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Economic strengthening for retention in HIV care and adherence to antiretroviral therapy: a review of the evidence

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ABSTRACT

To address the economic drivers of poor HIV care and treatment outcomes, household economic strengthening (HES) initiatives are increasingly being implemented with biomedical and behavioral approaches. The evidence linking HES with HIV outcomes is growing, and this evidence review aimed to comprehensively synthesize the research linking 15 types of HES interventions with a range of HIV prevention and treatment outcomes. The review was conducted between November 2015 and October 2016 and consisted of an academic database search, citation tracking of relevant articles, examination of secondary references, expert consultation, and a gray literature search.

Given the volume of evidence, the results are presented and discussed in three papers, each focused on a different HIV outcome area. This is the third paper in the series and focuses on the 38 studies on retention in HIV care, ART adherence, morbidity, and HIV-related mortality. Monthly food rations and conditional cash transfers are associated with improvements in care seeking and medication pick-up. Transportation assistance, income generation and microcredit show positive trends for care and treatment, but evidence quality is moderate and based heavily on integrated interventions. Clinical outcomes of CD4 count and viral suppression were not significantly affected in most studies where they were measured.

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Introduction

Retention in care and adherence to antiretroviral therapy (ART) are essential to achieving viral suppression, which reduces AIDS-related deaths as well as onward transmission of the virus. In 2014, the Joint United Nations Programme on HIV/AIDS (UNAIDS) established ambitious treatment targets to increase the proportion of people living with HIV (PLHIV) who are diagnosed, receiving treatment, and virally suppressed. These targets highlight that, while ART coverage has increased dramatically over the last 15 years, challenges persist for long-term retention in care and viral suppression (UNAIDS, 2014). In line with these targets, in 2015 the World Health Organization revised its treatment guidance, recommending that ART be provided to all people who test positive regardless of CD4 count or clinical disease stage (known as the “test and treat” approach). As a result, notable progress has been made in recent years, and in 2016, an estimated 53% of PLHIV aged 15–49 globally were receiving ART, and 44% were virally suppressed (UNAIDS, 2017). However, significant gaps remain, and as more people start treatment under the test and treat approach, keeping them in care and adherent to ART will be essential to epidemic control.

Poverty and economic insecurity are known barriers to routine access to HIV care and treatment services (Centers for Disease Control and Prevention, 2014). The global HIV burden is concentrated in resource-limited settings (Kharsany & Karim, 2016) and, in these contexts, the direct and indirect costs of care-seeking can prevent adherence and retention. Transportation costs, time away from productive economic activities, and the costs of medical services create barriers to care and treatment (Weiser et al., 2003), which are particularly challenging for those who are not economically stable. Poverty is also highly correlated with food insecurity, which can affect adherence in multiple ways. When hunger or side-effects from ART are heightened by a lack of food, food insecure PLHIV may choose not to take their medications. Trade-offs between finding or paying for food and accessing treatment can also lead to missed appointments, or even selling medications (Young, Wheeler, McCoy, & Weiser, 2014). Lack of food also contributes to immunologic decline, which can reduce ART adherence (Kalichman et al., 2014).

To address the economic drivers of poor care and treatment outcomes, household economic strengthening (HES) interventions are increasingly being implemented

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Table 1. HIV outcomes assessed.

HIV Outcomes	
Prevention (clinical outcomes, risk behaviors, and gender-based violence/intimate partner violence) Onward transmission (prevention with PLHIV, PMTCT)	Swann (2018a)
HIV testing services (HTS)/diagnosis Linkage to HIV care	Swann (2018b)
Retention in HIV care Adherence to antiretroviral therapy (ART)/viral suppression Morbidity Mortality	Current paper

in coordination with biomedical and more traditional behavioral approaches. HES encompasses a range of strategies that seek to enhance household economic resilience. HES services can complement clinical HIV services by addressing financial barriers to care and treatment and mitigating other economic challenges associated with HIV/AIDS. HES interventions that support retention in care and medication adherence may contribute to better health outcomes for PLHIV and further reductions in transmission of HIV (Haberer et al., 2017).

This is the final paper in a three-part evidence review that comprehensively documents the published and gray literature on a broad set of HES interventions and their effect on a range of HIV outcomes. This paper focuses on ongoing care and treatment outcomes, including retention in clinical care, ART adherence, morbidity and mortality. The first and second papers in the series (Swann, 2018a, 2018b) cover prevention outcomes, and HIV testing and linkage to care, respectively (Table 1).

HES interventions can be classified into three categories: provision, protection, and promotion. Provision interventions support basic needs; protection interventions help smooth consumption and protect assets against shocks; and promotion interventions help households to grow their income and assets (Woller, 2011). Results are presented by individual HES intervention, and discussed in the context of these wider categories. Descriptions of each HES intervention are provided in Table 2.

Methods

The methodology of this review was described in detail in the first paper in this series (Swann, 2018a) including a description of the search strategy, quality assessment approach, study classification and search terms. Briefly, the review was conducted between November 2015 and October 2016. The initial search was completed using nine academic databases. Four consistent search strings were entered into each database using a list of HES interventions, plus terms associated with different HIV outcomes or population groups. Included evidence had to meet the following criteria: (1) evaluated one or more

HES intervention of interest, (2) reported on at least one HIV outcome of interest, (3) available in English, and (4) relevant to low-income contexts or vulnerable populations. There were no geographic exclusion criteria, but studies conducted in high-income countries were only included in the review if the intervention and findings were relevant to low-income or otherwise vulnerable groups. Articles from the initial search were screened for inclusion based on a review of the title and abstract by two reviewers. Relevant records then underwent a full text review by the study author.

Using a citation tracking approach, the reference sections of each of the selected papers were screened for additional pertinent research. In addition, all secondary sources identified in the initial search were reviewed, and all source studies meeting the criteria were included. Recommendations for additional citations were solicited from experts in this field through a half-day consultative meeting. Finally, a gray literature search was conducted.

All evidence was assessed for quality using the Department for International Development's *Assessing the Strength of Evidence* methodology (DFID, 2014). This assessment tool has 20 questions grouped under seven principles of quality: conceptual framing, transparency, appropriateness, cultural sensitivity, validity, reliability, and cogency. Using the quality assessment results, which provided an overall score between 7 and 21, each citation was given a rating of high, medium-high, medium or low based on pre-defined cut-off points. This assessment was only applied to written articles as there was insufficient information to complete the assessment for conference abstracts and presentations.

For quantitative studies, findings were classified as positive or negative if the results were statistically significant according to a $p \leq 0.05$ threshold. Where tests of statistical significance were not conducted/presented, results were classified as null even when directional trends were strong. For qualitative studies, results were classified as positive or negative based on the qualitative data and interpretations presented. Many studies looked at the effectiveness of integrated programs, grouping multiple HES, health and/or social services. Whether a study assessed the independent relationship between a specific HES component and the outcome(s) of interest was an important element of analysis.

Results

Results for the full review are reported in the first paper in this series (Swann, 2018a), including overall study characteristics, PRISMA diagram (see Appendix 1) and full evidence map (see Appendix 2) (Snilstveit, Vojtkova, Bhavsar, Stevenson, & Gaarder, 2016).

Table 2. HES interventions assessed.

HES Interventions	Descriptions
Unconditional cash transfers (UCTs)	UCTs are a common form of social protection that provide basic consumption support to stabilize vulnerable individuals or households. Without specific conditions that must be met by participants to receive the transfer, or rules for how the money must be spent, they are less complex than conditional cash transfers (CCTs) to administer and are often favored in large-scale government social protection programs. UCTs generally aim to increase access to food or social services such as health care or education, and may be intended to influence specific behaviors, such as caring for orphans and vulnerable children, though this is done indirectly by increasing household income (Heise, Lutz, Ranganathan, & Watts, 2013).
Conditional cash transfers (CCTs)	Like UCTs, CCTs aim to provide consumption support to targeted households, but require the ongoing fulfillment of conditions. Conditions are intended to improve uptake of key services and incentivize protective behaviors, but can be difficult for highly vulnerable individuals or households to comply with, which can influence the groups to which CCTs are targeted. The CCT studies identified involved nongovernmental organization programs and research efforts, rather than large-scale government CCTs which are less common in the regions of Africa hardest hit by HIV (Adato & Bassett, 2012). Because of this, some of the interventions were only provided for a short time, though classification as a CCT was based on their expected application in a real-world setting where transfers would likely be more reliable over time.
Financial incentives	In this review, financial incentives are defined as cash or non-cash rewards (gift cards, vouchers, etc.) or lottery schemes, used to directly incentivize specific behaviors or outcomes. Unlike CCTs and UCTs, they are not designed to be ongoing predictable sources of support.
Asset transfer	Asset transfers include the provision of an item of value, either to support basic household needs or for generation of income. All studies that provided assets to participants also included related support for income generation and therefore were classified under that intervention.
Transportation assistance	Long distances and transportation costs are demonstrated barriers to a range of health services, including HTS and HIV-related care and treatment (Lankowski, Siedner, Bangsberg, & Tsai, 2014). Transportation assistance seeks to overcome these barriers by covering all or part of the costs associated with transport to health facilities. Although other financial incentives or transfers may be used for transport, they motivate behavior in less prescriptive ways.
Food aid/assistance	Food assistance includes food rations, as well as school feeding and food gardens. These interventions can be used to decrease food insecurity, which is a known barrier to HIV prevention, as well as incentivize desired behaviors (Anema, Vogenthaler, Frongillo, Kadiyala, & Weiser, 2009). This review did not include literature on nutritional support provided to clinically treat malnutrition, and instead focused on interventions that used economic targeting criteria rather than (or in addition to), biomedical criteria. ^a
Educational support	Children in HIV-affected households face disadvantages that can hinder their ability to get an education, including economic strain and responsibilities to care for ill family members (Cluver, Operario, Lane, & Kganakga, 2011). Children who have lost one or both parents to HIV often fall behind their peers on a range of measures related to school attendance and performance, and educational attainment (Guo, Li, & Sherr, 2012). Educational support mitigates economic barriers to education access by paying school fees and/or providing school supplies.
Savings (individual and group)	Savings interventions help participants build liquid assets to pay for lump-sum expenses and cope with unexpected life events. Savings services support the accumulation of long-term savings, which is typically difficult for poor households (Rutherford, 2000), and include individual formal or informal savings accounts, matched savings accounts, and savings and lending groups.
Microinsurance	Microinsurance services offer protection against specific risks or shocks in exchange for regular premium payments. These services are provided to individuals who cannot afford, or do not qualify for, traditional insurance schemes. No studies were identified that included this intervention.
Financial capabilities education/training	As financial services become more available to the poor, efforts to enhance the financial capabilities required to leverage these opportunities have been recognized as a key component of financial inclusion (Deb & Kubzansky, 2012). Relevant interventions help participants learn fundamental financial principles and skills, such as budgeting, saving, borrowing, and using formal financial services.
Income generation	Income generating activities (IGAs) include support for small-scale, often informal business initiatives that are typical in resource-constrained contexts. IGAs generally include training to build fundamental skills and the provision of basic business inputs, and can be implemented individually or in groups.
Microcredit	Microcredit services aim to alleviate poverty by providing loans to people who typically lack access to, or are not considered creditworthy, by traditional financial institutions. These loans are generally intended to support small or micro enterprises. Often delivered through solidarity groups, they differ from savings groups because they focus on receipt and repayment of loans from an external party, rather than from pooled savings.
Vocational or entrepreneurial training	Vocational training helps poor households build their economic capacity by developing technical skills required to enter specific trades. Entrepreneurship training builds the capacity of participants to start and run their own businesses. Training programs are often accompanied by placement in apprenticeships or support for developing a business.
Employment support	Employment support builds the capacity of participants to obtain formal wage-based employment. Interventions, often aimed at young people, include employability and soft skills training, career counseling, and job placement. In this context employment support is also delivered to PLHIV who have recovered their health and are re-entering the workforce.

