplicative effects of cash and nutrition on cognitive or educational outcomes. The exponential coefficients (odds ratio/Beta) of such interactions are presented. Covariates identified as being prominent in the existing literature with strong associations ( $p < 0.2$ ) with both predictor and outcome variables were included within the models. Covariates within these analyses include child gender, child age, child HIV status, and number of household assets. Unadjusted and adjusted odds ratios (ORs and aORs, respectively) with 95% confidence intervals (95% CI) are reported.

Marginal effects analyses were undertaken to further explore the impact of cash grant receipt and good nutrition of child educational and cognitive outcomes where associations were identified. Probability predictions for binary outcomes, adjusted for covariates, with 95% confidence intervals are presented.

## Results

### Participant characteristics

The majority of children in the sample (82.0%; 653/796) resided in South Africa and 18.0% (143/796) resided in Malawi. 52.3% (416/796) of children were female. The average age of children in the sample was 10.5 years (SD: 2.61) 13.8% (110/796) of children were reported to be living with HIV. The average number of reported household assets was 3.88 (SD: 1.94; Range 0-10).

### Household cash grant receipt and nutritional status

66.4% (574/796) children lived in a household in receipt of a cash grant. 56.0% (446/796) received good nutrition (based on both child and caregiver report). Overall, 19.7% (157/796) did not live in a household in receipt of a cash grant and did not report good nutrition (child and caregiver report). 32.5% (258/796) lived in a household in receipt of a cash grant or reported good receiving good nutrition and, 47.9% (381/796) reported living in a household in receipt of a cash grant and receiving good nutrition. With regard to participant characteristics, group differences (relating to cash grant and nutrition receipt) were identified regarding Country of residence; with a higher proportion of no cash grant receipt and poor nutritional status identified amongst children in Malawi, and number of household assets reported; with those reporting cash grant receipt and/or good nutritional status reporting a greater number assets comparative to those reporting no cash grant receipt and poor nutritional status. A trend for group differences relating to HIV status was identified; a greater proportion of children living with HIV were identified in the group classified as receiving no cash grant and poor nutrition (19.9%) comparative to those classified as receiving a cash grant and/or good nutrition (12.6%/12.0%; see Table 1).

Group differences regarding cash grant and nutritional receipt were also identified amongst for some educational and cognitive outcomes. Children in receipt of no cash grant and were classified as having poor nutrition were identified as having; a greater number of educational risks, were less likely to be in the correct class for age, were less likely to attend school regularly and missed less

than a week of school in the previous two weeks comparative to those children in receipt of a cash grant and/or good nutrition. Similarly, in the assessment of cognitive outcomes these children were identified as having lower average scores in the assessment of non-verbal cognitive ability, and caregivers were more likely to report difficulties in learning and remembering new things comparative to those receiving cash grants and/or good nutrition (see Table 1).

### **Associations between household cash grant/good nutrition receipt and child education/cognitive outcomes**

Table 2 and table 3 present univariate and multivariable regression models exploring the association between household cash grant receipt and reported good nutrition (receipt of either or both in combination) with child education and cognitive outcomes (respectively).

Within the multivariable models, comparative to living in a household not in receipt of a cash grant and not receiving good nutrition, those receiving *either* component of interest had greater odds of being in the correct class for age. Four educational outcomes showed improvement when a child was in receipt of a cash grant *and* good nutrition in combination. Improvements identified included; reduced educational risk scores, greater odds of being in the correct class for age, greater odds of regular attendance and greater odds of missing less than a week of school in the previous two weeks (see Table 2).

Comparative to not receiving a household cash grant and not receiving good nutrition, receiving *either* a cash grant receipt or good nutrition was found to be associated with improved outcomes for two cognitive measures: non-verbal cognitive ability and, attention and working memory. Receiving a *combination of both* a household grant and good nutrition was found to be associated with three cognitive measures: nonverbal cognitive ability, attention and working memory and not having any difficulty learning new things (see Table 3).

