Cash versus food assistance to improve adherence to antiretroviral therapy among HIV-infected adults in Tanzania: a randomized trial

Sandra McCoy, Prosper Njau, Carolyn Fahey, Nancy Czaicki, Ntuli Kapologwe, Suneetha Kadiyala, William Dow, Nicholas Jewell, and Nancy Padian

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Economic Barriers to ART Adherence

- Economic factors increasingly recognized as barriers to antiretroviral therapy (ART) adherence & retention in care

- Food insecurity (FI) is one dimension of economic wellbeing
  - FI is the lack of secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life
  - In sub-Saharan Africa, 220 million (23%) people are undernourished

FI Associated with Poor ART Adherence

Source: Singer AW, Weiser SD, McCoy SI. AIDS Behav. 2015 Aug;19(8):1510-26
Limited evidence that food aid programs improve ART adherence in LMIC

• Few intervention studies of food aid for people living with HIV infection (PLHIV) in low and middle-income countries
  - (Cantrell et al., 2008; Serrano et al., 2010; Tirivayi et al., 2012; Posse et al., 2013; Martinez et al., 2014)

• Some studies report improved ART adherence
  - For example, in Zambia, food supplementation increased the percent of clients with ≥95% ART adherence after 1 year (70% vs. 48%, $RR_a = 1.5$, 95% CI: 1.2, 1.8) (Cantrell et al., 2008)

• Lack of rigorous evaluations limits conclusions

Could cash be as effective or more effective than food aid for improving ART adherence?

• Long-standing debate about cash versus in-kind assistance
  - Cash is as good or better than many forms of aid for poverty alleviation
    *(Blattman & Niehaus, 2014)*
  - Cash gives freedom of choice, is cheaper to distribute, and in some settings
    cash may be preferred over food assistance*(Gentilini 2016)*

• Among PLHIV, cash transfers can improve ART adherence and
  retention in care *(Galárraga et al., 2013; El-Sadr et al., 2015, Yotebieng et al., 2016)*
  - Few studies conducted in sub-Saharan Africa
Study Objective

Evaluate the effectiveness of short-term cash and food assistance to mitigate food insecurity and improve adherence to antiretroviral therapy and retention in care among people living with HIV infection in Tanzania

• **Protocol:** McCoy SI et al. BMC Infectious Diseases 2015;15:490.

• **Trial Registration:** Clinicaltrials.gov, NCT01957917

• **Ethical Approvals:** National Institute for Medical Research and UC Berkeley
Study Setting & Population

- Three HIV primary care clinics in Shinyanga, Tanzania

Inclusion criteria:
1. ≥18 years
2. living with HIV infection
3. food insecure, ascertained by the Household Hunger Scale (*FANTA 2011*)
4. Initiated ART ≤90 days before enrollment

Exclusion criteria:
1. Severe malnourishment (BMI<16 kg/m²)
Intervention Descriptions

Nutrition Assessment and Counseling (NAC)

Comparison arm:
- Standard-of-care, including NAC

1. ≤6 consecutive months of support
2. Conditional on attending scheduled visits
3. Patients were counseled to “use the cash/food as you wish to help you with your health.”

Monthly cash transfer
• 22,500 TZS (~US $11)

Monthly basket (~$11) of locally procured food:
• 12kg maize flour
• 3kg beans
• 3kg groundnuts
Outcomes

Primary Outcome:
- ART adherence at 6 months (*end of intervention period*)
  - Measured with the *medication possession ratio* (MPR), the proportion of days that an individual is in possession of ≥1 ART dose
  - MPR and MPR ≥95%

Secondary Outcomes:
- MPR ≥95% at 12 months (*6 months after the intervention period*)
- Loss to follow-up (LTFU): ≥90 days since the last scheduled visit
**Trial Profile**

921 screened

116 ineligible:
- 102 not eligible
- 14 did not consent

805 randomized

- 113 assigned to NAC only (comparison condition)
  - 1 excluded
    - died before first visit
  - 112 in ITT analysis on primary outcomes