^aIn many contexts, clinical interventions provide therapeutic foods with the aim of treating malnutrition among PLHIV and other vulnerable groups. These interventions use biomedical criteria such as body-mass index for targeting. They differ from other food assistance programs, which aim to improve access to food and alleviate the economic burden of accessing food, and which target recipients either at a population level or using food security or economic vulnerability criteria. Interventions providing food for the clinical treatment of malnutrition were not included as they are outside the scope of HES.

Evidence for ongoing care and treatment outcomes

From all search methods, 3309 unique records were identified and screened; 436 records underwent a full-text review. A total of 108 citations were included in the full evidence review, 38 of which evaluated ongoing

care and treatment outcomes and were included in this paper. Of those 38, the majority (79%) measured an adherence outcome, while 32% measured retention in care; morbidity and mortality outcomes were each measured by nearly 11% of the studies (11 studies reported on more than one outcome area). Retention

in care outcomes include self-reported and clinical record data on appointment attendance and accessing HIV-related care over time. Adherence outcomes include self-reported measures, clinical records on medication pick up, pill counts or bottle openings, and clinical data on immune response (CD4 count) and viral load. Morbidity includes self-reported and clinical record data on physical illness or opportunistic infections. Fifty percent of the studies in this paper used at least some self-reported outcomes which can be susceptible to bias; this should be considered when interpreting the findings. The evidence map excerpt for ongoing care and treatment outcomes is provided in Figure 1.¹

Given the diversity in study characteristics – geography, target group, intervention implementation, study design, sample size, outcome indicators, and overall study contexts – in most cases the studies in this review have only limited comparability. The summary of literature for each intervention instead highlights patterns within these characteristics but does not seek to explicitly compare the studies. Even when the same outcome was measured, variation in these characteristics as well as different analysis methods make it difficult to directly compare effect sizes between studies. The study characteristics and effect sizes are summarized in Tables 3–14, providing important information when interpreting these results. Where studies included multiple HES interventions they are discussed in each relevant section.

Provision interventions

Unconditional cash transfers. Five studies assessed the effect of unconditional cash transfers (UCTs) on adult HIV adherence, and findings were mixed (Table 3). One study was medium quality, three were low quality, and one was not able to be assessed for quality, highlighting a weak evidence base. Three studies evaluated the effect of the South Africa Disability Grant (SADG) on ART adherence. Eligibility for the SADG required CD4 counts below a defined threshold, and all three studies found that this requirement incentivized poor adherence to maintain grant eligibility (Haber et al., 2015; Jones, 2011; Phaswana-Mafuya et al., 2009). Because eligibility was tied to a low CD4 count, these results should not be generalized to other UCT interventions. The other two studies found positive associations between UCTs and self-reported ART adherence among adults, though one was a small qualitative study in Malawi (Miller & Tsoka, 2012), and in the other, transfers were only provided to highly vulnerable households in Ethiopia and were combined with several other forms of support (Bezabih, 2016).

Conditional cash transfers. Eight studies examined CCTs and retention and adherence outcomes, including one that evaluated retention in prevention of mother-to-child transmission (PMTCT) services (Table 4). Two studies were high quality, while two were medium, and one was low quality; three were not assessed. Five of the studies used experimental designs, more than any other intervention in this paper. At the same time, almost half of the studies were pilot feasibility studies, and five were conducted in high-income countries with diverse or vulnerable target groups. The wide range of transfer amounts (USD 2–100) and frequencies limit the comparability of results. There was also variation in the conditions – including clinical appointment attendance, correctly-timed pill bottle openings, and viral suppression – all of which were directly associated with the study outcomes.

A pilot CCT study with ART patients in the United States (U.S.) found that, among those with a detectable viral load at baseline, the proportion of undetectable viral load tests increased over the intervention period (Farber et al., 2013). A small study in the United Kingdom reported only trends of higher CD4 counts and greater viral suppression among perinatally infected adolescents receiving CCTs (Foster et al., 2014). Three other studies, all of which used experimental designs, found improvements on measures such as clinical appointment attendance (El-Sadr et al., 2015; Solomon et al., 2014), and timed pill bottle openings (Rigsby et al., 2000), but not on viral load or CD4 count. Similarly, clients participating in a randomized controlled trial (RCT) in Tanzania receiving nutrition assessment and counseling (NAC) plus a CCT were more likely to be retained in care and adherent compared to those receiving NAC only; clinical outcomes were not measured (McCoy et al., 2016).

Qualitative findings from a U.S.-based RCT sub-study found that CCTs were particularly motivating for moderate adherers at baseline (Tolley et al., 2016). A final experimental study in the Democratic Republic of the Congo found that CCTs given to HIV-positive pregnant women supported retention throughout the PMTCT cascade (Yotebieng et al., 2016).

Financial incentives. Four studies examined associations between financial incentives and ongoing care and treatment (Table 5). Two studies were high quality, while one was medium, and one was not assessed. A wide range of incentive amounts were used, each of which incentivized unique behaviors, limiting their comparability. The first study found that participants in an integrated community-based program in Uganda who received rent support had lower loss to follow-up (LTFU) and mortality than participants not getting



Figure 1. Evidence map excerpt for retention in care, ART Adherence, Morbidity, and Mortality.

this support (Talisuna-Alamo et al., 2012). Similarly, participants in an experimental study of a combined intervention in Swaziland that included incentives for attending clinical appointments had higher retention

and lower risk of death (McNairy et al., 2016). A U.S.-based RCT with hospitalized substance users also found that financial incentives were initially effective in improving viral suppression but effects were not

Table 3. Studies of unconditional cash transfers on adherence and retention outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Jones (2011)	Eastern Cape, South Africa	35 adults living with HIV	Ethnographic research	South African Disability Grant (ZAR 2000 or USD 125 per month)	The grant is provided to PLHIV with a CD4 of <200, which resulted in people refusing ART or modifying treatment in order to maintain a low CD4 count and remain eligible for the grant.	Medium
Bezabih (2016)	Ethiopia	1240 food insecure adult PLHIV	Comparative cross-sectional study to assess whether the HES interventions designed to address poverty and food security had an impact on HIV treatment adherence	Intervention participants received a series of trainings on business development and financial management, and formed saving and lending groups. Those with severe hunger received monthly cash or food support for 6 months.	At 36-month follow up, using the Visual Analogue Approach, participation in HES activities was significantly associated with a 2.4 factor increase in the odds of reporting $\geq 95\%$ ART adherence (95% CI: 1.699–3.435). Using the AIDS Clinical Trials Group questionnaire, participation in HES activities was associated with a 5.6 factor increase in reporting $\geq 95\%$ adherence (95% CI: 2.559–12.301).	Low
Miller and Tsoka (2012)	Mchinji, Malawi	24 PLHIV receiving the Malawian Social Cash Transfer (SCT)	Qualitative study to assess how PLHIV households use the SCT	SCT targets the poorest 10% of households and provides an average monthly grant of MWK 2000/USD 14 per month, depending on household size and number of school-aged children	37.5% of SCT recipients interviewed reported improvements in their ability to access ART; 41.7% reported improvements in their personal health.	Low
Phaswana-Mafuya, Peltzer, and Petros (2009)	Eastern Cape, South Africa	607 adults living with HIV and 25 stakeholders involved in administering the Disability Grant	Cross-sectional explorative descriptive study	South African Disability Grant (ZAR 2000 or USD 125 per month)	Being on the grant was associated with a CD4 of < 200 (39% for recipients and 30.6% for non-recipients, $p < 0.01$) and there was a trend toward greater reported non-adherence among grant recipients.	Low
Haber, Tanser, Herbst, Pillay, and Barnighausen (2015)	South Africa	1450 PLHIV with at least 1 recorded CD4 count above and below 200	2-stage panel regression analysis to assess trends in the population distribution of CD4 counts	South African Disability Grant (ZAR 2000 or USD 125 per month)	The distribution of CD4 counts shows an excess mass just below a CD4 count of 200 mmHg. The rate of recovery for those near the 200 threshold is 0.23 mmHg/year lower for grant recipients than non-recipients ($p = 0.02$), and the effect is stronger for women (differential recovery 58 mmHg/year, $p = 0.018$). This indicates a moderate but significant manipulation of CD4 counts to remain eligible for the grant.	Not Assessed

Table 4. Studies of conditional cash transfers on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Solomon et al. (2014)	Chennai, India	120 adult drug users who are HIV+ and ART naïve	Block RCT to evaluate the effectiveness of vouchers on linkage and retention in care among a difficult-to-treat population	Up to 15 vouchers for groceries or household items (USD 4–8 in value) could be earned for pre-specified actions: 1 for initiating ART, 12 for monthly clinical/ medication refill visits, and 2 for viral load suppression	Over 12 months, participants in the intervention arm completed more monthly clinical follow-up visits (8 visits vs. 3 visits, $p = .005$) than those in the control arm but vouchers had no effect on CD4 gains or viral suppression.	High
Yotebieng et al. (2016)	Kinshasa, Democratic Republic of the Congo	433 newly diagnosed HIV + pregnant women	RCT to determine whether CCTs increase the uptake of PMTCT services and retention in care	Cash payments starting at USD 5 and increasing by USD 1 at every visit, conditional on women attending scheduled clinic visits and completing associated actions such as providing a blood sample, delivering at a clinic, and accepting ART referrals	Intervention participants were more likely to be in care six weeks post-partum compared to controls (81% vs. 72%, $p = 0.055$). Intervention participants were also significantly more likely to have completed all PMTCT clinical visits and received all related services (68% vs. 54%, $p = 0.0037$).	High
Farber et al. (2013)	USA (unspecified)	77 patients receiving ART for > 1 year with a recent detectable viral load test	Pilot study to evaluate the feasibility and effectiveness of using transfers to improve ART adherence	Monetary payment of USD 100 conditional on either an undetectable viral load or having a viral load at least log ₁₀ lower than the lowest prior test (eligible once/quarter)	Among those with a detectable viral load, the proportion of undetectable viral load tests increased from 57% before the intervention to 69% ($p = 0.03$) at 12-month follow up, and ART prescription fills increased from a mean of 18.8 to 20.4 ($p = 0.02$). Among all participants there was no significant change in the proportion of tests with an undetectable viral load.	Medium
Rigsby et al. (2000)	West Haven and Hartford, Connecticut (USA)	55 ART clients, predominantly male (89%), African American (69%) with a history of heroin or cocaine use (80%)	Pilot RCT to assess the feasibility and efficacy of two interventions for improving ART adherence	One arm received cue-dose training using personalized cues to remember dose times (partial intervention), another arm (full intervention) used cue-dose training combined with cash reinforcements of between USD 2–10 for correctly timed bottle openings using Medication Event Monitoring System (MEMS)	During the four weeks of training the full intervention arm had significantly higher adherence compared to the control ($p < 0.05$) but there was no significant difference compared to the partial intervention. Over the follow-up period (weeks 5–12), adherence among the full intervention arm returned to near-baseline levels, remaining higher than the other two arms, but not significantly so. Mean changes in viral load from baseline to 12 weeks were not statistically different among the three study arms.	Medium
Foster, McDonald, Frize, Ayers, and Fidler (2014)	United Kingdom	11 adolescents with perinatally acquired HIV age 16–25, CD4 \leq 200, off ART despite multiple attempts, and willing to restart therapy	Single center pilot cohort study looking at the effect of transfers on viral load reduction/ suppression among perinatally infected adolescents	GBP 25 and 50 gift vouchers conditional on viral load test results and attendance at motivational interviewing sessions (total of GBP 200 possible over 12 months)	At 12 months 9 of 11 participants ever achieved an undetectable viral load (<50) and 5 of 11 maintained virologic suppression; mean CD4 gain was 90. At 24 months	Low

