

Barriers, facilitators, and potential impact of linkage to social protection interventions for individuals with tuberculosis and/or HIV in Zimbabwe

by
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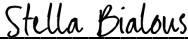
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DEDICATION

This work, like everything I do, is dedicated to our daughter.

Cecilia Shai, you are our greatest gift.

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Barriers, facilitators, and potential impact of linkage to social protection interventions for individuals with tuberculosis and/or HIV in Zimbabwe

Mollie Hudson

ABSTRACT

Background: Tuberculosis (TB) is one of the leading causes of infectious disease deaths worldwide. Despite effective and widely available treatment, in 2022, an estimated 10.6 million people were infected with TB and 1.3 million people died from TB.¹ TB is also the leading cause of death among people living with HIV (PLHIV), causing 167,000 deaths worldwide in 2022 and highlighting the importance of the TB/HIV “syndemic.”² Both TB and HIV have long been recognized as diseases that disproportionately impact the impoverished who primarily reside in resource limited settings. To break out of the cycle of poverty and disease, interventions to minimize socioeconomic vulnerability, termed *social protection interventions*, are now a key pillar of the World Health Organization (WHO) End TB Strategy, the 2023 United Nations General Assembly High-level meeting commitments for TB-affected individuals and households, the Joint United Nations Programme on HIV/AIDS (UNAIDS), and the United Nations’ Sustainable Development Goals (SDGs). However, there are significant gaps in understanding the impact of, and barriers to access social protection interventions among people with TB and or HIV in high burden, low income countries (LICs). Further, key information about how to operationalize social protection in LICs is lacking.

Objectives: To address the aforementioned gaps, this study used a multimethod approach that uses published research and programmatically available data to quantify the extent to which social protection interventions improve TB treatment success and HIV viral load suppression, as well as empirical data collection to inform the design of policies and strategies that may improve the uptake of social protection for TB and HIV affected individuals and communities. The three aims of this dissertation were to quantify the effect of social protection interventions on TB treatment and socioeconomic outcomes (Aim 1), to estimate the association between

socioeconomic characteristics and HIV treatment outcomes, as well as outcomes pertaining to antenatal care among pregnant and lactating women with HIV in Zimbabwe (Aim 2), and to describe barriers and facilitators to accessing social protection interventions among PLHIV both with TB and at risk for acquiring TB (Aim 3).

Methods: For Aim 1, we conducted a systematic review and meta-analysis to evaluate if people with TB who had been recipients of social protection interventions demonstrated an improvement in TB treatment or socioeconomic outcomes when compared to people with TB who had not been recipients of social protection interventions. For Aim 2, we used generalized estimating equations to quantify the association between sociodemographic characteristics and various clinical outcomes among pregnant and lactating women with HIV in Zimbabwe. Lastly, for Aim 3, we conducted in depth, semi-structured interviews with 25 PLHIV (with and without TB) in Zimbabwe to assess barriers and facilitators to accessing social protection interventions.

Results: Our systematic review and meta-analysis yielded 46 articles for inclusion. Our meta-analysis demonstrated that recipients of social protection interventions had 2.12 times the odds of TB treatment success (defined as cure or completion of treatment) compared to individuals who were not recipients of these interventions (95% CI 1.7, 2.6). Our findings also suggested improved economic outcomes, such as lower rates of catastrophic costs (total costs in excess of 20% of annual household income), among recipients of social protection interventions. Using generalized estimating equations, we found that in Zimbabwe, pregnant and lactating women with HIV experience many forms of poverty and socioeconomic vulnerability. Intimate partner violence was significantly associated with HIV viral load non-suppression across several models. Additionally, dissaving, or negative financial coping strategies, was associated with delayed presentation to antenatal care. Lastly, the semi-structured interviews provided key insights into barriers and facilitators accessing social protection interventions. These barriers included lack of knowledge about existing social protection interventions, limited reach of social protection interventions, and limited sustainability of social protection interventions.

Conclusions: When implemented effectively, social protection interventions can significantly improve TB treatment outcomes for at-risk individuals. Pregnant and lactating women with HIV are particularly vulnerable to the co-occurring effects of HIV and poverty, but additional research is needed to better understand how to target social protection interventions to support at-risk populations effectively. Lastly, PLHIV with and without TB in Zimbabwe experience a range of socioeconomic vulnerabilities, but encounter multiple barriers to accessing social protection interventions. Efforts must be made to improve access to social protection among vulnerable populations to optimize their potential benefit.

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CHAPTER 1: INTRODUCTION

Tuberculosis (TB) is one of the leading causes of infectious disease deaths worldwide, with an estimated 10.6 million cases and over one million deaths in 2022.¹ Several countries in sub-Saharan Africa, including Zimbabwe, experience a persistent high disease burden from TB, particularly among people living with HIV (PLHIV).² TB is the leading cause of death among PLHIV, causing 167,000 deaths in 2022. PLHIV are approximately 18 times more likely to develop active TB and three times as likely to die from TB, even when taking antiretroviral (ARV) therapy to treat HIV.³ The relationship between HIV and TB is frequently referred to as syndemic; having HIV increases the risk of both acquiring and developing active TB, and having TB worsens health outcomes among PLHIV.⁴

Zimbabwe, one of the thirty high burden TB/HIV countries designated by the World Health Organization (WHO),⁵ is also one of the most impoverished countries in the world; 70% of individuals live below the Total Consumption Poverty Line and 29% of individuals live in extreme poverty.⁶ Given the relationship between TB, HIV and poverty, TB and HIV affected individuals are at heightened socioeconomic risk. While TB treatment is free in Zimbabwe, over 80% of people with TB face catastrophic costs (defined as out-of-pocket expenses >20% of annual household income⁷) related to TB illness due to indirect costs (such as lost wages due to missed work). Similarly, lower socioeconomic status and food insecurity are associated with higher rates of HIV infection,⁸ and HIV illness is associated with loss of work productivity.⁹ Addressing the relationship between TB, HIV, and poverty in Zimbabwe remains urgent for Zimbabwe to reach the 2030 End TB Goals,¹² the 2030 UNAIDS goals,¹⁰ and the United Nation's Sustainable Development Goals (SDG).^{11,12} These goals are, respectively, 1) to reduce global TB incidence by 80% and reduce the number of TB deaths by 90% globally by 2030 relative to 2015,¹³ 2) for 90% of PLHIV to know their HIV status, 90% of PLHIV to be on ARV

therapy, and 90% of individuals on ARV therapy to have a suppressed viral load,¹⁴ and 3) to end poverty and food insecurity globally.^{11,12}

As a core pillar of their 2015 End TB Strategy, the WHO recommends *social protection interventions* for people with TB and TB affected households to reduce TB morbidity and mortality and eliminate TB-related catastrophic costs. This recommendation was also emphasized in the 2023 United Nations General Assembly High-level meeting commitments, which called for social protection for all TB-affected individuals and households.¹⁵ Similarly, the Joint United Nations Programme on HIV/AIDS (UNAIDS) has recommended social protection for PLHIV to reduce HIV incidence, improve adherence to antiretroviral (ARV) therapy, and mitigate the socioeconomic impact of HIV on individuals and households.¹⁶ Social protection interventions are broadly defined by the World Bank as systems that “help the poor and vulnerable cope with crisis and shocks, invest in the health and education of their children, and protect the aging population.”¹⁷ Such interventions include, but are not limited to, direct cash transfers, job training programs, and nutrition support.

When implemented effectively, social protection interventions can decrease TB incidence, improve TB treatment outcomes, and improve socioeconomic outcomes.^{18–20} Social protection interventions also have the potential to increase rates of viral load suppression among PLHIV.²¹ Lastly, social protection interventions have been shown to reduce risk of catastrophic costs among TB affected households, thus contributing to disease reduction by interrupting the cycle of TB and poverty.²⁰ However, many individuals who are eligible for social protection intervention benefits are not enrolled in available programs.⁶ For example, despite high rates of poverty and food insecurity, coverage of social protection interventions in Zimbabwe is only 11% of all eligible individuals.⁶

Methods to optimize access to social protection interventions in low-income settings, which is necessary for implementation and scalability, remain poorly understood. For example, many cash transfer interventions rely on unstable banking systems, which frequently results in

delayed or failed disbursements of funds to beneficiaries.²² Failed disbursement of funds limits the impact of an intervention,²³ but there is a paucity of studies exploring patient and system specific barriers and facilitators to accessing cash transfers. Similarly, while transportation assistance is a frequently cited example of social protection among people with TB,²⁴ little is known about how to implement transportation programs so people with TB can consistently access medical care. Understanding the barriers and facilitators to accessing social protection for PLHIV and TB is critical to improved implementation of lifesaving social protection interventions in impoverished settings. To address these gaps, we utilized a multimethod approach to both quantify the impact of social protection interventions on TB and HIV treatment outcomes, and to identify barriers and facilitators to accessing social protection interventions among PLHIV and TB.

First, we conducted a systematic review and meta-analysis to evaluate if people with TB who had been recipients of social protection interventions demonstrated an improvement in TB treatment or socioeconomic outcomes when compared to people with TB who had not been recipients of social protection interventions (Aim 1, chapter 2). This study focused on people with TB and TB affected households to better address a key gap in the literature; there is already substantial evidence base about HIV and social protection.^{25,26} Additionally, despite individual studies describing the benefits of social protection interventions, as well as systematic reviews that synthesize evidence regarding the impact of social protection on TB treatment outcomes, existing studies have several limitations. First, available systematic reviews are limited by standard definitions of social protection. Second, to date, no systematic reviews have evaluated the impact of social protection interventions on socioeconomic outcomes in TB affected individuals and households.

Second, we used generalized estimating equations to quantify the association between sociodemographic characteristics and clinical outcomes for a group that is particularly vulnerable: pregnant and lactating women with HIV in Zimbabwe (Aim 2, chapter 3). We

focused on pregnant and lactating women because this is a particularly vulnerable population to the co-occurring effects of HIV and poverty, as well as a programmatic priority for the Zimbabwean Ministry of Health and Child Care (MoHCC). Lastly, we conducted in depth, semi-structured interviews with 25 PLHIV (with and without TB) in Zimbabwe to assess barriers and facilitators to accessing social protection interventions (Aim 3, chapter 4).

The research conducted in Aims 2 and 3 was a secondary analysis of data collected in Zimbabwe and was implemented within my mentor's, Dr. Priya Shete, research infrastructure, a collaboration with the Zimbabwean-based Organization for Public Health, Interventions and Development (OPHID), with whom faculty from the UCSF Center for Tuberculosis have been working since 2011. OPHID works closely with the Zimbabwean MoHCC to improve outcomes related to HIV and TB, as well as Zimbabwean Ministry of Public Service, Labour & Social Welfare. OPHID's manages health programs in 317 health clinics across 15 districts in Zimbabwe that provide care for PLHIV. Aims 2 and 3 leverage this ongoing partnership, which facilitated access to health data, to describe the impact of social protection interventions on TB and HIV treatment outcomes and identify barriers and facilitators to social protection among people with TB.

The results of these three aims provide insight on both the impact of, and access to, social protection intervention among PLHIV and TB in Zimbabwe. Despite the growing evidence that social protection interventions improve TB treatment outcomes and reduce incidence, there is limited guidance regarding the implementation of social protection interventions in high burden, low-income settings. This research also assessed barriers and facilitators to implementation of social protections interventions and contribute to developing strategies that could enhance access to these interventions. Additionally, although socioeconomic needs are increasing in Zimbabwe, both government and international funding for social protection in Zimbabwe is decreasing and is not projected to meet current or future socioeconomic needs. Findings from this research provide quantifiable, outcome-based information on the impact of

social protection interventions on HIV and TB treatment outcomes. This is crucial given the limited resources available to help Zimbabwe meet the 2030 End TB Goals, the 2030 HIV targets, the 2030 SDGs.

CHAPTER 2: THE IMPACT OF SOCIAL PROTECTION INTERVENTIONS ON TREATMENT AND SOCIOECONOMIC OUTCOMES OF TUBERCULOSIS-AFFECTED INDIVIDUALS AND HOUSEHOLDS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Abstract

Background: Tuberculosis is a leading cause of death due to infectious disease worldwide, causing 1.3 million deaths in 2022. Social protection interventions, when combined with biomedical treatment, have the potential to improve TB treatment and socioeconomic outcomes in TB-affected households. We conducted a systematic review and meta-analysis to quantify the impact of social protection on TB treatment and socioeconomic outcomes.

Methods: We identified articles published from January 2012 to September 2023 by searching three electronic databases: PubMed (includes MEDLINE), Embase, and Web of Science.

Randomized control trials, cohort studies, cross sectional studies, and qualitative analyses that described at least one social protection intervention and reported on either TB treatment or socioeconomic outcomes for people with TB or TB-affected households were eligible for inclusion. Random-effects meta-analysis was used for our primary outcome of interest, TB treatment success. Risk of bias was assessed using the Newcastle Ottawa Scale and the Cochrane Risk of Bias tool. This review was registered prospectively in the PROSPERO database (registration number CRD42022382181).

Results: After duplicates were removed, our search generated 44,404 articles, 46 of which were eligible for inclusion. Included studies were primarily cohort studies with quantitative analyses.

Thirty-three studies reported TB treatment outcomes, seven studies reported on socioeconomic outcomes, and two studies reported both TB treatment and socioeconomic outcomes. Eight studies described implementation challenges, with the most common reason for poor implementation fidelity being administrative related barriers (n=6). Random-effects meta-

analysis (n=22) found that individuals who were recipients of social protection interventions in conjunction with standard biomedical treatment had 2.12 times the odds of TB treatment success (95% CI 1.7, 2.6).

Conclusion: Social protection interventions significantly improve rates of TB treatment success.

While social protection has the potential to improve other TB treatment outcomes such as mortality, and socioeconomic outcomes such as costs and negative financial coping strategies, additional studies that systematically collect such data are required. The standardized outcomes and definitions used in this systematic review and meta-analysis have the potential to guide further research on social protection programs for TB-affected populations.

Introduction

Tuberculosis (TB) is one of the leading causes of infectious disease deaths worldwide. Despite effective and widely available treatment, in 2022, an estimated 10.6 million people were infected with TB and 1.3 million people died from TB.¹ TB has long been recognized as a disease that disproportionately impacts the impoverished in resource limited settings. TB-affected individuals are often trapped in a vicious cycle of poverty; impoverished individuals often have risk factors that make them more susceptible to TB (e.g. crowded living conditions, poor access to care, malnutrition), and becoming ill with TB often precipitates devastating economic effects from direct costs (such as cost of treatment) and indirect costs (such as lost wages due to missed work).^{20,27} TB-affected households are at an increased risk of incurring catastrophic costs (costs that exceed 20% of a TB-affected household's annual income²⁸) and dissaving (such as taking out loans, using savings, selling assets).

To break out of the cycle of poverty and disease, interventions to minimize socioeconomic vulnerability, termed "social protection interventions", are now a key pillar of the World Health Organization (WHO) End TB Strategy and the United Nations' Sustainable Development Goals (SDGs).^{11,12} Social protection interventions are broadly defined by the

World Bank as systems that “help the poor and vulnerable cope with crisis and shocks, invest in the health and education of their children, and protect the aging population.”¹⁷ Such interventions include, but are not limited to, direct cash transfers, job training programs, and nutrition support. When implemented effectively, social protection interventions can decrease TB incidence, improve TB treatment outcomes, and improve socioeconomic outcomes.^{18–20}

Several studies, including systematic reviews, have found that social protection interventions can improve TB treatment outcomes.²⁹ However, interventions described in existing literature are either narrowly focused on a specific intervention, or broadly focused on interventions that would not be considered social protection interventions as defined by the World Bank. Further, no systematic review has described the impact of social protection interventions on socioeconomic outcomes, including catastrophic costs, dissaving, or standardized measures of poverty. The objective of this systematic review and meta-analysis is to answer the following questions:

1. Do people with TB who have enrolled in and/or been recipients of at least one social protection intervention demonstrate an improvement in TB treatment success (completion of treatment or cure) compared to people with TB who have not enrolled in and/or been recipients of social protection interventions?
2. Do people with TB who have enrolled in and/or been recipients of at least one social protection intervention have better socioeconomic outcomes, including lower rates of catastrophic costs and dissaving, compared to people with TB who have not enrolled in and/or been recipients of social protection interventions?

Methods

We used the Population, Intervention, Comparison, Outcome, and Time (PICOT) format to define our research questions for this systematic review. The two PICOT questions for this systematic review are described in **Table 2.1**.

Table 2.1. PICOT framework

PICOT statement	Population	Intervention	Comparison	Outcome	Time
#1	TB-affected individuals and households	Social protection in conjunction with standard biomedical TB treatment (medication to treat TB, standard medical appointments)	Individuals who are not recipients of/enrolled in social protection; biomedical TB treatment only	TB treatment outcomes (cure, completion of treatment, death, treatment default, TB treatment success)	2012-2023
#2	TB-affected individuals and households	Social protection in conjunction with standard biomedical TB treatment (medication to treat TB, standard medical appointments)	Individuals who are not recipients of/enrolled in social protection; biomedical TB treatment only	Improved socioeconomic outcomes (e.g. reduced catastrophic costs, dissaving, various measures of poverty)	2012-2023

This systematic review protocol was guided by the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) protocol checklist³⁰ and the protocol has been published previously.³¹

Search strategy and selection criteria

Our initial search was conducted in March 2021, and then repeated September 2023 to ensure recently published studies were captured. We searched three electronic databases: PubMed (includes MEDLINE), Embase, and Web of Science, for relevant publications. We also used Google Scholar Advanced to search selected, relevant databases e.g. the WHO or World Bank databases with a limited number of search terms to identify relevant articles in the grey literature (such as reports from the WHO). Articles obtained from the electronic database searches were imported into Covidence³² for systematic screening by the study team (Appendices A-D) in accordance with PRISMA guidelines. Given the range of types of interventions and outcomes, we implemented a broad search strategy to ensure that we captured all potentially eligible studies.

From the articles deemed eligible for inclusion, two researchers (MH and HT; refer to appendix A for study team) also reviewed references and used snowball sampling to further identify potentially relevant articles that our original search may have missed. Studies were included if they were randomized controlled trials, cross-sectional, cohort, cost-effectiveness analyses, ecological, or quasi-experimental studies, and included people with pulmonary and extra pulmonary TB, people with drug-sensitive (DS-TB) and drug-resistant (DR-TB)/multi-drug resistant TB (MDR-TB), people either with or without HIV-TB co-infection, or TB-affected households in either low-to-middle-income countries (LMICs) and/or high burden TB countries. We excluded both review articles and systematic reviews. Further, we only included studies published between 2012 and 2023 that were peer reviewed and published in English. The time frame for eligibility (2012-2023) was chosen based on the “World Bank’s Social Protection and Labour Strategy 2012-2022,”³³ in which the World Bank focused their initiatives on reducing socioeconomic risk and strengthening social protection interventions. Lastly, studies were included if the location was either 1) a high burden TB country when the study was conducted,

or 2) Low- and middle-income country (LMIC) or low-income country (LIC) when the study was conducted.

