Pre-Analysis Plan: Economic Strengthening through Saving and Budgeting: Evidence from a Field Experiment in South Africa

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Abstract

What helps to improve the effectiveness of financial literacy programs in promoting household economic welfare? This study examines the impact of providing poor families in South Africa with a financial literacy and savings training that was integrated into a broader psychosocial parenting intervention. Using a cluster randomized control trial (RCT) with 40 villages and approximately 550 families, we test whether this program can increase saving, borrowing, and financial planning, as well as help reduce financial distress, vulnerability to economic shocks, and improve economic welfare.

1 Introduction

Saving and careful financial planning are essential tools for consumption smoothing, future-oriented investment, and resilience to income shocks among people living in poverty (Ksoll et al., 2015; Collins et al., 2009; Conning & Udry, 2007). In response, interventions to promote saving and budgeting have gained prominence in policy and research in international development. Underlining this growing interest, a body of literature has started to investigate the effectiveness of such programs with the help of randomized controlled trials. While programs that give access to formal banking have shown success across a range of trials (e.g. Dupas et al., 2016; Brune et al., 2015; Dupas & Robinson, 2013; Prina, 2013), the evidence is less conclusive when it comes to financial literacy programs (Cole et al., 2014; Coville et al., 2014; Fernandes et al., 2014; OPrey & Shephard, 2014). Yet, these programs might be the most adequate for very poor and rural populations in areas where penetration of formal banking remains low. This research project therefore aims at gaining a better understanding of the conditions under which financial literacy programs can be successful. We evaluate the effectiveness of a combined parenting and financial literacy program targeted at low-income families in the Eastern Cape province of South Africa. Our study sample reflects the economy of the province and is

characterised by high levels of household poverty, high unemployment rates, and a high dependency on state-provided social assistance, with most families largely living on monthly governmental cash grants. The present document outlines the analysis plan for the study, including the econometric methods that will be used to assess program impact as well as a detailed description of all outcome variables.

2 The Intervention

The program, named *Sinovuyo Teen* (translated as "We have Happiness" in vernacular isiXhosa), is embedded in the larger WHO/UNICEF initiative *Parenting for Lifelong Health*, that aims at developing and testing violence-prevention programs in low-resource settings. More specifically, the Sinovuyo Teen program was primarily designed as an evidence-informed parenting program, iteratively tested and adapted over the course of three years to ensure cultural adequacy for the context of South Africa (see Lachmann et al., 2016; Cluver et al., 2016). The 14-session, group-based program incorporates psychosocial and economic training elements (see Table 1). Psychosocial components (12 sessions) drew on evidence-based parenting principles, such as promoting praise and individuals self-worth, anger and stress control, responding to crises, and modelling positive behaviour. The economic part of the program (2 sessions) breaks down into three core aspects, namely motivating participants to save, teaching budgeting and saving skills, and making soft commitments for saving.

Table 1: Program Curriculum

Session	Content	Delivery
1	Introducing the programme & defining participant goals	Joint
2	Building a positive relationship through spending time together	Joint
3	Praising each other	Joint
4	Talking about emotions	Separate
5	Managing anger and solving problems	Separate
6	Problem solving techniques	Joint
7	Motivation to save and making a budget for the month	Joint
8	Coping with problems I	Separate
9	Coping with problems II	Separate
10	Establishing rules and routines in the household	Joint
11	Ways to save money & making a family saving plan	Joint
12	Avoiding risk in the community	Joint
13	Responding to crisis Anger reduction and problem solving	Joint
14	Identify support structures for lasting change	Joint

Weekly sessions last between 3-4 hours and are attended by one adolescent and their primary caregiver per participating family. A warm lunch is served at the beginning of each session. Delivery methods of the program include group discussions, role-plays, homework activities to practice skills with the whole family, problem-solving techniques evolving around common challenges experienced at home, as well as traditional songs, dances, and prayers. All elements are designed as low-cost for

delivery in low-resource settings. For instance, video vignettes are replaced with illustrated comic strips, depicting family dynamics and challenges that were typical for the setting and therefore easily related to. If participants are unable to attend sessions in consequence of illness or social obligations such as funerals, facilitators delivered a condensed version of the session in the participants home.