(Continued)

Table 4. Continued.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
El-Sadr, Branson, and Beauchamp (2015)	Bronx, NY, and Washington, DC (USA)	1346 HIV+ persons identified at HIV test sites; 15,780 patients on ART	Site-randomized RCT to assess the effectiveness of transfers in increasing linkage to care following HIV diagnosis, and viral suppression	Patients on ART received a USD 70 gift card every 3 months, conditional on having an undetectable viral load	(12 months post-intervention): 6 of 10 participants were virally suppressed, but 3 had VL > 1000; mean CD4 count gain was 122 but 4 participants showed CD4 decline from baseline despite gains at 12 months. There were no participant deaths. After 18 months, transfers did not significantly increase the overall proportion of virally suppressed clients, but sub-site analysis showed significant effects at hospital clinics, smaller sites, and sites with lower viral suppression at baseline. In sites that provided transfers, an 8% improvement in continuity of care (clinic visits in 4 of last 5 quarters) was seen ($p = 0.008$).	Not assessed
McCoy et al. (2016)	Shinganga, Tanzania	805 food insecure adult PLHIV who initiated ART within 90 days of enrollment	Individually randomized RCT to assess the effects of short-term cash and food assistance on food security, adherence, and retention	For 6 months, participants either received nutrition assessment and counseling (NAC) plus a cash transfer of 22,500 TZS (USD 11/ month), NAC plus a food basket worth USD 11, or NAC only. All interventions were conditional upon attending clinical visits.	At 12 months (six months after the end of the intervention), adherence (measured by medication possession ratio) was significantly higher among those in the NAC + cash (90.9%), and NAC + food (87.3%) groups, compared to the NAC only group (80.8%, $p < 0.01$). Appointment adherence was significantly higher among the NAC + cash (92.8%), and NAC + food (91.0%) participants, compared to the NAC only group (83.1%, $p < 0.01$). There were no significant differences between cash and food assistance.	Not Assessed
Tolley et al. (2016)	Bronx, NY, and Washington, DC (USA)	76 ART clients participating in RCT	Qualitative study (sub-study to RCT) that assessed adherence barriers and the role of conditional transfers in ART adherence, examining differences among three adherence levels	Patients on ART received a USD 70 gift card every 3 months, conditional on having an undetectable viral load	Most of the $n = 29$ participants classified at baseline as moderate adherers found the transfers motivating to achieve adherence. Among the $n = 31$ strong adherers, there were no negative attitudes toward the transfers, but less than 10% felt that they motivated their own adherence, having already established explicit routines. Similarly, for the $n = 13$ classified at baseline as low adherers, most felt the transfers did not change their adherence.	Not assessed

sustained (Metsch et al., 2016). A final study in Cambodia found no association between receipt of occasional cash assistance and retention in care (Daigle et al., 2015).

Transportation assistance. Seven studies evaluated transportation assistance (Table 6). A range of study designs were employed. Of these, one was medium-high quality, while five were medium, and one was low quality. Three studies assessed programs that included transport assistance as only one component of more comprehensive adherence-focused interventions. Two reported positive results on outcomes of viral suppression, mortality, self-reported adherence (Muñoz et al., 2011) and adherence verified through pill counts (Nyamathi et al., 2012), while the third reported only trends

of higher CD4 counts (Rich et al., 2012). A fourth study, found no independent association between transport assistance and ART appointment adherence in Cambodia (Daigle et al., 2015).

Qualitative data from studies of combined interventions in Tanzania, India and Cambodia indicate that the provision of transportation assistance, specifically, increased access to clinical sites for ART (Nsigaye et al., 2009; Zaveri, 2008), and participants in another qualitative study in Zambia reported that free transport to the clinic facilitated adherence (Sanjoba et al., 2008).

Food assistance. Fourteen studies evaluated food assistance and HIV care and treatment outcomes (Table 7). Of these, three studies were high quality, while two

Table 5. Studies of financial incentives on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Metsch et al. (2016)	11 hospitals throughout the USA	801 hospitalized PLHIV who are substance users	RCT to compare viral suppression between clients receiving patient navigation, with or without financial incentives, compared to a control group receiving the standard of care.	For six months one arm received patient navigation (case management and motivational interviewing) and another arm received patient navigation plus financial incentives up to USD 1160 for behaviors aimed at reducing substance use, increasing engagement in care and viral suppression	After six months, patients in the navigation plus incentives arm achieved greater viral suppression compared to the control arm (46.2% vs. 35.2%, $p = 0.04$). However, at 12 months (6 months after the end of the intervention), patient navigation with or without financial incentives had no effect on viral suppression.	High
Talisuna-Alamo et al. (2012)	Kampala, Uganda	6654 adult PLHIV who participated in the Reach Out Mbuya (ROM) program	Retrospective observational cohort evaluation to understand the contribution of socioeconomic support (none, 1 type, or 2+ types) to patient retention in care	ROM is a community-based ART program that provides socioeconomic support to clients in need, including food assistance, school fees, interest-free loans, entrepreneurial training, rent payment, and/or employment at ROM.	Over 10 years, patients receiving no socioeconomic support were 1.5 (95% CI: 1.39–1.64) times more likely to be LTFU and 1.5 (95% CI: 1.16–1.89) times more likely to die than those getting 1 service; and 6.7 (95% CI: 5.56–7.69) times more likely to be LTFU and 4.3 (95% CI: 2.94–6.25) times more likely to die than those getting 2+ services. Rent payment was independently associated with reduced LTFU and lower mortality ($p < 0.05$).	High
Daigle et al. (2015)	Battambang, Cambodia	287 adult PLHIV (19+ years old) on ART for at least 1 year	Retrospective data collection and client interviews to identify factors associated with on-time clinical appointment adherence	Several potential predictors were examined, including short/infrequent cash assistance.	There was no statistically significant association between short/infrequent cash assistance and ART appointment adherence.	Medium
McNairy et al. (2016)	Swaziland	2201 newly diagnosed PLHIV	Cluster RCT to evaluate the effectiveness of a combination intervention on linkage to care within one month and retention in care at 12 months, compared to the standard of care	Point of care CD4 at HIV diagnosis, accelerated ART, mobile appointment reminders, health education, and financial incentives of USD 8–10 in phone air time vouchers provided at linkage to care and clinic visits at 6 and 12 months.	Participants in the intervention arm had higher 12-month retention (RR = 1.45, $p < 0.0001$); and lower death before ART initiation (RR = 0.44, $p = 0.02$).	Not assessed

Table 6. Studies of transportation assistance on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Rich et al. (2012)	Southeastern Rwanda	1041 HIV+ adults enrolled in community-based ART	Retrospective medical record review/large-scale evaluation looking at the effectiveness of a multi-component intervention on retention, adherence, and viral suppression of ART clients	Community-based ART, including free ART with direct observation by community health worker, TB screening and treatment, food package for 10 months, transport for routine visits (USD 2/visit), and psychosocial support	After two years in the intervention 92.3% were retained in care, 5% had died, and 2.7% were LTFU/defaulted. CD4 was available for $n = 710$ retained patients and indicated the median increase was 323.5 cells from baseline to 2 years. Viral load testing of a convenience sample of those retained indicated that 84.4% had <40 copies and 97.5% had <500 copies.	Med-high
Daigle et al. (2015)	Battambang, Cambodia	287 adult PLHIV (19+ years old) on ART for at least 1 year	Retrospective data collection and client interviews to identify factors associated with on-time clinical appointment adherence	Several potential predictors were examined, including transport allowance for clinical visits and lodging for clinical visits.	There was no statistically significant association between transport or lodging assistance and ART appointment adherence.	Medium
Muñoz et al. (2011)	Lima Este, Peru	120 PLHIV recently started on highly active antiretroviral therapy (HAART)	Matched cohort study comparing ART adherence and mortality between community-based accompaniment with supervised ART (CASA) clients and matched controls eligible for ART at the tertiary hospital	CASA included 12 months of directly observed treatment (DOT-HAART), emotional and logistic support, medical care, transport, and nutritional support (when needed). Some also received peer support and/or microcredit plus food baskets.	At two years, CASA participants were more likely than controls to be on HAART (86.7% vs. 51.7%, $p < 0.01$), report adherence to HAART, (79.3% vs. 44.1%, $p = 0.01$), and achieve virologic suppression (66.7% vs. 46.7%, $p = 0.03$); CD4 cell counts did not differ significantly among groups. Time to death was significantly longer among individuals in the CASA group, compared with controls (HR = 0.29).	Medium
Nsigaye et al. (2009)	Mwanza, Tanzania	349 men and women who tested HIV+	Assessment of a pilot referral intervention on linkage to care following HIV diagnosis	Referral to HIV clinical treatment that included a transportation allowance and a community escort from a local home-based care (HBC) organization, plus supportive counseling	Qualitative data showed the benefits of the transport assistance as expressed by a female client: "The problem I had was about transport, that was what was troubling me. And at the time I didn't have any money that I could pay for my fare ... therefore I was not going there constantly ... But afterwards when I got a sponsor, they were giving me an allowance and I attended (adherence) training continuously."	Medium
Nyamathi et al. (2012)	Andhra Pradesh, India	68 HIV+ women age 18–45, on ART for at least 3 months with CD4 > 100	Prospective pilot RCT to assess the effectiveness of Asha-Life intervention in improving ART adherence compared to the standard of care	Asha-Life, which included positive living group classes, weekly home visits, and bus fare to clinical visits	At six months, improvements in ART adherence (measured through observed pill counts) were significantly higher in the intervention arm (from 41.7% to 99.3%, $p < 0.001$) compared to controls (from 54.9% to 60.6%).	Medium
Sanjoko, Frich, and Fretheim (2008)	Copperbelt Province, Zambia	60 ART patients and 12 health care workers	Qualitative study to explore the perceived facilitators and barriers to patient ART adherence	Free transport to the health facility	Free transport was reported to be a facilitator of ART adherence as highlighted by a female patient:	Medium

(Continued)

Table 6. Continued.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Zaveri (2008)	India, Bangladesh, and Cambodia	Children affected by HIV/AIDS	Case studies of four community-based programs and their effects on vulnerable and/or HIV-affected children	Each of the four programs included a number of economic strengthening and other supportive interventions	“Availability of free transport to take me to the hospital for review motivates me to continue taking my medicines. Otherwise if I had to use my own means, I was not going to manage.” In India and Cambodia, provision of transport costs (through grants or mobilized from the community) increased access to ART centers where they could get free ART.	Low

were medium-high, four were medium, and three were low quality; two were not assessed. Most evaluated food assistance in the context of other clinical or community-based programming, including health, psychosocial, and/or economic services, though 11 still assessed food assistance independently.