Controlling for all covariates, potential multiplicative effects of household cash grant receipt and receipt of good nutrition (child and caregiver report) were explored using interaction terms in regression models for both child education and cognitive outcomes (model 3; table 2 and table 3).

For the majority of outcomes found to be associated with receipt of combined cash grant receipt and good nutrition, no statistically significant interactions were apparent indicative of no multiplicative effects. However, multiplicative effects were identified relating to children being the correct class for age (education; see Table 2) and scores on the draw-a-person assessment of non-verbal cognitive ability (cognition; see Table 3). These multiplicative effects indicate that the joint impact of receiving *both* a cash grant and good nutrition in combination differs from the independent effects of receiving either intervention alone. This suggests that for these outcomes, social protections, in the form of cash grant receipt and good nutrition, do not act independently of each other. To explore potential additive effects of cash grant receipt and good nutrition amongst outcomes where multiplicative effects were not identified, estimates of the predicted probability of nutritional outcome were calculated for binary outcomes, controlling for all predictor variables (see Figure 1). Predicted probability of regular attendance was 91.5% when no cash grant or good nutrition was received, 94.8% when *either* a cash grant or good nutrition was received and 98.6% when both a cash grant and good nutrition were received in combination. Similar patterns were identified regarding being in the correct class for age (55.5%, 74.1% and 74.7%, respectively) and not having any difficulty learning new things (73.9%, 83.0% and 89.8%, respectively). The majority of children within the sample did not miss less than a week of school within the previous two weeks,

thus predicted probabilities were found to be similar (98.9%, 99.8% and 99.9%, respectively for the three categories of interest; see Figure 1). Tables 2 and 3 show the additive impacts of for continuous variables found to be associated with cash grant receipt and good nutrition (educational risk score, non-verbal cognitive ability and, attention and working memory). These models show the discrete change in scores relating to receiving either intervention or both interventions in combination from the base level (no cash grant and poor nutritional status).

## Discussion

### Summary

This study utilises a large sample of children identified through community-based organisations living in two high HIV endemic countries within sub-Saharan Africa (South Africa and Malawi) to explore the impact of social protection (in the form of cash grant receipt and good nutritional status) on child educational and cognitive outcomes. Three levels of social protection were explored within these analyses; receiving both a household cash grant and good nutrition in combination, either intervention alone, or neither a cash grant receipt or good nutrition. Within analyses, receiving either intervention, comparative to no intervention, had positive impacts for one out of six educational outcomes (being in the correct class for age) and, two out of five cognitive outcomes (scores on assessments of non-verbal cognitive ability and, attention and working memory). This positive impact was enhanced when children were in receipt of both interventions (a cash grant and good nutrition) in combination. Comparative to no intervention, children in receipt of both interventions in combination, showed improved outcomes on four out of the six educational outcomes (reduced educational risk scores, improved odd of being in the correct class for age, regular attendance and missing less than a week of school in the previous two weeks). Likewise, combined provision was associated with improvements amongst three out of five cognitive outcomes (scores on assessments of non-verbal cognitive ability, attention and working memory, and no difficulty learning new things). While being in receipt of either a cash grant or good nutrition alone was sufficient to enhance outcomes relating to being in the correct class for age, non-verbal cognition, and attention and working memory, being in receipt of a combination of provision seemingly had positive impacts across more child educational and cognitive outcomes (seven out of eleven outcomes explored). Combined provision was also found to have enhanced effects for some outcomes comparative to receiving a single intervention alone – markedly non-verbal cognition scores and being in the correct class for age.

This data suggests a complex pattern. For some outcomes, either of these interventions provide benefits. However, for substantially more outcomes, receiving the combined package significantly affected more outcomes. Of note was that for some outcomes these interventions had no effect. This data thus suggests that combination interventions are more effective, but local understanding is needed to seek out alternative interventions for some specific outcomes where cash or nutrition does not have an effect.