The program is implemented in collaboration with the NGO *Clowns without Borders South Africa* and *UNICEF South Africa*. Sessions are held in community locations such as town halls or schools and facilitated by youth development facilitators, auxiliary social workers, and local lay workers from a range of professional backgrounds. Each session is delivered by facilitator pairs who have to take part in a week-long training and receive further support in ongoing weekly supervisions and focused training on specific session content.

3 Evaluation Questions

This project has two research strands. The first strand examines whether the above program is effective in preventing the physical and emotional abuse of adolescents, in improving parenting skills and in reducing adolescent behavioural problems. The respective study protocol has been published elsewhere (Cluver et al., 2016). This analysis plan will focus on the second strand that examines the effects of the program on family economic welfare. Specifically, our main questions are:

1. What are the overall impacts of the program on financial planning, including financial self-efficacy and attitudes as well as actual saving and borrowing practices?
2. Is the program effective in decreasing financial and psychological distress, including consumption shortfalls as well as the psychological consequences of experiencing poverty?
3. Can the program increase resilience to economic shocks?

Lastly, we add an explorative research question that was not initially included as the primary program rationale:

4. Are there wider economic welfare impacts from the program as captured by household access to a range of basic necessities?

4 Experimental Design

4.1 Power Analysis

The sample size was chosen based on power calculations using Optimal Design software (Raudenbush et al. 2011), which showed that 40 clusters (villages) with an average of 12 families per village would be required for a minimum detectable effect size of 0.35-0.40 and desired power of 0.80 with 95% confidence. The trial had to be powered for a cluster RCT rather than an individual RCT considering that the study pilot had pointed to potential spillovers from sharing program content with friends and neighbors.

4.2 Sample

The study took place in rural and peri-urban settlements within a radius of 2-hour driving distance from King Williams Town in the Eastern Cape - South Africa's poorest province(Statistics South Africa, 2013). We used purposive sampling strategies for recruitment, aiming at enrolling designated at-risk families who had experienced high levels of intra-household conflict and economic hardship. Families were either referred by the local Departments of Social Development and Education, UNICEF South Africa, as well as local community-based social workers, schools, and community guides and chieftains or identified through door-to-door risk screenings[1] conducted by a trained local research team. Eligibility criteria were defined as follows:

For adolescents:

- Aged 10-18 years at initial assessment
- Lived in the respective dwelling at least 4 nights per week
- Had an adult primary caregiver who lived in the same household
- Able to attend the sessions in the afternoon on workdays
- Referred by any of the above listed bodies or self-referred for experiencing conflict and economic hardship in their family

For adults:

- Aged 18 years or older
- Served as the primary caregiver [2] of the adolescent participant
- Lived in the same dwelling at least 4 nights per week
- Able to attend the sessions in the afternoon on workdays
- Referred by any of the above listed bodies or self-referred for experiencing conflict and economic hardship in their family

Approximately 2,120 families were screened for inclusion in the study and more than 600 families were eligible and gave consent for participation. For each family, we enrolled one adolescent and the adult household member identified as their primary caregivers. 640 caregivers and 620 adolescents completed at least parts of the baseline assessment (first wave interview, "Baseline 1"), but the final study sample only included families for which both caregiver and adolescent had completed baseline interviews from two waves ("Baseline 1" & "Baseline 2"). The final sample size at baseline was therefore 552 families.

[1] For the screening, research assistants used the following three questions in door-to-door visits in order to assess families risk potential: 1) Do you and your teen argue and shout a lot every week?, 2) Do you sometimes end up hitting your teen when things are really stressful? , 3) Is your family struggling with money?

[2] Primary caregivers were defined as the person primarily responsible for the day-to-day care and support of the children in the house and could include one of the biological parents of the child, another family member such as an aunt/grandparent, or a non-relative.

4.3 Data

Once recruited and consented into the study, baseline and post-test interviews were conducted with participants via standardized questionnaires administered on mobile computers (tablets). Baseline data collection was divided up into two waves due to questionnaire length and with the purpose of building trust with participants before asking more sensitive questions. Surveys were designed as audio- and mobile-assisted self-interviews with the intention to increase privacy and confidentiality of the interview and reduce possible social desirability bias. Questionnaires were available both in English and isiXhosa and each question had been translated and back-translated (Brislin, 1970). Research assistants were trained to guide participants in the use of the tablets and offer assistance where needed. Adolescents and adults were interviewed separately and interviews lasted between 90-120 minutes.