Eight studies evaluated monthly food rations for adult PLHIV in Africa, Latin America, the Caribbean, and the U.S., all of which had positive findings for at least some of the care and treatment outcomes studied, with no negative results (Byron et al., 2008; Cantrell et al., 2008; Egge & Strasser, 2006; Ivers et al., 2010; Martinez et al., 2014; McCoy et al., 2016; Tirivayi et al., 2012). While positive results were found for self-reported adherence, medication pick-up and appointment attendance, the only study that measured clinical outcomes found no association with improved CD4 counts (Tirivayi et al., 2012). A study with South African adolescents also found that food support was associated with better self-reported ART adherence in this population (Cluver et al., 2016). In contrast, a study in Cambodia found no association between receipt of food assistance and appointment adherence, though food was provided inconsistently, distinguishing this from predictable rations (Daigle et al., 2015).

Three studies evaluated community-based ART interventions that incorporated other support, including food aid. One had positive results – including greater likelihood of viral suppression – though only a portion of the participants received food support (Muñoz et al., 2011), while others did not report any significant results from food assistance (Rich et al., 2012; Talisuna-Alamo et al., 2012). In a final study, participants in a combined HES intervention, including monthly food support for those with severe hunger, reported better adherence than non-participants (Bezabih, 2016).

Educational support. Of the two studies of education support, one was high quality and the other medium quality (Table 8). The first found that HIV positive adults in a combined intervention in Uganda who received school fee support for their children were less likely to be LTFU and had a lower likelihood of mortality than intervention participants not getting this support (Talisuna-Alamo et al., 2012). The other found that support with school fees for HIV-positive adolescents in South Africa was not predictive of higher reported ART adherence (Cluver et al., 2016).

Protection interventions

Savings (individual and group). Three studies assessed savings support on these outcomes (Table 9). Two were medium quality, and one was low quality. An intervention in Ethiopia, including group savings and other HES components, was associated with better self-reported adherence than a comparison group (Bezabih, 2016). In contrast, participants in another program in Ethiopia with several health and HES services, including group savings and lending, unexpectedly reported lower levels of adherence and more opportunistic infections than the comparison group, though the participants’ mortality rate declined during the intervention period (Okello et al., 2013). The reason for these discordant findings is unclear though they may be due, in part, to the study’s sampling strategy. A third study in Zambia compared a combined HES and adherence support intervention that included individual savings, to adherence support alone, finding no difference in self-reported adherence between study arms (Masa, 2016).

Financial capabilities education and training. Only one medium quality study evaluated financial training (Table 10). Participants in an intervention in Zambia that

Table 7. Studies of food assistance on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Martinez et al. (2014)	Honduras	400 adults on ART	Cluster matched study to assess the effects of household food baskets plus nutrition education compared to nutrition education alone	Monthly World Food Programme (WFP) family food ration plus HIV-specific nutrition education	Both arms had a significant decrease in ART refill delays and the improvement was 19.6% larger for the group receiving food baskets at six months ($p < 0.01$) and 11.1% larger at 12 months ($p < 0.1$). Both arms had significant reductions in self-reported missed ART doses at six and 12 months compared to baseline, but there was no additional effect of the food baskets on this outcome. Similarly, both groups significantly increased clinical appointment adherence at six and 12 months, but there was no additional effect of the food baskets.	High
Talisuna-Alamo et al. (2012)	Kampala, Uganda	6654 adult PLHIV that participated in the Reach Out Mbuya (ROM) program	Retrospective observational cohort evaluation to understand the contribution of socioeconomic support (none, 1 type, or 2+ types) to patient retention in care	ROM is a community-based ART program that provides socioeconomic support to clients in need, including food assistance, school fees, interest-free loans, entrepreneurial training, rent payment, and/or employment at ROM.	Over 10 years, patients receiving no socioeconomic support were 1.5 (95% CI: 1.39–1.64) times more likely to be LTFU and 1.5 (95% CI: 1.16–1.89) times more likely to die than those getting 1 service; and 6.7 (95% CI: 5.56–7.69) times more likely to be LTFU and 4.3 (95% CI: 2.94–6.25) times more likely to die than those getting 2+ services. Food aid was not independently associated with reduced LTFU or lower mortality.	High
Tirivayi, Koethe, and Groot (2012)	Lusaka, Zambia	292 non-pregnant adult ART patients	Propensity score matched cohort study and retrospective analysis of clinical data to compare ART adherence among food recipients and non-recipients	Monthly WFP family food ration provided based on poverty and food insecurity screening.	After six months, food recipients had a higher ART adherence measured as medication possession ratio (98.3%) compared to non-recipients (88.8%, $p < 0.01$), but no significant differences were observed for CD4 cell count. The improvement in adherence was greater for those on ART for less than 230 days, with low BMI, more advanced disease, or a CD4 count < 350 .	High
Cantrell et al. (2008)	Lusaka, Zambia	636 food-insecure ART clients (age 15+) enrolled in home-based adherence support	Pilot study comparing ART adherence, CD4, and weight gain outcomes among patients receiving food rations, compared to those at control clinics	Monthly household food rations for 6–12 months provided to food-insecure ART patients (based on household food security assessment).	Over 12 months, adherence to ART (medication possession ratio of 95% or greater) was higher among patients receiving the intervention (70%) compared to controls (48%) (RR = 1.5, $p < 0.05$). There was no significant difference in CD4 cell response between the groups.	Med-high
Rich et al. (2012)	Southeastern Rwanda	1041 HIV+ adults enrolled in community-based ART	Retrospective medical record review/large-scale evaluation looking at the effectiveness of a multi-	Community-based ART, including free ART with direct observation by community health worker,	After two years in the intervention 92.3% were retained in care, 5% had died, and 2.7% were LTFU/	Med-high

(Continued)

Table 7. Continued.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
			component intervention on retention, adherence, and viral suppression of ART clients	TB screening and treatment, food package for 10 months, transport for routine visits (USD 2/visit), and psychosocial support	defaulted. CD4 was available for $n = 710$ retained patients and indicated the median increase was 323.5 cells from baseline to 2 years. Viral load testing of a convenience sample of those retained indicated that 84.4% had <40 copies and 97.5% had <500 copies.	
Cluver et al. (2016)	Eastern Cape, South Africa	1059 10–19-year-olds ever initiated on ART	Cross-sectional study to assess whether various forms of social protection are associated with adolescent ART adherence	Several social protection services/support were assessed, including food security and free school access and materials, among other non-HES “care” factors.	Food security assistance was associated with lower non-adherence (AOR = 0.57, $p < 0.001$) compared to those with no social protection support. There were strong additive effects when combined with participation in an HIV support group and parental supervision, but no multiplicative effects were found from combining these interventions.	Medium
Daigle et al. (2015)	Battambang, Cambodia	287 adult PLHIV (19+ years old) on ART for at least 1 year	Retrospective data collection and client interviews to identify factors associated with on-time clinical appointment adherence	Several potential predictors examined, including short/ infrequent food assistance	No statistically significant association was found between short/infrequent food assistance and ART appointment adherence.	Medium
Ivers, Chang, Gregory Jerome, and Freedberg (2010)	Central Haiti	600 HIV+ adults	Prospective observational cohort study to understand the effect of targeted food assistance on the health, food security, and quality of life of PLHIV	Monthly WFP family food ration provided to patients meeting health or socioeconomic criteria	At six months, the mean number of clinical visits attended by the food assistance group was significantly higher (5.49 of 6 visits) compared to the controls (2.82 of 6, $p < 0.001$). At 12 months the food assistance group had attended an average of 9.73 of 12 visits compared to 8.34 for controls ($p = 0.033$).	Medium
Muñoz et al. (2011)	Lima Este, Peru	120 PLHIV recently started on HAART	Matched cohort study comparing ART adherence and mortality between community-based accompaniment with supervised ART (CASA) clients and matched controls eligible for ART at the tertiary hospital	CASA included 12 months of DOT-HAART, emotional and logistic support, medical care, transport and nutritional support (when needed). Some also received peer support and/or microcredit plus food baskets.	At two years, CASA participants were more likely than controls to be on HAART (86.7% vs. 51.7%, $p < 0.01$), report adherence to HAART, (79.3% vs. 44.1%, $p = 0.01$), and achieve virologic suppression (66.7% vs. 46.7%, $p = 0.03$); CD4 cell counts did not differ significantly among groups. Time to death was significantly longer among individuals in the CASA group, compared with controls (HR = 0.29).	Medium
Bezabih (2016)	Ethiopia	1240 food insecure adult PLHIV	Comparative cross-sectional study to assess whether the HES interventions designed to address poverty and food security had an impact on HIV treatment adherence	Intervention participants received a series of trainings on business development and financial management, and formed saving and lending groups. Those with severe hunger received monthly cash or food support for 6 months.	At 36-month follow up, using the Visual Analogue Approach, participation in HES activities was significantly associated with a 2.4 factor increase in the odds of reporting $\geq 95\%$ ART adherence (95% CI: 1.699–3.435). Using the AIDS Clinical Trials Group	Low

(Continued)

Table 7. Continued.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Byron, Gillespie, and Nangami (2008)	North Rift Valley, Kenya	79 ART patients (intervention and non-intervention) and 18 key informants	Qualitative analysis of the program's effects on people on ART and implementation lessons	6–12 months household food rations (eligibility based on either nutritional or economic criteria) and nutrition education	questionnaire, participation in HES activities was associated with a 5.6 factor increase in reporting $\geq 95\%$ adherence (95% CI: 2.559–12.301). 58% of the patients enrolled in the program reported that it improved their adherence by decreasing medication side effects. All but one patient claimed that the food supplementation increased their physical health status. After weaning many clients had to restart the program due to problems with adherence, among other reasons.	Low
Egge and Strasser (2006)	Malawi, Zimbabwe, and Zambia	66 key informants, including Targeted Food Aid (TFA) beneficiaries	Qualitative study, including key informant interviews, group discussions, and observational visits, and collection of M&E tools to investigate practices for measuring the impact of TFA on beneficiaries	TFA included individual or household rations targeted to 4 HIV/AIDS-related beneficiary groups: PLHIV/chronically ill, PMTCT, ART, and TB patients	Beneficiaries reported reductions in morbidity and improvements in ART adherence from TFA, demonstrated by the following quotes: "Before food aid I had many challenges. I was sick, had stomach aches, heart palpitations, headaches, pneumonia. I started ARVs then got [food aid]. With drugs and food my physical problems decreased. [Since the food has been stopped], I have an increased problem taking the medication ... " Clinicians also emphasized the impact of food aid on treatment adherence, among other health outcomes.	Low
McCoy et al. (2016)	Shinganga, Tanzania	805 food insecure adult PLHIV who initiated ART within 90 days of enrollment	Individually randomized RCT to assess the effects of short-term cash and food assistance on food security, adherence and retention	For 6 months, participants either received nutrition assessment and counseling (NAC) plus a cash transfer of 22,500 TZS (USD 11/month), NAC plus a food basket worth USD 11, or NAC only. All interventions were conditional upon attending a clinical visit.	At 12 months (six months after the end of the intervention), adherence (measured by medication possession ratio) was significantly higher among those in the NAC + cash (90.9%), and NAC + food (87.3%) groups, compared to the NAC only group (80.8%, $p < 0.01$). Appointment adherence was significantly higher among the NAC + cash (92.8%) and NAC + food (91.0%), compared to the NAC only group (83.1%, $p < 0.01$). There were no significant differences between cash and food assistance.	Not Assessed
Palar et al. (2016)	San Francisco and Oakland, CA (USA)	30 PLHIV	Six-month pilot program to examine how providing food assistance may improve HIV health outcomes	Participants were provided with meals and snacks designed to comprise 100% of their daily energy/nutritional requirements.	The proportion of participants with 95% ART adherence increased from 47% at baseline to 70% after six months ($p = 0.046$).	Not Assessed