Intervention

We only included studies in which the main independent variable was enrollment in a social protection program and/or receipt of at least one social protection intervention. Additionally, *TB specific* interventions are defined as social protection interventions that target people with TB or TB-affected households, with the intention of improving outcomes related to TB. *TB sensitive* interventions are designed to reach individuals who are at risk of TB infection or disease, but is not limited to those with disease and often include targeting or enrollment based other non-TB characteristics.³⁴ Given the study's overall goal of supporting programmatic implementation of social protection interventions, we aimed to focus on TB-specific social protection programs

Outcomes

We only included studies for which the main dependent variable is at least one outcome related to TB treatment outcomes and/or socioeconomic outcomes (Appendix B). Standardized TB treatment outcomes (cure, completion of treatment, treatment success [a composite variable of TB cure and completion of treatment], mortality/death, treatment default, loss to follow up) were used in keeping with WHO definitions.³⁵ Socioeconomic outcomes (e.g. catastrophic costs and dissaving) as defined by World Bank and the United Nations were used.³⁶ Socioeconomic outcomes are reported at the household level in accordance with the 2015 End TB Strategy, as costs related to TB tend to impact socioeconomic status at the household level.³⁶

Screening and descriptive analysis

After duplicate articles were removed, the remaining titles and abstract were systematically and independently screened by the study team (MH, HT, CC, JK, TN, NP, KS, PT). Articles considered potentially eligible were sorted separately to be included in full text review. Questions about study inclusion based on title and abstract screening were discussed as a team and adjudicated by HT and MH. Two researchers (MH and HT) independently reviewed the initial set of titles/abstracts selected for full text review and came to a consensus with a third reviewer (TN) if MH and HT were not in agreement. Full text articles were read independently by MH and HT to determine whether an article should be included in the systematic review, and any disagreements were discussed with the core group of investigators (PBS, TN, TW). Similarly, two researchers (MH and CC) independently reviewed articles identified in the search conducted in September 2023 and discussed any disagreements with the core group of investigators (PBS, TN, TW, HT). **Figure 2.1** describes the specific number of articles included in each aforementioned stage.

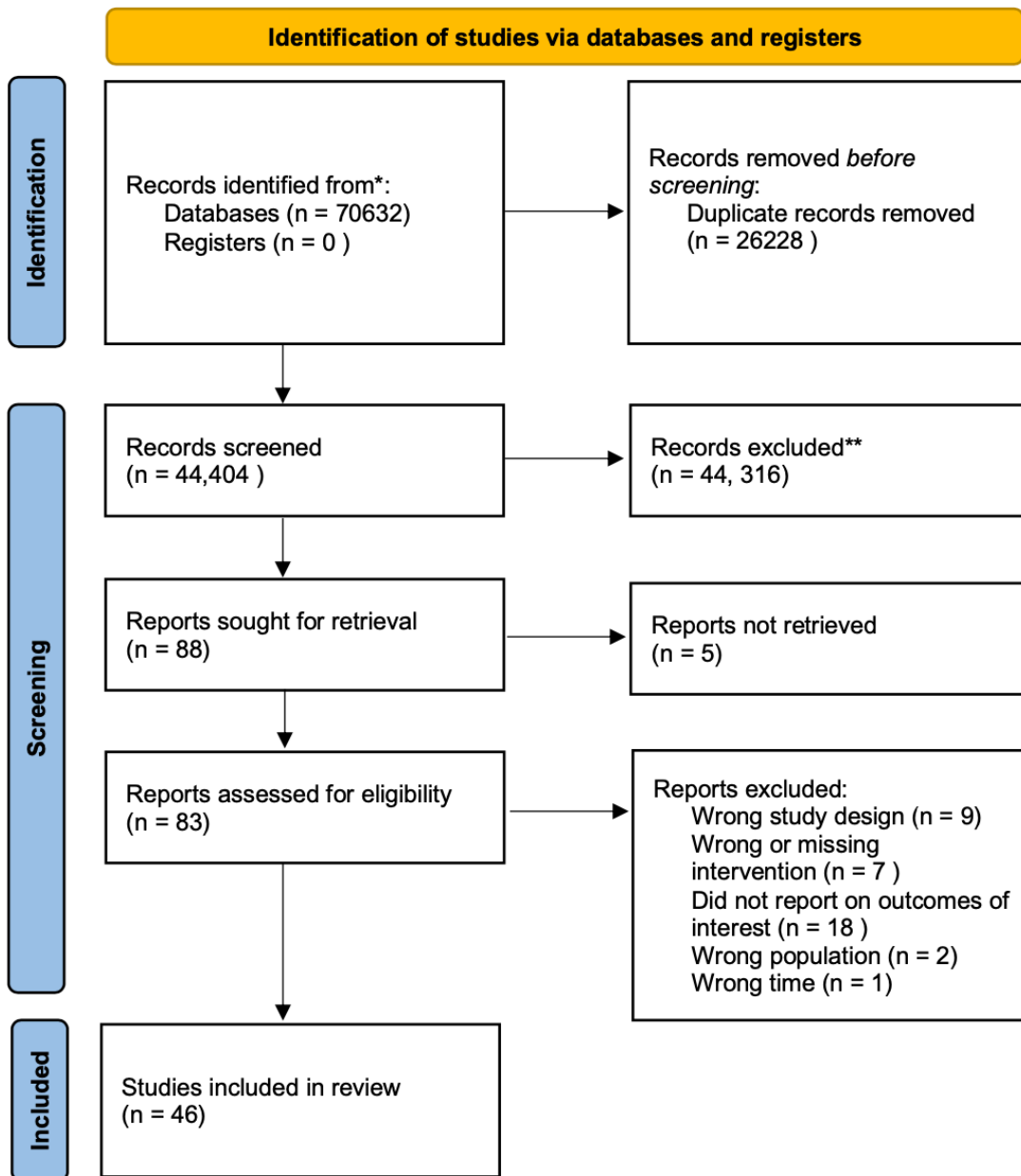


Figure 2.1 Flow diagram of search process to identify eligible studies using PRISMA.

Quantitative analysis

Quantitative data related to TB treatment outcomes, e.g. number of individuals who had TB treatment success, were extracted from eligible papers and were organized into an Excel table. MH, AS, and CC independently extracted data and met to discuss findings and resolve discrepancies. When sufficient data were available, we grouped studies based on outcomes included for meta-analyses. Specifically, we grouped studies that reported on TB treatment success (defined as cure or treatment completion). All estimates of effect for dichotomous outcomes (e.g. “achieved treatment success” versus “did not achieve treatment success”) were reported as odds ratios with a 95% confidence interval. For our meta-analysis, we used a random effects model³⁷ to account for heterogeneity between studies. Results are presented as a forest plot. All calculations were conducted in STATA BE version 17.³⁸

Qualitative analysis

There was insufficient data to describe socioeconomic outcomes or implementation outcomes quantitatively, therefore we summarized findings from included studies qualitatively (**Table 2.5**).

Risk of bias in individual studies

We used the Cochrane Risk of Bias (RoB) tool³⁹ for RCTs and the Newcastle Ottawa Scale⁴⁰ (NOS) for all other studies that quantitatively reported on outcomes. Risk of bias was appraised by two researchers independently (MH and AS appraised articles identified in the initial search; MH and CC appraised articles identified in the search conducted September 2023) with discrepancies resolved by consensus or third reviewer (PS).

Role of the funder

Funding for this study comes from the Nina Ireland Program in Lung Health (PI: Shete, fund number 7710-138404-7504523-45). The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Our search yielded 70,632 articles, from which 26,228 duplicates were removed. We screened the remaining 44,404 titles and abstracts. After removing 44,316 articles based on title and abstracts, we attempted to retrieve 88 full text articles to assess eligibility. We were unable to retrieve five articles, and subsequently evaluated 83 articles for eligibility. Thirty-seven articles did not meet inclusion criteria for the following reasons: Wrong study design (n = 9), wrong intervention (n=7), focused on a study population that did not meet our inclusion criteria (n=2), described a study that was not conducted during our time frame of interest (n=1), or did not report on outcomes of interest (n=18). Our screening yielded 46 eligible articles. Forty-two articles reported primarily on quantitative outcomes, while four articles reported only on qualitative outcomes. The results of our research are reported in the PRISMA flow chart (**Figure 2.1**) in accordance with PRISMA guidelines.

Study findings are summarized in **Tables 2.2-2.5**.

Table 2.2. Study characteristics of quantitative studies (n=42)

Authors	Study Title	Year of Publication	Country	Setting
Bhargava et al.	Nutritional support for adult patients with microbiologically confirmed pulmonary tuberculosis: outcomes in a programmatic cohort nested within the RATIONS trial in Jharkland, India	2023	India	Rural
Bhatt R et al.	Impact of integrated psycho-socio-economic support on treatment outcome in drug resistant tuberculosis - A retrospective cohort study.	2019	India	Urban

Authors	Study Title	Year of Publication	Country	Setting
Carter et al.	The impact of a cash transfer programme on tuberculosis treatment success rate: a quasi-experimental study in Brazil.	2019	Brazil	Mixed
Chenicer et al.	Social and health factors associated with unfavourable treatment outcome in adolescents and young adults with tuberculosis in Brazil: a national retrospective cohort study	2021	Brazil	Mixed
Ciobanu et al.	Do incentives improve tuberculosis treatment outcomes in the Republic of Moldova?	2014	Moldova	Mixed
Dave et al.	Does Direct Benefit Transfer Improve Outcomes Among People With Tuberculosis? – A Mixed-Methods Study on the Need for a Review of the Cash Transfer Policy in India	2022	India	Mixed
de Souza et al.	Family health and conditional cash transfer in Brazil and its effect on tuberculosis mortality.	2018	Brazil	Mixed
Durovni et al.	The impact of the Brazilian family health strategy and the conditional cash transfer on tuberculosis treatment outcomes in Rio De Janeiro: an individual-level analysis of secondary data	2017	Brazil	Urban
Florentino et al.	Expansion of social protection is necessary towards zero catastrophic costs due to TB: The first national TB patient cost survey in the Philippines	2022	Philippines	Mixed
Jiang et al.	Factors associated with loss to follow-up before and after treatment initiation among patients with tuberculosis: A 5-year observation in China	2023	China	Not specified
Klein et al.	Evaluation of a social protection policy on tuberculosis treatment outcomes: A prospective cohort study	2019	Argentina	Urban
Li et al.	Effect of a comprehensive programme to provide universal access to care for sputum-smear-positive multidrug-resistant tuberculosis in China: a before-and-after study.	2015	China	Urban
Liu et al.	Impacts of Medical Security Level on Treatment Outcomes of Drug-Resistant Tuberculosis: Evidence from Wuhan City, China	2023	China	Urban

Authors	Study Title	Year of Publication	Country	Setting
Lutge et al.	Economic support to improve tuberculosis treatment outcomes in South Africa: a pragmatic cluster-randomized controlled trial.	2013	South Africa	Mixed
Mansour et al.	Impact of a nutritional support programme on loss to follow-up after tuberculosis diagnosis in Kenya	2018	Kenya	Mixed
Modi et al.	Financial Incentive - does this have an impact on outcome of Tuberculosis?	2020	India	Urban
Ngamvithayapong-Yanai et al.	Engaging women volunteers of high socioeconomic status in supporting socioeconomically disadvantaged tuberculosis patients in Chiang Rai, Thailand.	2013	Thailand	Urban
Oliosi et al.	Effect of the Bolsa Familia Programme on the outcome of tuberculosis treatment: a prospective cohort study.	2019	Brazil	Urban
Pedrazzoli et al.	Does Ghana's National Health Insurance Scheme provide financial protection to tuberculosis patients and their households?	2021	Ghana	Mixed
Potty et al.	Tuberculosis treatment outcomes and patient support groups, southern India	2023	India	Urban
Priedeman et al.	Evaluating the impact of social support services on tuberculosis treatment default in Ukraine	2018	Ukraine	Mixed
Randhawa et al.	Outcome Optimization for Patients with Drug-Resistant TB Via The Implementation of An All-Inclusive Care Program	2023	Pakistan	Not specified
Reis-Santos et al.	A Matter of Inclusion: A Cluster-Randomized Trial to Access the Effect of Food Vouchers Versus Traditional Treatment on Tuberculosis Outcomes in Brazil	2022	Brazil	Urban
Reis-Santos et al.	Tuberculosis in Brazil and cash transfer programs: A longitudinal database study of the effect of cash transfer on cure rates.	2019	Brazil	Mixed
Rogers et al.	Impact of community-based adherence support on treatment outcomes for tuberculosis, leprosy and HIV/AIDS-infected individuals in post-Ebola Liberia.	2019	Liberia	Not specified

Authors	Study Title	Year of Publication	Country	Setting
Rohit et al.	Does provision of cash incentive to HIV-infected tuberculosis patients improve the treatment success in programme settings? A cohort study from South India.	2020	India	Mixed
Rudgard et al.	Uptake of governmental social protection and financial hardship during drug-resistant tuberculosis treatment in Rio de Janeiro, Brazil.	2017	Brazil	Urban
Samuel et al.	Relationship between nutritional support and tuberculosis treatment outcomes in West Bengal India	2015	India	Rural
Singh et al.	Improving tuberculosis treatment success rate through nutrition supplements and counseling: Findings from a pilot intervention in India	2021	India	Not specified
Soares et al.	Tuberculosis control in a socially vulnerable area: a community intervention beyond DOT in a Brazilian favela.	2013	Brazil	Urban
Sripad et al.	Effects of Ecuador's national monetary incentive program on adherence to treatment for drug-resistant tuberculosis.	2014	Ecuador	Mixed
Timire et al.	Coverage and effectiveness of conditional cash transfer for people with drug resistant tuberculosis in Zimbabwe: A mixed methods study	2022	Zimbabwe	Mixed
Torrens et al.	Effectiveness of a conditional cash transfer programme on TB cure rate: A retrospective cohort study in Brazil	2016	Brazil	Mixed
Ukwaja et al.	Economic Support Intervention improves tuberculosis treatment outcomes in Rural Nigeria	2017	Nigeria	Rural
Wei et al.	Providing financial incentives to rural-to-urban tuberculosis migrants in Shanghai: an intervention study.	2012	China	Urban
Wingfield et al.	Beyond pills and tests: addressing the social determinants of tuberculosis	2016	Peru	Urban
Wingfield et al.	The economic effects of supporting tuberculosis-affected households in Peru.	2016	Peru	Urban
Wingfield et al.	A randomized controlled study of socioeconomic support to enhance tuberculosis prevention and treatment, Peru.	2017	Peru	Urban

Authors	Study Title	Year of Publication	Country	Setting
Wrohan et al.	Predictors of treatment outcomes among patients with multidrug-resistant tuberculosis in Vietnam: a retrospective cohort study	2022	Vietnam	Not specified
Xiang et al.	The impact of the new cooperative medical scheme on financial burden of tuberculosis patients: evidence from six counties in China.	2016	China	Urban
Yin et al.	The relationship between social support, treatment interruption and treatment outcome in patients with multidrug resistant tuberculosis in China: A mixed methods study.	2018	China	Urban
Zhao et al.	Impacts of the "transport subsidy initiative on poor TB patients" in Rural China: a patient-cohort based longitudinal study in rural china	2013	China	Rural

Table 2.3. Study characteristics of qualitative studies (n=4)

Authors	Study Title	Year of Publication	Country	Setting
George et al.	TB patient support systems in Kerala: A qualitative analysis.	2021	India	Urban
Kaliakbarova et al.	Psychosocial support improves treatment adherence among MDR-TB patients: Experience from East Kazakhstan	2013	Kazakhstan	Mixed, primarily urban
Orlandi et al.	Social incentives for adherence to tuberculosis treatment	2019	Brazil	Urban
Ukwaja et al.	Sustaining the DOTS': stakeholders' experience of a social protection intervention for TB in Nigeria	2021	Nigeria	Rural

Table 2.4. Social protection interventions described in quantitative studies (n=42)

Study	Primary funding source	Social protection intervention type	Eligibility for social protection intervention	TB sensitive vs. TB specific
Bhargava et al.	Study intervention/source	Nutritional support	Study intervention	TB specific
Bhatt R et al.	Government/national TB program	Mixed with psychosocial support	Study intervention	N/A
Carter et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive

Study	Primary funding source	Social protection intervention type	Eligibility for social protection intervention	TB sensitive vs. TB specific
Chenicer et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive
Ciobanu et al.	Mixed funding sources	Mixed without psychosocial support	TB status	TB sensitive
de Souza et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive
Dave et al.	Government/national TB program	Cash	TB status	TB specific
Durovni et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive
Florentino et al.	Government/national TB program	Mixed without psychosocial support	TB status	TB specific
Jiang et al.	Government/national TB program	Social health insurance	Not described	TB sensitive
Klein et al.	Government/national TB program	Cash	TB status	TB sensitive
Li et al.	Government/national TB program	Cash	TB status	TB sensitive
Liu et al.	Government	Social health insurance	Not described	TB sensitive
Lutge et al.	Study intervention/source	Cash	Study intervention	TB specific
Mansour et al.	Government/national TB program	Nutritional support	TB status	TB sensitive
Modi et al.	Government/national TB program	Cash	TB status	TB specific
Ngamvithay- apong- Yanai et al.	Study intervention/source	Mixed with psychosocial support	Study intervention	TB specific
Olios et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive
Pedrazzoli et al.	Government/national TB program	Social health insurance	Not described	TB sensitive
Potty et al.	Study intervention/source	Psychosocial support	TB status	TB specific
Priedeman et al.	NGO/multilateral agency	Mixed without psychosocial support	TB status	TB sensitive
Randhawa et al.	Study intervention/source	Mixed with psychosocial support	TB status	TB specific
Reis-Santos et al (2022)	Study intervention/source	Nutritional support	Study intervention	TB specific
Reis-Santos et al. (2019)	Government/national TB program	Cash	Measures of poverty	TB sensitive
Rogers et al.	NGO/multilateral agency	Mixed with psychosocial support	Study intervention	TB specific

Study	Primary funding source	Social protection intervention type	Eligibility for social protection intervention	TB sensitive vs. TB specific
Rohit et al.	Government/national TB program	Cash	TB status	TB sensitive
Rudgard et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive
Samuel et al.	NGO/multilateral agency	Nutritional support	TB status	TB sensitive
Singh et al.	Study intervention/source	Nutritional support	TB status	TB specific
Soares et al.	Government/national TB program	Primarily psychosocial support	TB status	TB sensitive
Sripad et al.	Government/national TB program	Cash	TB status	TB sensitive
Timire et al.	Government/national TB program	Cash	TB status	TB specific
Torrens et al.	Government/national TB program	Cash	Measures of poverty	TB sensitive
Ukwaja et al.	Study intervention/source	Cash	TB status	TB sensitive
Wei et al.	Study intervention/source	Cash	Study intervention	TB specific
Wingfield et al. (2016a)	Study intervention/source	Mixed with psychosocial support	Study intervention	TB specific
Wingfield et al. (2016b)	Study intervention/source	Mixed with psychosocial support	Study intervention	TB specific
Wingfield et al. (2017)	Study intervention/source	Mixed with psychosocial support	Study intervention	TB specific
Wrohan et al.	Government/national TB program	Social health insurance	Not described	TB sensitive
Xiang et al.	Government/national TB program	Cash	Other	TB specific
Yin et al.	Not specified	Mixed with psychosocial support	Study intervention	TB specific
Zhao et al.	NGO/multilateral agency	Cash	TB status	TB specific

Table 2.5. Outcomes and implementation challenges described in quantitative studies (n=42). “Mix of other TB treatment outcomes” include mortality, TB treatment default (treatment interruption of at least two months), loss to follow up, or treatment failure.

