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# The heterogeneous effect of short-term transfers for improving ART adherence among HIV-infected Tanzanian adults

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## Abstract

A recently concluded randomized study in Tanzania found that short-term conditional cash and food transfers significantly improved HIV-infected patients' possession of antiretroviral therapy (ART) and reduced patient loss to follow-up (LTFU) (McCoy et al., 2017). We examined whether these transfers had differential effects within population subgroups. In the parent study, 805 individuals were randomized to one of three study arms: standard-of-care (SOC) HIV services, food assistance, or cash transfer. We compared achievement of the medication possession ratio (MPR) 95% at 6 and 12 months and patient LTFU at 12 months between those receiving the SOC and those receiving food or cash (combined). Using a threshold value of p<0.20 to signal potential effect measure modifiers (EMM), we compared intervention effects, expressed as risk differences (RD), within subgroups characterized by: sex, age, wealth, and time elapsed between HIV diagnosis and ART initiation. Short-term transfers improved 6 and 12-month MPR 95% and reduced 12-month LTFU in most subgroups. Study results revealed wealth and time elapsed between HIV diagnosis and ART initiation as potential EMMs, with greater effects for 6-month MPR 95% in the poorest patients (RD: 32, 95% CI: (9, 55)) compared to those wealthier (RD: 16, 95% CI: (5, 27); p=0.18) and in newly diagnosed individuals (<90 days elapsed since diagnosis) (RD: 25, 95% CI: (13, 36)) compared to those with 90 days (RD: 0.3, 95% CI (−17, 18); p=0.02), patterns which were sustained at 12 months. Results suggest that food and cash transfers may have stronger beneficial effects on ART adherence in the poorest patients. We also provide preliminary data suggesting that targeting interventions at patients more recently diagnosed with HIV may be worthwhile. Larger and longer-term assessments of transfer programs for the improvement of ART adherence and their potential heterogeneity by sub-population are warranted.

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## BACKGROUND

Successful antiretroviral therapy (ART) treatment for people living with HIV/AIDS (PLHIV) is recognized as one of the most critical tools for HIV prevention. Indeed, evidence demonstrates that early ART initiation and optimal adherence improves clinical outcomes, prevents progression to AIDS, and effectively eliminates the onward transmission of HIV (Karim & Karim, 2011; Palella et al., 1998; Rodger et al., 2016; Siegfried, Uthman, & Rutherford, 2010). Recognizing this, UNAIDS' "90–90-90" strategy for eliminating AIDS by 2030 (UNAIDS, 2014) necessitates that by 2020, 90% of HIV-positive individuals are diagnosed, 90% of those infected are on treatment, and 90% on treatment are virally suppressed. The success of this strategy largely hinges upon high levels of ART adherence; however, in sub-Saharan Africa, on average only 73% of HIV-infected adults are ART adherent (Heestermans, Browne, Aitken, Vervoort, & Klipstein-Grobusch, 2016), and in Eastern and Southern Africa an estimated 50% are virally suppressed (UNAIDS, 2017). These critical shortcomings underscore the need for new strategies to improve outcomes among PLHIV in order to reach "90–90-90", and to ultimately end the HIV epidemic.

Transfer programs, which may include the short-term provision of cash and/or other types of in-kind (i.e. food) assistance, have been shown to be effective in improving patient outcomes in both high income and low- and middle-income countries (LMIC) (Petry, Rash, Byrne, Ashraf, & White, 2012; Ranganathan & Lagarde, 2012). Recently, such programs have emerged as an important strategy for improving HIV prevention (Heise, Lutz, Ranganathan, & Watts, 2013). For example, short-term cash transfers mitigated risky sexual behavior and risk of HIV infection among Tanzanian adults (World Bank, 2010) and reduced prevalence of HIV infection among schoolgirls in Malawi (Baird, Garfein, McIntosh, & Ozler, 2012). A smaller but growing body of evidence demonstrates transfer effectiveness in improving outcomes for PLHIV: incremental cash transfers significantly increased uptake of, and retention in, prevention of mother-to-child transmission services among HIV-infected pregnant women in the Democratic Republic of Congo (Yotebieng et al., 2016), and food/cash transfers significantly reduced loss-to-follow-up (LTFU) and improved ART adherence amongst beneficiaries in Tanzania (McCoy et al., 2017). Overall, this literature suggests that transfers may be an important tool for reducing LTFU, increasing adherence, and ultimately improving outcomes for PLHIV in LMIC.