Table 8. Studies of educational support on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Talisuna-Alamo et al. (2012)	Kampala, Uganda	6654 adult PLHIV that participated in the Reach Out Mbuya (ROM) program	Retrospective observational cohort evaluation to understand the contribution of socioeconomic support (none, 1 type, or 2+ types) to patient retention in care	ROM is a community-based ART program that provides socioeconomic support to clients in need, including food assistance, school fees, interest-free loans, entrepreneurial training, rent payment, and/or employment at ROM.	Over 10 years, patients receiving no socioeconomic support were 1.5 (95% CI: 1.39–1.64) times more likely to be LTFU and 1.5 (95% CI: 1.16–1.89) times more likely to die than those getting 1 service; and 6.7 (95% CI: 5.56–7.69) times more likely to be LTFU and 4.3 (95% CI: 2.94–6.25) times more likely to die than those getting 2+ services. Payment of school fees was independently associated with reduced LTFU and lower mortality ($p < 0.05$).	High
Cluver et al. (2016)	Eastern Cape, South Africa	1059 10–19-year-olds ever initiated on ART	Cross-sectional study to assess whether various forms of social protection are associated with adolescent ART adherence	Several social protection services/support were assessed, including food security and free school access and materials, among other non-HES “care” factors.	Support with access to school was not a significant predictor of ART adherence.	Medium

provided financial education, other HES support, and adherence counseling, were no more likely to report ART adherence than those receiving adherence counseling only (Masa, 2016).

Income generation. Eight studies were identified that examined income generating activities (IGAs) (Table 11). Two studies were medium-high quality, while five were medium, and one was low quality. Two studies assessed IGAs independently: one found no association between participation in IGAs and retention in care in Cambodia (Daigle et al., 2015), while a qualitative study in Zambia found that IGAs motivated ART adherence (Sanjobo et al., 2008).

Six more studies evaluated the effectiveness of combined interventions, some of which had explicit health components. Two studies of integrated health and HES support, including IGAs, in Uganda and Ethiopia found no association with self-reported experiences of disease and ART adherence, respectively (Abimanyi-Ochom et al., 2013; Masa, 2016). A third study, in Ethiopia, unexpectedly found negative associations between participation in an HES and health intervention and self-reported ART adherence and opportunistic infections, though improvements were seen in participants’ mortality rate during the intervention period (Okello et al., 2013). As noted above, these findings may be due, in part, to the study’s sampling approach.

In contrast, an experimental study of an IGA and microcredit intervention in Kenya found positive results

for CD4 counts and viral suppression (Weiser et al., 2015). A qualitative sub-study found ART adherence was improved by reducing food insecurity, increasing access to transport, and improving social capital and a desire to prioritize health (Weiser et al., 2017). The preceding feasibility study of the same intervention reported only positive trends for CD4 counts (Pandit et al., 2010).

Promotion interventions

Microcredit. Seven studies evaluated care and treatment outcomes of microcredit programs (Table 12). Of these, one study was high quality, while two were medium-high, and four were medium quality. All but one study found positive results, with no negative findings. Only two studies looked at microcredit independently, finding that that receipt of a loan was associated with better appointment adherence in Cambodia (Daigle et al., 2015), and lower LTFU and reduced mortality in Uganda (Talisuna-Alamo et al., 2012).

An experimental study of a combined microcredit and IGA intervention in Kenya, also cited in the section on IGAs, found promising results related to CD4 and viral suppression (Weiser et al., 2015); a related qualitative study highlighted the pathways by which the intervention affected these outcomes (Weiser et al., 2017). The preceding feasibility study was not powered to detect significant differences in CD4 counts but found positive trends (Pandit et al., 2010). Two studies that combined ART adherence support and HES, including microcredit, yielded positive findings in relation to self-reported adherence (Arrivillaga et al., 2014),

Table 9. Studies of savings on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
<i>Individual Savings</i>						
Masa (2016)	Lundazi District, Eastern Province, Zambia	101 economically poor adult PLHIV on ART	Pre- and post-test study with non-equivalent groups to evaluate the effects of the Health and Wealth Program on food security and ART adherence.	The intervention group received IGA support (cash to purchase an income generating asset and business training), access to individual savings, financial education, health training, and adherence counseling. The control group received adherence counseling only.	After one year of implementation, when controlling for baseline adherence, intervention participants were more likely to report optimal adherence compared to controls, but the result was not statistically significant.	Medium
<i>Group Savings</i>						
Okello, Stuer, Kidane, and Wube (2013)	Four regions of Ethiopia	2168 adult PLHIV	Propensity-score matched cross-sectional survey, plus longitudinal program data to assess health, social, and economic effects of the community and home-based care (CHBC) program	CHBC program, including provision of health care, psychosocial support, and training of households in IGAs, community self-help, and savings and loans groups, and mobilizing communities to provide shelter, clothing, and other basic needs.	A significantly higher percentage of individuals in the control group (95%) reported they were currently receiving ART compared to those receiving the intervention for at least a year (91%, $p = 0.001$). A significantly higher percentage in the control group also reported not having an opportunistic infection in the past six months (53.8%) compared to the intervention group (45.5%, $p = 0.000$). The annual mortality rate among program clients declined from 10% in 2005 to 0.7% in 2009.	Medium
Bezabih (2016)	Ethiopia	1240 food insecure adult PLHIV	Comparative cross-sectional study to assess whether the HES interventions designed to address poverty and food security had an impact on HIV treatment adherence	Intervention participants received a series of trainings on business development and financial management, and formed savings and lending groups. Those with severe hunger received monthly cash or food support for 6 months.	At 36-month follow up, using the Visual Analogue Approach, participation in HES activities was significantly associated with a 2.4 factor increase in the odds of reporting $\geq 95\%$ ART adherence (95% CI: 1.699–3.435). Using the AIDS Clinical Trials Group questionnaire, participation in HES activities was associated with a 5.6 factor increase in reporting $\geq 95\%$ adherence (95% CI: 2.559–12.301).	Low

virologic suppression, and mortality (Muñoz et al., 2011). However, in the latter study only a fraction of intervention participants received microcredit services, therefore the results may be unrelated to this intervention component.

Vocational and entrepreneurial training. Three studies of varied quality assessed entrepreneurial training interventions; one was high quality, one medium quality, and one low quality (Table 13). Two evaluated entrepreneurial training as components of larger

Table 10. Studies of financial education and training on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Masa (2016)	Lundazi District, Eastern Province, Zambia	101 economically poor adult PLHIV on ART	Pre- and post-test study with non-equivalent groups to evaluate the effects of the Health and Wealth Program on food security and ART adherence.	The intervention group received IGA support (cash to purchase an income generating asset and business training), access to individual savings, financial education, health training, and adherence counseling. The control group received adherence counseling only.	After one year of implementation, when controlling for baseline adherence, intervention participants were more likely to report optimal adherence compared to controls, but the result was not statistically significant.	Medium

Table 11. Studies of income generation on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Weiser et al. (2015)	Nyanza Region, Kenya	140 PLHIV age 18–49 in an ART care and treatment program, and with moderate to severe food insecurity	Two site cluster RCT to assess the health outcomes of the Shamba Maisha intervention	After a down payment of KES 500/USD 6, loans of USD 150 were given to purchase farming equipment and a water pump. The intervention arm also received agricultural and financial management training sessions.	After one year, CD4 counts in the intervention group increased significantly by an average of 75.6 cells for intervention participants and decreased by 89.3 cells for controls ($p < 0.001$). The proportion those in the intervention group who were virologically suppressed increased from 51% to 79%, and decreased from 72% to 67% in the control group (comparative improvement of the intervention group = 33%, $p < 0.002$)	Med-high
Weiser et al. (2017)	Nyanza Region, Kenya	54 PLHIV aged 18–49 in ART care who participated in in the Shamba Maisha RCT; 20 key informants	Longitudinal qualitative study using in-depth interviews to understand how and why the Shamba Maisha livelihood intervention affected health and health behaviors	After a down payment of KES 500/USD 6, loans of USD 150 were given to purchase farming equipment and a water pump. The intervention arm also received agricultural and financial management training sessions	Over one year of implementation, Shamba Maisha affected participants' clinic attendance and ART adherence through several mechanisms: reducing food insecurity and hunger, improving financial stability (including access to transport), improving productivity which enhanced social support, improving control over work situations, and renewed desire to prioritize own health. These changes were not described by control participants.	Med-high
Daigle et al. (2015)	Battambang, Cambodia	287 adult PLHIV (19+ years old) on ART for at least 1 year	Retrospective data collection and client interviews to identify factors associated with on-time clinical appointment adherence	Several potential predictors examined, including income-generating activities	There was no statistically significant association between IGA participation and ART appointment adherence.	Medium
Masa (2016)	Lundazi District, Eastern Province, Zambia	101 economically poor adult PLHIV on ART	Pre- and post-test study with non-equivalent groups to evaluate the effects of the Health and Wealth Program on food security and ART adherence.	The intervention group received IGA support (cash to purchase an income generating asset and business training), access to individual savings, financial education, health training, and adherence counseling. The control group received adherence counseling only.	After one year of implementation, when controlling for baseline adherence, intervention participants were more likely to report optimal adherence compared to controls, but the result was not statistically significant.	Medium
Okello et al. (2013)	Four regions of Ethiopia	2168 adult PLHIV	Propensity-score matched cross-sectional survey, plus longitudinal program data to assess health, social, and economic effects of the community and home-based care (CHBC) program	CHBC program, including provision of health care, psychosocial support, and training of households in IGAs, community self-help, and savings and loan groups, and mobilizing communities to provide shelter, clothing, and other basic needs	A significantly higher percentage of individuals in the control group (95%) reported they were currently receiving ART compared to those receiving the intervention for at least a year (91%, $p = 0.001$). A significantly higher percentage in the control group also reported not having an	Medium

(Continued)