Study	Primary outcome	Secondary outcome	Primary implementation challenge	Secondary implementation challenge
Bhargava et al.	TB treatment success	Mix of other TB treatment outcomes, weight gain	Not described	Not described
Bhatt R et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Carter et al.	TB treatment success	N/A	Not described	Not described
Chenicer et al.	Unfavorable treatment outcomes	Mix of other TB treatment outcomes	Not described	Not described
Ciobanu et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Dave et al.	Unfavorable treatment outcomes	TB treatment success	Delayed payments or non-receipt of payment	Insufficient funds
de Souza et al.	Death	N/A	Not described	Not described
Durovni et al.	TB treatment success	N/A	Not described	Not described
Florentino et al.	Catastrophic costs and dissaving	Financial coping mechanisms	Not described	Not described
Jiang et al.	Loss to follow up	N/A	Not described	Not described
Klein et al.	TB treatment success	Mix of other TB treatment outcomes	Administrative issues (inadequate banking systems/issues with paperwork or forms required)	Lack of knowledge/awareness about the program or how to link patients to the program (patient or provider/provisioner)
Li et al.	Other positive TB treatment outcome/outcomes	Socioeconomic outcome	Not described	Not described
Liu et al.	TB treatment success	Out of pocket expenses	Not described	Not described

Study	Primary outcome	Secondary outcome	Primary implementation challenge	Secondary implementation challenge
Lutge et al.	TB treatment success	N/A	Administrative issues (inadequate banking systems/issues with paperwork or forms required, delayed disbursement or non-receipt of funds/benefit)	Not described
Mansour et al.	Loss to follow up	N/A	Not described	Not described
Modi et al.	TB treatment success	Mix of other TB treatment outcomes	Administrative issues (inadequate banking systems/issues with paperwork or forms required, delayed disbursement or non-receipt of funds/benefit)	Lack of knowledge/awareness about the program or how to link patients to the program (patient or provider/provisioner)
Ngamvithay- apong- Yanai et al.	TB treatment success	Treatment failure	Not described	Not described
Pedrazzoli et al.	Catastrophic costs	Direct and indirect costs	Not described	Not described
Oliosi et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Potty et al.	TB treatment success	N/A	Not described	Not described
Priedeman et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Randhawa et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described

Study	Primary outcome	Secondary outcome	Primary implementation challenge	Secondary implementation challenge
Reis-Santos et al. (2022)	TB treatment success	Nutritional support	Not described	Not described
Reis-Santos et al. (2019)	TB treatment success	N/A	Not described	Not described
Rogers et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Rohit et al.	TB treatment success	Mix of other TB treatment outcomes	Administrative issues (inadequate banking systems/issues with paperwork or forms required, delayed disbursement or non-receipt of funds/benefit)	Lack of knowledge/awareness about the program or how to link patients to the program (patient or provider/provisioner)
Rudgard et al.	Socioeconomic outcome	N/A	Not described	Not described
Samuel et al.	Unsuccessful treatment outcome	Mix of other TB treatment outcomes	Not described	Not described
Singh et al.	Treatment success	Weight gain	Not described	Not described
Soares et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Sripad et al.	Treatment default	N/A	Administrative issues (inadequate banking systems/issues with paperwork or forms required)	Not described

Study	Primary outcome	Secondary outcome	Primary implementation challenge	Secondary implementation challenge
Timire et al.	TB treatment success	Mix of other TB treatment outcomes	Administrative issues (inadequate banking systems/issues with paperwork or forms required, delayed disbursement or non-receipt of funds/benefit), insufficient funds	Lack of knowledge/awareness about the program or how to link patients to the program (patient or provider/provisioner)
Torrens et al.	TB treatment success	N/A	Not described	Not described
Ukwaja et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Wei et al.	TB treatment success	Mix of other TB treatment outcomes	Administrative issues (inadequate banking systems/issues with paperwork or forms required)	Not described
Wingfield et al. (2016a)	Socioeconomic outcome	N/A	Not described	Not described
Wingfield et al. (2016b)	Socioeconomic outcome	N/A	Not described	Not described
Wingfield et al. (2017)	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Wrohan et al.	Loss to follow up	TB treatment success	Not described	Not described
Xiang et al.	Socioeconomic outcome	N/A	Not described	Not described
Yin et al.	TB treatment success	Mix of other TB treatment outcomes	Not described	Not described
Zhao et al.	Socioeconomic outcome	N/A	Other-insufficient funds	Not described

Study Characteristics

Study type. Of the 42 articles that reported on quantitative outcomes, 36 were cohort studies. Two studies were randomized controlled trials, two studies were cross sectional, and two studies were cluster randomized trials. Four eligible articles described qualitative studies.^{41–44}

Location and setting. Studies were conducted across a large range of countries (**Table 2.2**), and slightly less than half of the studies (n=20) were conducted in urban environments. Fifteen studies were conducted in mixed (rural and urban) settings, while six studies were conducted in primarily rural settings. Four studies did not specify if they were conducted in an urban, rural, or mixed setting (**Table 2.2**). The qualitative studies (**Table 2.3**) were conducted in Brazil, Nigeria, Kazakhstan, and India.

Type of social protection interventions. In total, there were six different categories of social protection interventions (Appendix C) described in the studies that reported quantitatively (n=42) on outcomes (**Table 2.4**): Cash transfers (n=20), nutritional support (n=5), social health insurance (n=4), mixed interventions with psychosocial support (n=8), mixed interventions without psychosocial support (n=3), and primarily psychosocial support (n=2). Fourteen studies described novel social protection interventions developed for research purposes rather than existing programs. Among the qualitative studies (n=4), social protection interventions included psychosocial support, nutritional support, and financial support.

Eligibility for interventions. Among the quantitative studies, seven studies reported eligibility criteria primarily pertaining to measures of poverty (such as income level) for “TB sensitive” social protection interventions (**Table 2.4**). Twenty studies described “TB specific” interventions for which only people with TB were eligible. One study defined eligibility for the social protection intervention based on a combination of various factors, and we were unable to categorize the

program as TB sensitive, TB specific, or designed within the context of the study.⁴⁵ We included studies that described TB-affected individuals and households with all types of TB (drug-sensitive TB, drug resistant TB, adults or children with TB, pulmonary and extrapulmonary TB).

TB treatment outcomes

Of the 42 studies that presented their results primarily quantitatively, 28 reported TB treatment success (defined as cure or completion of treatment) as the primary outcome of interest. Other outcomes included were mortality, TB treatment default (treatment interruption of at least two months⁷), loss to follow up, or treatment failure (**Table 2.5**).⁴⁷

Several studies in our review demonstrated that cash transfer benefits during the treatment phase could significantly improve TB treatment success rates⁴⁸⁻⁵⁰ and reduce loss to follow up⁴⁴ when used in conjunction with standard medical treatment. One study found that individuals in Nigeria who received a payment of \$15 USD per month through the duration of TB treatment demonstrated a 21% increase in treatment success rates and a 75% decrease in loss to follow-up compared to an historical, pre-intervention cohort.⁴⁴ Another study conducted in India described how a food assistance intervention, which cost \$10 USD per patient per month, was associated with a statistically significant lower risk of TB death and loss to follow-up.⁵¹ A 2013 study by Soares et al. conducted in Brazil found that combined patient education, treatment support, and a “supportive social network in the community”⁵² improved TB treatment success and decreased treatment default rates.

Socioeconomic outcomes

Seven studies reported on socioeconomic outcomes. Rudgard et. al⁵³ assessed the impact of three different social protection interventions in Rio de Janeiro, Brazil and their effect on catastrophic costs. Findings of their study demonstrated that social protection was significantly associated with a lower risk of incurring catastrophic costs. These findings mirrored

those of two papers by Wingfield et al.^{20,54} that evaluated the impact of a social protection intervention in Peru. Both papers describe how the implemented intervention was significantly associated with a reduction in catastrophic costs. Additionally, these effects were more pronounced in poorer households and among women. Similarly, a study conducted in the Philippines by Florentino et al.⁵⁵ found that people with MDR-TB who were recipients of a TB enabler package inclusive of food, transportation, and accommodation experienced reduced rates of catastrophic costs. As a secondary outcome of their study, Li et al.⁵⁶ evaluated patient expenses related to hospital admissions for MDR-TB. Researchers concluded that expenses related to hospital admissions did decrease as a result of social protection. Lastly, Liu et al. found that higher reimbursement rates from a social health insurance schemes for treatment in the outpatient setting was associated with improved treatment outcomes.⁵⁷

Two papers from China demonstrated slightly different results. A 2016 study by Xiang et al.⁴⁶ evaluated the impact of a medical insurance reimbursement model for people with TB. Authors found that there was a non-significant reduction in catastrophic costs among those who had received the reimbursement. Similarly, Zhao et al.⁵⁸ evaluated the effect of a transportation subsidy on reducing financial burdens among people with TB. Researchers concluded that overall, the amount provided with the subsidy was not sufficient to significantly reduce financial burdens. Pedrazzoli et al., who evaluated the impact social health insurance had on various financial outcomes among people with TB in Ghana, reported that social health insurance did not reduce catastrophic costs.⁵⁹ Lastly, Liu et al. found that higher rates of reimbursement from social health insurance schemes for inpatient related costs did not improve treatment outcomes.⁵⁷

While we intended to describe a range of socioeconomic outcomes in our results, particularly pertaining to various measures of poverty (see Appendix B), studies only reported on catastrophic costs (n=2), dissaving (n=1), out of pocket expenses (n=1), and direct and indirect costs (n=1) (**Table 2.5**).

Cycle of TB and poverty

Several studies explicitly described how social protections interventions helped interrupt the cycle of poverty and TB. For example, in the 2013 study by Zhao et al., researchers described how a transportation subsidy was particularly useful for the more impoverished individuals with TB.⁵⁸ Further, prior to the subsidy, patients described how they would not sometimes not pick up their TB medication refills due insufficient funds.⁵⁸ Several studies described how the actual amount of social protection provided to people with TB, whether a cash transfer, transportation subsidy, or other, must be sufficient to exert an effect.^{45,58}

Implementation outcomes

The majority of studies did not quantitatively describe implementation outcomes related to process metrics or feasibility of implementation (**Table 2.5**). Specifically, these three categories of implementation outcomes are fidelity (defined as “the degree to which an intervention or programme is delivered as intended”⁶⁰), reach (the number or proportion of individuals willing and/or able to participate in an intervention⁶¹), and coverage. Seven studies did report implementation outcomes qualitatively, with the most common reason (n=6) for poor implementation fidelity related to administrative issues in the provision of social protection benefits. Administrative issues described included inadequate banking systems, barriers completing required paperwork, and/or delayed or non-disbursement of social protection benefits.

Meta-analysis

The meta-analysis only focused on studies that reported quantitative results of TB treatment success (n = 22), as TB treatment success is the most inclusive outcome reported by research studies and public health programs (**Table 2.5**). All studies included in the meta-analysis estimated the effect of social protection interventions on dichotomous outcomes (“achieved treatment success” versus “did not achieve treatment success”). Of the 28 studies that quantitatively reported on TB treatment success, two studies did not have a control group^{57,62} and two studies did not report findings such that data could be extracted for meta-analysis calculations.^{63,64} Additionally, one study did not provide any information about how the historical cohort was recruited and subsequently compared to the intervention cohort.⁶⁵ Lastly, although Wrohan et al.⁶⁶ reported treatment success by social health insurance status, researchers only evaluated one type of social health insurance as the “social protection intervention,” and did not include additional information about the cohort of individuals not using social health insurance. Authors of this meta-analysis agreed that there was not sufficient information provided in the study to consider the “not using social health insurance” group a true control group. We therefore included 22 studies in our meta-analysis. All estimates of effect were reported as odds ratios with a 95% confidence interval (**Figure 2.2**). People with TB who were exposed to social protection interventions in conjunction with standard biomedical treatment (medication and standard medical appointments for treatment of TB) had approximately two times the odds of achieving TB treatment success (**Figure 2.2**, overall OR). The distribution of study effects is relatively narrow, with almost all studies reporting a positive effect. Our pooled estimate has an odds ratio of 2.12 with a confidence interval of 1.7 to 2.6, suggesting moderate heterogeneity, even with an I^2 of 93%.

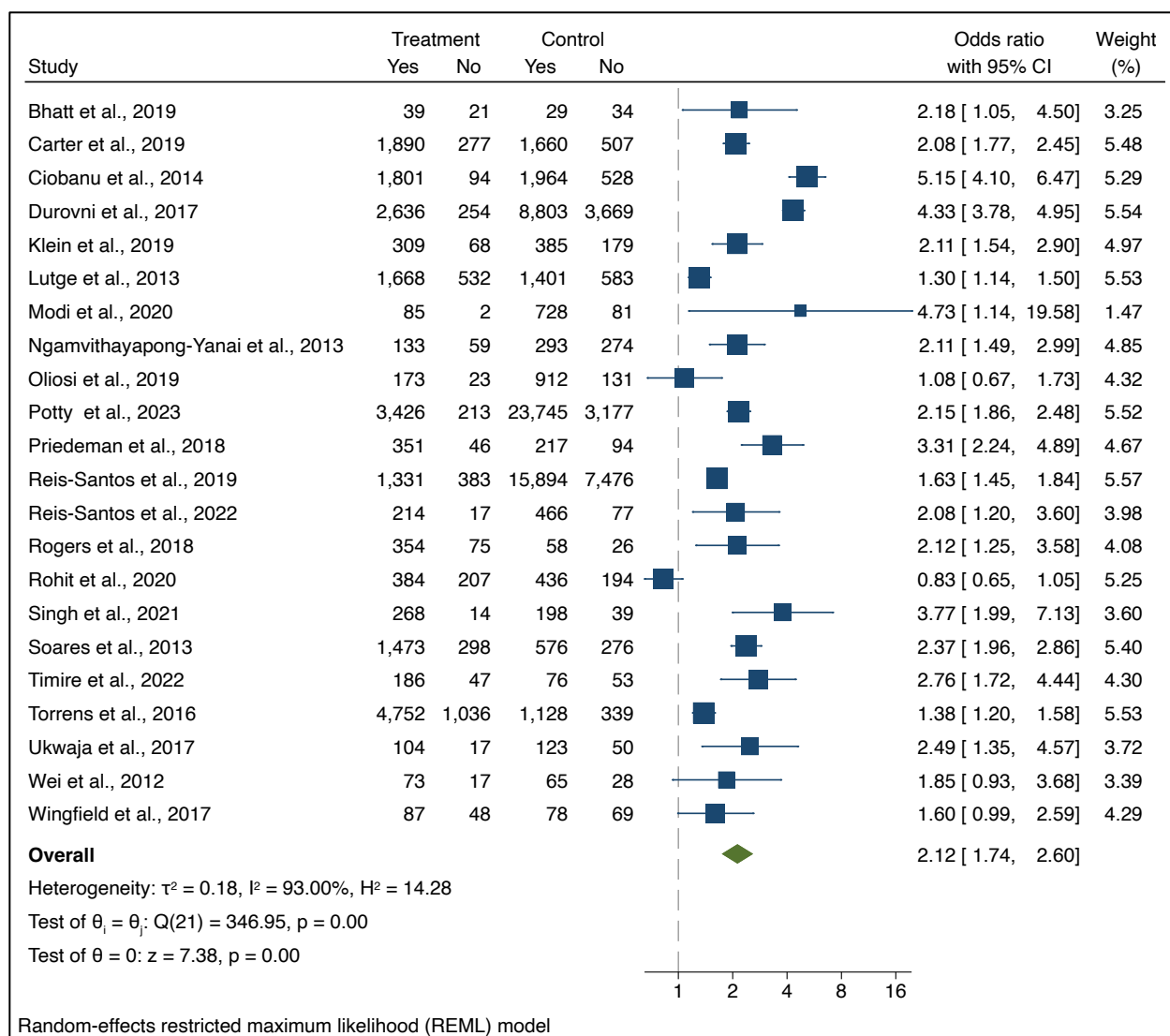


Figure 2.2. Meta-analysis of treatment success rates in individuals with access to a social protection vs. those who did not have access to a social protection intervention. Treatment=exposed to social protection, control=not exposed to social protection.

Risk of Bias Assessment

Results of the risk of bias assessments, which use standardized tools to score the risk of bias in individual studies, are described in **Table 2.6** and **Table 2.7**. AS, CC and MH used the Cochrane Risk of Bias Tool for Randomized studies,⁶⁷ and the Newcastle Ottawa Scale⁶⁸ to independently evaluate risk of bias in non-randomized studies that reported quantitatively on outcomes. Studies are scored in 3 areas – selection (scored 0-4) comparability (scored 0-2),

and outcome (scored 0-3). The higher the score, the more positive the assessment, meaning the study was less likely to be biased. We found the quality of the studies included to be high based on these criteria.

Table 2.6. Risk of bias assessments of non-randomized studies using the Newcastle Ottawa Scale (NOS).

Study	Selection (maximum score=4)	Comparability (maximum score=2)	Outcome (maximum score=3)
Bhargava, 2023	4	2	3
Bhatt et al., 2019	3	0	3
Carter et al., 2019	4	2	3
Chenicer et al.	4	2	3
Ciobanu et al., 2014	4	2	3
Dave et al., 2022	4	2	3
de Souza et al., 2018	4	2	3
Durovni et al., 2017	4	2	3
Florentino et al. 2022	4	2	3
Jiang et al. 2023	4	2	3
Klein et al., 2019	4	2	3
Li et al., 2015	4	2	3
Liu et al., 2023	4	2	3
Mansour et al., 2018	4	2	3
Modi et al., 2020	3	0	2
Ngamvithayapong-Yanai et al., 2013	3	1	3
Oliosi et al., 2019	4	2	3
Pedrazzoli et al., 2021	4	2	3
Potty et al., 2023	4	2	3
Priedeman et al., 2018	4	2	3
Randhawa et al., 2023	1	0	1
Reis-Santos et al., 2019	4	2	3
Rogers et al., 2018	4	2	3
Rohit et al., 2020	4	2	3
Rudgard et al., 2018	4	2	3
Samuel et al., 2016	4	1	3
Singh et al., 2021	4	1	3
Soares et al., 2013	4	2	3
Sripad et al., 2014	4	2	3

Study	Selection (maximum score=4)	Comparability (maximum score=2)	Outcome (maximum score=3)
Timire et al., 2022	4	2	3
Torrens et al., 2016	4	2	3
Ukwaja et al., 2017	4	2	3
Wei et al., 2012	4	2	3
Wrohan et al., 2022	4	2	3
Xiang et al., 2016	4	2	3
Yin et al., 2018	1	0	0
Zhao et al., 2013	4	2	3

Table 2.7. Risk of bias assessments of randomized controlled trials (RCTs) using the Cochrane Risk of Bias (RoB) assessment tool.