4.4 Identification Strategy

The study randomly assigned 40 clusters (32 rural and 8 peri-urban) including 552 caregiver-adolescent pairs to either receive the Sinovuyo Teen program (treatment group) or a one-day hygiene intervention focused on skills-building for safe water conservation and handwashing (control group). Randomization was done for clusters within the two strata rural vs. peri-urban location in a 1:1 ratio. Randomization was performed by an external statistician of the South African Medical Research Council using a random number generator in Excel.

4.5 Randomization Verification

To establish experimental integrity, we will compare the treatment group to the control group on key sociodemographic and outcome variables as measured at baseline. We will use a joint orthogonality F-test to assess balance across arms. The following variables will be tested for balance between experimental arms:

Individual Characteristics

1. Participant Age
2. Participant Sex
3. Marital Status (adult)
4. Educational Level (categorized into no secondary degree vs. high school degree or higher) (adult)
5. Employment (coded as binary with formal, informal, and temporary employment coded as 1) (adult)
6. School attendance (adolescent)
7. HIV Status (using verbal autopsy/illness questionnaires validated for high-prevalence regions)

Household Characteristics

1. Household Size
2. House Type (formal vs. informal)
3. Water Source (coded as binary, 1 indicating a water tap inside the house)
4. Electricity Access
5. Food Security (measured as days without sufficient food in the past 7 days) (using both adult & adolescent report)
6. Household Assets (weighted aggregated scale from principal component analysis of: livestock, TV, car, bike, phone)
7. Necessities (weighted aggregated scale from principal component analysis of access to eight basic necessities, i.e. school uniform, warm cloths, toiletries) (using both adult & adolescent report)
8. Financial Distress (weighted aggregated scale from principal component analysis of four items measuring past-month consumption shortfalls) (using both adult & adolescent report)
9. Monetary Grant Value[3] (measured in ZAR per capita)
10. RDP Housing Assistance[4]

Financial Planning

1. Past-month Saving
2. Past-month Borrowing (both from close social network and moneylender)
3. Insurance Holding
4. Ability to Cope with Economic Shock
5. Adult/Adolescent Financial Self-Efficacy (Additive score based on two ranked responses on a 1-10 point Likert scale)
6. Adult/Adolescent Financial Attitudes (Additive score based on three (adults) / four (teens) ranked responses on a 1-10 point Likert scale)

[3]These include the child support grant (3500.00 ZAR/month), the foster care grant (890.00 ZAR/month), the care dependency grant (1500.00 ZAR/month), the disability grant (1510.00 ZAR/month), the old age pension (1510.00 ZAR/month), the grant in aid (350.00 ZAR/month), and the war veterans grant (1520.00 ZAR/month).

[4]Housing assistance is part of the Reconstruction and Development Program (RDP) that was adopted by the African National Congress in 1994 with the intention to address shortages in social service and infrastructure provision, including state-subsidies for housing, clean water, and electrification.

5 Econometric Specifications

5.1 Basic Specification for Estimation of Treatment Effects

We will estimate the average effect of being assigned to the treatment group, the intent-to-treat effect (ITT), on each outcome variable Y by running the following ANCOVA regression:

$$Y_i = \alpha + \beta T_i + \gamma Y_{i(t-1)} + \delta S_i + \epsilon X_i + \omega_{ij} \tag{1}$$

where T_i is an indicator variable for treatment arm equal to 1 if individual i has been assigned to receive the program, $Y_{i(t-1)}$ the lagged outcome (at baseline), S_i is a strata dummy for urban/rural location, X_i is a vector of individual-level baseline covariates, and ω_{ij} is an error term for individual i and village cluster j. We follow McKenzie (2012) by conditioning on the baseline level of outcomes for improved statistical power. Further, we include the following baseline covariates for increased precisions: age, gender, marital status, educational status, employment, baseline poverty level (asset index), and receipt of welfare grants (grant value per capita for each household). We will run two separate models for every outcome as a robustness check: one where we estimate equation (1) without individual controls and one where we include all baseline covariates as control. We will cluster standard error by the unit of randomization, the village.