Considering this evidence base, however, it could be possible that transfer programs have heterogeneous effects. For example, they might be particularly effective for improving outcomes in vulnerable groups–like women, youth, and the poorest population members– who face immediate, largely economic, barriers to care. Indeed, empirical evidence demonstrates lack of economic resources as an important risk factor for ART non-adherence among women in South Africa (El-Khatib et al., 2011) and HIV-infected youth in Uganda (Bermudez et al., 2016). Transfer programs in LMIC have traditionally targeted the poorest

population members, and have observed even among this sub-population the greatest health impacts in the "poorest of the poor" (Adato & Bassett, 2012; Ranganathan & Lagarde, 2012). Consistently, beneficiaries of such programs have revealed that the costs associated with seeking and obtaining needed services often serve as the greatest barriers to HIV care (Lagarde, Haines, & Palmer, 2009; Mshana et al., 2006; Weiser et al., 2003). Collectively, this literature implies that transfers could be an especially effective intervention within these vulnerable population subgroups.

Furthermore, it is largely unknown whether or for whom short-term transfers may engender sustained effects on clinical retention and ART adherence (Blattman et al., 2017; Petry, Rash, Byrne, Ashraf, & White, 2012). Providing transfers to recently diagnosed patients–a subgroup of individuals whose healthcare habits and identity surrounding their HIV status are still being formed (Baumgartner, 2007)–may be an important strategy for achieving long-term effects. However, although it is possible that this window of "new diagnosis" is a pivotal period within which it is possible to influence long-term behavior change, this has not been rigorously explored (Baumgartner, 2007; Galárraga, Genberg, Martin, Barton Laws, & Wilson, 2013).

Overall, a lack of conclusive evidence indicating whether transfers work differentially amongst subgroups in improving adherence and retention (Heise et al., 2013; Lagarde, Haines, & Palmer, 2007; Taaffe, Cheikh, & Wilson, 2016) has led to a strong call for more research examining effect measure modifiers (EMMs) of potential interest (Blattman et al., 2017). Assessing differential effects may generate hypotheses regarding the mechanisms by which transfers work, providing clarity to a process that has been described as a "black box" (Adato & Bassett, 2012). Additionally, such studies may provide relevant information for settings where decisions must be made regarding how to best allocate finite resources (Heckman, 1997; VanderWeele, 2014). Finally, the informed targeting of transfers to those for whom they work best can yield significant strides towards reaching "90–90-90".

To address this gap, we conducted a secondary analysis of data from a recently concluded randomized trial in Shinyanga, Tanzania that investigated the effect of short-term cash or food transfers in improving ART adherence and retention among PLHIV (McCoy et al., 2017). The parent study found that both cash and food significantly and equivalently improved ART possession and reduced LTFU, and provided evidence suggesting long-term impacts associated with short-term transfers (McCoy et al., 2017). Here we evaluated the combined effect of the food/cash, collectively referred to as transfers, to determine whether their benefits differed by strata defined by sex, age, wealth, and time elapsed between HIV diagnosis and ART initiation.

## METHODS

### Study Participants

Study recruitment and enrollment spanned from December 2, 2013 until July 22, 2015, with follow-up until August 17, 2016 (McCoy et al., 2017). The study was pre-registered in clinicaltrials.org (NCT01957917). Procedures were described and results published previously (McCoy et al., 2015, 2017). Eligible PLHIV were: 18 years, food insecure as

measured with the Household Hunger Scale (Deitchler, 2011), and initiated ART 90 days prior to enrollment, and were recruited and enrolled from three HIV clinics in Shinyanga. Those with BMI<16 kg/m², indicating severe malnutrition, were excluded as they required nutritional/clinical support for recovery. This study was reviewed and approved by the Committee for the Protection of Human Subjects at the University of California, Berkeley and the National Institute for Medical Research in Dar es Salaam, Tanzania.

### Procedures

Overall, 805 eligible participants were randomized at three clinics in a 3:3:1 ratio into one of three study arms: cash transfer and nutritional assessment and counseling (NAC, n=347), food and NAC (n=345), or NAC alone (n=113). Food/cash transfers, equivalently valued at ~ $11/month (22,500 Tanzanian Shillings), were provided for 6 months and conditional upon monthly visits to an HIV care clinic. Transfers were accompanied by a message to use as needed to improve health. All participants received the standard-of-care (SOC) for PLHIV in Tanzania, which includes NAC. In-person interviews at baseline, 6 and 12 months collected data on individual characteristics, health behaviors, food security, and household welfare. Patient pharmacy and medical records were used to collect information on visit attendance and pharmacy dispensing.