Study	Overall risk assessment
Lutge et al., 2013	Low risk
Reis-Santos et al. 2022	Low risk
Wingfield et al., 2016	Low risk
Wingfield et al., 2016	Low risk
Wingfield et al., 2017	Low risk

Qualitative studies

There were four eligible studies that primarily described their results qualitatively. George et al.⁴¹ evaluated social support services for people with TB in Kerala, India through in-depth interviews of healthcare workers. Researchers found that social support interventions generally improved treatment outcomes, increased adherence, provided people with emotional support, and reduced out-of-pocket expenditures. Kaliakbarova et. al⁴² described a qualitative evaluation of a psychosocial support program that was implemented via a collaboration between a local foundation and the national TB control program in Kazakhstan. Authors found that a majority of patients felt that social support was paramount to their treatment success, and that

almost 90% of individuals with MDR-TB reported that the psychosocial support intervention “increased their adherence to treatment and helped them to solve some individual problems”⁴². Orlandi et al.⁴³ conducted a qualitative study in Brazil in which they interviewed health professionals about their perception of the impact of the national social assistance program on TB treatment. Healthcare professionals reported mixed results; for some people with TB, they perceived that food assistance and social support impacted treatment outcomes significantly and positively, while for others, such as those with comorbidities like substance use disorder, social protection interventions appeared to have a muted effect.⁴³ Lastly, Ukwaja et al. described how researchers implemented a social protection intervention in Nigeria and then conducted semi-structured interviews among people with TB and key informants (such as health care workers) to evaluate the impact and acceptability of the intervention.⁶⁹ Researchers found that the intervention helped defray transportation costs, provided helpful nutritional supplementation, and allowed patients to purchase non-TB medication. Further, researchers concluded that the social protection intervention decreased delays in care seeking behavior, increased awareness about follow up appointments and adherence to TB treatment, and had a high level of acceptability.⁶⁹

Discussion

The results of this systematic review and meta-analysis provide a holistic assessment of the effect of social protection interventions on both TB treatment outcomes and socioeconomic outcomes for TB-affected populations. Our study highlights the potential impact of social protection interventions on reducing the risk of catastrophic and out-of-pocket costs among TB-affected households, thus contributing to disease reduction by interrupting the cycle of TB and poverty.^{41,53,70} However, the types of socioeconomic outcomes reported on by eligible studies were variable and not comprehensive. For example, only five of the 33 studies reported on

socioeconomic outcomes. Only three studies reported on catastrophic costs,^{46,54,71} and no studies reported on dissaving, a well-described proxy measure for catastrophic costs.⁷² One study reported on costs related to hospital admissions from MDR-TB⁵⁶, but researchers did not quantify these costs relative to annual income. This study highlights the potential for standardizing socioeconomic outcomes in terms of dissaving or catastrophic costs.

Operational challenges to providing social protection feasibly and sustainably for TB affected individuals have long been cited as a barrier for program coverage and uptake.⁷³ Unfortunately, the majority of studies did not describe implementation outcomes, and those that did, did not use standardized metrics to reflect on the feasibility, fidelity of implementation or coverage of studied programs (**Table 2.4**). Key implementation challenges described by a handful of studies in our review included problems with provision of benefits; many cash transfer interventions rely on unstable banking systems which frequently results in delayed or failed disbursement of funds to beneficiaries;²² Another study highlighted how failed disbursement of funds limits the impact of an intervention,⁴⁴ which authors attributed to poorly developed banking systems in rural sub-Saharan Africa. This finding is particularly relevant because impoverished individuals with TB tend to live in rural, rather than urban, areas of Sub-Saharan Africa. Similarly, while transportation assistance is a frequently cited example of social protection to address an unmet social need among people with TB,²⁴ little is known about how to implement transportation programs so people with TB can consistently access medical care other than by providing cash transfers to use existing transportation systems.⁶⁹ Zhao et al. describes how the benefit of a transportation subsidy depends both on cost and distance to health care, but the authors did not include a discussion of how to implement programs to target transportation programs to specific at-risk populations.⁵⁸ These findings suggest that additional research is needed to better understand barriers and facilitators to accessing social protection, as there is a paucity of studies exploring patient and system specific barriers and facilitators to accessing cash transfers. Additionally, standardizing the reporting of implementation outcomes

would provide needed evidence to support the deployment, monitoring and scale up of this group of interventions.

Our findings had some similarities with prior systematic reviews. For example, the 2018 study conducted by Richterman et al. found that cash transfer social protection interventions increased the odds of TB treatment success. Specifically, researchers found that participants who were recipients of social protection had 1.77 times the odds of a “positive TB treatment outcome.”⁷⁴ A 2018 study by Andrade et al. found that participants who were beneficiaries of social protection interventions had 1.09 times the odds of TB treatment success and 1.11 times the odds of a cure compared to those who were not beneficiaries of social protection interventions.⁷⁵ Prior studies, while influential, were limited by a narrow definition of social protection or type of intervention chosen. Andrade et al. conducted their search using only 14 search terms, and Richterman et al. focused on cash transfers only. Strengths of our analysis include our use of the more comprehensive World Bank definition of social protection and our search strategy to include all possible definitions that may arise from the World Bank version (Appendix C). Although this search strategy yielded many articles that did not meet our criteria, it also allowed us to capture studies that we may not have otherwise found with a narrower definition of social protection.

Our search yielded sufficient eligible studies (n=22) to conduct a meta-analysis demonstrating that TB-affected individuals who were provided social protection interventions, when combined with standard of care treatment, had double the odds of TB treatment success compared to people with TB who did not have access to social protection. Our results also suggest that providing TB-affected individuals with social protections can dramatically improve programmatic TB outcomes. This aligns with modeling and ecological studies that estimate the substantial extent to which social protection interventions can reduce TB incidence and prevalence,^{76,77} an important potential pathway for high disease burden countries to reach both the 2030 End TB Goals and SDGs. The findings of our systematic review and meta-analysis

also expand upon the evolving body of evidence that demonstrates the benefit of individual components or types of social protection, financial supports, and incentives used to improve TB outcomes. In sum, our findings demonstrate that a range of social protection interventions can improve TB treatment outcomes.

To our knowledge, this is the first systematic review and meta-analysis that comprehensively evaluates the impact of social protection interventions on both TB treatment and socioeconomic outcomes. Prior systematic reviews were more limited in scope, with a smaller number of search terms, or too general, focusing on a range of interventions beyond the World Bank definition of social protection interventions. Additionally, this is the first systematic review to evaluate the impact of social protection on socioeconomic outcomes among TB-affected households. Lastly, the findings in prior systematic reviews were too heterogenous to consolidate in meta-analysis. In contrast, this systematic review has an extensive list of search terms, expanded eligibility criteria for outcomes of interest, and a focused definition of social protection interventions which allowed us to obtain an adequate number of studies to conduct a meta-analysis. Additionally, the studies used in this systematic review were generally high quality as determined by our risk of bias assessments. In sum, this study fills an essential gap in existing synthesized evidence of the impact of social protection interventions on TB, socioeconomic, and implementation outcomes. Our findings also highlight the need for standardized definitions of social protection, as well as uniform reporting procedures, to better help evaluate the impact of social protection interventions for TB-affected individuals and households.

Our findings have limitations. First, the majority of studies that met our eligibility criteria were from middle income settings, primarily Brazil, limiting generalizability of our findings. While Brazil has several well described and successfully implemented social protection programs, more than half of the high burden TB countries are located in low-income African⁷ countries. Research representative of those settings is needed. Second, the majority of studies reported

cash transfer interventions. While there were not a sufficient number of studies to conduct sub-analyses based on type of intervention, our findings point to a key gap in the literature. Additional evidence about other non-cash transfer-based social protection interventions would be beneficial to quantify the potential impact of other types of social protection interventions. Further, additional research is required to understand the implementation and cost-effectiveness of social protection interventions for TB-affected populations.

Conclusion

Social protection interventions can significantly improve TB treatment outcomes. In our meta-analysis, individuals who had access to social protection interventions had twice the odds of attaining TB treatment success compared to those who did not have access to social protection interventions. Our results suggest that social protection improved other outcomes, such as decreased mortality and treatment default in addition to potential socioeconomic outcomes, although more evidence is required on these outcomes as well implementation outcomes. The standardized outcomes and definitions used in this systematic review and meta-analysis have the potential to guide further research on social protection programs for TB-affected populations.

Appendix A: Study team

Name	Initials	Role
Mollie Hudson	MH	Conceptualization, title and abstract screening, full text review, data extraction, meta-analysis, writing
Heather Todd	HT	Conceptualization, title and abstract screening, full text review, data extraction, meta-analysis, writing
Delia Boccia	DB	Conceptualization
Canice Christian	CC	Title and abstract screening, full text review, data extraction, risk of bias assessments
Joseph Kazibwe	JK	Title & abstract screening
Talemwa Nalugwa	TN	Conceptualization
Joseph Pearman	JP	Title & abstract screening
Shreya Puntambekar	SP	Full text review, data extraction
Ann Schraufnagel	AS	Data extraction, risk of bias assessments, meta-analysis
Priya B. Shete	PBS	Conceptualization, full text review, data extraction, meta-analysis, writing
Kristina Skender	KS	Title & abstract screening
Phuong Tran	PT	Title & abstract screening
Tom Wingfield	TW	Conceptualization, full text review, data extraction, meta-analysis, writing

Appendix B: Outcomes by PICOT

- **Outcomes for PICOT #1:** Primary and secondary outcomes related to TB treatment and catastrophic costs, and the nature of the social protection intervention.
 - *Primary TB treatment outcome:*
 - TB treatment success
 - Death
 - *Secondary TB treatment outcomes:*
 - Cure
 - Treatment completion
 - Adverse TB treatment outcomes:

- Loss to follow up
 - Relapse
 - Treatment failure
 - While this terminology as no longer used, it is likely that studies will have used this terminology.
 - No evaluation
- **Outcomes for PICOT #2:**
 - Catastrophic costs
 - Catastrophic costs (total costs of entire TB illness >20% of the same household's annual pre-TB income)
 - Costs
 - Direct medical
 - Direct non-medical
 - Indirect (lost income, time, and productivity)
 - Of note, these metrics may be calculated different based on the study approach, which will have to be taken into account when analyzing our findings.
 - Dissaving
 - Dissaving
 - If the patient/household took out a formal or informal loan
 - If the patient/household sold an asset or item
 - If the patient/household used savings
 - If the patient/household took a child out of school
 - Reduced household food consumption

- Percent poor⁷⁸ based on multidimensional poverty index scores
 - Percent poorer than median poverty score (person with TB and/or TB-affected household)
 - Experiencing extreme poverty
 - Below specified higher poverty lines (USD \$3.20 or \$5.50 (TB-affected household)
 - % below SPL (TB affected household)
 - Person with TB and/or TB-affected household's perception of poverty and the impact of TB on their poverty
 - For example, if a study used the WHO TB Patient Cost Survey, which asks questions about how TB illness has affected individual and/or household level poverty

Appendix C: Search strategy keywords

	Generic keywords	Other keywords
1	Tuberculosis (“TB treatment terms”)	TB, Mycobacterium tuberculosis, pulmonary TB, TB-affected, TB-infected, TB patients, drug-resistant TB, TB individuals/households, TB prevalent, TB cases Pulmonary TB, PTB
2	social protection (“intervention terms”)	Social safety net Socioeconomic support Social support Economic support Financial support Cash transfers; food-based programs, supplementary feeding programmes, food stamps, vouchers, and coupons; in-kind transfers such as school supplies and uniforms; conditional cash transfers; price subsidies for food, electricity, or public transport; public works programmes; and fee waivers and exemptions for health care, schooling, and utilities, welfare Food baskets, food rations Protections against shocks Social risk management Transportation Government financing Reimbursement Low and middle income, LMIC Support groups, education, community support
3	Support (“intervention terms”)	Intervention, incentive, program, scheme, policy, assistance, livelihood support, enabler
4	Impact (“outcome terms”)	Affect, effect, association, associated, consequence
5	Treatment (“outcome terms”)	Outcome, success, rates, unsuccessful, uptake, enrolment, adherence, cured, completed, treated, follow-up, loss to follow-up, relapse, recurrence, adverse outcome, diagnostic pathways, TB testing, quality of life, default, care cascade
6	Socioeconomic (“outcome terms”)	Outcome, financial burden, economic burden, economic consequences, social consequences, socioeconomic consequences, social impact, socioeconomic impact, costs, expenditure, expenses, spending, catastrophic expenditure, catastrophic costs, impoverishment, coping strategies, poverty, food security, loans, sold assets, dissaving, deprivation, defray, mitigate

Appendix D: Search strategies

#	Searches	Results
1	(Tuberculosis[Title/Abstract] OR TB[Title/Abstract] OR "Mycobacterium tuberculosis" [Title/Abstract] OR "Pulmonary TB" [Title/Abstract] OR "TB affected" [Title/Abstract] OR "TB infected" [Title/Abstract] OR "TB patients" [Title/Abstract] OR "Drug-resistant TB" [Title/Abstract] OR "TB individuals" [Title/Abstract] OR "TB affected households" [Title/Abstract] OR "TB prevalent" [Title/Abstract] OR "Pulmonary tuberculosis" [Title/Abstract] OR "Pulmonary TB" [Title/Abstract] OR PTB[Title/Abstract]) AND (Social protection[Title/Abstract] OR "Social safety net" [Title/Abstract] OR "Socioeconomic support" [Title/Abstract] OR "Social support" [Title/Abstract] OR "Economic support" [Title/Abstract] OR "Financial support" [Title/Abstract]) AND ("2012"[Date - Publication] : "2021"[Date - Publication])	308
2	(All TB treatment terms by title and abstract with OR as the Boolean operator) AND (All intervention terms by title and abstract with OR as the Boolean operator) AND ("2012"[Date - Publication] : "2021"[Date - Publication]) (i.e. #1 + additional terms)	17,461
3	(Tuberculosis[MeSH] + all TB treatment terms by title and abstract with OR as the Boolean operator) AND (All intervention terms by title and abstract with OR as the Boolean operator) AND ("2012"[Date - Publication] : "2021"[Date - Publication]) (i.e. #2+ MeSH terms)	17,732
4	("2012"[Date - Publication] : "2021"[Date - Publication]) AND (Tuberculosis[MeSH] OR all TB treatment terms by title and abstract) AND (all intervention terms by title and abstract) AND (all outcome terms by title and abstract) (i.e. #3 + outcome terms).	17,732

Web of Science search strategy

#	Searches	Results
1	TS=(TB terms with OR as the Boolean operator) AND TS=(all intervention terms with OR as the Boolean operator) AND TS=(all outcome terms with OR as the Boolean operator)	28,985
2	TI=(TB terms with OR as the Boolean operator) AND TS=(all intervention terms with OR as the Boolean operator) AND TS=(all outcome terms with OR as the Boolean operator)	14,687
3	TI=(TB terms with OR as the Boolean operator) AND TI=(all intervention terms with OR as the Boolean operator) AND TI=(all outcome terms with OR as the Boolean operator)	1412
4	TI=(TB terms with OR as the Boolean operator) AND TI=(all intervention terms with OR as the Boolean operator) AND TS=(all outcome terms with OR as the Boolean operator)	3568

CHAPTER 3: THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS, SELF-REPORTED HIV TREATMENT OUTCOMES, AND SOCIAL PROTECTION AMONG PREGNANT AND LACTATING WOMEN IN ZIMBABWE

Abstract

Background: Pregnant and lactating women with HIV are vulnerable to the co-occurring effects of HIV and poverty. In Zimbabwe, socioeconomically vulnerable young women are at particularly high risk of HIV infection. Addressing poverty is critical to ensuring improved health outcomes among pregnant and lactating women living with HIV in Zimbabwe. This study aimed to describe the association between socioeconomic vulnerability and health outcomes among pregnant and lactating women in Zimbabwe.

Methods: Pregnant and lactating women (n=600) with HIV, who are registered patients at a community health center operated by the Organization for Public Health Interventions and Development (OPHID), completed a questionnaire that contained questions about sociodemographic characteristics and self-reported clinical outcomes. We analyzed cross sectional data using generalized estimating equations to assess the relationship between HIV viral load non-suppression, ARV treatment interruption, delayed presentation to antenatal care, and several covariates, including access to social protection interventions. We report our results with risk ratios and 95% confidence intervals.

Results: Of the 600 participants, 74.5% reported that they were lactating while 25.5% reported that they were pregnant. Over half (54.2%) of participants described having experienced some form of unmet social need, with 47.2% describing food insecurity. Approximately a quarter (26.2%) describing lacking funds for transportation to or from a health facility, while another quarter ((23.7%) described lacking funds for user fees or other costs at health facilities. Half of respondents (49.5%) reported having experienced some form of dissaving, or negative financial coping strategy. Intimate partner violence was significantly associated with HIV viral load non-

suppression across several models. Having been a recipient of social protection was associated with ARV treatment interruption. Lastly, dissaving was associated with delayed presentation to antenatal care.

Conclusion: Pregnant and lactating women with HIV who experienced dissaving delayed presentation to antenatal care while those experiencing intimate partner violence had poor viral load suppression. Our findings suggest that pregnant and/or lactating women may benefit from targeted social protection interventions that address these factors. Additional research is needed to better understand how to effectively target social protection interventions in this population.

Introduction

Human Immunodeficiency Virus (HIV) is a leading cause of death among individuals in Zimbabwe.⁷⁹ HIV prevalence rates are high in Zimbabwe; approximately 11.3% among males and 15.4% among females.⁸⁰ Younger women aged 15-29 are at particularly high risk of HIV infection, and have the highest rates of HIV incidence in Zimbabwe; HIV incidence in this age cohort is estimated to be six times higher among women than men in this age cohort.⁸¹

Existing evidence suggests that in Zimbabwe, poverty is a significant risk factor among women for acquiring HIV. For example, a 2015 study demonstrated that lower socioeconomic status was associated with earlier marriage and a higher rate of high risk sexual behaviors.⁸ Food insecurity was also associated with higher rates of HIV infection.⁸ Additionally, several studies have demonstrated that poverty is a barrier to retention in antenatal care, thus potentially increasing rates of mother-to-child transmission of HIV.⁸² This is notable given that pregnant and lactating women are also especially vulnerable to the effects of poverty. For example, food insecurity during pregnancy is associated with negative physical and mental health outcomes.⁸³ Similarly, the increased micro and macronutrient demands required for

breastfeeding make lactating women particularly susceptible to food insecurity.⁸⁴ In sum, addressing poverty is essential to ensuring improved health outcomes among pregnant and lactating women, especially for those living with HIV.

To reduce HIV incidence and prevalence, improve access to health care, minimize the economic impact of HIV on individuals and households, and mitigate gender inequalities, interventions to minimize socioeconomic vulnerability, termed social protection interventions, are now a key pillar of both The United Nations Joint Programme on HIV/AIDS (UNAIDS) and the United Nations' Sustainable Development Goals (SDGs).^{11,12} Social protection interventions are broadly defined by the World Bank as systems that “help the poor and vulnerable cope with crisis and shocks, invest in the health and education of their children, and protect the aging population.”¹⁷ Such interventions include, but are not limited to, direct cash transfers, job training programs, and nutrition support. Prior studies have demonstrated that in low-income-countries (LICs) & low-and-middle-income-countries (LMICs), social protection interventions can reduce mother-to-child-transmission of HIV,⁸⁵ improve engagement in antenatal care services,^{86,87} increase rates of viral load suppression,²¹ and reduce transmission of HIV.⁸⁸ These interventions are critical in Zimbabwe, where 70% of individuals live below the Total Consumption Poverty Line and 29% of individuals live in extreme poverty.⁶

Several studies have described the relationship between HIV and poverty among women in Zimbabwe, while others have demonstrated how pregnant and lactating women are particularly vulnerable to the co-occurring effects of HIV and poverty.^{8,82,83} However, few studies have quantified the relationship between various forms of socioeconomic vulnerabilities and clinical outcomes among pregnant and lactating women with HIV. The objectives of this study are as follows:

- 1) Describe the association between measures of socioeconomic vulnerability and HIV treatment outcomes in pregnant and lactating women.