Children affected by HIV (living with HIV, living within HIV-affected household, living within high HIV-endemic countries or being HIV-exposed uninfected) face additional burdens (i.e. through virus exposure and social determinants such as poverty). As such, these children may be disadvantaged with regard to access and engagement with education,<sup>41</sup> and such burdens, both biological and social, may have negative implications for cognition.<sup>42</sup> These data suggest that engagement with education and some cognitive outcomes for such children may be enhanced through combining social protection interventions that are often already in place within many low and middle income communities in silos. It may be accurate to assume that children living with or affected by HIV



would have greater needs for cash grants and nutrition support. Our data shows they are significantly less likely to get the interventions in the first place. This underscores the importance of access support and targeted provision for the most vulnerable or those who are hardest to reach.

Within global agendas, there remains a requisite to examine need and progression towards optimal child development and, the robustness of interventions for child development as we shift away from siloed responses towards more integrated programming. Calls for novel approaches often accompany such requisites; however, well-established existing interventions should not be forgotten in the response. These data indicate possible pathways for utilising existing, well-established interventions in combination to improve outcomes, enhance the reach of programming and promote a synergistic response. Single interventions alone may not be impactful on multiple outcomes. This study suggests that combinations of well-established interventions may in fact have positive impacts for children, more than each individual intervention. The challenge therefore is to explore various combinations and understand which outcomes these enhance as well as clarity on the accelerator effects of provision in combination as opposed to single interventions.

### **Limitations**

These data should be interpreted within the context of several limitations. The data presented within this study are cross-sectional, drawn from a study with a non-randomised study design which allows for less certainty regarding causality. As such, these exploratory findings should be explored further in longitudinal and/or randomised controlled trials. Furthermore, these data are limited to two settings and, the generalisation of findings to other setting would need further exploration. These data also do not report on a specific intervention and rely on child and caregiver report of cash or nutrition receipt. However, it should be noted that the use of both caregiver and child report relating to nutritional status aids in the robustness of the measure.

### **Conclusions**

These data indicate that educational and cognitive outcomes for children can be bolstered by social protection measures (cash grant receipt and good nutrition), particularly when delivered in combination. Such findings support previous literature advocating for synergistic social protection responses for both children and adolescents living in environments impact by high levels of HIV burden and deprivation and supports calls for complex programming models to enhance the efficacy of interventions to promote positive child development.