### Exposure Definition

In this analysis we combined cash and food into one intervention group for three reasons. First, 1) in the original analysis, cash was found to be at least as effective as food in improving 6-month adherence and reducing attrition; 2) we were interested in determining how the intervention effect may be differential within study subgroups rather than exploring differences between food and cash; and 3) combining groups allowed for increased power to detect effect heterogeneity, as the original study was not designed to examine subgroup effects. SOC was the comparison.

### Outcome Measures

There were two primary outcome measures ascertained from medical and pharmacy record review. The first was the medication possession ratio of 95% (MPR 95%) (McMahon et al., 2011). This threshold was selected because achieving MPR 95% is optimal for HIV virologic outcomes under many first-line regimens, and can serve as a good proxy for viral suppression (Messou et al., 2011). It was assessed as a binary variable at 6 and 12 months.

The secondary outcome of LTFU was assessed as a binary variable. We used the World Health Organization (WHO) (2008) and the Tanzanian Ministry of Health, Community Development, Gender, Elderly and Children definition, classifying patients as LTFU if >90 days had elapsed since their last scheduled appointment within the 0–6 and 6–12 month observation periods.

### Potential Effect Measure Modifiers (EMM)

We examined four potential EMMs. Sex and age were assessed as binary variables. Considering the subgroup sample sizes resulting from various age categorizations (2006; Elul et al., 2013; Heestermans et al., 2016; Murray et al., 2017; Pettifor et al., 2005), we

ultimately dichotomized age into youth (18–35 years) vs. non-youth ( 35 years). Wealth was also analyzed as a binary variable. A wealth index was generated through principal components analysis (Fry, 2014), and accounted for ownership of various assets such as motor vehicles, electronics, appliances, livestock, and household characteristics. From this index, quartiles were generated; the lowest 25% was our cutoff to distinguish between poorest households and all others.

Finally, a variable representing time elapsed between HIV diagnosis and ART initiation was created. We used the self-reported diagnosis date and the medical record ART start date to generate a dichotomous variable representing those with  90 vs. <90 days elapsed. While all participants had initiated ART <90 days prior to study enrollment, this variable captured two distinct groups as it related to treatment initiation: those aware of their status longer prior to ART start, and "quick initiates", or those who initiated within 90 days of HIV diagnosis. Recognizing the potential limitations of self-reported patient information, we conducted sensitivity analyses creating this variable using the medical record diagnosis date.

### Statistical Analysis

Balance of baseline characteristics across transfer and SOC groups were compared using chi-square tests. For our primary analysis, we constructed log binomial regression models for the relationship between transfers and each outcome adjusting only for clinic, as participants were randomized within site. We then calculated the proportion achieving each outcome in each arm, and derived mean RDs and 95% confidence intervals (CIs) for 6 and 12-month MPR  95% and LTFU between intervention and SOC groups. We conducted sensitivity analyses adjusting for imbalanced baseline variables.

We added each potential EMM variable and corresponding interaction term with the main exposure to our model separately; from each we derived adjusted risk percentages for outcomes in each arm and subgroup. We compared within EMM strata to obtain RDs and 95% CIs. To determine statistical significance, we examined the relative excess risk due to interaction (RERI) p-value (Rothman, 2008; VanderWeele, 2014). Similar to standard subgroup analyses (Beneciuk et al., 2017), we specified a p<0.20 threshold to indicate potential effect heterogeneity. All analyses were conducted using Stata-14 (College Station, Texas).

## RESULTS

Of 921 patients assessed, 116 were ineligible: 102 did not meet inclusion criteria and 14 did not provide informed consent. Among the 805 randomized, 5 had no medical records or follow-up time and were excluded. Our final ITT analysis consisted of 688 transfer individuals and 112 in SOC (Figure 1). At baseline, mean age was 37 years (SD: 10), 64% (509/800) were women, and 43% (345/800) were married/with partner. More than half (405/800) were farmers, and mean household size was 4 (SD: 2). Aside from language, occupation, and WHO stage, there were no significant baseline differences between groups (Table 1).

At 6 and 12 months, 80% (n=636) and 68% (n=540) of the study population had achieved MPR 95%, respectively. Twenty (3%) were LTFU at 6 months, and 75 (9%) were LTFU at 12 months.