Table 11. Continued.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
					opportunistic infection in the past 6 months (53.8%) compared to the intervention group (45.5%, $p = 0.000$). The annual mortality rate among program clients declined from 10% in 2005 to 0.7% in 2009.	
Pandit et al. (2010)	Kisumu, Kenya	29 HIV+ farmers who were participants in an HIV care and treatment program	Pre- and post-intervention surveys and end line FGDs to test the feasibility of the intervention and assess the health and economic effects	After a down payment of KES 600/USD 8, farmers received an in-kind loan (worth KES 6600/USD 95) of farming inputs, including an irrigation pump, a selection of seeds, fertilizer, and pesticides, as well as training on the pump and preparing fields.	After 12 months, there were no significant changes in CD4 counts though all three patients with CD4 counts below 200 at baseline had increased to over 200 at end line. Of the six participants that were not on ART at baseline, two were started on ART by the 12-month time point.	Medium
Sanjoko et al. (2008)	Copperbelt Province, Zambia	60 ART patients and 12 health care workers	Qualitative study to explore the perceived facilitators and barriers to patient ART adherence	Support groups that had IGAs	Patients and health care providers indicated that patients who belonged to a support group with IGAs were motivated to continue their medication, as explained by this male patient: "Our support group runs a grocery and a hammer mill. Part of the money we generate assists us to support ourselves. This has motivated many of us to continue with our treatments."	Medium
Abimanyi-Ochom, Lorgelly, Hollingsworth, and Inder (2013)	Central Uganda	450 PLHIV households and a total of 908 adults	Cross-sectional survey comparing characteristics of household members served by Ministry of Health (MOH) to those served by The AIDS Service Organization (TASO)	TASO-served households receive ART plus social support, including home-based care (HBC) and group IGAs in one site, and HBC, group IGAs, plus the provision of cows, ag tools and inputs, and ag training in the other site. MOH-served households only received ART.	There were no statistically significant differences in self-reported occurrence of either chronic or acute disease between adults in the TASO and MOH households.	Low

interventions aimed at supporting ART adherence. One, conducted with females in Colombia, found that self-reported adherence improved over the intervention period (Arrivillaga et al., 2014); the other found entrepreneurial training was independently associated with lower LTFU and reduced mortality among adult PLHIV in Uganda (Talisuna-Alamo et al., 2012). Similarly, participants in an intervention in Ethiopia which included entrepreneurial training and other HES support, reported better adherence than a comparison group (Bezabih, 2016).

Employment support. Only one high quality study evaluated the effectiveness of employment support (Table 14). A community-based ART program in

Uganda provided additional socioeconomic support to clients, as needed, including employment with the program for some. The study found that employment support was independently associated with lower LTFU and lower mortality (Talisuna-Alamo et al., 2012).

Ongoing studies

One ongoing study was also identified which is assessing the effectiveness of an integrated HES and ART adherence intervention, compared to adherence support alone, for younger adolescents in Uganda. The HES intervention combines savings, financial capabilities training, and entrepreneurial training, and will increase the evidence base for these interventions, and may support the identification of stronger trends, which are

Table 12. Studies of microcredit on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Talisuna-Alamo et al. (2012)	Kampala, Uganda	6654 adult PLHIV that participated in the Reach Out Mbuya (ROM) program	Retrospective observational cohort evaluation to understand the contribution of socio-economic support (none, 1 type, or 2+ types) to patient retention in care	ROM is a community-based ART program that provides socioeconomic support to clients in need, including food assistance, school fees, interest-free loans, entrepreneurial training, rent payment, and/or employment at ROM.	Over 10 years, patients receiving no socioeconomic support were 1.5 (95% CI: 1.39–1.64) times more likely to be LTFU and 1.5 (95% CI: 1.16–1.89) times more likely to die than those getting 1 service; and 6.7 (95% CI: 5.56–7.69) times more likely to be LTFU and 4.3 (95% CI: 2.94–6.25) times more likely to die than those getting 2+ services. Receipt of interest-free loans was independently associated with reduced LTFU and lower mortality ($p < 0.05$).	High
Weiser et al. (2015)	Nyanza Region, Kenya	140 PLHIV age 18–49 in an ART care and treatment program, and with moderate to severe food insecurity	Two site cluster RCT to assess the health outcomes of the Shamba Maisha intervention	After a down payment of KES 500/USD 6, loans of USD 150 were given to purchase farming equipment and a water pump. The intervention arm also received agricultural and financial management training sessions.	After one year, CD4 counts in the intervention group increased significantly by an average of 75.6 cells/ul for intervention participants and decreased by 89.3 cells for controls ($p < 0.001$). The proportion those in the intervention group who were virologically suppressed increased from 51% to 79%, and decreased from 72% to 67% in the control group (comparative improvement of the intervention group = 33%, $p < 0.002$).	Med-high
Weiser et al. (2017)	Nyanza Region, Kenya	54 PLHIV aged 18–49 in ART care who participated in the Shamba Maisha RCT; 20 key informants	Longitudinal qualitative study using in-depth interviews to understand how and why the Shamba Maisha livelihood intervention affected health and health behaviors	After a down payment of KES 500/USD 6, loans of USD 150 were given to purchase farming equipment and a water pump. The intervention arm also received agricultural and financial management training sessions.	Over one year of implementation, Shamba Maisha affected participants' clinic attendance and ART adherence through several mechanisms: reducing food insecurity and hunger, improving financial stability (including access to transport), improving productivity that enhanced social support, improving control over work situations, and renewed desire to prioritize own health. These changes were not described by control participants.	Med-high
Arrivillaga, Salcedo, and Pérez (2014)	Cali, Columbia	48 literate, low-income, adult, HIV + women on ART for 6+ months	Pre- and post-test without controls to assess the effectiveness of the intervention on health outcomes and business formation	The IMEA intervention incorporates microcredit and entrepreneurship training, microenterprise implementation support, and treatment adherence workshops.	After 15 months, participants' adherence to treatment increased from 16.5% to 52.5% ($p < .001$).	Medium

(Continued)

Table 12. Continued.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Daigle et al. (2015)	Battambang, Cambodia	287 adult PLHIV (19 + years old) on ART for at least 1 year	Retrospective data collection and client interviews to identify factors associated with on-time clinical appointment adherence	Several potential predictors were examined, including microcredit loans.	Being a member of a microcredit group who received a loan during the study period was associated with ART appointment adherence (OR = 2.45, $p = 0.04$).	Medium
Muñoz et al. (2011)	Lima Este, Peru	120 PLHIV recently started on HAART	Matched cohort study comparing ART adherence and mortality between community-based accompaniment with supervised ART (CASA) clients and matched controls eligible for ART at the tertiary hospital	CASA included 12 months of DOT-HAART, emotional and logistic support, medical care, transport, and nutritional support (when needed). Some also received peer support and/or microcredit plus food baskets.	At two years, CASA participants were more likely than controls to be on HAART (86.7% vs. 51.7%, $p < 0.01$), report adherence to HAART, (79.3% vs. 44.1%, $p = 0.01$), and achieve virologic suppression (66.7% vs. 46.7%, $p = 0.03$); CD4 cell counts did not differ significantly among groups. Time to death was significantly longer among individuals in the CASA group, compared with controls (HR = 0.29). Only 10 (16.7%) participants received microcredit services, but all were on HAART at 24 months	Medium
Pandit et al. (2010)	Kisumu, Kenya	29 HIV+ farmers who were participants in an HIV care and treatment program	Pre- and post-intervention surveys and end line FGDs to test the feasibility of the intervention and assess the health and economic effects	After a down payment of KES 600/USD 8, farmers received an in-kind loan (worth KES 6600/USD 95) of farming inputs, including an irrigation pump, a selection of seeds, fertilizer, and pesticides, as well as training on the pump and preparing fields.	After 12 months, there were no significant changes in CD4 counts though all three patients with CD4 counts below 200 at baseline had increased to over 200 at end line. Of the six participants that were not on ART at baseline, two were started on ART by the 12-month time point.	Medium

currently lacking. However, without a factorial design the relative contributions of these different intervention components will not be measured (Table 15).

Discussion

As the universal test and treat approach is implemented globally, more individuals are initiating ART immediately following their HIV diagnosis, regardless of clinical stage. Keeping new initiates in care and adherent to ART is essential to their health and to epidemic control. Yet people in resource constrained contexts face a wide range of barriers to care. Economic barriers such as transportation costs, lost opportunity costs, and food insecurity threaten ongoing care and treatment objectives and must be addressed to ensure progress toward the UNAIDS 90-90-90 goals. For those who are economically insecure, HES interventions are increasingly integrated into adherence-focused interventions to

mitigate these barriers. Thirty-eight citations were identified that evaluated HES interventions and ongoing care and treatment outcomes. This research represents evidence from 20 countries, though 63% of the studies were conducted in sub-Saharan Africa.

Because food insecurity is highly correlated with poverty and is a known barrier to ART adherence (Young et al., 2014), food support is an intuitive type of assistance for improving care and treatment outcomes. The quality associated with the literature on food assistance is mixed, though the studies collectively indicate this support – particularly monthly food rations – is associated with improved medication pick-up, appointment attendance and self-reported adherence. Few studies measured clinical outcomes, but these results were less conclusive. In addition, some studies targeted highly vulnerable populations for this support, which could differentially affect health outcomes. The evidence for CCTs is also primarily positive for improved appointment

Table 13. Studies of vocational and entrepreneurial training on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Talisuna-Alamo et al. (2012)	Kampala, Uganda	6654 adult PLHIV that participated in the Reach Out Mbuya (ROM) program	Retrospective observational cohort evaluation to understand the contribution of socioeconomic support (none, 1 type, or 2+ types) to patient retention in care	ROM is a community-based ART program that provides socioeconomic support to clients in need, including food assistance, school fees, interest-free loans, entrepreneurial training, rent payment, and/or employment at ROM.	Over 10 years, patients receiving no socioeconomic support were 1.5 (95% CI: 1.39–1.64) times more likely to be LTFU and 1.5 (95% CI: 1.16–1.89) times more likely to die than those getting 1 service; and 6.7 (95% CI: 5.56–7.69) times more likely to be LTFU and 4.3 (95% CI: 2.94–6.25) times more likely to die than those getting 2+ services. Receipt of entrepreneurial training was independently associated with reduced LTFU and lower mortality ($p < 0.05$).	High
Arrivillaga et al. (2014)	Cali, Columbia	48 literate, low-income, adult, HIV+ women on ART for 6+ months	Pre- and post-test without controls to assess the effectiveness of the intervention on health outcomes and business formation	The IMEA intervention incorporates microcredit and entrepreneurship training, microenterprise implementation support, and treatment adherence workshops	After 15 months, participants' adherence to treatment increased from 16.5 to 52.5 ($p < .001$).	Medium
Bezabih (2016)	Ethiopia	1240 food insecure adult PLHIV	Comparative cross-sectional study to assess whether the HES interventions designed to address poverty and food security had an impact on HIV treatment adherence	Intervention participants received a series of trainings on business development and financial management, and formed savings and lending groups. Those with severe hunger received monthly cash or food support for 6 months.	At 36-month follow up, using the Visual Analogue Approach, participation in HES activities was significantly associated with a 2.4 factor increase in the odds of reporting $\geq 95\%$ ART adherence (95% CI: 1.699–3.435). Using the AIDS Clinical Trials Group questionnaire, participation in HES activities was associated with a 5.6 factor increase in reporting $\geq 95\%$ adherence (95% CI: 2.559–12.301).	Low

attendance and medication pick-up, but null for most clinical outcomes (CD4 and viral load) measured.