For binary outcomes, we will estimate linear probability models in the main analyses and use probit models (or ordered probit models for ordinal scales) in supplementary analyses.

5.2 Heterogeneous Effects

We will test whether the impact of program varies with pre-determined village-level, household-level, and individual-level characteristics. We explore heterogeneity in treatment effects using the following specification:

$$Y_i = \alpha + \beta T_i + \theta TRAIT_i' \times T_i + \gamma Y_{i(t-1)} + \delta S_i + \epsilon X_i + \omega_{ij} \tag{2}$$

where $TRAIT_i$ is a vector of baseline characteristics for which we assume heterogeneity in the effectiveness of the treatment (note that each individual trait is also included in the vector X_i). The average treatment effect for the subgroup of people with a respective trait is then given by the sum of the coefficients $\beta + \theta$ for that trait. As before, we will cluster standard errors in this type of specification at the village level. All the tests considered here are two-sided.

Heterogeneous effects will be explored along the following dimensions:

1. Adolescent/Adult Sex
2. Adolescent/Adult Age
3. Adult Marital Status
4. Adult Psychological Welfare (using the using the Centre for Epidemiologic Studies Depression Scale)

5. Adolescent/Adult HIV Status (using verbal autopsy/illness questionnaires validated for high-prevalence regions)
6. Adult Social Capital (using the Medical Outcomes Study Social Support Survey)
7. Adult Education Level (categorized into no secondary degree vs. high school degree or higher)
8. Household Grant Income (per household capita)
9. Household Baseline Poverty Level (using a quartile split to denote the poorest quartile of the sample)
10. Rural/Urban Location
11. Implementation Quality of the Program (based on quality ratings of each session from independent observation)

5.3 Treatment on the Treated Effects

We will additionally estimate the average treatment on the treated (TOT) program effect using an instrumental variable approach. Specifically, we will instrument actual attendance of the program with being assigned to the treatment. The TOT estimate is given by:

$$A_i = a + bT_i + cY_{i(t-1)} + dS_i + eX_i + w_{ij} \tag{3}$$

$$Y_i = \alpha + \beta A_i + \gamma Y_{i(t-1)} + \delta S_i + \epsilon X_i + \omega_{ij} \tag{4}$$

Whereby A_i is an indicator for whether individual i did attend both of the two sessions with the financial literacy component.

5.4 Multiple Hypothesis Testing

We will account for multiple hypothesis testing by using False Discovery Rate (FDR) adjusted q-values (see Banerjee et al., 2015; Anderson, 2008; Benjamini et al., 2006; Benjamini & Hochberg, 1995). We use the Benjamini-Hochberg method which is considered less conservative than the Bonferroni adjustment, particularly when working with a range of outcomes that are likely correlated. For each outcome, we will report both unadjusted p-values as well as q-values corrected for multiple testing.

5.5 Differential Attrition

We will further assess the potential threat from attrition using three approaches. First, we test whether the magnitude of attrition is different for treatment and control households:

$$attrit_i = \alpha + \beta T_i + \omega_{ij} \tag{5}$$

Second, we will assess whether attrition households differ on a comprehensive set of baseline characteristics:

$$y_i = \alpha + \beta \times attrit_i + \omega_{ij} \tag{6}$$

Third, we will examine whether the baseline characteristics of attrition households in the treatment group are significantly different from the control group, restricting the sample to attriting respondents only:

$$(y_i|attrit = 1) = \alpha + \beta T_i + \omega_{ij} \tag{7}$$

If there are concerns with regards to differential attrition, we will employ bounds that are robust to attrition (such as Lee bounds) (see Behaghel et al., 2009).

5.6 Outcome Variables

In the following, we list the outcome variables which we will consider. Variables marked by an asterisk (*) are reported by both adults and adolescents living in the same household. For all measures, we first tried to identify existing measures so as to align our research with pre-existing literature in the field. Measures were then piloted with the target population and adapted further for improved understanding and contextual appropriateness.

1. **Self-reported past-month saving**

If respondents are saving, they are further asked to specify where savings are held: a) at their homes, b) in an informal institution such as a savings group, c) in a formal bank account or post office.