### Effect of Combined Transfers on ART Adherence and LTFU

Adjusting for site, 58% (95% CI: 50, 66) of SOC and 76% (95% CI: 72, 80) of transfer recipients had achieved 6-month (6M) MPR 95%, representing a 19 percentage point (pp) RD (95% CI: 11, 28, Table 2). 12-month (12M) MPR 95% was 15 pp greater in the transfer group compared to SOC (95% CI: 6, 24). 6M LTFU was rare, (n=20) which precluded analysis of this outcome. Risk of 12M LTFU within SOC was 16% (95% CI: 8, 23) and 7% for transfers (95% CI: 5, 10), representing a −9 pp RD (95% CI: −16, −2).

### Assessment of Effect Heterogeneity

**MPR 95%:** Stronger intervention effects for ART adherence were found in those more recently diagnosed and among the poorest population members. For those with <90 days elapsed since diagnosis, the RD for MPR 95% between SOC and transfer groups was 25 pp (95% CI: 13, 36) compared to a 0.3 pp RD (95% CI: −17, 18; $p_{RERI}$=0.02) for those with 90 days, a pattern that was sustained at 12 months ($p_{RERI}$=0.09, Table 3). Sensitivity analyses using the medical record diagnosis date rather than self-reported diagnosis date yielded similar results (Appendix 1). The RD between SOC and transfers was greater among very poor individuals (6M RD: 32, 95% CI: 9, 55) vs. wealthier individuals (6M RD: 16, 95% CI: 5, 27) at both 6 ($p_{RERI}$=0.18) and 12 months ($p_{RERI}$=0.14). Neither sex (6M $p_{RERI}$=0.71; 12M $p_{RERI}$=0.99) nor age (6M $p_{RERI}$=0.41; 12M $p_{RERI}$=0.64) met our criteria for effect heterogeneity. We conducted additional analyses adjusting for imbalanced baseline characteristics (language, occupation, and WHO stage); fully-adjusted and site-only adjusted RDs within EMM strata were similar and final conclusions regarding effect modification using our p<0.20 threshold criteria were the same, so we present site-adjusted results only.

**LTFU:** We found no evidence of effect heterogeneity for 12M LTFU (Table 4). Predicted RDs were similar across strata of sex ($p_{RERI}$=0.45), age ($p_{RERI}$=0.77), wealth ($p_{RERI}$=0.30) and time elapsed between diagnosis and ART initiation ($p_{RERI}$=0.69). RDs fully adjusted for baseline imbalances were similar to site-adjusted results and final conclusions reached regarding effect modification were the same.

## DISCUSSION

We previously demonstrated that short-term food and cash transfers can improve ART adherence and reduce LTFU among HIV-infected Tanzanian adults (McCoy et al., 2017), contributing to a growing body of evidence indicating that short-term transfers can be effective for improving outcomes for PLHIV in LMIC. Here we investigated whether the transfer effect was differential across four characteristics. Particularly in resource-constrained settings, an understanding of the circumstances and populations for which such interventions work best can guide resource-allocation and the design and targeting of future programs. We find that transfers improved 6 and 12M adherence and reduced 12M LTFU in most subgroups defined by sex, age, wealth, and time elapsed between diagnosis and ART

initiation, with stronger effects on 6 and 12M ART adherence among the poorest patients and in those more recently diagnosed. Recognizing our limited power to detect effect heterogeneity, these subgroups merit further investigation.

The increased magnitude of intervention effect found amongst the poorest individuals implies that targeting to that population may result in greater beneficial effects. Drawing from economic principles, a potential explanation for this may be that transfers created an "income effect", whereby consumers utilized more HIV services based on an increase in income. This effect may have been particularly strong among those for whom additional food/economic resources would be most impactful (Galárraga et al., 2013). Additionally, transfers may have helped offset the direct (i.e. cost of health services), indirect (i.e. cost of transport to the clinic), and/or opportunity costs (i.e. missed employment days) of seeking and obtaining needed health services, often cited as significant barriers to care among poorest population members in LMIC (Lagarde et al., 2009; Mshana et al., 2006; Weiser et al., 2003). Similar findings from the Democratic Republic of Congo led authors to conclude that cash transfers empowered those most vulnerable with the economic means of obtaining healthcare services that they were already motivated to undertake (Yotebieng et al., 2016). Here we draw a similar conclusion, and suggest that future programs be designed to target those most impoverished. While we found differences between the lowest wealth quartile and all others, larger future studies may consider measuring poverty using multiple levels to understand the thresholds for which such programs would be most impactful.