The smaller evidence base for financial incentives highlights a mix of positive and null results, possibly

indicating that the ongoing nature of CTs is more effective in supporting these ongoing care and treatment outcomes. Although studies of transportation assistance primarily reported positive outcomes, most assessed

Table 14. Studies of employment support on retention and adherence outcomes.

Author & Date	Location	Study Population	Study Design	Intervention	Main Results	Quality Ranking
Talisuna-Alamo et al. (2012)	Kampala, Uganda	6654 adult PLHIV that participated in the Reach Out Mbuya (ROM) program	Retrospective observational cohort evaluation to understand the contribution of socioeconomic support (none, 1 type, or 2+ types) to patient retention in care	ROM is a community-based ART program that provides socioeconomic support to clients in need, including food assistance, school fees, interest-free loans, entrepreneurial training, rent payment, and/or employment at ROM.	Over 10 years, patients receiving no socioeconomic support were 1.5 (95% CI: 1.39–1.64) times more likely to be LTFU and 1.5 (95% CI: 1.16–1.89) times more likely to die than those getting 1 service; and 6.7 (95% CI: 5.56–7.69) times more likely to be LTFU and 4.3 (95% CI: 2.94–6.25) times more likely to die than those getting 2+ services. Employment support was independently associated with reduced LTFU and lower mortality ($p < 0.05$).	High

Table 15. Ongoing studies of retention and adherence outcomes.

Study Title	Location	Study Population	Study Design	Intervention	Outcomes Studied
Evaluating a Youth-Focused Economic Empowerment Approach to HIV Treatment Adherence	Greater Masaka, Uganda	702 HIV+ adolescents age 10–16 in care	5-year cluster RCT	Savings accounts, financial management training, microenterprise training, and adherence information, compared to adherence information alone	ART adherence

the effects of combined interventions, indicating that transportation assistance may be a beneficial component of adherence-focused interventions.

The overall quality of evidence for IGAs is moderate, and most studies relied on relatively small sample sizes, and assessed combined interventions. These studies reveal inconsistent findings which may be partially explained by the wide variation in the interventions themselves, and in the specific outcomes measured. Microcredit studies also primarily assessed combined interventions and relied on small samples sizes, though positive trends spanned care seeking, as well as clinical outcomes of CD4 counts, viral suppression, and mortality. Unlike the literature on microcredit for HIV prevention outcomes, however, none of these studies reported effects on violence or increased vulnerability, which may warrant further exploration. Evidence for UCTs, education support, financial education, savings, entrepreneurial training, and employment support is too limited and varied to identify clear trends.

Half of the studies in this paper relied on self-reported data for at least some outcomes, while clinical record data (e.g., visit history, medication pick up and similar measures) were assessed in 42%, and clinical outcome data (CD4 count and viral load) were assessed in nearly 32% of the studies (eight studies looked at multiple outcomes that spanned these larger outcome categories). Compared to self-reported outcomes and clinical record data on visit history and medication pick-up, where results were consistently positive with few exceptions, CD4 count and viral suppression outcomes were primarily null. While self-reported measures of adherence and retention are subject to bias, the clinical record data provide greater confidence in positive behavioral trends. However, future research using longer intervention and follow-up periods is needed to confirm whether HES can have an effect beyond behavior change and improve clinical health outcomes.

Nearly 82% of studies in this part of the series were based on or included provision components, while only 24 and 21%, respectively, included protection and promotion interventions. The comparatively limited data on protection and promotion interventions restricts our understanding of their value in the context of ongoing HIV care and treatment. In many contexts, the need for ongoing resources makes some provision interventions less viable outside of a government

supported program. Given the lifelong nature of ART, prioritizing research on protection and promotion interventions will improve our understanding of the effectiveness of program approaches that have the potential to support long-lasting care and treatment benefits. While most of the included studies assessed the direct associations of intervention components on the outcomes of interest, nearly 32% only assessed the effectiveness of integrated interventions, preventing a clear understanding of the individual association between each intervention component and these outcomes.

The study limitations are discussed in greater detail in the first paper in this series (Swann, 2018a). They include the introduction of reviewer bias in the inclusion of a quality assessment, which was mitigated through the creation of a structured codebook and using two reviewers. Categorization of studies into each intervention and outcome was done through a thorough assessment of the study details; when methodological details were limited, categorization was based careful review of available information. Given the variation in study characteristics, there may be additional trends which were not identified from the analytical framework used.

Conclusions

The evidence for food assistance – particularly monthly food rations – as well as CCTs shows a positive association with ongoing care and treatment outcomes, signifying that these types of HES support may be an important component of adherence efforts in many contexts. Transportation assistance, IGAs and microcredit also highlight positive trends, though evidence quality is moderate and based heavily on combined interventions. Overall, the evidence is more conclusive for self-reported and clinically-documented behaviors, while outcomes related to CD4 counts and viral suppression were mostly null.

Additional research is needed to understand possible effects of protection and promotion interventions on these outcomes. Stronger research designs are needed to more fully understand the effect of HES interventions on retention and adherence, particularly when they are provided within an integrated package of services.

Research and evaluation efforts going forward should incorporate clinical data on CD4 counts and viral load, where possible, to strengthen findings.

Note

1. Green (positive) = positive findings on one or more primary outcome of interest and no negative findings; blue (null) = no effect/association was observed on primary outcome(s) or study was under-powered; yellow (mixed) = a mix of positive and negative results on primary outcomes of interest; and red (negative) = negative findings on one or more primary outcomes of interest and no positive findings.

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References

- Abimanyi-Ochom, J., Lorgelly, P., Hollingsworth, B., & Inder, B. (2013). Does social support in addition to ART make a difference? Comparison of households with TASO and MOH PLWHA in central Uganda. *AIDS Care*, 25(5), 619–626. doi:10.1080/09540121.2012.726337
- Adato, M., & Bassett, L. (2012). Social protection and cash transfers to strengthen families affected by HIV and AIDS. In M. Adato, & L. Bassett (Eds.), *Social protection and cash transfers to strengthen families affected by HIV and AIDS* (pp. 1–3). Washington: International Food Policy Research Institute.
- Anema, A., Vogenthaler, N., Frongillo, E. A., Kadiyala, S., & Weiser, S. D. (2009). Food insecurity and HIV/AIDS: Current knowledge, gaps, and research priorities. *Current HIV/AIDS Reports*, 6(4), 224–231.
- Arrivillaga, M., Salcedo, J. P., & Pérez, M. (2014). The IMEA project: An intervention based on microfinance, entrepreneurship, and adherence to treatment for women with HIV/AIDS living in poverty. *AIDS Education and Prevention*, 26(5), 398–410. doi:10.1521/aeap.2014.26.5.398
- Bezabih, T. (2016). *Urban HIV and AIDS nutrition and food security project economic strengthening key outcome level results*. Addis Ababa: WFP Ethiopia Country Office.
- Byron, E., Gillespie, S., & Nangami, M. (2008). Integrating nutrition security with treatment of people living with HIV: Lessons from Kenya. *Food and Nutrition Bulletin*, 29(2), 87–97.
- Cantrell, R. A., Sinkala, M., Megazinni, K., Lawson-Marriott, S., Washington, S., Chi, B. H., ... Stringer, J. S. (2008). A pilot study of food supplementation to improve adherence to antiretroviral therapy among food-insecure adults in Lusaka, Zambia. *Journal of Acquired Immune Deficiency Syndromes*, 49(2), 190–195. doi:10.1097/QAI.0b013e31818455d2
- Centers for Disease Control and Prevention. (2014). *Understanding the HIV Care Continuum*.
- Cluver, L. D., Operario, D., Lane, T., & Kganakga, M. (2011). “I can’t go to school and leave her in so much pain”: educational shortfalls among adolescent “young carers” in the South African AIDS epidemic. *Journal of Adolescent Research*, 27(5), 581–605. doi:10.1177/0743558411417868
- Cluver, L. D., Toska, E., Orkin, M., Meincka, F., Hodesa, R., Yakubovicha, A., & Sherr, L. (2016). Achieving equity in HIV-treatment outcomes: Can social protection improve adolescent ART-adherence in South Africa? *AIDS Care*, 28(NO. S2), 1–10.
- Daigle, G. T., Jolly, P. E., Chamot, E. A. M., Ehiri, J., Zhang, K., Khan, E., & Sou, S. (2015). System-level factors as predictors of adherence to clinical appointment schedules in antiretroviral therapy in Cambodia. *AIDS Care*, 27(7), 836–843. doi:10.1080/09540121.2015.1024098
- Deb, A., & Kubzansky, M. (2012). *Bridging the gap: The business case for financial capability*. New York: Monitor Group and Citi Foundation.
- DFID. (2014). *Assessing the strength of evidence*. London: DFID.
- EGGE, K., & STRASSER, S. (2006). Measuring the impact of targeted food assistance on HIV/AIDS-related beneficiary groups: Monitoring and evaluation indicators. In S. E. Gillespie (Ed.), *AIDS, poverty, and hunger* (pp. 305–324). Washington, D.C.: International Food Policy Research Institute (IFPRI).
- El-Sadr, W., Branson, B., & Beauchamp, G. (2015). *Effect of financial incentives on linkage to care and viral suppression: HPTN 065*. Seattle: CROI.
- Farber, S., Tate, J., Frank, C., Ardito, D., Kozal, M., Justice, A. C., & Braithwaite, R. S. (2013). A study of financial incentives to reduce plasma HIV RNA among patients in care. *AIDS and Behavior*, 17(7), 2293–2300. doi:10.1007/s10461-013-0416-1
- Foster, C., McDonald, S., Frize, G., Ayers, S., & Fidler, S. (2014). “Payment by results”--financial incentives and