- 347 assigned to NAC plus cash transfers
  - 1 excluded
    - transferred same day
  - 346 in ITT analysis on primary outcomes

- 345 assigned to NAC plus food assistance
  - 3 excluded
    - 1 opted out at 1st visit
    - 1 transferred same day
    - 1 missing all records
  - 342 in ITT analysis on primary outcomes
# Participant Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total (N=800)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td><strong>Sociodemographic Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Age (median, IQR)</td>
<td>35 (29–43)</td>
</tr>
<tr>
<td>Female</td>
<td>509 (64%)</td>
</tr>
<tr>
<td>No formal education</td>
<td>194 (24%)</td>
</tr>
<tr>
<td>Swahili is primary language</td>
<td>489 (61%)</td>
</tr>
<tr>
<td>Farmer (primary occupation)</td>
<td>405 (51%)</td>
</tr>
<tr>
<td>Severe household hunger$^b$</td>
<td>328 (41%)</td>
</tr>
<tr>
<td>Minutes to clinic (median, IQR)</td>
<td>30 (20–60)</td>
</tr>
<tr>
<td><strong>Clinical Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>BMI (median, IQR)$^c$</td>
<td>21.0 (19.1–23.0)</td>
</tr>
<tr>
<td>CD4 (per mm$^3$, median, IQR)$^d$</td>
<td>200 (101–299)</td>
</tr>
<tr>
<td>WHO Clinical Stage 3-4</td>
<td>453 (57%)</td>
</tr>
</tbody>
</table>

NAC: nutrition assessment and counseling; BMI: Body mass index; ART: antiretroviral therapy; IQR: interquartile range

a. Chi-squared test for categorical variables and Kruskal-Wallis test of medians for continuous variables.
b. Household Hunger Scale
c. 772 participants had BMI available.
d. 637 participants had CD4 available.
## ITT Results: ART Adherence (6 mo)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall (n=800)</th>
<th>Study group</th>
<th>Between-group difference* (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>NAC only (n=112)</td>
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<tr>
<td><strong>Adherence to ART (6 months: end of intervention period)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPR≥95%b</td>
<td>79.5%</td>
<td>63.4%</td>
<td>85.0%</td>
</tr>
<tr>
<td>MPRc</td>
<td>92.8%</td>
<td>85.4%</td>
<td>95.1%</td>
</tr>
</tbody>
</table>

ART: antiretroviral therapy; MPR: medication possession ratio; CI: confidence interval
* P<0.05 **P<0.01
a. Unadjusted intent-to-treat estimate using a Wald test and Bonferroni’s correction for multiple comparisons.
b. MPR is the proportion of time an individual is in possession of ≥1 ART dose. MPR≥95% is the proportion of patients with MPR ≥95% during the 0-6 or 0-12 month interval.
c. The proportion of time an individual is in possession of ≥1 ART dose

### ITT Results: ART Adherence (12 mo)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall</th>
<th>NAC only</th>
<th>NAC + Cash</th>
<th>NAC + Food</th>
<th>Between-group differencea (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adherence to ART (6 months: end of intervention period)</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>MPR≥95%b</td>
<td>79.5%</td>
<td>63.4%</td>
<td>85.0%</td>
<td>79.2%</td>
<td>21.6 (9.8, 33.4)**</td>
</tr>
<tr>
<td>MPRc</td>
<td>92.8%</td>
<td>85.4%</td>
<td>95.1%</td>
<td>92.9%</td>
<td>9.7 (5.6, 13.8)**</td>
</tr>
<tr>
<td>Adherence to ART (12 months: 6 months after intervention has ended)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPR≥95%b</td>
<td>67.5%</td>
<td>55.4%</td>
<td>74.9%</td>
<td>64.0%</td>
<td>19.5 (6.9, 32.1)**</td>
</tr>
<tr>
<td>MPRc</td>
<td>90.1%</td>
<td>83.3%</td>
<td>93.0%</td>
<td>89.5%</td>
<td>9.7 (4.9, 14.5)**</td>
</tr>
</tbody>
</table>