The effect of transfers for 6 and 12M adherence was also greater in those with <90 days elapsed between diagnosis and ART initiation. The implications of this finding could be considerable with a bourgeoning population of individuals initiating ART immediately following diagnosis, irrespective of CD4 count, under the new WHO "test and treat" strategy (WHO, 2016). Importantly, a recent study in South Africa assessing the impact of universal test and treat showed that while it increased HIV testing, ART usage in those recently diagnosed remained low (Dabis, 2016). Another ongoing trial in Kenya and Uganda found that while community-based test and treat was successful in improving viral suppression and increasing ART initiation overall, newly diagnosed patients failed to achieve these targets–highlighting the need for strategies to improve linkage and adherence in this particularly vulnerable subgroup (Petersen et al., 2017). Our results, indicating a stronger intervention effect for adherence in those recently diagnosed, may imply that pairing test and treat with short-term transfers could be an important strategy for strengthening adherence amongst this subgroup in the future. More research is warranted to understand whether this holds true in alternate settings.

Building upon results from the primary analysis of these data, which found evidence indicative of potential long-term impacts associated with transfers (McCoy et al., 2017), our subgroup analysis suggests that targeting transfer programs to recently diagnosed individuals who are still forming their HIV identity and healthcare habits (Baumgartner, 2007; Terry, Hogg, & White, 1999) could lead to the most profound beneficial effects. Results indicating marked and sustained intervention effects for 12M adherence–6 months after transfers had ceased–amongst "quick initiates" and minimal to no improvement for those in the ≥90 days subgroup provide preliminary evidence to support this hypothesis. We highlight this as an

important area for further research: longer-term evaluations will provide stronger evidence for the relationship between short-term transfers and long-term habit formation within populations of recently diagnosed individuals.

We found no evidence indicating that the beneficial effect of food/cash transfers on ART adherence or retention was differential by sex or age. In order to optimize the potential power we had to detect statistically significant differences across groups, we dichotomized age as 18–35 years vs. 35; however, this dichotomization may have obscured nuanced differences across more refined age categories. It could also be there was truly no difference, or due to small sample size within subgroups and corresponding lack of power. Indeed, our main limitation in this study was lack of statistical power to detect some RDs with relative precision, as the parent study was designed only with the power to detect differences in MPR 95% between those receiving food/cash transfers and the SOC, rather than for assessing heterogeneity of effect among population subgroups (McCoy et al., 2015). Although we created a larger-sized intervention group by combining food and cash, some estimates were unstable with wide CIs; we recommend that these estimates be interpreted with caution and results viewed as exploratory. Our analysis also had important strengths, including the randomized design of the parent study.

To reach "90–90-90", new and effective strategies for improving outcomes amongst PLHIV are needed. It is imperative to understand and capitalize upon how the effects of such strategies may be differential; program success may even hinge upon effective targeting to achieve optimal improvements. Although not powered for subgroup analyses, we find that food/cash transfers may have stronger beneficial effects on adherence in the poorest patients. While perhaps unsurprising, this highlights anew the need to improve outcomes amongst those who often face insurmountable economic barriers to care. We also provide preliminary evidence suggesting that targeting those more recently diagnosed may be worthwhile. Particularly in the era of test and treat, optimizing outcomes within this growing subpopulation of PLHIV will be crucial for reaching UNAIDS' "90–90-90" targets, and for moving the global response further towards ending the HIV epidemic.

## Acknowledgments

## Appendix 1.: Sensitivity analyses conducted using medical record date for HIV diagnosis for "Time elapsed between HIV diagnosis and ART initiation".

**Table 1.**

Predicted risk percentages for ART adherence and predicted risk differences between standard of care and food/cash groups.

| | 6 Month MPR 95%[1] (95% CI)[2] | | Risk Difference % (CI) | | 12 Month MPR 95%[1] (95% CI)[2] | | Risk Difference % (CI) | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Standard-of-care N = 112 | Food/Cash N = 688 | Standard-of-care vs. Food/Cash | p-value[3] | Standard-of-care N = 112 | Food/Cash N = 688 | Standard-of-care vs. Food/Cash | p-value[3] |
| **Time elapsed between HIV diagnosis and ART initiation** | | | | | | | | |
| < 90 days | 59 (49, 68) | 83 (80, 86) | 25 (13, 36) | 0.13 | 51 (42, 61) | 71 (67, 74) | 20 (8, 31) | 0.11 |
| 90 days | 85 (67, 100) | 77 (71, 84) | −8 (−29, 13) | | 70 (53, 87) | 64 (55, 72) | −6 (−28, 15) | |

[1]The proportion of patients who were in possession of 1 antiretroviral or prescriptions for antiretroviral medication divided by the amount time between two prescriptions 95% of the time or greater (McMahon et al., 2011).