## References

1. Black MM, Walker SP, Fernald LC, et al. Early childhood development coming of age: science through the life course. *The Lancet*. 2017;389(10064):77-90.
2. Britto PR, Lye SJ, Proulx K, et al. Nurturing care: promoting early childhood development. *The Lancet*. 2017;389(10064):91-102.
3. Goldberg RE, Short SE. What do we know about children living with HIV-infected or AIDS-ill adults in Sub-Saharan Africa? A systematic review of the literature. *AIDS care*. 2016;28(sup2):130-141.
4. Bain LE, Awah PK, Geraldine N, et al. Malnutrition in Sub-Saharan Africa: burden, causes and prospects. *Pan African Medical Journal*. 2013;15(1).
5. Hotez PJ, Kamath A. Neglected tropical diseases in sub-Saharan Africa: review of their prevalence, distribution, and disease burden. *PLoS neglected tropical diseases*. 2009;3(8).
6. Mudogo CM. Vulnerability of Urban Poor Women and Children to the Triple Burden of Malnutrition: A Scoping Review of the Sub-Saharan Africa Environment. *Global Journal of Medical Research*. 2017.
7. Bryant M, Beard J. Orphans and vulnerable children affected by human immunodeficiency virus in sub-Saharan Africa. *Pediatric Clinics*. 2016;63(1):131-147.
8. Gaarder MM, Glassman A, Todd JE. Conditional cash transfers and health: unpacking the causal chain. *Journal of development effectiveness*. 2010;2(1):6-50.
9. Lagarde M, Haines A, Palmer N. The impact of conditional cash transfers on health outcomes and use of health services in low and middle income countries. *Cochrane database of systematic reviews*. 2009(4).
10. Bassani DG, Arora P, Wazny K, Gaffey MF, Lenters L, Bhutta ZA. Financial incentives and coverage of child health interventions: a systematic review and meta-analysis. *BMC Public Health*. 2013;13(S3):S30.
11. Fernald LC, Gertler PJ, Neufeld LM. Role of cash in conditional cash transfer programmes for child health, growth, and development: an analysis of Mexico's Oportunidades. *The Lancet*. 2008;371(9615):828-837.
12. Schubert B, Slater R. Social cash transfers in low-income African countries: Conditional or unconditional? *Development Policy Review*. 2006;24(5):571-578.
13. Baird S, Ferreira FH, Özler B, Woolcock M. Relative effectiveness of conditional and unconditional cash transfers for schooling outcomes in developing countries: a systematic review. *Campbell systematic reviews*. 2013;9(1):1-124.
14. Crea TM, Reynolds AD, Sinha A, et al. Effects of cash transfers on Children's health and social protection in Sub-Saharan Africa: differences in outcomes based on orphan status and household assets. *BMC public health*. 2015;15(1):511.
15. Kilburn K, Thirumurthy H, Halpern CT, Pettifor A, Handa S. Effects of a large-scale unconditional cash transfer program on mental health outcomes of young people in Kenya. *Journal of Adolescent Health*. 2016;58(2):223-229.
16. Shangani S, Operario D, Genberg B, et al. Unconditional government cash transfers in support of orphaned and vulnerable adolescents in western Kenya: Is there an association with psychological wellbeing? *PLoS one*. 2017;12(5).
17. Cluver LD, Orkin FM, Campeau L, et al. Improving lives by accelerating progress towards the UN Sustainable Development Goals for adolescents living with HIV: a prospective cohort study. *The Lancet Child & Adolescent Health*. 2019;3(4):245-254.
18. Sherr L, Tomlinson M, Macedo A, Skeen S, Hensels IS, Cluver LD. Can cash break the cycle of educational risks for young children in high HIV-affected communities? A cross-sectional study in South Africa and Malawi. *Journal of global health*. 2017;7(2).
19. Adato M, Bassett L. Social protection to support vulnerable children and families: the potential of cash transfers to protect education, health and nutrition. *AIDS care*. 2009;21(sup1):60-75.