**ART**: antiretroviral therapy; **MPR**: medication possession ratio; **CI**: confidence interval

* P<0.05  **P<0.01

a. Unadjusted intent-to-treat estimate using a Wald test and Bonferroni’s correction for multiple comparisons.
b. MPR is the proportion of time an individual is in possession of ≥1 ART dose. MPR≥95% is the proportion of patients with MPR ≥95% during the 0-6 or 0-12 month interval.
c. The proportion of time an individual is in possession of ≥1 ART dose

## ITT Results: Loss to Follow-up

<table>
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<th>Outcome</th>
<th>Overall (n=800)</th>
<th>Study group</th>
<th>Between-group difference&lt;sup&gt;a&lt;/sup&gt; (95% CI)</th>
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<tr>
<td>NAC only</td>
<td>NAC + Cash</td>
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<td>NAC + Cash vs. NAC only</td>
</tr>
<tr>
<td>(n=112)</td>
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<td>(n=342)</td>
<td>NAC + Food vs. NAC only</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>NAC + Cash vs. NAC + Food</td>
</tr>
<tr>
<td><strong>LTFU</strong></td>
<td></td>
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</tr>
<tr>
<td>Loss to follow-up, 6 mo&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.6%</td>
<td>10.9%</td>
<td>-10.0 (-17.3, -2.8)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.9%</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>1.5%</td>
<td></td>
</tr>
<tr>
<td>Loss to follow-up, 12 mo&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.5%</td>
<td>17.3%</td>
<td>-10.6 (-20.1, -1.1)*</td>
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<tr>
<td></td>
<td></td>
<td>6.7%</td>
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<td></td>
<td></td>
<td>9.7%</td>
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**ART**: antiretroviral therapy; **MPR**: medication possession ratio; **CI**: confidence interval

<sup>a</sup> Unadjusted intent-to-treat estimate using a Wald test and Bonferroni’s correction for multiple comparisons.

<sup>b</sup> The proportion of patients with no evidence of HIV primary care at 6 months, defined not seen for at least 90 days since the last appointment scheduled prior to 6 months.

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Kaplan-Meier curve of the proportion of participants in care over time, stratified by study arm (nutrition assessment and counseling (NAC) plus cash or food transfers)\textsuperscript{a}

\textsuperscript{a} The proportion of participants retained in care was defined as one minus the probability of LTFU (\(\geq 3\) months since the last scheduled visit). By definition, follow-up time between 9 and 12 months could not be classified as LTFU and is therefore not on the graph.
Pathways to Better Adherence

In-depth interviews revealed that the incentives acted through three primary pathways to increase adherence:

1. Incentives addressed competing needs and offset opportunity costs
2. They increased motivation via a price effect, and
3. They alleviated stress and anxiety, a mental health pathway supported by conceptual models and empirical data (Weiser SD, 2011; Nel A, 2011)

Limitations

• Viral load not measured
  - MPR is highly correlated with short-term viral suppression
    (*McMahon et al., 2011; Hong et al., 2013*)

• Potential for missing data from paper-based facility registers
  - Unlikely that missing data would be differential by study arm
  - Would likely result in *underestimates* of adherence and retention

• Study powered to determine whether cash assistance was non-inferior
to food assistance; not to detect small differences between the two interventions
Discussion (1)

• Short-term cash and food transfers increase 6-month adherence and retention among food insecure treatment initiates vs. standard of care
  - The effects are most pronounced in the first 3 months
  - Many effects maintained at 12 months, 6 months after the incentive period
  - Demonstrates potential of short-term interventions at treatment initiation

• For some outcomes, cash was superior to food assistance. Cash was preferred by participants and was easier and cheaper to implement, warranting further evaluation.
Discussion (2)

LIVELIHOOD STRATEGIES

PROMOTION
Asset & income growth, consumption improvement
- Enterprise development
- Microcredit
- Value chains