[2]Model adjusted for site of randomization.

**MPR:** medication possession ratio

**ART:** Antiretroviral therapy

**Table 2.**

Predicted risk percentages for LTFU and predicted risk differences between standard-of-care and food/cash groups.

| | 12 Month LTFU[1] % (95% CI)[2] | | Risk Difference % (CI) | |
| | Standard-of-care | Food/Cash | Standard of care vs. Food/Cash | p-value[3] |
|---|---|---|---|---|
| | *N = 112* | *N = 688* | | |
| **Time elapsed between HIV diagnosis and ART initiation** | | | | |
| < 90 days | 16 (9, 24) | 9 (7, 11) | −7 (−16, 2) | |
| 90 days | 19 (2, 36) | 3 (0.1, 7) | −16 (−35, 4) | 0.51 |

[1]The proportion of patients lost-to-follow-up, defined as anyone with more than ninety days from a missed scheduled clinical or drug pickup appointment (WHO, 2008).

[2]Model adjusted for site of randomization.

**LTFU:** lost-to-follow-up

**ART**: Antiretroviral therapy

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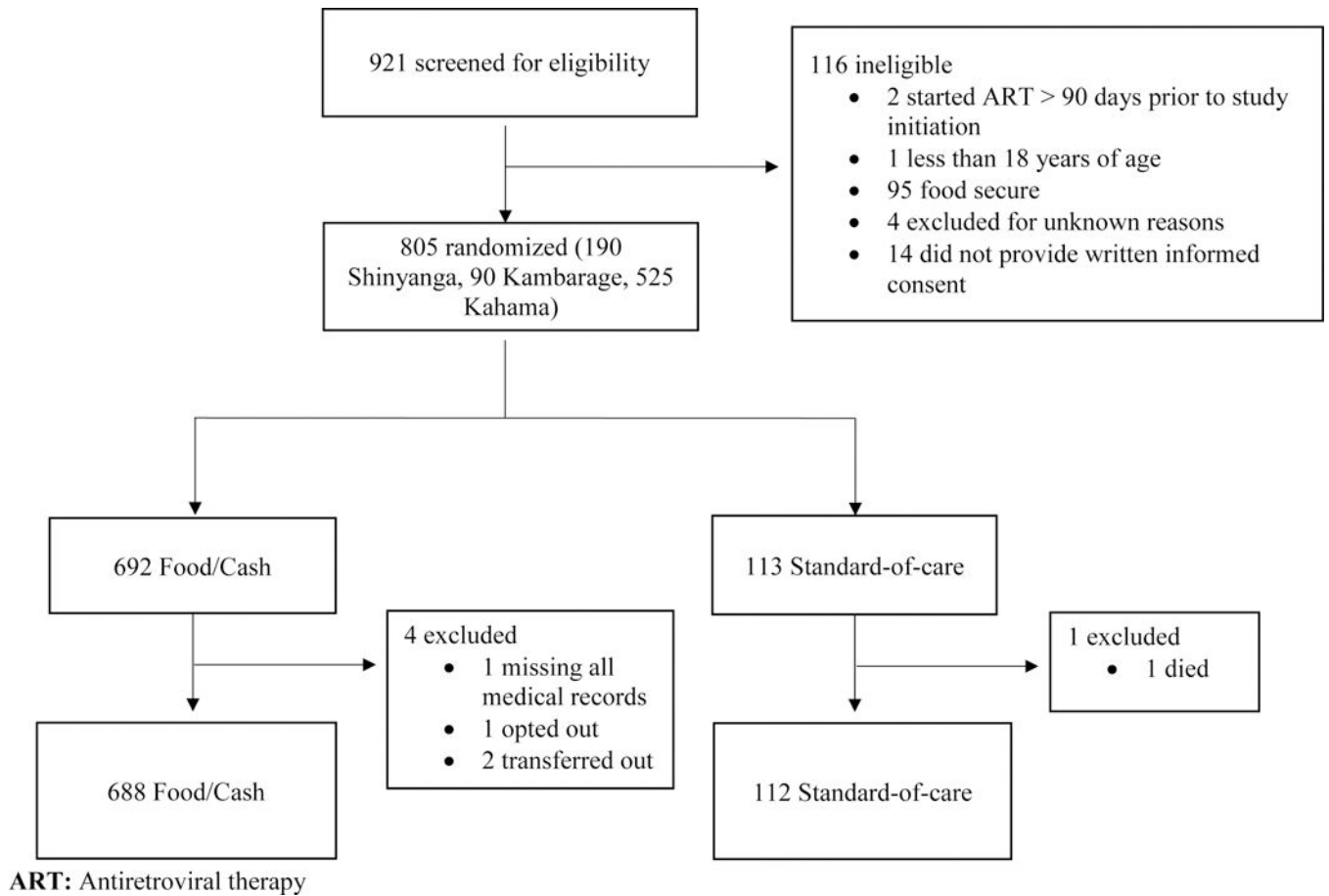
**Figure 1.**
Participant flowchart.