20. Lucas PJ, McIntosh K, Petticrew M, Roberts HM, Shiell A. Financial benefits for child health and well-being in low income or socially disadvantaged families in developed world countries. *Campbell Systematic Reviews*. 2008;4(1):1-93.
21. Baird SJ, Garfein RS, McIntosh CT, Özler B. Effect of a cash transfer programme for schooling on prevalence of HIV and herpes simplex type 2 in Malawi: a cluster randomised trial. *The Lancet*. 2012;379(9823):1320-1329.
22. Cluver LD, Orkin FM, Boyes ME, Sherr L. Cash plus care: social protection cumulatively mitigates HIV-risk behaviour among adolescents in South Africa. *Aids*. 2014;28:S389-S397.
23. Pettifor A, MacPhail C, Hughes JP, et al. The effect of a conditional cash transfer on HIV incidence in young women in rural South Africa (HPTN 068): a phase 3, randomised controlled trial. *The Lancet Global Health*. 2016;4(12):e978-e988.
24. Martins APB, Canella DS, Baraldi LG, Monteiro CA. Cash transfer in Brazil and nutritional outcomes: a systematic review. *Revista de saude publica*. 2013;47:1159-1171.
25. Andrew A, Attanasio O, Fitzsimons E, Grantham-McGregor S, Meghir C, Rubio-Codina M. Impacts 2 years after a scalable early childhood development intervention to increase psychosocial stimulation in the home: A follow-up of a cluster randomised controlled trial in Colombia. *PLoS medicine*. 2018;15(4).
26. Fernald LC, Gertler PJ, Neufeld LM. 10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behaviour: a longitudinal follow-up study. 2010.
27. Fernald LC, Hidrobo M. Effect of Ecuador's cash transfer program (Bono de Desarrollo Humano) on child development in infants and toddlers: a randomized effectiveness trial. *Social science & medicine*. 2011;72(9):1437-1446.
28. Schady N, Paxson C. *Does money matter? The effects of cash transfers on child health and development in rural Ecuador*: The World Bank; 2007.
29. Sherr L, Macedo A, Tomlinson M, Skeen S, Cluver LD. Could cash and good parenting affect child cognitive development? A cross-sectional study in South Africa and Malawi. *BMC pediatrics*. 2017;17(1):123.
30. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *The lancet*. 2008;371(9608):243-260.
31. Sabates-Wheeler R, Devereux S. Cash transfers and high food prices: Explaining outcomes on Ethiopia's Productive Safety Net Programme. *Food Policy*. 2010;35(4):274-285.
32. Leroy JL, Ruel M, Verhofstadt E. The impact of conditional cash transfer programmes on child nutrition: a review of evidence using a programme theory framework. *Journal of development effectiveness*. 2009;1(2):103-129.
33. Baye K, Retta N, Abuye C. Comparison of the effects of conditional food and cash transfers of the Ethiopian Productive Safety Net Program on household food security and dietary diversity in the face of rising food prices: ways forward for a more nutrition-sensitive program. *Food and nutrition bulletin*. 2014;35(3):289-295.
34. Tomlinson M, Solomon W, Singh Y, et al. The use of mobile phones as a data collection tool: a report from a household survey in South Africa. *BMC medical informatics and decision making*. 2009;9(1):51.
35. Nyangara F, O'Donnell K, Murphy R, Nyberg B. Child Status Index: A tool for assessing the well-being of orphans and vulnerable children. *Washington: USAID*. 2009.
36. O'Donnell K, Nyangara F, Murphy R, Cannon M, Nyberg B. Child Status Index: a tool for assessment the well-being of orphans and vulnerable children—manual. *Chap Hill NC Meas Eval*. 2009.
37. Wechsler D. *WISC-IV: Wechsler Intelligence Scale for Children, Integrated: Technical and interpretive manual*. . San Antonio, Tx: Harcourt Brace; (2004).
38. Harris D. *Children's Drawings as Measures of Intellectual Maturity*. New York—Chicago—San Francisco—Atlanta: Harcourt, Brace&World, Inc; 1963.

39. Durkin MS, Wang W, Shrout PE, et al. Evaluating a ten questions screen for childhood disability: reliability and internal structure in different cultures. *Journal of clinical epidemiology*. 1995;48(5):657-666.
40. StataCorp. Stata 15 Base Reference Manual. . College Station, Tx: Stata Press; 2017.
41. P. Zinyemba T, Pavlova M, Groot W. EFFECTS OF HIV/AIDS ON CHILDREN'S EDUCATIONAL ATTAINMENT: A SYSTEMATIC LITERATURE REVIEW. *Journal of Economic Surveys*. 2019.
42. Phillips N, Amos T, Kuo C, et al. HIV-associated cognitive impairment in perinatally infected children: a meta-analysis. *Pediatrics*. 2016;138(5):e20160893.