2) Describe the association between measures of socioeconomic vulnerability and delays in accessing antenatal care in pregnant and lactating women.

3) Describe the effect of receiving social protection interventions on both HIV treatment outcomes and accessing antenatal care services in the above models.

We hypothesized that poverty and measures of socioeconomic vulnerability would be associated with HIV viral load non-suppression, increased rates of antiretroviral (ARV) treatment interruption, and increased rates of delay in accessing antenatal care. We also hypothesized that being a recipient of any social protection interventions would reduce rates of HIV viral load non-suppression, ARV treatment interruption and delayed presentation to antenatal care.

Methods

Study design

Data for this study was collected via the 112-item Client Satisfaction Survey (CSS) between February 8th, 2020 and July 27th, 2023 by staff from the Zimbabwean-based Organization for Public Health, Interventions and Development (OPHID). The CSS survey is used by The U.S. President's Emergency Plan for AIDS Relief (PEPFAR) implementing partners to assess care quality at health facilities. Data for the CSS surveys is collected on a quarterly basis. OPHID supports 317 health centers which are clinics that serve both individuals newly diagnosed with HIV as well as people living with HIV (PLHIV) to support retention in care. This survey is routinely administered to participants across 15 districts in Zimbabwe as part of routine programmatic activities within OPHID. Specifically, the survey is administered in either English, Shona, or Ndebele by Community HIV and AIDS Support Agents (CHASA), who are staff of the Zimbabwe National Network of People Living with HIV (ZNNP+). ZNNP+ is an umbrella organization that coordinates the various HIV support groups within Zimbabwe⁸⁹ and works with OPHID on various programmatic activities. The survey takes approximately 30

minutes to complete with male respondents, and 30-45 minutes to complete with female respondents as there are additional questions pertaining to cervical cancer for women.

Study population

Clients were systematically sampled from 317 health centers across 15 districts in Zimbabwe using stratified random sampling. Clients were eligible to be surveyed if they were at least 18 years old, were receiving care at an OPHID health facility, and agreed to participate in the survey. All participants were HIV positive and receiving HIV care at an OPHID supported clinic, and were all pregnant and/or lactating.

Dependent variables: HIV treatment clinical outcomes

We included two HIV treatment outcomes in our analysis: 1) Self-reported HIV viral load, and 2) Self-reported ARV treatment interruption. Self-reported HIV viral load was a dichotomous response, with respondents reporting a viral load of either > 1000 copies/mL or <1000 copies/mL. This value was chosen because the viral load test available in Zimbabwe cannot detect HIV viral loads <1000 copies/mL, and an individual with a viral load <1000 copies/mL is considered to have a “controlled” viral load.⁹⁰ The second HIV treatment outcome measured was “ARV treatment interruption,” defined as whether an individual ever stopped their ARVs. Participants were not asked to further describe this interval. These responses were also dichotomized.

Dependent variables: Engagement in antenatal care

To evaluate engagement in antenatal care, clients were asked if they made their first antenatal care appointment before 12 weeks or after 12 weeks of pregnancy. These responses were therefore dichotomized at the point of data collection, with clients presenting to antenatal care after 12 weeks of pregnancy considered “delayed.”⁹¹ Timing of presenting to antenatal

care is an implementation outcome, rather than a clinical outcome, which reflect the quality of service delivery or health care access.

Covariates

We hypothesized that the following variables would be associated with the outcomes described above. We chose the following covariates based on current literature suggesting that these variables affected HIV treatment outcomes as well as timing of presentation to antenatal care.

Household size. Participants were asked how many members lived in their household, as crowding is a frequently cited measure of poverty^{92,93} which, in turn, has been shown to impact both HIV and antenatal treatment outcomes. Participants were asked how many people live in their household, and responses were categorized into the following categories: 1) 1-2 people, 2) 3-4 people, and 3) 5 or more people.

Living with a disability. Participants were asked if they had a disability. Although the survey asks individuals to further describe their type of disability (physical, hearing, visual, mental, intellectual, or albinism), we only included whether or not individuals self-identified as having any kind of disability (yes/no).⁹⁴

Transportation time to clinic. Individuals were asked how long it took them to reach a health clinic from their place of residence. Responses were categorized as: 1) 30 minutes to 1 hour, 2) 1-2 hours, and 3) More than two hours. Individuals who lived within 30 minutes of the health center were grouped with individuals who did not have to travel to a health center, as this was considered relatively local in our study setting. We included this covariate because prior studies

have demonstrated that distance to a healthcare center is a potential barrier to HIV⁹⁵ and antenatal care.⁹⁶

Costs incurred with care. Participants were asked if they incurred costs for healthcare, either costs associated with transportation to a health care facility or fees associated with a clinic visit, as prior studies have described cost as a barrier to care.⁹⁷ Responses were dichotomized (yes/no).

Dissaving. Participants were asked if they or their family had experienced dissaving since March of 2020. Specifically, participants were asked if they had 1) taken out a loan, 2) sold an asset, 3) withdrawn money from savings⁷², reduced personal or household food consumption, or 5) taken a child out of school to support access to HIV care or adherence to ARVs. Measures of dissaving are frequently used in settings where it is difficult or impossible to collect data about individual or household income.²⁰ Responses were dichotomized.

Social protection intervention ever received. In the survey, participants were asked if they had ever been a recipient of a social protection intervention. Those who responded “yes” were asked to further specify which of the three main social protection interventions they had been recipients of (the Harmonized Social Cash Transfer, the Emergency Social Cash Transfer, and/or the Basic Education assistance Model, described in further detail below). For our GEE model, we included a dichotomous variable indicating whether or not an individual had been a recipient of any social protection intervention.

Social protection-specific program. Individuals who had been recipients of social protection interventions were asked to further specify which intervention they, or their household, had been a beneficiary of. Participants responded that they were either beneficiaries of the

Harmonized Social Cash Transfer (HSCT), the Emergency Social Cash Transfer (ESCT), and/or the Basic Education Assistance Module (BEAM). HSCT is a nationally implemented cash transfer intervention targeting impoverished and food insecure households as defined by the Zimbabwean Ministry of Health and Child Care (MoHCC).⁹⁸ HSCT is jointly funded by the government of Zimbabwe and partners, including UNICEF, and has been implemented in waves at the district level during specific time frames. ESCT was an additional cash transfer program jointly implemented by UNICEF and the MoHCC between 2020 and 2023 across three urban districts in Zimbabwe. ESCT was created in an effort to address poverty, food insecurity, and socioeconomic vulnerability that had been exacerbated by the COVID-19 pandemic, and consisted of monthly payments of \$48 for eligible households.⁹⁹ Lastly, BEAM is a government funded, nationally implemented program to help orphans and vulnerable children pay for school-related fees (e.g. tuition and exam fees).¹⁰⁰ It has been primarily implemented by the Zimbabwean government.

Unmet social needs. To evaluate unmet social needs, participants were asked if they had experienced financial or food vulnerabilities that affected their adherence to antiretroviral therapy and/or their ability to attend clinic visits. Specifically, participants were asked if they ever 1) Lacked food for themselves or for family, 2) Lacked funds for transportation to or from the health facilities, 3) Lacked funds for user fees or other costs at the health facility, or 4) Experienced any other form of socioeconomic vulnerability (described with free text). If a participant answered “yes” to any of the aforementioned questions, they would be considered to have experienced vulnerability. Responses were dichotomized accordingly.

Multidimensional poverty. The 2022 Multidimensional Poverty Index (MPI), which was created by the Oxford Poverty and Human Development Index in partnership with the United Nations Development Program. The index uses ten indicators across three dimensions to evaluate

deprivation at the household level. The three dimensions are health, education, and standards of living.¹⁰¹ Health and education each have two indicators, while standards of living has six indicators. Weight is assigned accordingly: each health indicator is weighted 1/6, while each standard of living indicator is weighted 1/18. Each of these weights is considered to be a “deprivation score,” and the sum of the indicators is the household deprivation score with a maximum deprivation score of 100%.¹⁰¹ Households with a deprivation score greater than 1/5 (20%) but less than 1/3 (33.3%) are considered to be vulnerable to multidimensional poverty. If the household deprivation score is 1/3 (33.3%) to 1/2 (50%), the household is considered to be multidimensionally poor. If the household deprivation score is 1/2 (50%) or greater, the household is considered to be in severe multidimensional poverty. For our GEE analysis, we grouped multidimensionally poor with severe multidimensional poverty to help ensure a sufficient number of participants in each category; we were therefore less likely to find associations by chance. Participants were asked about each of these ten indicators and scored according to the above described calculations.

Intimate partner violence & gender-based violence. Participants were asked if they had experienced abuse from their intimate partner in the last three months and if they had experienced gender-based violence in the last three months. We chose to include these as covariates because current evidence suggests that both gender-based violence and intimate partner violence negatively affect HIV treatment outcomes and engagement with antenatal care.¹⁰² Responses were dichotomized (yes/no). Participants were also asked if they had experienced gender-based violence from anyone other than their intimate partner in the last three months, as the survey is administered quarterly. Responses were dichotomized (yes/no).

Number of months of ARVs given. Participants were asked how many months of ARVs they were given at their last clinic visit. This was asked primarily because Zimbabwe uses a

differentiated service delivery model, in which individuals receive several month's supply of ARVs in a single clinic visit.¹⁰³ Differentiated service delivery models have been implemented in settings where it may be difficult for individuals to access clinics on a monthly basis. Response options were 1) One month, 2) two months, 3) Three months, and 4) Six months. This covariate was only used in our descriptive statistics but was not included in the GEE analysis. The primary reason this covariate was included in descriptive statistics was to help us better describe and quantify how individuals access HIV care in our study setting.

Statistical analysis

Descriptive statistics were generated to summarize basic sociodemographic and socioeconomic characteristics of our study population (n=600) (**Table 3.1**). We then generated descriptive statistics stratified by whether or not individuals had been recipients of social protection interventions (**Table 3.2**). We tested whether the two groups were statistically significantly different from each other on each measure. We considered a p-value of <.05 to be statistically significant. To evaluate the relationship between clinical and implementation outcomes and various measures of socioeconomic status, we used generalized estimating equation (GEE) models, clustered by district. GEE is a statistical method used for modeling clustered data, often used when measures are binary. GEE models a population average, estimating parameters for each cluster.¹⁰⁴ For our model, we declared district as our cluster variable. GEE was chosen as the most appropriate model because 1) CSS data are collected at the district level, and 2) each district has specific socioeconomic risks (such as challenges accessing water) and different potential exposures to social protection interventions. A GEE model was also chosen because we were interested in the average response of a population to covariates while accounting for within-subject correlation. Multivariate Poisson regression models were constructed using the log link function to estimate the incidence rate ratio of each outcome of interest. We report unadjusted and adjusted risk ratios (RR) and 95% confidence

intervals (CI), and considered a p-value of $<.05$ to be statistically significant. We used STATA BE version 17.³⁸

We first ran GEE models with the following independent variables: household size, disability, transportation time to clinic, dissaving, vulnerability, costs incurred with care, MPI, social protection receipt, gender-based violence, and intimate partner violence. Our primary outcomes of interest were HIV viral load suppression (Model 1), ARV treatment interruption (Model 2), and delayed presentation to antenatal care (Model 3). For model 1, we also included “interruption in ARVs,” as we expected interruption in ARVs to be associated with HIV viral load non-suppression.¹⁰⁵ We ran our models to account for the different sample sizes as not all questions had the same number of responses. For example, not all clients had a viral load result from the past three months. Next, we ran univariate GEE models only for covariates previously identified in the literature as variables that have an effect on HIV and antenatal care outcomes, as noted above. Lastly, we ran adjusted models with all of the aforementioned covariates included. We generated RRs for all models given that our data was cross sectional.

Ethics statement

Written consent is not required to participate in the CSS surveys because 1) the CSS survey is part of routinely collected programmatic data, and 2) only deidentified data is provided in the surveys for analysis. The study was reviewed and approved by the Institutional Review Boards of the University of California San Francisco and the Medical Research Council of Zimbabwe.

Results

Descriptive statistics

A total of 600 participants were surveyed at one point in time (**Table 3.1**). Approximately half of respondents (57.5%) were between 30 and 44 years old, while approximately one third (37.5%) (4.3%) were between 18 and 29 years old. Respondents were relatively evenly

distributed across the 15 districts, with the exception of Bulawayo (2.2%). Almost half of respondents (45.2%) reported having to travel between 30 minutes and an hour to access a health clinic. Of the 600 respondents, 497 reported receiving a viral load result within the last 12 months. The majority of those who had undergone viral load testing reported a viral load of under 1000 copies/mL. Approximately one quarter of those who had undergone viral load testing (26%) did not know their viral load result.

Of the 600 participants, 74.5% reported that they were lactating while 25.5% reported that they were pregnant. The majority (72.2%) had attended their first antenatal appointment within the first 12 weeks of their pregnancy. Over half of participants described having experienced some form of vulnerability, with over half (54.2%) describing food insecurity. Approximately a quarter (26.2%) describing lacking funds for transportation to or from a health facility, while another quarter described lacking funds for user fees or other costs at health facilities. Half of respondents (49.5%) reported having experienced some form of dissaving.

When stratified by whether or not individuals had been recipients of social protection interventions, findings were relatively similar (**Table 3.2**). However, there were a few key differences. Among individuals who had been recipients of social protection interventions, 11% had household sizes of one to two people. Among individuals who had never been recipients of social protection interventions, 18% had household sizes of one to two people. Additionally, individuals who had been recipients of social protection interventions were less likely to report a viral load of <1000 copies/mL (70.6% versus 85.7% in the group of individuals who had not been recipients of social protection interventions). This covariate was the only measure in which there was a statistically significant difference between the two groups ($p=.003$). The percentage of individuals who reported experiencing any form of unmet social need was similar between the two groups. Individuals who had been recipients of social protection interventions reported slightly higher rates of dissaving compared to individuals who had not been recipients of social protection interventions (55.5% and 48%, respectively).

Table 3.1. Demographics and socioeconomic characteristics of pregnant and lactating women living with and receiving care for HIV in 15 districts of Zimbabwe (N = 600)

	N (%)
Pregnant/Lactating (n = 600)	
Pregnant	153 (25.5%)
Lactating	447 (74.5%)
Age Group	
Young adults (18-29)	225 (37.5%)
Middle-aged adults (30-44)	345 (57.5%)
Adult (45-64)	30 (5.0%)
Viral Load result (within past 12 months) (n = 497)	
<1000	305 (61.4%)
>= 1000	63 (12.7%)
Unknown	129 (26%)
Interruption to ARV (Yes)	59 (9.8%)
First Antenatal Appointment (n = 600)	
Before 12 weeks	433 (72.2%)
After 12 weeks	167 (27.8%)
Household size	
Household size groups	
1-2	101 (16.8%)
3-4	226 (37.7%)
5+	273 (45.5%)
Living with a disability	20 (3.3%)
District	
Beitbridge	59 (9.8%)
Bulawayo	13 (2.2%)
Bulilima	42 (7.0%)
Chiredzi	65 (10.8%)
Chitungwiza	22 (3.7%)
Chivi	19 (3.2%)
Gutu	49 (8.2%)
Gwanda	62 (10.3%)
Insiza	47 (7.8%)
Mangwe	26 (4.3%)
Masvingo	48 (8.0%)
Matobo	42 (7.0%)
Mwenezi	36 (6.0%)
Umzingwane	42 (7.0%)
Zaka	28 (4.7%)
Transportation time to clinic	
0-30 minutes	143 (25.5%)
30 min to 1 hour	264 (45.2%)
1 hour to 2 hours	148 (25.3%)
More than 2 hours	27 (4.6%)

	N (%)
Paid for clinic services (Yes)	18 (3.0%)
Paid for transportation (Yes)	239 (34.8%)
Received ARVs at clinic visit if due (Yes)	541 (90.2%)
ARV # months prescription given	
1 month	56 (10.4%)
2 months	9 (1.7%)
3 months	255 (47.1%)
6 months	221 (40.9%)
Unmet social need (Any)	235 (54.2%)
Lack of food for participant or family	283 (47.2%)
Lack of funds for transportation to or from health facility	157 (26.2%)
Lack of funds for user fees or other costs at the health facility	142 (23.7%)
Other	
Dissaving (Any)	297 (49.5%)
Taken out a loan	30 (5.0%)
Withdrawn from personal or household savings	104 (17.3%)
Sold assets	198 (33.0%)
Reduced personal or household food consumption	206 (34.3%)
Taken a child out of school	71 (11.8%)
MPI 4 categories	
Not multidimensionally poor/not vulnerable	114 (19.0%)
Not poor but vulnerable	133 (22.2%)
Multidimensionally poor	266 (44.3%)
Severe multidimensionally poor	87 (14.5%)
Social Protections Program Receipt (Ever)	119 (19.8%)
HSCT (n = 119)	29 (24.4%)
ESCT (n = 119)	35 (29.4%)
BEAM (n = 199)	57 (47.9%)
Experienced Intimate Partner Violence in past 3 months (Yes)	52 (8.7%)
Experienced Gender-Based Violence in past 3 months (Yes)	30 (5.0%)

Table 3.2. Demographics and socioeconomic characteristics of pregnant and lactating women living with and receiving care for HIV in 15 districts of Zimbabwe (N = 600), stratified by whether or not clients had been recipients of social protection interventions.