**Table 1.**

Demographic and clinical characteristics of HIV-infected study participants in standard-of-care and food/cash transfer groups measured at baseline, Tanzania, 2014–2015.

| Characteristic[1,2] | Standard-of-care (n=112) | Food/Cash (n=688) |
|---|---|---|
| **Sex** | | |
| Male | 39 (35) | 252 (37) |
| Female | 73 (65) | 436 (63) |
| **Age** | | |
| Youth (18–35) | 59 (53) | 319 (46) |
| Non-youth (35+) | 53 (47) | 369 (54) |
| **Language*** | | |
| Swahili | 80 (71) | 409 (59) |
| Sukuma/Other | 32 (29) | 279 (41) |
| **Marital status** | | |
| Married | 49 (44) | 296 (43) |
| **Household size** | | |
| 1 person | 19 (17) | 89 (13) |
| 2 people | 19 (17) | 125 (18) |
| 3 people | 21 (19) | 136 (20) |
| 4 people | 25 (22) | 126 (18) |
| 5 people | 18 (16) | 95 (14) |
| 6+ people | 10 (9) | 49 (7) |
| **Occupation*** | | |
| Farmer | 47 (42) | 358 (52) |
| Other | 65 (58) | 330 (48) |
| **Wealth quartile** | | |
| Poorest quartile (1st) | 23 (21) | 177 (26) |
| Higher quartiles (2nd – 4th) | 89 (79) | 511 (74) |
| **WHO Clinical Stage*** | | |
| 1 | 14 (13) | 95 (14) |
| 2 | 41 (37) | 188 (28) |
| 3 | 46 (41) | 355 (53) |
| 4 | 10 (9) | 34 (5) |
| **Site of randomization** | | |
| Shinyanga | 26 (23) | 162 (24) |
| Kahama | 13 (12) | 76 (11) |
| Kambarage | 73 (65) | 450 (65) |
| **Time elapsed between HIV diagnosis and ART initiation** | | |
| < 90 days | 85 (76) | 518 (75) |
| 90 days | 27 (24) | 170 (25) |

[1]. All values are in n (%)

*2.*Statistically significant p-values at p<0.05 indicated with a *

**ART:** Antiretroviral therapy

**Table 2.**

Predicted risks and risk differences of MPR ≥ 95% and LTFU for standard-of-care and food/cash groups, Tanzania, 2014–2016.

| | 6 Month MPR ≥ 95%[1] (95% CI)[3] | 12 Month MPR ≥ 95% (95% CI)[3] | 12 Month LTFU[2] (95% CI)[3] |
|---|---|---|---|
| **Standard-of-care (N = 112)** | 58 (50, 66) | 47 (39, 56) | 16 (8, 23) |
| **Food/Cash (N = 688)** | 76 (72, 80) | 60 (56, 65) | 7 (5, 10) |
| **Risk Difference** | 19 (11, 28) | 15 (6, 24) | −9 (−16, −2) |
| **p-value** | <0.001 | 0.001 | 0.02 |

[1]The proportion of patients who were in possession of ≥ 1 antiretroviral or prescriptions for antiretroviral medication divided by the amount time between two prescriptions 95% of the time or greater (McMahon et al., 2011).

[2]The proportion of patients lost-to-follow-up, defined as anyone with more than ninety days from a missed scheduled clinical or drug pickup appointment (WHO, 2008).

[3]Model adjusted for site of randomization.