NOT FOR DISTRIBUTION

**Table 1.** Outcomes stratified by cash and nutritional status (n=796)

	Total (n=796)	Cash plus good nutrition (n=381)	Cash or good nutrition (n=258)	No cash, poor nutrition (n=157)	F/X <sup>2</sup> , p-value
<b>Socio-demographics</b>					
<i>Country</i>					581.91, 0.000
South Africa	653 (82.0%)	381 (100%)	247 (95.7%)	25 (15.9%)	
Malawi	143 (18.0%)	0 (0.00%)	11 (4.30%)	132 (84.1%)	
Child biological sex (female)	416 (52.3%)	205 (53.8%)	132 (51.2%)	79 (50.3%)	0.73, 0.70
Child Age (years)	M: 10.48 (SD: 2.61)	M: 10.22 (SD: 2.62) <sup>a</sup>	M: 10.39 (SD: 2.60) <sup>a</sup>	M: 11.30 (SD: 2.46)	0.89, 0.64
Child living with HIV	110 (13.8%)	48 (12.6%)	31 (12.0%)	31 (19.9%)	5.97, 0.05
No. Household assets (0-10)	M: 3.88 (SD: 1.94)	M: 4.48 (SD: 1.67) <sup>a</sup>	M: 4.30 (SD: 1.69) <sup>a</sup>	M: 1.75 (SD: 1.40)	7.76, 0.02
<b>Educational outcomes</b>					
Number of educational risks (0-5)	M: 0.85 (SD:1.15)	M: 0.65 (SD: 0.95) <sup>a</sup>	M: 0.84 (SD: 1.11) <sup>a</sup>	M: 1.36 (SD: 1.27)	19.93, <0.0001
Correct class for age	521 (66.3%)	284 (74.7%)	185 (72.8%)	52 (34.2%)	86.99, <0.0001
Regular attendance	747 (95.0%)	375 (98.7%)	241 (94.9%)	131 (86.2%)	35.9, <0.0001
Quick learner	560 (72.2%)	282 (75.6%)	170 (67.5%)	108 (71.5%)	5.00, 0.08
Doing as well as or better than most in school	653 (83.1%)	326 (85.8%)	207 (81.5%)	120 (79.0%)	4.28, 0.12
Missed less than a week of school	772 (98.2%)	379 (99.7%)	253 (99.6%)	140 (92.1%)	40.27, <0.0001
<b>Cognitive outcomes</b>					
Draw-a-person score (40-130)	M: 91.45 (SD: 17.19)	M: 96.05 (SD: 14.28)	M: 93.78 (SD: 15.85)	M: 76.25 (SD: 17.47)	9.78, 0.008
Digit span score (0-20)	M: 8.84 (SD: 3.55)	M: 9.14 (SD: 3.34)	M: 9.30 (SD: 3.76)	M: 7.34 (SD: 3.29)	5.17, 0.08
No cognitive functioning difficulty – Learning	664 (83.4%)	344 (90.3%)	215 (83.3%)	105 (66.9%)	44.05, <0.0001
No cognitive functioning difficulty – Remembering	568 (71.4%)	281 (73.8%)	192 (74.4%)	95 (60.5%)	11.29, 0.004
No cognitive functioning difficulty – Comprehension	766 (96.2%)	369 (96.9%)	248 (96.1%)	149 (94.9%)	1.17, 0.56

Note: Tukey's post hoc test undertaken to identify mean differences between groups (for continuous variables only):

<sup>a</sup> Statistically different from the No cash grant receipt, poor nutrition group (p<0.05)

**Table 2.** Cross-sectional regression models exploring associations between cash grant receipt and good nutrition, and child educational outcomes (n=796)