PROTECTION
Asset protection & consumption smoothing
- Group savings and loans
- Micro-insurance
- Household food production

PROVISION
Asset recovery & consumption support
- Cash transfers
- Savings
- Food and labor schemes

Source: LIFT II Livelihood and Food Security Conceptual Framework, FHI 360
Acknowledgements

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• Dr. Nancy Padian
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• Dr. Nicholas Jewell
• Dr. Nancy Czaicki
• Ms. Carolyn Fahey

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• Dr. Ramadhan Kabala

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• PEPFAR Food and Nutrition Technical Working Group

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• Dr. Prosper Njau

LSHTM
• Dr. Suneetha Kadiyala
Effect on MPR≥95% is concentrated in the first 3 months of the intervention

- Proportion with MPR≥95%
  - Months 0-3: 89%, 85%
  - Months 3-6*: 82%, 80%
  - Months 6-9*: 73%, 79%, 78%
  - Months 9-12*: 73%, 73%, 70%

- NAC Only
- NAC+Cash
- NAC+Food

Effect on MPR≥95% is concentrated in the first 3 months of the intervention period.

Intervention period ends

* Restricted to individuals in possession of at least one dose during the interval
Likelihood of employment, before and after ART, Kwazulu-Natal, South Africa

ITT Results: ART Adherence

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<td>83.0%</td>
</tr>
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<td>MPR≥80%&lt;sup&gt;d&lt;/sup&gt;</td>
<td>88.3%</td>
<td>79.5%</td>
<td>92.2%</td>
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<td>Adherence to ART (12 months: 6 months after intervention has ended)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPR</td>
<td>87.9%</td>
<td>80.8%</td>
<td>90.9%</td>
</tr>
<tr>
<td>MPR≥95%</td>
<td>58.8%</td>
<td>52.3%</td>
<td>63.3%</td>
</tr>
<tr>
<td>MPR≥80%</td>
<td>80.8%</td>
<td>74.3%</td>
<td>84.6%</td>
</tr>
</tbody>
</table>

ART: antiretroviral therapy; MPR: medication possession ratio; CI: confidence interval
* P<0.05 **P<0.01
a. Unadusted intent-to-treat estimate using Bonferroni’s adjustment for multiple comparisons.
b. The proportion of time an individual is in possession of >1 ART dose or prescription for ART.
c. The proportion of patients with MPR ≥95% during the 0-6 month interval.
d. The proportion of patients with MPR ≥80% during the 0-6 month interval.
## ITT Results: Retention in Care

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall (n=800)</th>
<th>Study group</th>
<th>Between-group difference</th>
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<td>NAC only (n=112)</td>
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<td>NAC + Food (n=342)</td>
</tr>
<tr>
<td><strong>LTFU (6 months: end of intervention period)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment attendance</td>
<td>93.5%</td>
<td>82.6%</td>
<td>96.1%</td>
<td>94.5%</td>
</tr>
<tr>
<td>Loss to follow-up, 6 mo</td>
<td>2.6%</td>
<td>10.9%</td>
<td>0.9%</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>LTFU (12 months: 6 months after intervention has ended)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment attendance</td>
<td>92.1%</td>
<td>83.4%</td>
<td>94.7%</td>
<td>92.3%</td>
</tr>
<tr>
<td>Loss to follow-up, 12 mo</td>
<td>9.5%</td>
<td>17.3%</td>
<td>6.7%</td>
<td>9.7%</td>
</tr>
</tbody>
</table>

ART: antiretroviral therapy; MPR: medication possession ratio; CI: confidence interval
* P<0.05 **P<0.01

a. Unadjusted intent-to-treat estimate using a Wald test and Bonferroni’s correction for multiple comparisons.
b. The proportion of scheduled visits completed during the 0-6 month or 0-12 month observation period.
c. The proportion of patients with no evidence of HIV primary care at 6 months, defined not seen for at least 90 days since the last appointment scheduled prior to 6 months.