	Has never been a recipient of SP (n=481) N (%)	Has been a recipient of SP (n=119) N (%)	P value
Pregnant/Lactating (n = 600)			.9
Pregnant	123 (25.6%)	30 (25.2%)	
Lactating	358 (74.4%)	89 (74.8%)	
Age			
Age Group			
Young adults	181	44	.6
Middle-aged adults (20-44)	278	67	
Adult (45-64)	22	8 (6.7%)	

	Has never been a recipient of SP (n=481) N (%)	Has been a recipient of SP (n=119) N (%)	P value
Viral Load result (within past 12 months) (n = 497)			<.05 (.003)
<1000	257 (85.7%)	48 (70.6%)	
>/= 1000	43 (14.3%)	20(29.4%)	
Unknown			
Interruption to ARV (Yes)	42 (8.7%)	17 (14.3)	
First Antenatal Appointment (n = 600)			.2
Before 12 weeks	354 (73.6%)	79 (66.4%)	
After 12 weeks	127 (26.4%)	40 (33.6%)	
Household size			
Household size groups			
1-2	88 (18.2%)	13 (11%)	.1
3-4	182 (37.8%)	44 (37%)	
5+	211 (43.9%)	62 (52.1%)	
Living with a disability	11 (2.3%)	9 (7.6%)	
District			
Beitbridge	54 (11.2%)	5 (4.2%)	<.05 (.00)
Bulawayo	11 (2.3%)	2 (1.7%)	
Bulilima	21 (4.4%)	21 (17.6%)	
Chiredzi	53 (11%)	12 (10.1%)	
Chitungwiza	22 (4.6%)	0 (0%)	
Chivi	17 (3.5%)	2 (1.7%)	
Gutu	41 (8.5%)	8 (6.7%)	
Gwanda	50 (10.4%)	12 (10.1%)	
Insiza	39 (8.1%)	8 (6.7%)	
Mangwe	14 (2.9%)	12 (10.1%)	
Masvingo	41 (2.9%)	7 (5.9%)	
Matobo	25 (5.2%)	17 (14.3%)	
Mwenezi	30 (6.2%)	6 (5%)	
Umzingwane	38 (7.9%)	4 (3.7%)	
Zaka	25 (5.2%)	3 (2.5%)	
Transportation time to clinic			
0-30 minutes	118 (24.7%)	25 (22%)	.9
30 min to 1 hour	211 (45%)	53 (46%)	
1 hour to 2 hours	117 (24.3%)	31 (26%)	
More than 2 hours	22 (4.7%)	5 (4.2%)	
Paid for clinic services (Yes)	17 (3.5%)	1 (.8%)	
Paid for transportation (Yes)	195 (40.5%)	44 (37%)	
Received ARVs at clinic visit if due (Yes)	439 (91.3%)	102 (85.7%)	
ARV # months prescription given			.4
1 month	50 (10.4%)	6 (5%)	
2 months	8 (1.7%)	1 (.8%)	
3 months	205 (42.6%)	50 (42%)	
6 months	176 (36.6%)	45 (37.8%)	

	Has never been a recipient of SP (n=481) N (%)	Has been a recipient of SP (n=119) N (%)	P value
Unmet social need(Any)	258 (53.6%)	67 (56.3%)	.6
Lack of food for participant or family	220 (45.7%)	63 (52.9%)	
Lack of funds for transportation to or from health facility	132 (27.4%)	25 (21%)	
Lack of funds for user fees or other costs at the health facility	114 (23.7%)	28 (23.5%)	
Other			
Dissaving (Any)	231 (48%)	66 (55.5%)	.1
Taken out a loan	26 (5.4%)	4 (3.4%)	
Withdrawn from personal or household savings	86 (17.9%)	18 (15.1%)	
Sold assets	116 (24.1%)	38 (32%)	
Reduced personal or household food consumption	158 (32.8%)	48 (40.3%)	
Taken a child out of school	55 (11.4%)	16 (13.4%)	
MPI 4 categories			.1
Not multidimensionally poor/not vulnerable	93 (19.3%)	21 (17.6)	
Not poor but vulnerable	106 (22%)	27 (22.7%)	
Multidimensionally poor	220 (45.7%)	46 (38.7%)	
Severe multidimensionally poor	62 (12.9%)	25 (21%)	
Social Protections Program Receipt (Ever)			
HSCT (n = 119)		29 (24.4%)	
ESCT (n = 119)		35 (29.4%)	
BEAM (n = 199)		57 (47.9%)	
Experienced Intimate Partner Violence in past 3 months (Yes)	40 (8.3%)	12 (10.1%)	.5
Experienced Gender-Based Violence in past 3 months (Yes)	24 (5%)	6 (5%)	1

Generalized estimating equation models

Results of the GEE models for HIV viral load non-suppression are presented in **Table 3.3**. In our first GEE model, we estimated the association between HIV viral load suppression and socioeconomic covariates. In the unadjusted model, HIV viral load non-suppression was associated with living with a disability (RR 2.3, 95% CI 1.2-4.4, p=.01), having been a recipient of social protection (RR 2.1, 95% CI 1.3, 3.4, p=.004), and having experienced intimate partner

violence within the last three months (RR 2.6, 95% CI 1.3, 5.6, p=.01). In the adjusted model, HIV viral load non-suppression was only associated with intimate partner violence (RR 2.4, 95% CI 1.5, 4, p<.005). Household size, transportation time to clinic, costs incurred with care, and interruption in ARV were not significant in either the adjusted or unadjusted model.

Table 3.3. Association of patient characteristics with HIV viral load non-suppression (n=361), controlling for age.

	Unadjusted RR (95% CI)	p-value	Adjusted RR (95% CI)	p-value
Household size				
3-4	1 (.42, 2.4)	0.9	0.82 (.32, 2.1)	0.7
5+	1.2 (.5, 2.6)	0.7	1.0 (0.5, 2.3)	0.9
Living with a disability	2.3 (1.2, 4.4)	0.01	1.8 (.9, 3.5)	.08
Transportation time to clinic				
0-30 min (Ref)	--	-	--	-
30 min to 1 hour	1.7 (.8, 3.6)	0.1	1.6 (.8, 3.0)	0.2
1 hour to 2 hours	1.1 (.4, 2.7)	0.9	1 (.3, 2.9)	1.0
More than 2 hours	1.8 (.5,6.4)	0.4	1.7 (.7, 4.2)	0.3
Costs incurred with care (transportation or clinic costs)	1.1 (.7, 1.8)	0.7	1.1 (0.7, 2.0)	0.6
Dissaving	1.0 (.5, 2.1)	1	1 (.5, 1.8)	0.9
Unmet social need	.7 (.4, 1.4)	0.4	.7 (.4, 1.2)	0.7
Multidimensional poverty index				
Not multidimensionally poor/not vulnerable (Ref.)	--	--	--	--
Not multidimensionally poor/vulnerable	.8 (.3, 1.7)	0.5	.9 (.4, 1.9)	0.8
Multidimensionally poor/severely poor	1.3 (.6, 2.8)	0.5	1.3 (.7, 2.7)	0.4
Social Protections Receipt	2.1 (1.3, 3.4)	<.05 (0.004)	1.1 (.3, 3.5)	0.9
Interruption to ARV	.7 (.2, 1.9)	0.5	.48 (.1, 1.9)	0.3

	Unadjusted RR (95% CI)	p-value	Adjusted RR (95% CI)	p-value
Gender based violence	1.2 (.4, 3.5)	0.7	.7 (.3, 1.5)	0.4
Intimate partner violence	2.6 (1.3, 5.6)	<.05 (0.01)	2.4 (1.5, 4)	<.05 (.000)

In our second GEE model, we estimated the association between ARV treatment interruption and socioeconomic covariates (**Table 3.4**). In the unadjusted model, ARV interruption was associated with having more than five individuals in the household (RR 2.6, 95% CI 1.1, 5.8, p=.03). In the adjusted model, having been a recipient of social protection was significantly associated with ARV interruption (RR 2.3, 95% CI 1.3, 4.2, p=.006).

Table 3.4. Association between patient sociodemographic and clinical characteristics with antiretroviral (ARV) interruption (n=582)

	Unadjusted RR (95% CI)	p-value	Adjusted RR (95% CI)	p-value
Household size				
3-4	1.8 (.9, 3.8)	0.12	1.7 (.7, 4.1)	0.2
5+	2.6 (1.1, 5.8)	<.05 (0.03)	2.3 (1, 5.7)	0.06
Living with a disability	1 (.4, 2.4)	1	.79 (.4, 1.7)	0.5
Transportation time to clinic				
0-30 min (Ref)	--	--	--	--
30 min to 1 hour	1 (.5, 2.1)	0.9	.9 (.4, 1.9)	0.8
1 hour to 2 hours	1.1 (.5, 2.4)	0.8	.9 (.4, 2.0)	0.8
More than 2 hours	2.4 (.7, 8.4)	0.2	2.1 (.5, 8.9)	0.3
Costs incurred with care (transportation or clinic costs)	1.1 (.7, 1.8)	0.6	1.1 (0.6, 1.8)	0.9
Dissaving	1 (.7, 1.5)	0.9	.9 (.6, 1.3)	0.6
Unmet social need	1.1 (.7, 1.7)	0.8	1.1 (.6, 1.8)	0.8

	Unadjusted RR (95% CI)	p-value	Adjusted RR (95% CI)	p-value
MPI 3 Categories				
Not multidimensionally poor/not vulnerable (Ref.)	--	--	--	--
Not multidimensionally poor/vulnerable	1 (.5, 2)	0.9	1 (.5, 1.9)	1.0
Multidimensionally poor/severely poor	1.1 (.6, 2.1)	0.8	1.2 (.7, 2.0)	0.8
Social Protections Receipt	1.7 (.9, 3)	0.1	2.3 (1.3, 4.2)	<.05 (0.006)
Gender based violence	1.3 (.6, 3.1)	0.5	1 (.5, 2.1)	1
Intimate partner violence	1.4 (.5, 3.9)	0.6	1.6 (.5, 4.7)	0.4

In our third GEE model (**Table 3.5**), we estimated the association between delayed presentation to antenatal care and sociodemographic covariates. In both the unadjusted and adjusted model, dissaving was associated with delayed presentation to antenatal care (RR 1.7, 95% CI 1.4, 2.3, $p < .05$ and RR 1.8, 95% CI 1.4, 2.3, $p < .05$, respectively). Similarly, both the unadjusted and adjusted models showed that intimate partner violence was associated with delayed presentation to antenatal care (RR 1.9, 95% CI 1.4, 2.5, $p < .05$ & RR 1.6, 95% CI 1, 2.4, $p = .03$, respectively).

Table 3.5. Association between patient characteristics and delayed presentation to antenatal care (> 12 weeks) (n=582)

	Unadjusted RR (95% CI)	p-value	Adjusted RR (95% CI)	p-value
Household size				
3-4	.8 (.6, 1.2)	0.2	0.8 (.4, 1.6)	0.5
5+	1 (.8, 1.4)	0.8	1.0 (.6, 1.1)	0.8
Living with a disability	1.3 (.9, 1.9)	0.2	1.2 (.9, 1.7)	0.3
Transportation time to clinic				
0-30 min (Ref)	--	--	--	--
30 min to 1 hour	0.8 (.5, 1.1)	0.2	0.7 (.5, 1.0)	0.1
1 hour to 2 hours	1 (.8, 1.2)	0.8	.9 (.7, 1.1)	0.2
More than 2 hours	0.8 (.5, 1.3)	0.4	.8 (.5, 1.4)	0.4
Costs incurred with care (transportation or clinic costs)	1.2 (.9, 1.5)	0.2	1.1 (0.6, 1.8)	0.9
Dissaving	1.7 (1.4, 2.3)	<.05 (.000)	1.8 (1.4, 2.3)	<.05 (.000)
Unmet social need	1.3 (1, 1.8)	.06	1 (.7, 1.3)	0.8
MPI 3 Categories				
Not multidimensionally poor/not vulnerable (Ref.)	--	--	--	--
Not multidimensionally poor/vulnerable	1 (.5, 2.2)	1	1.2 (.5, 2.3)	0.8
Multidimensionally poor/severely poor	1.1 (.7, 1.7)	0.7	1.1 (.7, 1.7)	0.7
Social Protections Receipt	1.3 (.9, 1.8)	0.6	1.6 (.7, 3.7)	0.3
Gender based violence	1.8 (.9, 3.4)	0.1	1.6 (.9, 2.8)	.09
Intimate partner violence	1.9 (1.4, 2.5)	<.05 (.000)	1.6 (1.0, 2.4)	<.05 (.03)

Discussion

To our knowledge, our study is one of few that has evaluated the impact of various socioeconomic indicators on HIV treatment outcomes for pregnant and lactating women in Zimbabwe. It is the only known study that has assessed the effect of social protection

interventions on HIV outcomes and engagement in antenatal care for pregnant and lactating women living with HIV in Zimbabwe.

Our findings highlight the many socioeconomic vulnerabilities experienced by this population. Approximately half of respondents reported that they had experienced a form of dissaving. Additionally, over half of respondents reported having experienced at least one form of vulnerability as described in the CSS survey. Similarly, approximately half of respondents described experiencing food insecurity. It is evident that the population surveyed experiences significant vulnerabilities and forms of impoverishment. However, only about 25% of participants had ever been recipients of any social protection intervention. These findings indicate a supply-demand mismatch of those who would potentially benefit from social protection and those who have actually received social protection.

Across several models, we found intimate partner violence to be associated with HIV viral load non-suppression, as well as delayed presentation to antenatal care. This finding is consistent with evidence in the current literature. For example, a 2022 study conducted by Gibbs et al. found that intimate partner violence was independently associated with reduced viral load suppression among pregnant women in South Africa.¹⁰² Similarly, a 2022 study conducted by Aboagye et al. found that women who experienced intimate partner violence were less likely to attend a prenatal appointment within the first 12 weeks of pregnancy.⁹¹ Our findings suggest that policy makers should focus efforts on creating and implementing policies that have the potential to reduce intimate partner violence among women, especially those who are pregnant or lactating. These efforts may improve HIV viral load suppression rates and engagement in antenatal care, among other health and socioeconomic benefits.

We found that social protection receipt was associated with ARV treatment interruption. While we initially hypothesized that social protection receipt would reduce ARV treatment interruption, we suspect that this finding indicates that those eligible for social protection experience socioeconomic vulnerabilities.¹⁰⁶ One potential next step to better understand the

relationship between socioeconomic characteristics, social protection intervention receipt, and various health outcomes would be to conduct a moderation analysis. A moderation analysis could help us better understand how social protection intervention as the moderator variable affects the relationship between socioeconomic vulnerability and ARV treatment interruption. Additionally, the CSS survey only asked individuals if they had ever been recipients of social protection interventions. A one-time allotment of a benefit, that may or may not have been disbursed during a period of particularly acute economic hardship, would likely have had a limited effect on health outcomes. In subsequent surveys, it may be helpful to ask respondents about how many disbursements they received, actual amount disbursed, and when individuals received any forms of socioeconomic support.

Transportation time to clinic was not significantly associated with HIV viral load non-suppression or engagement in antenatal care. We suspect the reasons for this are multifold. First, Zimbabwe's health ministry uses a differentiated service delivery model in which individuals receive three to six months of ARVs during one visit.¹⁰⁷ This is consistent with what was demonstrated with our descriptive statistics, which show that more than 40% of individuals surveyed receive a three month supply of ARVs while approximately a third of respondents receive a six month supply of ARVs (**Table 3.1**). These findings may indicate that an individual with HIV may only have to visit a clinic twice a year. Thus, even though approximately a quarter of respondents reported lacking sufficient funds for transportation to clinic (**Table 3.1**) transportation time to clinic may not be a significant factor in their ability to engage with HIV care. Costs incurred with care was also not significantly associated with HIV viral load non-suppression or engagement in antenatal care. This may be due to several reasons. First, ARVs are free in Zimbabwe. If individuals only have to travel to a clinic one or two times each year, and if ARVs are free, an individual may not incur significant costs with HIV care.

In both the adjusted and unadjusted models, dissaving was associated with delayed presentation to antenatal care. Specifically, individuals who experienced at least one form of

dissaving were almost twice as likely to have delayed presentation to antenatal care. Given that dissaving has been demonstrated to be an indicator of socioeconomic vulnerability,²⁰ this finding is consistent with our hypothesis that socioeconomic vulnerability would be associated with delayed presentation to antenatal care. It is notable that HIV treatment is free in Zimbabwe, while other health services-including antenatal care- require individuals to pay user fees.¹⁰⁸ It is possible that engaging with antenatal care requires more resources and thus makes this population more susceptible to experiencing dissaving. Additionally, we suspect that the differentiated service delivery models, which are specific to HIV care, is protective against dissaving and other forms of socioeconomic hardship. This is consistent with our finding that costs incurred with care were not associated with HIV viral load non-suppression or ARV treatment interruption.

Surprisingly, in all of our models, multidimensional poverty was not associated with HIV viral load non-suppression, ARV treatment interruption, or delayed presentation to antenatal care. Similarly, household size as a proxy for poverty was also not associated with adverse health outcomes. This may be due to the fact that the majority of our study population was categorized as either poor or severely poor by the MPI metrics.

Our study has limitations. First, all of our outcomes are self-reported. It is possible that people did not accurately report HIV viral load non-suppression rates, ARV treatment interruption rates, or when they engaged with antenatal care services. Ideally, these reports would have been correlated with national registers or other official clinical documentation. Second, while GEE models are not restricted to longitudinal data, they are often better suited for longitudinal data with multiple time points. While we adjusted for this by calculating a risk ratio rather than an odds ratio, this may partially account for why our findings were not statistically significant. Third, our sample size may not have been adequate to capture statistical differences in our population. This is likely given the wide confidence intervals in our GEE analysis, suggesting that the sample size did not provide a precise representation of the population.

Lastly, as noted, we suspect that social protection moderates the relationship between measures of socioeconomic vulnerability and clinical outcomes. Next steps would include a moderation analysis to better describe this relationship.

Conclusion

To our knowledge, this is the only study to date that has evaluated the association between measures of socioeconomic vulnerability, including access to social protection, and clinical outcomes among pregnant and lactating women with HIV in Zimbabwe. We found that intimate partner violence was associated with HIV viral load non-suppression, ARV treatment interruption, and delayed presentation to antenatal care. Additionally, in our models, dissaving was associated with delayed presentation to antenatal care. These findings suggest that policy makers should focus efforts on 1) creating and providing implementation guidance for policies that have the potential to reduce intimate partner violence among pregnant and lactating women, and 2) strategies to reduce rates of dissaving among pregnant and lactating women in order to improve HIV and antenatal care outcomes.

CHAPTER 4: BARRIERS AND FACILITATORS TO ACCESSING SOCIAL PROTECTION INTERVENTIONS AMONG PEOPLE LIVING WITH HIV AND TB IN ZIMBABWE: A QUALITATIVE ANALYSIS

Abstract

Background: Tuberculosis (TB) is the leading cause of death among people living with Human Immunodeficiency Virus HIV (PLHIV) worldwide. Both TB and HIV disproportionately impact socioeconomically vulnerable populations. Social protection interventions have the potential to improve TB and HIV treatments and socioeconomic outcomes. This study aimed to describe the barriers and facilitators to accessing social protection among PLHIV with and without TB in Zimbabwe, a high burden HIV/TB country as defined by the World Health Organization.

Methods: We conducted in depth, semi-structured interviews with 25 PLHIV receiving care across three health facilities in Chitungwiza district, Zimbabwe. Interviews explored participants' socioeconomic and demographic profiles, knowledge of social protection interventions, and barriers and facilitators to accessing social protection. Participants were also asked about perceived acceptability and benefits of social protection interventions. Interviews were audio recorded, transcribed and translated from Shona into English, and uploaded to Dedoose software for thematic coding.

Results: Exploration, Preparation, Implementation, and Sustainment (EPIS) Framework guided the framing of results. The majority of participants described experiencing various forms of socioeconomic vulnerabilities, highlighting significant unmet social needs. Participants experienced multiple barriers to accessing social protection, such as inadequate recruitment strategies, poorly disseminated information, and limited sustainability of programs. All participants noted that social protection interventions would have significant benefits, both at the individual and community level, highlighting the supply demand mismatch between need for forms of social and economic support and availability of interventions.

Conclusion: Although social protection interventions can significantly improve both HIV and TB treatment and socioeconomic outcomes, study participants described a number of barriers to accessing social protection interventions. Based on our implementation science framed analysis, we propose several potential strategies to reduce barriers and improve access to social protection for vulnerable PLHIV in Zimbabwe.