	<i>Total no. educational risks (0-5)</i> <i>B (95% CI)</i>	<i>Correct class for age</i> <i>OR (95% CI)</i>	<i>Regular attendance</i> <i>OR (95% CI)</i>	<i>Quick learner</i> <i>OR (95% CI)</i>	<i>Doing as well as or better than most in school</i> <i>OR (95% CI)</i>	<i>Missed less than a week of school</i> <i>OR (95% CI)</i>
<b>Model 1</b>						
No cash, poor nutrition (n=157)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Either cash or good nutrition (n=258)	-0.53 (-0.74, -0.31)***	5.16 (3.34-7.96)***	2.97 (1.44-6.12)**	0.83 (0.53-1.28)	1.17 (0.71-1.94)	21.69 (2.79-168.52)*
Cash plus good nutrition (n=381)	-0.71 (-0.92, -0.51)***	5.68 (3.79-8.55)***	12.02 (4.44-32.53)***	1.23 (0.81-1.88)	1.61 (0.99-2.61)	32.49 (4.18-252.1)**
<b>Model 2</b>						
No cash, poor nutrition (n=157)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Either cash or good nutrition (n=258)	-0.22 (-0.46, 0.02)	2.29 (1.33-3.92)**	1.69 (0.68-4.21)	0.73 (0.43-1.24)	0.71 (0.38-1.32)	5.81 (0.60-55.89)
Cash plus good nutrition (n=381)	-0.38 (-0.61, -0.15)**	2.36 (1.39-4.00)**	6.49 (2.03-20.7)**	1.10 (0.65-1.85)	0.99 (0.53-1.85)	9.59 (1.01-90.34)*
<b>Model 3</b>						
No cash, poor nutrition (n=157)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Cash	-0.14 (-0.39, 0.11)	2.13 (1.21-3.75)**	1.43 (0.54-3.77)	0.61 (0.35-1.04)	0.60 (0.32-1.15)	3.76 (0.36-39.15)
Good nutrition	-0.46 (-0.79, -0.14)**	2.86 (1.31-6.26)**	2.95 (0.61-14.22)	1.55 (0.70-3.43)	1.29 (0.50-3.38)	2.46 (0.14-41.41)
Interaction – Cash BY Good nutrition	0.22 (-0.15, 0.59)	0.39 (0.16-0.94)*	1.51 (0.23-10.09)	1.19 (0.50-2.85)	1.27 (0.44-3.68)	1

*B: Beta, OR: Odds Ratio, CI: confidence interval | p < 0.05, \* p < 0.01, \*\* p ≤ 0.001, \*\*\**

**Model 1:** Univariate regression analyses showing associations of cash or good nutrition and combined cash and good nutrition with child educational outcomes.

**Model 2:** Multivariable regression analyses showing associations of cash or good nutrition and combined cash and good nutrition with child educational outcomes controlling for covariates: child biological sex (female), child age (years), child HIV status (positive), number of household assets (proxy wealth indicator).

**Model 3:** Multivariable regression analyses showing the interaction between cash grant receipt and good nutrition, and child educational outcomes controlling for covariates: child biological sex (female), child age (years), child HIV status (positive), number of household assets (proxy wealth indicator).

**Table 3.** Cross-sectional logistic regression models exploring associations between cash grant receipt and good nutrition, and child cognitive outcomes (n=796)

	<i>Performance on cognitive tests</i>		<i>No cognitive functioning difficulty or disability</i>		
	<i>Draw-a-person (40-130)</i>	<i>Digit span (0-20)</i>	<i>Learning</i>	<i>Remembering</i>	<i>Comprehension</i>
	<i>B (95% CI)</i>	<i>B (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>
<b>Model 1</b>					
No cash, poor nutrition (n=157)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Either cash or good nutrition (n=258)	17.52 (14.43,20.61)***	1.96 (1.27-2.70)***	2.48 (1.55-3.94)***	1.89 (1.24-2.90)**	1.33 (0.51-3.45)
Cash plus good nutrition	19.79 (16.89,22.69)***	1.80 (1.15-2.45)***	4.60 (2.86-7.40)***	1.83 (1.24-2.72)**	1.65 (0.66-4.12)
<b>Model 2</b>					
No cash, poor nutrition (n=157)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Either cash or good nutrition (n=258)	15.15 (11.60,18.70)***	1.22 (0.43, 2.01)**	1.72 (0.97-3.04)	1.55 (0.94-2.56)	0.50 (0.17-1.53)
Cash plus good nutrition (n=381)	17.46 (14.00,20.92)***	1.02 (0.25, 1.79)**	3.13 (1.74-5.61)***	1.48 (0.91-2.41)	0.59 (0.20-1.75)
<b>Model 3</b>					
No cash, poor nutrition (n=157)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Cash	16.05 (12.37, 19.74)***	1.27 (0.44, 2.09)**	1.79 (0.98-3.28)	1.51 (0.90-2.55)	0.52 (0.15-1.73)
Good nutrition	12.22 (7.38, 17.06)***	1.07 (-0.02, 2.15)	1.55 (0.70-3.40)	1.68 (0.83-3.40)	0.48 (0.11-2.07)
Interaction Cash BY Good nutrition	-10.89 (-16.34, -5.44)***	-1.32 (-2.54, -0.10)*	1.13 (0.44-2.87)	0.59 (0.26-1.31)	2.37 (0.41-13.60)

*B: Beta, OR: Odds Ratio, CI: confidence interval | p < 0.05, \* p < 0.01, \*\* p ≤ 0.001, \*\*\**

**Model 1:** Univariate regression analyses showing associations of cash or good nutrition and combined cash and good nutrition with child cognitive outcomes.