**MPR:** medication possession ratio

**LTFU:** lost-to-follow-up

**RD:** risk difference

**Table 3.**

Predicted risk percentages for ART adherence and predicted risk differences between standard-of-care and food/cash groups, Tanzania, 2014–2016.

| | 6 Month MPR 95%[1] (95% CI)[2] | | Risk Difference % (95% CI) | | 12 Month MPR 95%[1] (95% CI)[2] | | Risk Difference % (95% CI) | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Standard-of-care N = 112 | Food/Cash N = 688 | Standard-of-care vs. Food/Cash | RERI p-value[3] | Standard-of-care N = 112 | Food/Cash N = 688 | Standard-of-care vs. Food/Cash | RERI p-value[3] |
| **Sex** | | | | | | | | |
| Male | 66 (52, 80) | 83 (79, 87) | 17 (1, 33) | 0.71 | 55 (40, 69) | 69 (64, 74) | 15 (−3, 32) | 0.99 |
| Female | 61 (51, 72) | 82 (79, 85) | 21 (8, 34) | | 55 (44, 65) | 70 (66, 74) | 15 (2, 28) | |
| **Age** | | | | | | | | |
| Youth (18–35) | 66 (55, 77) | 82 (78, 85) | 16 (3, 29) | 0.41 | 56 (45, 67) | 69 (64, 73) | 13 (−1, 27) | 0.64 |
| Non-Youth (35+) | 59 (46, 72) | 83 (79, 86) | 24 (8, 39) | | 53 (40, 66) | 70 (66, 74) | 17 (2, 32) | |
| **Time elapsed between HIV diagnosis and ART initiation** | | | | | | | | |
| < 90 days | 58 (48, 68) | 83 (80, 86) | 25 (13, 36) | 0.02 | 51 (41, 61) | 71 (67, 74) | 19 (7, 31) | 0.09 |
| 90 days | 79 (65, 94) | 80 (74, 85) | 0.3 (−17, 18) | | 67 (50, 83) | 67 (60, 73) | −0.3 (−21, 20) | |
| **Wealth quartile** | | | | | | | | |
| Lowest | 51 (32, 71) | 83 (78, 87) | 32 (9, 55) | 0.18 | 40 (20, 59) | 68 (62, 74) | 29 (5, 53) | 0.14 |
| Higher | 66 (57, 75) | 82 (78, 85) | 16 (5, 27) | | 58 (49, 68) | 70 (67, 74) | 12 (0.3, 23) | |

[1] The proportion of patients who were in possession of 1 antiretroviral or prescriptions for antiretroviral medication divided by the amount time between two prescriptions 95% of the time or greater (McMahon et al., 2011).

[2] Model adjusted for site of randomization.

**MPR:** medication possession ratio

**ART:** Antiretroviral therapy

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**Table 4.**

Predicted risk percentages for LTFU and predicted risk differences between standard-of-care and food/cash groups, Tanzania, 2014–2016.

| | 12 Month LTFU[1] % (95% CI)[2] | | Risk Difference % (CI) | |
| --- | --- | --- | --- | --- |
| | Standard-of-care<br>N = 112 | Food/Cash<br>N = 688 | Standard-of-care<br>vs. Food/Cash | p-<br>value[3] |
| **Sex** | | | | |
| Male | 24 (10, 37) | 10 (6, 14) | −13 (−29, 2) | |
| Female | 13 (6, 21) | 7 (5, 9) | −6 (−16, 3) | 0.45 |
| **Age** | | | | |
| Youth (18–35) | 18 (8, 28) | 8 (5, 11) | −10 (−22, 2) | |
| Non-youth (35+) | 15 (6, 25) | 8 (5, 11) | −7 (−19, 4) | 0.77 |
| **Time elapsed between HIV diagnosis and ART initiation** | | | | |
| < 90 days | 17 (9, 25) | 9 (7, 12) | −8 (−17, 2) | |
| 90 days | 16 (2, 30) | 4 (1, 7) | −11 (−28, 5) | 0.69 |
| **Wealth quartile** | | | | |
| Lowest | 27 (8, 45) | 8 (4, 12) | −19 (−41, 3) | |
| Higher | 14 (7, 22) | 8 (6, 10) | −6 (−15, 2) | 0.30 |

[1] The proportion of patients lost-to-follow-up, defined as anyone with more than ninety days from a missed scheduled clinical or drug pickup appointment (WHO, 2008).

[2] Model adjusted for site of randomization.

**LTFU:** lost-to-follow-up

**ART**: Antiretroviral therapy