Introduction

Tuberculosis (TB) is one of the leading causes of infectious disease deaths worldwide, particularly among people living with HIV (PLHIV).⁵ In 2022, of the 1.3 million people who died from TB, approximately 187,000 were PLHIV. Despite significant progress towards the United Nations General Programme on HIV/AIDS (UNAIDS) Fast Track 90-90-90 targets (90% of PLHIV to know their HIV status, 90% of PLHIV to be on antiretroviral [ARV] therapy, and 90% of individuals on ARV therapy to have a suppressed viral load)⁸⁰, as well as progress towards the 2030 End TB targets (an 80% reduction in annual incidence and a 90% reduction in TB mortality relative to 2015), Given the relationship between TB, HIV and poverty, both PLHIV goals, Zimbabwe is still considered one of the 30 high burden HIV/TB countries as designated by the World Health Organization. Zimbabwe is also one of the most impoverished countries in the world; as of 2019, approximately 38% of the population was living in extreme poverty (defined as living on \$1.83 USD per day).¹⁰⁹ Zimbabwe's population is primarily rural and heavily reliant on agriculture, rendering the economy particularly vulnerable to environmental shocks. Both urban and rural communities in Zimbabwe face food insecurity, challenges accessing clean water, and poverty as a result of both climate related events as well as the economic impact of the COVID-19 pandemic.¹¹⁰ Although rural communities in Zimbabwe have historically been particularly socioeconomically vulnerable, current data suggests that urban communities are experiencing increasing rates of poverty.¹⁰⁹

Both PLHIV and TB affected individuals in Zimbabwe are at heightened socioeconomic risk. While TB treatment is free in Zimbabwe, over 80% of people with TB face catastrophic costs (defined as out-of-pocket expenses >20% of annual household income⁷) related to TB illness due to indirect costs (such as lost wages due to missed work). Similarly, lower socioeconomic status and food insecurity are associated with higher rates of HIV infection,⁸ and HIV illness is associated with loss of work productivity.⁹ To break out of the cycle of poverty and disease, interventions to minimize socioeconomic vulnerability, termed social protection interventions, are now a key pillar of the World Health Organization (WHO) 2015 End TB Strategy¹¹, The United Nations Joint Programme on HIV/AIDS (UNAIDS)¹⁶ and the United Nations' Sustainable Development Goals (SDGs).¹²

Social protection interventions are broadly defined by the World Bank as systems that “help the poor and vulnerable cope with crisis and shocks, invest in the health and education of their children, and protect the aging population.”¹⁷ Such interventions include, but are not limited to, direct cash transfers, job training programs, and nutrition support. When implemented effectively, social protection interventions can decrease TB incidence, improve TB treatment outcomes, and improve socioeconomic outcomes.^{18–20} Social protection has also been shown to reduce HIV incidence,¹¹¹ increase rates of viral load suppression, retention in HIV care, and adherence to ARV therapy. Lastly, several studies have demonstrated that social protection can reduce rates of catastrophic costs and dissaving (such as taking a child out of school, selling an asset, or using savings).¹¹² Addressing the relationship between TB, HIV and poverty in Zimbabwe remains urgent for the country to reach the 2030 End TB Goals, the 2030 UNAIDS goals,¹⁰ and the United Nation's Sustainable Development Goals (SDG).^{11,12} However, while social protection interventions have the potential to improve both TB and socioeconomic outcomes, many individuals who are eligible for social protection intervention benefits are not enrolled in programs.⁶ Despite high rates of poverty and food insecurity, coverage of social protection interventions in Zimbabwe is only 11%.⁶

Optimizing access to social protection interventions in low-income settings remains poorly understood. For example, many cash transfer interventions rely on unstable banking systems, which frequently results in delayed or failed disbursements of funds to beneficiaries.²² Failed disbursement of funds limits the impact of an intervention,²³ but there is a paucity of studies exploring patient and system specific barriers and facilitators to accessing cash transfers. While transportation assistance is a frequently cited example of social protection among people with TB,²⁴ little is known about how to implement transportation programs so people with TB can consistently access medical care.

The objective of this study was to describe barriers and facilitators to accessing social protection interventions among PLHIV with or without and TB. In Zimbabwe, one of the thirty high burden HIV/TB countries³ with high rates of poverty, as well as an existing network of well described social protection interventions,⁶ offers ideal conditions to study HIV, TB, and social protection interventions.

Methods

Study design

This study used semi-structured interviews to collect qualitative data. We used the Exploration, Preparation, Implementation, and Sustainment (EPIS) Framework,¹¹³ an implementation science framework that is rooted in equity, to guide the framing of results. Utilizing a validated implementation science framework helped ensure that the results would systematically inform the development of targeted strategies that improve access to social protection intervention for at-risk populations for people with HIV and TB.

EPIS framework

The EPIS framework was initially designed as a novel approach to evaluating both child welfare and mental health in public sector services. It was initially proposed in 2011 by Aarons et al.¹¹⁴ as a way to evaluate these public sector services through an implementation science lens. Researchers focused on what they felt were the most important aspects of successful implementation of evidence based practices in public sector services.¹¹⁴

EPIS is comprised of four main contexts: 1) The outer context, 2) the inner context, 3) bridging factors, and 4) innovation factors. Each context contains a set of constructs. Encircling the four domains are the four main stages of implementation: 1) Exploration, 2) Preparation, 3) Implementation, and 4) Sustainment (**Figure 4.1**)¹¹⁵. The phases of implementation help guide specific actions within each of the domains.

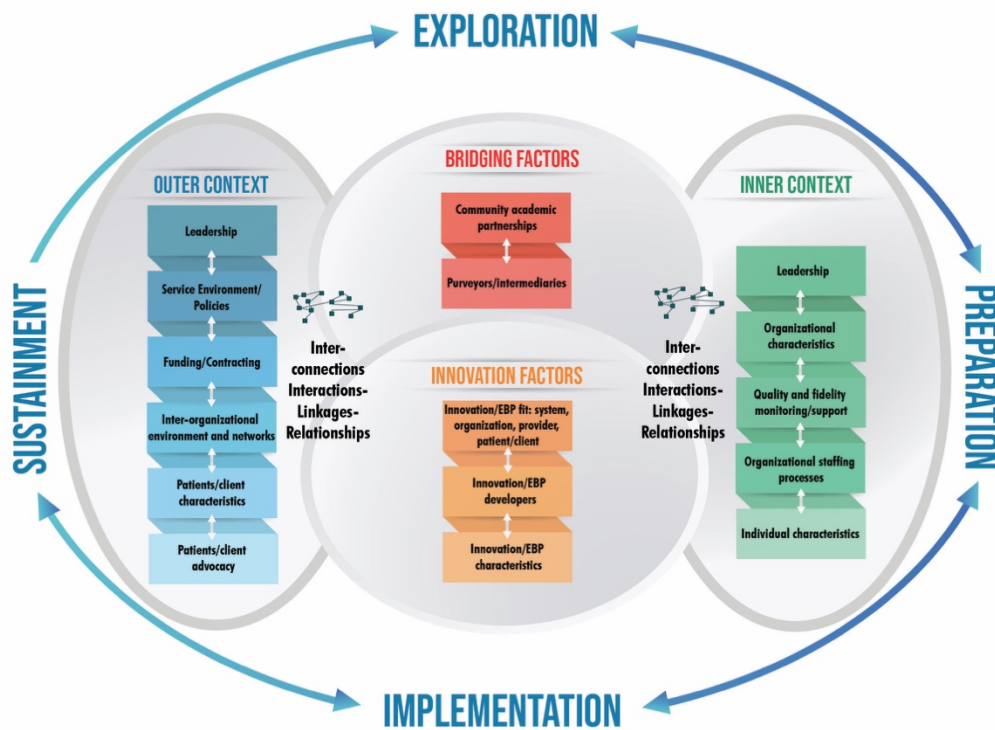


Figure 4.1. EPIS framework, from Aarons et al.¹¹⁴

The outer context is defined as “the environment external to the organization, and can include the service and policy environment and characteristics of the individuals who are the targets of the evidence-based practice.”¹¹⁵ The inner context is defined as “characteristics within an organization such as leadership, organizational structures and resources, internal policies, staffing, practices, and characteristics of individual adopters (e.g., clinicians or practitioners)”.¹¹⁵ The inner context is the setting in which implementation actually occurs, and those involved in the inner context generally play an active role in implementation.¹¹⁵ Bridging factors are described as “relational ties (e.g. partnerships), formal arrangements (e.g. contracts or policies) and processes (e.g. data sharing agreements).”¹¹⁵ Innovation factors are described as the “characteristics of the innovation developers, characteristics of the innovation, and fit to system, organization, provider and/or client.”¹¹⁵ Innovation factors also include how well an innovation can adapt to its context.

A key component of the EPIS framework is that encircling the domains are the four stages of implementation: Exploration, preparation, implementation, and sustainment.¹¹⁵ During the exploration phase, researchers or stakeholders evaluate the health needs of a given system or environment and determine what evidence-based practice, if any, should be implemented to address a health issue. During preparation, researchers or stakeholders identify key barriers and facilitators to implementation. They also plan what will be needed for successful implementation. During the implementation phase, the intervention is implemented and monitored. Lastly, during the sustainment phase, the inner and outer contexts work to continue implementation. This may or may not require adaptation of the intervention. Our study focused on the exploration and preparation phases.

Setting

This study was conducted across three clinics (Seke North, Seke South, and St Marys) in Chitungwiza district Zimbabwe where the Organization for Public Health Interventions and

Development (OPHID) operates. OPHID is a Zimbabwean organization that develops and implements innovative approaches and strategies to strengthen the provision of quality HIV prevention, care and treatment services for PLHIV. OPHID works closely with the Ministry of Health and has a mandate to conduct operational and implementation research to improve provision of care for HIV affected populations. OPHID is currently active in 15 districts and 317 clinics. The clinics selected for this study were chosen for two reasons. First, these three clinics were thought to be representative of our population of interest based on demographic and geographic considerations. Second, it was feasible for the study coordinator to travel to those sites. Faculty from the UCSF Center for Tuberculosis have been working in close collaboration with OPHID since 2011.

Study Population

OPHID clients at these three health facilities were eligible for enrollment in this study if they had HIV, were over 18 years old, and were receiving care at OPHID supported health facilities in Chitungwiza district (inclusion criteria). Participants were excluded if they were unable to provide informed consent or did not speak Shona or English, the languages in which interviews were conducted. Interview timing and additional logistics were affected by the current political climate in Zimbabwe, in which upcoming national elections had the potential to cause disruption to study activities.

Participant recruitment and data collection

The OPHID project coordinator, RM visited three health facilities namely (Seke North, Seke South and St Mary's Clinic) in Chitungwiza and used a semi-structured in-depth interview (IDIs) to collect data (n=25) from participants who were receiving care at these OPHID health centers between July and August 2023. Participants were purposively sampled to achieve an equal number of male and female participants and diversity in age and various level of

engagement with social protection interventions. Additionally, we purposively sampled participants according to TB status, with a goal of recruiting at least ten participants who either previously or currently had TB in order to obtain data specific to those affected by the TB/HIV syndemic. Prior studies have demonstrated that this is a sufficient sample size for reaching thematic saturation.¹¹⁶ Additionally, PLHIV living in poverty are at significant risk for acquiring TB³; our findings would therefore be relevant to our population of interest, regardless of current TB status.

In each health facility, clinical staff who have reason to know the patient and their HIV/TB status, made the first in-person contact and briefly described the study using an UCSF and Zimbabwean Medical Research Council IRB-approved information sheet. If the individual was interested in being enrolled in the study, they were referred to the OPHID study coordinator, RM, in person, who was trained in qualitative analysis and study protocols, to learn more about the study. RM rotated through three clinics, discussed the study with interested individuals, formally screened using an eligibility screening tool, consented eligible individuals for the interview, and enrolled individuals into the study. Interviews were conducted in Shona and lasted approximately 30-60 minutes, and were conducted in a private space either at the clinic or at the participant's home, depending on the participants' preference. All interviews were recorded, transcribed and translated from Shona into English. Participants were compensated \$5 USD for participation in the study.

Research team and reflexivity

The interviews were all conducted by RM. RM is from Zimbabwe, holds a Master of Social Science in Development Studies and Bachelor of Arts in Development Studies. He also has over 10 years of experience conducting operational research on HIV and TB related areas within a public health program. RM had no prior relationships with study participants. MH and NW coded the interviews with RM. MH is an American white female PhD candidate fluent in

English. Data analyst N.W. is an American white female PhD-level social scientist fluent in English and trained in qualitative research methods and analysis. Study participants were read an IRB approved statement about the purpose of the research

Data analysis

We adapted a more extensive coding process in part because NW, who has extensive experience in qualitative research, was building RM 's capacity in qualitative research analysis.

Data cleaning, transcription and translation

Interviews were professionally transcribed and translated to English by RM, who speaks both Shona and English. All transcribed interviews were deidentified before they were uploaded to a secure UCSF Box folder and shared for review.

Codebook development

Two investigators (MH and NW) read ten transcripts and generated initial summaries and codes as a list in a Microsoft Word document. One investigator (MH) then read the remaining interviews and generated the initial codebook in an Excel document. The second investigator (NW) reviewed the codebook to revise the code as needed. The final codebook was agreed upon *by* four investigators (MH, NW, RM, CC).

Manual coding

Three investigators (MH, RM, and CC) worked together to complete a line-by-line coding of an excerpt of a transcript (approximately one third of the entire transcript). Two investigators (MH and RM) then completed line-by-line coding of two full transcripts using the revised codebook, and a separate third investigator (NW) reviewed the coded transcripts to evaluate the degree of intercoder reliability, which tests the validity and the consistency of the codebook.

This work was overseen by a fourth investigator (CC) to help improve accuracy and minimize bias. The manual coding, which also served to build capacity of the team in qualitative data analysis, was followed by coding using Dedoose.

Thematic coding

Transcripts were uploaded into Dedoose¹¹⁷ software for coding of the full dataset. First, using the agreed upon codebook, researchers coded one interview in Dedoose together. This helped ensure that the team had the skills to use the online platform for data coding purposes. Once the team skills were established, remaining interviews (n=24) were divided between the three researchers, who each coded six interviews. MH, RM, and NW met every two weeks to discuss any coding questions and iteratively modify the codebook as needed. A final agreed upon codebook was applied to the 25 transcripts. Codes were categorized according to the different domains of the EPIS framework. Reflexive memos were written throughout the coding process to provide reflection for those coding. Lastly, the quotes that best described the codes and best exemplified participants' responses were chosen for inclusion in the results by MH and reviewed with RM and NW. Selected quotes are presented in italics below, Participants did not provide feedback on the findings.

Ethics approval and consent to participate

The study received approval from both the University of California, San Francisco's Institutional Review Board and from the Medical Research Council of Zimbabwe. All participants were given informed consent forms which were read with the study coordinator and reviewed before the consent forms were signed. Participants were informed about the purpose of the study, risks and benefits of participating in the study, and their rights as participants. Participants were told they could decline participation at any point. The study coordinator

explained to participants that although interviews would be recorded, all transcripts would be de-identified.

Results

Twenty-five interviews were completed between July and August 2023 in three clinics of Chitungwiza. Clients ranged from 23 age to 57 years old, and were receiving care at either Seke North, Seke South or St Mary’s Clinic. We conducted interviews with 12 males and 13 females. All participants were living with HIV, and thirteen participants either previously or currently had TB. Basic demographic information of study characteristics, including biological sex, age, TB status, and health facility is described in **Table 4.1**. Refer to Appendix A for descriptions of specific social protection interventions.

Table 4.1. Demographic characteristics of study participants in three OPHID health centers in Chitungwiza (n=25)

	Number	(%)
Age group		
18-24	1	4%
25-39	9	36%
40-59	15	60%
Sex		
Male	12	48%
Female	13	52%
Previously or currently diagnosed with TB		
Male	9	36%
Female	4	16%
Facility		
Seke North	8	32%
Seke South	9	36%
St Mary’s	8	32%

Outer context

To better understand the “outer context,”-specifically, the ‘policy environment and characteristics of the individuals who are the targets of the evidence-based practice,’ the interview guide contained questions about the socioeconomic vulnerability at the individual and household level, how their HIV and/or TB diagnosis and treatment experience affected their individual or household finances, unmet social needs in the community, and knowledge of social protection interventions.

Participant and household description. The majority of participants described themselves as renting, often in multigenerational households, in crowded conditions:

“I am using one room, but when it comes to sleeping arrangements, since I have one room, my son normally sleeps with my landlord's children, who are all boys. As for the little one, we have no problem; we just sleep with her.” (Male, 41 years old)

Most participants interviewed also described having a variable monthly household income, and/or living in poverty. Often, participants described living “hand-to-mouth,” or “surviving.” Participants often attributed this to the unreliable nature of work, particularly if they made an income by selling goods, working on construction projects, or similarly inconsistent work. For example, when asked how much money a participant made by the end of the month, one stated:

“It depends on the availability of work sometimes; by the end of the month, I will have nothing at all. That is when I will survive on food handouts. Sometimes, on a good month, I can earn around one hundred dollars.” (Male, 31 years old)

Participants also frequently described experiencing food insecurity at the individual or household level. For example, one participant noted:

“I have really missed traditional and nutritional foods like white meat, fruits, and vegetables that can boost my immune system. So normally, when you do not have money, you don’t tend to be choosy; you just take whatever comes your way, and normally that will be from January to December with the same meals.” (Male, 46 years old)

Description of community. A number of the participants described the community as impoverished, with many of the individuals suffering from food insecurity, variable monthly income, and crowded living conditions. Participants also spoke of the lack of resources in the community to support vulnerable individuals.

“Ah, we have a range of social issues that affect us as a community, such as poverty and unemployment, but there are no resources that exist to curb that. Worse, we still have the elderly in our community, and no support is given to them. Normally, the situation is that when you are ill, you find your own means, and when you do not have money, that will be your own problem.” (Male, 31 years old)

Knowledge of social protection interventions. To help create a comprehensive understanding of the outer context as it pertained to our research question, we asked participants about their knowledge of social protection interventions in their community. We found that while many individuals were generally aware of the concept of social protection or social welfare, few participants were aware of more than one specific programs (either by name or by eligibility criteria):

“... I am familiar with BEAM [Basic Education Assistance Module] and social welfare programs, but their processes are just something else, especially social welfare. They tend to ask so many questions, and if you happen to dress properly, you won’t get assistance. I know they really help the most vulnerable, but it’s a process for you to get the services.” (Female, 50 years old)

Another participant stated:

“I have only heard people talking about social welfare saying that they can assist other than that, um, social assistance programs. It’s a new concept for me.” (Male, 54 years old)

When asked about what he had heard about social welfare, this same participant noted:

“I have heard that they assist the most vulnerable and the elderly with food and school fees. I do not know how true it is since I have never tried to seek assistance from them....It is obvious there is an office, but I have never been there before.” (Male, 54 years old)

Inner context

To better understand the inner context, which is where the implementation occurs, we asked participants about their HIV and TB diagnosis and treatment experience. These experiences are considered to be part of the inner setting; they relate to the process of implementing, or potentially implementing, social protection interventions to interrupt the cycle of HIV/TB disease and poverty.