- motivational interviewing, adherence interventions in young adults with perinatally acquired HIV-1 infection: A pilot program. *AIDS Patient Care and STDS*, 28(1), 28–32. doi:10.1089/apc.2013.0262
- Guo, Y., Li, X., & Sherr, L. (2012). The impact of HIV/AIDS on children's educational outcome: A critical review of global literature. *AIDS Care*, 24(8), 993–1012. doi:10.1080/09540121.2012.668170
- Haber, N., Tanser, F., Herbst, K., Pillay, D., & Barnighausen, T. (2015). Negative impact of South Africa's disability grants on HIV/AIDS recovery. *Journal of the International AIDS Society*, 18(Suppl 4), 45–45.
- Haberer, J. E., Sabin, L., Amico, K. R., Orrell, C., Galarraga, O., Tsai, A. C., ... Bangsberg, D. R. (2017). Improving antiretroviral therapy adherence in resource-limited settings at scale: A discussion of interventions and recommendations. *Journal of The international Aids Society*, 20(1), 1–15. doi:10.7448/ias.20.1.21371
- Heise, L., Lutz, B., Ranganathan, M., & Watts, C. (2013). Cash transfers for HIV prevention: Considering their potential. *Journal of the International AIDS Society*, 16, 18615. doi:10.7448/ias.16.1.18615
- Ivers, L. C., Chang, Y., Gregory Jerome, J., & Freedberg, K. A. (2010). Food assistance is associated with improved body mass index, food security and attendance at clinic in an HIV program in central Haiti: A prospective observational cohort study. *AIDS Research and Therapy*, 7, 33. doi:10.1186/1742-6405-7-33
- Joint United Nations Programme on HIV/AIDS (UNAIDS). (2014). *90-90-90: an ambitious treatment target to help end the AIDS epidemic*. Geneva: UNAIDS.
- Joint United Nations Programme on HIV/AIDS (UNAIDS). (2017). *Ending AIDS: Progress towards the 90-90-90 targets global AIDS update*. Geneva: UNAIDS.
- Jones, C. (2011). "If I take my pills I'll go hungry": the choice between economic security and HIV/AIDS treatment in Grahamstown, South Africa. *Annals of Anthropological Practice*, 35(1), 67–80. doi:10.1111/j.2153-9588.2011.01067.x
- Kalichman, S. C., Hernandez, D., Cherry, C., Kalichman, M. O., Washington, C., & Grebler, T. (2014). Food insecurity and other poverty indicators among people living with HIV/AIDS: Effects on treatment and health outcomes. *Journal of Community Health*, 39(6), 1133–1139.
- Kharsany, A. B. M., & Karim, Q. A. (2016). HIV infection and AIDS in Sub-Saharan Africa: Current status, challenges and opportunities. *The Open AIDS Journal*, 10, 34–48. doi:10.2174/1874613601610010034
- Lankowski, A. J., Siedner, M. J., Bangsberg, D. R., & Tsai, A. C. (2014). Impact of geographic and transportation-related barriers on HIV outcomes in sub-Saharan Africa: A systematic review. *AIDS and Behavior*, 18(7), 1199–1223. doi:10.1007/s10461-014-0729-8
- Martinez, H., Palar, K., Linnemayr, S., Smith, A., Derosé, K. P., Ramirez, B., ... Wagner, G. (2014). Tailored nutrition education and food assistance improve adherence to HIV antiretroviral therapy: Evidence from Honduras. *AIDS and Behavior*, 18(Suppl 5), S566–S577. doi:10.1007/s10461-014-0786-z
- Masa, R. D. (2016). *Food security and antiretroviral therapy adherence among people living with HIV in Lundazi District, Zambia: a pilot study* (Doctoral dissertation). University of North Carolina at Chapel Hill, Chapel Hill, NC.
- McCoy, S., Njau, P., Fahey, C., Czaicki, N., Kapologwe, N., Kadiyala, S., ... Padian, N. (2016, July 18–22). *A randomized study of short-term conditional cash and food assistance to improve adherence to antiretroviral therapy among food insecure adults with HIV infection in Tanzania*. Paper presented at the 21st international AIDS conference, Durban, South Africa.
- McNairy, M., Lamb, M., Gachuhi, A., Nuwagaba-Biribonwoha, H., Burke, S., Mazibuko, S. ... Group, L. H. S. (2016). LINK4HEALTH: a cluster-randomized controlled trial evaluating the effectiveness of a combination strategy for linkage to and retention in HIV care in Swaziland. *Journal of the International AIDS Society*, 19(Suppl 15), 66–66.
- Metsch, L. R., Feaster, D. J., Gooden, L., Matheson, T., Stitzer, M., Das, M., ... del Rio, C. (2016). Effect of patient navigation with or without financial incentives on viral suppression among hospitalized patients with HIV infection and substance use: A randomized clinical trial. *JAMA - Journal of the American Medical Association*, 316(2), 156–170. doi:10.1001/jama.2016.8914
- Miller, C., & Tsoka, M. G. (2012). ARVs and cash too: Caring and supporting people living with HIV/AIDS with the Malawi social cash transfer. *Tropical Medicine and International Health*, 17(2), 204–210. doi:10.1111/j.1365-3156.2011.02898.x
- Muñoz, M., Bayona, J., Sanchez, E., Arevalo, J., Sebastian, J. L., Arteaga, F., & Shin, S. (2011). Matching social support to individual needs: A community-based intervention to improve HIV treatment adherence in a resource-poor setting. *AIDS and Behavior*, 15, 1454–1464.
- Nsigaye, R., Wringe, A., Roura, M., Kalluvya, S., Urassa, M., Busza, J., & Zaba, B. (2009). From HIV diagnosis to treatment: Evaluation of a referral system to promote and monitor access to antiretroviral therapy in rural Tanzania. *Journal of the International AIDS Society*, 12, 31. doi:10.1186/1758-2652-12-31
- Nyamathi, A., Hanson, A. Y., Salem, B. E., Sinha, S., Ganguly, K. K., Leake, B., ... Marfisee, M. (2012). Impact of a rural village women (asha) intervention on adherence to antiretroviral therapy in southern India. *Nursing Research*, 61(5), 353–362. doi:10.1097/NNR.0b013e31825fe3ef
- Okello, F. O., Stuer, F., Kidane, A., & Wube, M. (2013). Saving the sick and improving the socio-economic conditions of people living with HIV in Ethiopia through traditional burial groups. *Health Policy and Planning*, 28(5), 549–557. doi:10.1093/heapol/czs097
- Palar, K., Napoles, T., Hufstedler, L. L., Seligman, H., Hecht, F., Madsen, K., ... Weiser, S. (2016, May 9–11). *Comprehensive and medically appropriate food support is associated with improved ART adherence and HIV outcomes*. Paper presented at the 11th international conference on HIV treatment and prevention adherence, Fort Lauderdale, FL.
- Pandit, J. A., Sirotnin, N., Tittle, R., Onjolo, E., Bukusi, E. A., & Cohen, C. R. (2010). Shamba maisha: A pilot study assessing impacts of a micro-irrigation intervention on the health and economic wellbeing of HIV patients. *BMC Public Health*, 10, 245. doi:10.1186/1471-2458-10-245

- Phaswana-Mafuya, N., Peltzer, K., & Petros, G. (2009). Disability grant for people living with HIV/AIDS in the eastern cape of South Africa. *Social Work in Health Care*, 48(5), 533–550. doi:10.1080/00981380802595156
- Rich, M. L., Miller, A. C., Niyigena, P., Franke, M. F., Niyonzima, J. B., Soggi, A., ... Binagwaho, A. (2012). Excellent clinical outcomes and high retention in care among adults in a community-based HIV treatment program in rural Rwanda. *Journal of Acquired Immune Deficiency Syndromes*, 59(3), e35–e42. doi:10.1097/QAI.0b013e31824476c4
- Rigsby, M. O., Rosen, M. I., Beauvais, J. E., Cramer, J. A., Rainey, P. M., O'Malley, S. S., ... Rounsaville, B. J. (2000). Cue-dose training with monetary reinforcement: Pilot study of an antiretroviral adherence intervention. *Journal of General Internal Medicine*, 15(12), 841–847.
- Rutherford, S. (2000). *The poor and their money*. New Delhi: Oxford University Press.
- Sanjobo, N., Frich, J. C., & Fretheim, A. (2008). Barriers and facilitators to patients' adherence to antiretroviral treatment in Zambia: A qualitative study. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, 5(3), 136–143. doi:10.1080/17290376.2008.9724912
- Snilstveit, B., Vojtkova, M., Bhavsar, A., Stevenson, J., & Gaarder, M. (2016). Evidence & gap maps: A tool for promoting evidence informed policy and strategic research agendas. *Journal of Clinical Epidemiology*, 79, 120–129. doi:10.1016/j.jclinepi.2016.05.015
- Solomon, S. S., Srikrishnan, A. K., Vasudevan, C. K., Anand, S., Kumar, M. S., Balakrishnan, P., ... Lucas, G. M. (2014). Voucher incentives improve linkage to and retention in care among HIV-infected drug users in Chennai, India. *Clinical Infectious Diseases*, 59(4), 589–595. doi:10.1093/cid/ciu324
- Swann, M. (2018a). Economic strengthening for HIV prevention and risk reduction: A review of the evidence. *AIDS Care*. doi:10.1080/09540121.2018.1479029
- Swann, M. (2018b). Economic strengthening for HIV testing and linkage to care: a review of the evidence. *AIDS Care*. doi:10.1080/09540121.2018.1476665
- Talisuna-Alamo, S., Colebunders, R., Ouma, J., Sunday, P., Ekoru, K., Laga, M., ... Wabwire-Mangen, F. (2012). Socioeconomic support reduces nonretention in a comprehensive, community-based antiretroviral therapy program in Uganda. *Journal of Acquired Immune Deficiency Syndromes*, 59(4), e52–e59. doi:10.1097/QAI.0b013e318246e2aa
- Tirivayi, N., Koethe, J. R., & Groot, W. (2012). Clinic-based food assistance is associated with increased medication adherence among HIV-infected adults on long-term antiretroviral therapy in Zambia. *Journal of AIDS & Clinical Research*, 3(7), 171.
- Tolley, E., Taylor, J., Pack, A., Greene, E., Stanton, J., El-Sadr, W., & Gamble, T. (2016, October 17–21). *Role of financial incentives along the ART adherence continuum: A qualitative analysis from the HPTN 065 study*. Paper presented at the HIV research For prevention, Chicago.
- Weiser, S. D., Bukusi, E. A., Steinfeld, R. L., Frongillo, E. A., Weke, E., Dworkin, S. L., ... Cohen, C. R. (2015). Shamba maisha: Randomized controlled trial of an agricultural and finance intervention to improve HIV health outcomes. *AIDS*, 29(14), 1889–1894. doi:10.1097/qad.0000000000000781
- Weiser, S. D., Hatcher, A. M., Hufstедler, L. L., Weke, E., Dworkin, S. L., Bukusi, E. A., ... Cohen, C. R. (2017). Changes in health and antiretroviral adherence among HIV-infected adults in Kenya: Qualitative longitudinal findings from a livelihood intervention. *AIDS and Behavior*, 21, 415–427. doi:10.1007/s10461-016-1551-2
- Weiser, S. D., Wolfe, W., Bangsberg, D. R., Thior, I., Gilbert, P., Makhema, J., ... Essex, M. (2003). Barriers to antiretroviral adherence for patients living with HIV infection and AIDS in Botswana. *Journal of Acquired Immune Deficiency Syndromes*, 34(3), 281–288.
- Woller, G. (2011). *Livelihood and food security conceptual framework*. Washington, DC: FHI 360, LIFT.
- Yotebieng, M., Thirumurthy, H., Moracco, K. E., Kawende, B., Chalachala, J. L., Wenzel, L. K., ... Behets, F. (2016). Conditional cash transfers and uptake of and retention in prevention of mother-to-child HIV transmission care: A randomised controlled trial. *The Lancet HIV*, 3(2), e85–e93. doi:10.1016/s2352-3018(15)00247-7
- Young, S., Wheeler, A., McCoy, S., & Weiser, S. D. (2014). A review of the role of food insecurity in adherence to care and treatment among adult and pediatric populations living with HIV and AIDS. *AIDS and Behavior*, 18(0 5), 505–515. doi:10.1007/s10461-013-0547-4
- Zaveri, S. (2008). Economic strengthening and children affected by HIV/AIDS in Asia: Role of communities. *Joint Learning Initiative on Children and AIDS [JLICA]*. Retrieved from http://ovcsupport.org/wpcontent/uploads/Documents/Economic_Strengthening_and_children_affected_by_HIV_in_Asia_Role_of_Communities_1.pdf.

Appendix 1. PRISMA diagram on selection of studies for full review.