**Model 2:** Multivariable regression analyses showing associations of cash or good nutrition and combined cash and good nutrition with child cognitive outcomes controlling for covariates: child biological sex (female), child age (years), child HIV status (positive), number of household assets (proxy wealth indicator).

**Model 3:** Multivariable regression analyses showing the interaction between cash grant receipt and good nutrition, and child cognitive outcomes controlling for covariates: child biological sex (female), child age (years), child HIV status (positive), number of household assets (proxy wealth indicator).

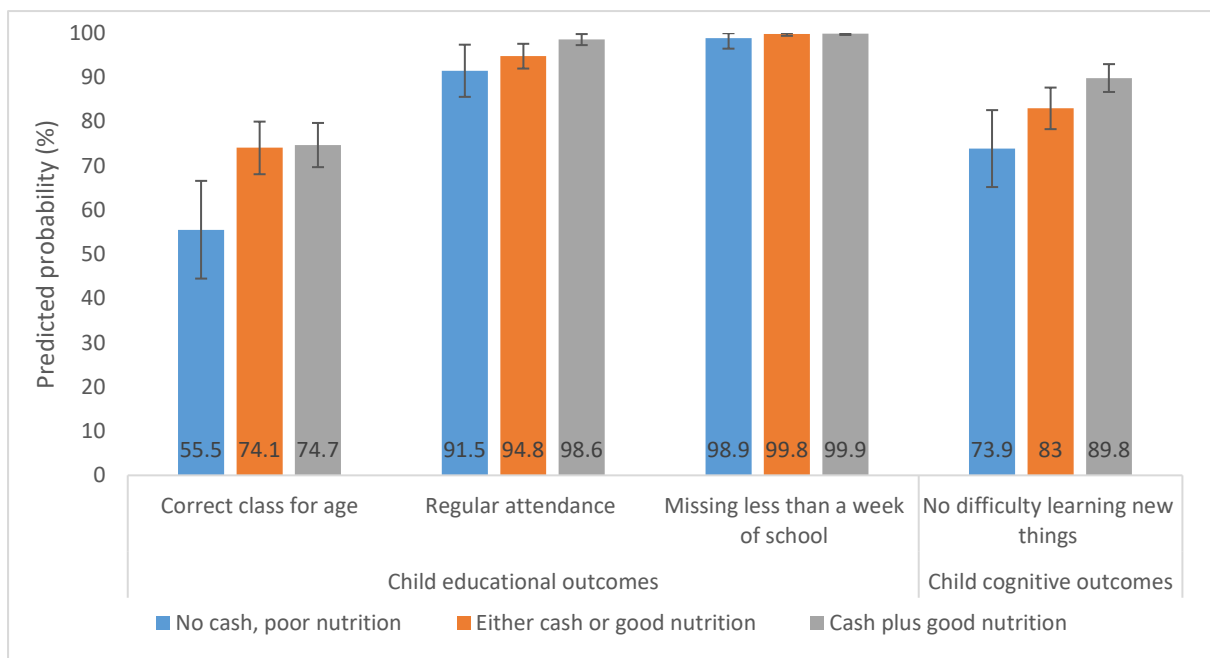


Figure 1. Probability predictions ascertained from marginal effects models testing exploring the effects of cash and good nutritional status on child educational and cognitive outcomes (binary). Adjusted for child biological sex (female), child age (years), child HIV status (positive) and number of household assets (proxy wealth indicator).

NOT FOR DISTRIBUTION