HIV and TB diagnosis and treatment experience. To better understand the outer context, we asked participants questions pertaining to their HIV and TB diagnoses and treatment experiences. Several participants described how they struggled to accept their HIV diagnosis. A number of participants spoke explicitly about how poverty was a risk factor for how they contacted HIV. For example, one participant stated:

“I got into prostitution as a result of poverty; I was impregnated, and the owner of the child refused to take responsibility. I was chased away from home; with my parents, I had no option but to find means to support my child. That is how I got into prostitution. It was not an easy journey. At times, we were abused by men, and at other times, in the middle of sexual intercourse, they removed the protection, and there is nothing that you can do since you want money.” (Female, 37 years old)

The majority of participants described how becoming ill with HIV affected their income. For some participants, HIV affected their interpersonal relationships, which, in turn, impacted their income. Several participants also described how feeling sick or experiencing frequent illnesses has affected their ability to generate income. Other participants described how becoming ill with HIV led to dissaving, such as having to take a child out of school, use savings, taking out loans, or selling assets:

“My firstborn was the one mostly affected as a result of my illness; I had no money to pay for her school fees, so she stopped going to school for one year. She had to repeat that she was supposed to be in Form 4 this year. Literally, she was affected for almost a year.” (Female, 37 years old)

A number of participants described how their personal or household income was affected by TB. Many participants endorsed worsening food insecurity, either for themselves or their household, as a result of TB:

“Well, when I got ill, sputum was collected, but nothing was detected. I spent six months without going to work, meaning we had completely no source of income. It was really tough for us. I went through a session where I couldn’t even afford to buy bread for my family; all our finances had been eroded.” (Male, 34 years old)

Other participants described how their experience with TB illness led to a form of dissaving. Specifically, many participants described having to take children out of school. For example, one participant stated:

“My children were affected [by the participant’s TB] since I was the breadwinner; they dropped out of school for almost two years.” (Male, 37 years old)

Another participant stated;

“When I got ill, my daughter was the one going to school. The six-month break from work affected her so much that I could no longer afford to pay for her school fees.” (Male, 34 years old)

To better understand the inner context, we also asked participants about perceived and experienced barriers to social protection. We identified four commonly described barriers to accessing social protection interventions across the 25 interviews: 1) Limited information, 2) inadequate enrollment strategies, 3) limited reach of programs, and 4) limited sustainability of programs. We also identified a few, albeit limited, facilitators to accessing social protection: 1) robust information campaigns, and 2) active recruitment strategies.

Limited information. Many participants described encountering challenges accessing specific information about social protection programs, such as the names of the program, eligibility criteria, or how to enroll. For example, when asked about how individuals learn about social protection programs, one participant responded:

“Um, it depends on the kind of program. It's difficult for people who are not HIV positive to know about Mavambo as children who are enrolled at the facility, and you can only come to know about it if you are HIV positive.” (Female, 41 years old)

Another participant stated:

“We do not have an information center or radio station meant for this community for information dissemination. What I know is that, as much as these organizations conduct sensitization meetings, they do not cover the whole community due to their limited funds.”

(Female, 43 years old)

Inadequate enrollment strategies. A number of the participants described how various social protection interventions had utilized “sensitization campaigns” to identify and/or enroll eligible participants or households. These campaigns typically involved a staff member going door-to-door to enroll people in the program. However, these campaigns were often limited, reducing the number of individuals or households that programs were able to enroll. For example, one participant described the following about a specific intervention:

“...when the enumeration was conducted, my house was skipped....I was told that there was a lady who mentioned that we are financially stable; just imagine, and they skipped my house.”

(Male, 37 years old)

Another participant stated:

“When they did enumeration of households, I was not around, neither was my wife present she had gone to Chikwana to replenish her products. When we came back, we heard that they skipped our house since they were no one present. Within a month selected households were already receiving the first lot of the cash transfer. This is one weakness that I have discovered in our community, lack of structures for information dissemination we could have benefited if we had been notified.” (Male, 41 years old)

Limited reach of programs. Several participants noted that prior or existing social protection interventions were limited in the population they targeted and/or were able to provide benefits for. For example, certain programs prioritized rural geographic areas while failing to recruit vulnerable individuals from urban locations:

“... they would rather prioritize rural areas since they are more vulnerable.”

(Male, 46 years old)

Another participant noted:

“What I have seen with these donors is that program coverage is limited in most cases. As such, a lucky few benefits.” (Female, 41 years old)

Limited sustainability of programs. Other participants described how social protection interventions were limited in sustainability. In some cases, participants perceived that social protection programs were available during political campaigns or elections, but would end shortly after the political event was over:

“As for humanitarian aid or organizations in the community, I last heard of it a long time ago. As for the support for farmers, normally that is done towards elections by the ruling party; other than that, they do not provide such assistance.” (Male, 47 years old)

In other cases, participants did not describe a particular reason a program had ended, but confirmed that there used to be more forms of accessible socioeconomic support:

“But, however, social welfare used to be vibrant back then, with social workers on the ground providing counseling to families in times of distress, but they are no longer as visible as they used to be.” (Male, 46 years old)

“Social support is a thing of the past; it existed long ago when we used to have community support through different partners for community development. As we speak right now, I’m not aware of any social support in the community.” (Female, 57 years old)

Facilitators to accessing social protection. Some participants identified facilitators to accessing social protection. Two facilitators were reported across several interviews. First, well established programs that had robust information campaigns were more effective at disseminating information about the social protection program or intervention. For example, when describing the GOAL program¹¹⁸, one participant stated:

“...at least many people were aware because news spread fast, especially when it involved money. The community can learn about these programs during the inception stage with proper sensitization so that no one is left behind.” (Female, 41 years old)

Second, participants described how some programs had active recruitment strategies which facilitated enrollment:

“During the BEAM program, even the school authorities help facilitate enrollment, especially if the child is a single or double orphan.” (Female, 50 years old)

Bridging factors

The study sought to describe bridging factors, which are the formal arrangements between the intervention being implemented/those implementing an intervention and those affected by/receiving the intervention.¹¹⁹ This study identified two bridging factors: 1) the relative co-location of social protection programs with other government services, and 2) the co-location of social protection programs with clinic services. For example, one participant noted:

“For social service programs, every district has an office, and the community can inquire about it at their offices.” (Female, 50 years old)

Another described how social protection staff interfaced with clinical staff to help enroll vulnerable populations:

“....you must be HIV positive to know about such programs since they mainly work with the OI/ART [opportunistic infection/antiretroviral therapy] department in recruiting their beneficiaries” (Female, 49 years old)

Innovation factors

To best understand innovation factors, which are the factors that affect how well an intervention fits with the target population,¹¹⁹ we asked participants questions about acceptability and perceived benefit of social protection interventions.

Acceptability of social protection interventions. The majority of participants expressed that additional social protection interventions, or increased access to social protection interventions, would be well accepted in the community. Many participants spoke to acceptability both at the individual and community level. Some participants spoke to the acceptability of social protection

interventions for the population as a whole, while others described how social protection would be particularly acceptable for vulnerable members of the community:

“Yes, it is acceptable. Since we have so many problems in the community, we have school dropouts, people living with HIV, orphans, vulnerable children, and the elderly; they all need help. How can they not be accepted with such suffering?” (Female, 33 years old)

“It is very acceptable, mainly because of poverty levels, and if that can be introduced, at least communities can have a balanced diet, and on the social side, for those who are ill, issues of mental health can be addressed.” (Male, 46 years old)

“Yes, it is very acceptable; as long as it benefits the community, it is very acceptable.” (Female, 26 years old)

Perceived benefits of social protection interventions. Similarly, most participants felt that social protection interventions would be beneficial for the community. Several interviewees explicitly stated that vulnerable populations, including those with HIV and TB, would benefit significantly from forms of social and economic support:

“Such assistance would assist patients to have a balanced diet and to take their medications without hesitation because, with TB and HIV, treatment itself drains when you lack proper food. With social support in the community, mental health issues can be addressed.” (Male, 32 years old).

Another participant described the following:

“Definitely, social support is important. When my wife left, I was in dire need of counseling. This also worsened my situation. I needed someone to talk to, but there was none. Financial support is very crucial. As I mentioned earlier, I spent almost three months not feeling well, and at the same time, I needed food, rentals, and school fees for my child. With such support in place, you can even recuperate fast since you won’t be thinking much.” (Male, 23 years old)

Discussion

Our study explored barriers and facilitators to accessing social protection among PLHIV with and without TB in Zimbabwe. Although there are a number of active social protection interventions in Zimbabwe,^{106,120} the majority of participants described numerous barriers to accessing and enrolling in these programs. Few participants described facilitators to accessing forms of social and economic support.

The results of the interviews highlight the many ways in which individuals, households, and the community as a whole experience multiple forms of socioeconomic vulnerabilities and poverty. Most participants described food insecurity at the household and community level, variable and unreliable monthly income, and dissaving. Many participants spoke about how poverty directly contributed to their becoming infected with HIV, and a number of participants described how HIV and/or TB contributed to their socioeconomic insecurity. Participants explained how their experience with HIV and/or TB negatively affected income, both through direct and indirect costs. These findings suggest that the individuals in this community would benefit from social protection interventions and that these programs have the potential to break the cycle of poverty and HIV/TB disease.

Participants described a number of barriers to accessing social protection interventions. For example, while many participants were generally aware of the concept of social protection, fewer participants knew about specific programs, either by name or eligibility criteria. This

barrier was exacerbated by the fact that participants perceived that existing social protection programs in did not disseminate information effectively. Without even basic knowledge of the names of programs, types of programs, or eligibility criteria for programs, it is nearly impossible for individuals to engage with and/or apply to programs. Often, participants explicitly stated that social protection interventions should expand their “sensitization campaigns,” to both disseminate information about specific programs, and use the campaign as an opportunity to enroll both individuals and households. Participants indicated that the “door-to-door” sensitization strategies seemed to be an effective strategy only if individuals were home at the time of the home outreach. The interviews suggested that these campaigns made only one attempt to enroll potential beneficiaries; if more attempts were made, individuals who had not been captured in the initial pass through would have more opportunities to enroll. Another potential strategy to improve dissemination of knowledge about various social protection programs would be to via radio broadcasting¹²¹ or social media,¹²² which have been shown to be effective messaging strategies in sub-Saharan Africa.

A number of participants described limitations in the reach of programs. Specifically, several noted that many programs were targeted to rural settings. This is likely due to the fact that historically, the rural population of Zimbabwe has been significantly more impoverished than the population living in urban settings. However, the gap between urban and rural poverty in Zimbabwe is shrinking, with urban poverty actually growing at a faster rate.¹⁰⁹ This finding suggests that social protection interventions should target both urban and rural populations. In some cases, implementing poverty reducing strategies may be easier in urban environments. For example, cash transfers that rely on a banking system frequently encounter challenges when implemented in rural settings. However, it may be easier to disburse funds in urban environments where individuals potentially have more reliable access to banking systems or other mechanisms to access funds. Multiple studies have described effectively implemented

social protection interventions in urban or mixed urban and rural settings,^{47,123,124} many of which could likely be adapted to urban settings in Zimbabwe.

Many participants spoke about the limited sustainability of programs. This finding highlights the need for long term, sustainable programs that reduce socioeconomic risk. Well established partnerships between funding organizations, such as the Global Fund to Fight AIDS, TB and Malaria,¹²⁵ The U.S. President's Emergency Plan for AIDS Relief (PEPFAR)¹²⁶ or other organizations with the Government of Zimbabwe have the potential to provide sustained social protection support. A stakeholder assessment could be considered as an important next step to evaluate the capacity and commitment of various organizations and government bodies to sustainably implement social protection interventions.

Our findings indicate that co-location of health and social welfare services could improve accessibility and could help quickly link socioeconomically vulnerable individuals to social protection interventions. For example, individuals who are attending regular clinic visits for HIV and/or TB care could complete a basic socioeconomic needs assessment, such as a brief questionnaire. This tool could be used to quickly identify vulnerable individuals and refer them to social protection service providers, who can formally screen individuals for eligibility and potentially link them to services.

Lastly, all 25 individuals interviewed agreed that social protection interventions would be well accepted and/or beneficial for the community. This finding alludes to the "innovation fit"-how well an intervention or group of interventions fits the needs or values of a population¹¹³ While testing innovation fit would require either novel implementation of social protection interventions or modifying existing implementation of social protection interventions, and subsequently assessing if individuals experienced improved access to social protection, the high acceptability of social protection in this community is key to successful implementation.

Our study had limitations. First, we were only able to recruit participants from an urban district. Ideally, we would recruit participants from a range of districts (both rural and urban).

Second, very few participants had actually applied to become beneficiaries of social protection interventions, thereby limiting our ability to evaluate barriers or facilitators pertaining to the application process. Lastly, we only interviewed potential or actual recipients of social protection interventions. It would be beneficial to conduct key informant interviews among social protection service providers (such as MoHCC staff) to develop a more comprehensive understanding of barriers and facilitators to social protection interventions. Additionally, key informant interviews, with either clinical staff or staff members of various social protection programs, would likely provide deeper insight into potential bridging factors. Lastly, although barriers and facilitators do not appear to be specific to HIV or TB, it may be beneficial to conduct interviews among those who are socioeconomically vulnerable but HIV negative to provide additional insight.

Conclusion

Individuals in Zimbabwe living with HIV, including individuals with both TB and HIV, experience numerous forms of socioeconomic vulnerabilities. These include food insecurity, dissaving, and variable monthly income due to a variety of factors. Illness due to HIV and TB contributes to lost productivity and worsens poverty in this population. While many participants believe that social protection would be significantly beneficial, participants described multiple barriers to accessing social protection. These findings successfully encapsulated the Preparation phase of the EPIS frameworks. Future research would ideally focus on the Implementation phase, in which various strategies to improve access to social protection would be implemented in our study settings. These strategies would include mechanisms to increase enrollment, making more interventions available to urban residents, and co-location of health and social protection services are strategies to improve access to social protection interventions.

Appendix A: Social protection interventions described

Name of intervention	Description of program
Harmonized Social Cash Transfer (HSCT)	HSCT is a nationally implemented cash transfer intervention targeting impoverished and food insecure households as defined by the Zimbabwean Ministry of Health and Child Care (MoHCC). ⁹⁸ HSCT is jointly funded by the government of Zimbabwe and partners, including UNICEF, and has been implemented in waves at the district level during specific time frames.
Emergency Social Cash Transfer (ESCT),	ESCT was an additional cash transfer program jointly implemented by UNICEF and the MoHCC between 2020 and 2023 across three urban districts in Zimbabwe. ESCT was created in an effort to address poverty, food insecurity, and socioeconomic vulnerability that had been exacerbated by the COVID-19 pandemic, and consisted of monthly payments of \$48 for eligible households. ⁹⁹
Basic Education Assistance Module	BEAM is a government funded, nationally implemented program to help orphans and vulnerable children pay for school-related fees (e.g. tuition and exam fees). ¹⁰⁰ It has been primarily implemented by the Zimbabwean government.

CHAPTER 5: CONCLUSION

There is a growing body of evidence that social protection interventions improve TB treatment outcomes, reduce TB incidence, improve HIV treatment outcomes, and mitigate the socioeconomic effects of both HIV and TB disease. ^{18,19} When people with TB and TB-affected households can reliably access social protection interventions, these interventions have the potential to significantly improve TB treatment outcomes. Similarly, social protection interventions have the potential to improve rates of viral load suppression and overall economic status of people living with HIV (PLHIV). There is a growing body of evidence that social protection interventions improve TB treatment outcomes, reduce TB incidence, improve HIV treatment outcomes, and mitigate the socioeconomic effects of both HIV and TB disease. However, there have been significant gaps in understanding the impact of, and barriers to access, social protection among people with HIV and/or TB in high burden low income countries^{6,22,23} Additionally, there is limited guidance regarding the implementation of social protection interventions in high burden, low income settings due to a limited understanding on barriers and facilitators to access these programs. Our study utilized a multimethod approach to fill gaps in understanding the impact of social protection interventions. We also described barriers and facilitators to accessing social protection interventions among PLHIV and TB. Therefore the three aims of this dissertation were to quantify the effect of social protection interventions on TB treatment and socioeconomic outcomes (Aim 1), to estimate the association between socioeconomic characteristics and HIV treatment outcomes, as well as outcomes pertaining to antenatal care among pregnant and lactating women with HIV in Zimbabwe (Aim 2), and to describe barriers and facilitators to accessing social protection interventions among PLHIV both with TB and at risk for acquiring TB (Aim 3).

First, we quantified the effect of social protection interventions on TB treatment and socioeconomic outcomes using a systematic review and meta-analysis (Aim 1; chapter 2). We found that social protection interventions, when used with standard biomedical interventions can double the odds of TB treatment success. We also found that social protection interventions had the potential to improve socioeconomic outcomes among TB affected individuals and households, such as lower rates of catastrophic costs and dissaving.

Next, we estimated the association between socioeconomic characteristics that impact HIV treatment outcomes, as well as outcomes pertaining to antenatal care, among pregnant and lactating women who are living with HIV in Zimbabwe using generalized estimating equations (Aim 2, chapter 3). We found that intimate partner violence was associated with HIV viral load non-suppression, ARV treatment interruption, and delayed presentation to antenatal care. We also found that pregnant and lactating women who experienced at least one form of dissaving were almost twice as likely to have delayed presentation to antenatal care. This finding suggests that social protection, which has been shown to reduce rates of dissaving, may improve outcomes related to antenatal care among pregnant and lactating women in Zimbabwe. This, in turn, may reduce rates of mother-to-child transmission of HIV.

Finally, we used qualitative methods to describe barriers and facilitators to accessing social protection interventions among PLHIV, with and without TB, in Zimbabwe (Aim 3, chapter 4). Although our study focused on a highly socioeconomically vulnerable population, study participants described numerous barriers to accessing social protection interventions. These barriers included limited knowledge about existing social protection interventions, limited enrollment strategies, suboptimal reach of existing interventions, and inadequate sustainability of social protection interventions. Our results also highlighted the high acceptability of social protection, with the majority of participants describing perceived benefits of social protection both for the general and particularly vulnerable populations.

In sum, our study demonstrated that social protection interventions have the potential to significantly improve TB treatment, HIV treatment, and socioeconomic outcomes. However, numerous implementation barriers remain to effective scale-up of social protection interventions in high HIV/TB, low-income settings. Both chapter two and chapter four of this dissertation described multiple implementation barriers, including poor dissemination of information about existing interventions, administrative barriers such as cumbersome applications, limited enrollment strategies, and a lack of funds for sustainable social protection interventions. Social protection interventions were described as inaccessible, either due to their geographic focus or because of a lack of information about where and how individuals can enroll. These challenges are especially problematic for individuals who already suffer. However, our study also found high acceptability of social protection interventions, which is key for successful implementation. We hope that the findings of this dissertation help contribute to calls to action, both in terms of research priorities and programmatic implementation efforts, for social protection for PLHIV and TB in high burden, low income settings. Such interventions are crucial to help reach 2030 End TB Goals,⁷ the 2030 UNAIDS goals,¹⁰ and the United Nation's Sustainable Development Goals.^{11,12}

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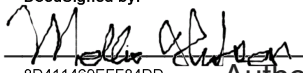
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