2. **Self-reported past-month borrowing from a family member or**

3. **Self-reported past-month borrowing from a moneylender/loanshark**

4. **Financial Attitudes***

Items drawn from a questionnaire previously used by Karlan & Linden (2014):

- It is important to save money for the future.
- It is important to only spend money on things you really need.
- It is not possible to save enough money to buy those things that I really want.
- Saving is for Adults only. (only measured for adolescents)

Individual items were rated on a 1-10 point Likert scale.
Financial Attitudes Index: Additive scale combining items (a)-(c)/(d)

5. **Financial Self-efficacy***

Items drawn from Lown (2011) and adapted to the context of this study:

- Imagine you just got paid or you have just received your grant money. How confident are you that you will not run out of money in the next month?
- How confident are you that you can plan carefully in advance how to use the money during the week?

Individual items were rated on a 1-10 point Likert scale.
Financial Self-Efficacy Index: Additive scale combining items (a) and (b)

6. Financial Distress *

We included a composite measure of financial distress to capture consumption shortfalls in day-to-day life, thus complementing some more conventional poverty measures. The items were piloted with research assistants as well as their children in the age range of 10-18. The reference period was defined as the past month in order to reflect the payment cycles of welfare grants.

- In the past four weeks, how often did you run out of money for meat?
- In the past four weeks, how often did you run out of money for electricity?
- In the past four weeks, how often did you run out of money for transport?
- In the past four weeks, how often did you run out of money for airtime?

Response options were "Never", "Rarely (1-3 times in the past four weeks)", "Sometimes (4-10 times in the past four weeks)", "Often (> 10 times in the past four weeks)"
Financial Distress Index: Weighted scale based on principal component analysis, combining items (a)-(d)

7. Worries about Money*

Previous research that has pointed to the psychological impact, including anxiety, stress, and sleeping problems, caused by living in poverty (see Calvo & Dercon, 2013; Banerjee & Duflo, 2007; Case & Deaton, 2005). We therefore include an additional item to assess the emotional consequences of experiencing poverty:

- In the past 4 weeks, how often did you worry or feel anxious about money?

Response options were "Never", "Rarely (1-3 times in the past four weeks)", "Sometimes (4-10 times in the past four weeks)", "Often (> 10 times in the past four weeks)"

8. Coping with Economic Shocks

We measured resilience to economic shocks using two items from previous research (Kast, Meier & Pomeranz, 2012; Barnes, Gaile & Kibombo, 2001; Prina, 2013; Dupas & Robinson, 2013):

- If you were facing an emergency, how difficult would it be for your family to get R1000?
- How would you get R1000?

Response options were: "Use existing income", "Use savings", "Use remittances", "Borrow from a friend/family member", "Borrow from a loan shark", "Sell belongings", "Reduce health expenditures", "Reduce educational expenditures", "Reduce food expenditures".

The above items were collapsed into a binary variable coping with economic shocks that was coded as 1 if participants indicated that they would be able to cover the costs of a hypothetical emergency, and 0 if they were not able to. The coping strategies of borrowing from a loan shark (at high interest) and cutting down expenses on health, education, or food were considered as risky and therefore also coded as 0.

9. Access to Basic Necessities*

The below items are based on the top eight most important necessities for children, as identified by the Centre for South African Social Policy in the Indicators of poverty and social exclusion project, and endorsed by over 80% of the South African population in a nationally representative survey (Wright, 2008; Wright & Noble, 2007; Pillay, Roberts & Rule, 2006).

- Were you able to afford three meals a day in the past month
- Were you able to afford the costs of going to school in the past month
- Were you able to afford the costs of going to a doctor when you were sick in the past month
- Were you able to afford a school uniform in the past month
- Were you able to afford enough warm clothes in the past month
- Were you able to afford toiletries in the past month
- Were you able to afford school equipment in the past month
- Were you able to afford two pairs of shoes in the past month

Basic Necessities Index: Weighted scale based on principal component analysis, combining items (a)-(h)

5.7 Construction of Indices

As outlined above, the **Financial Attitudes Index** and the **Financial Self-Efficacy Index** will be created based upon simple summative scores given the limited number of individual items. For the **Financial Distress Index** and the **Basic Necessities Index**, we will use principal component analysis to determine weights. In principal component analysis, variables are expressed as the linear combination of a set of underlying components for each respondent j:

$$a_{1j} = v_{11} \times A_{1j} + v_{12} \times A_{2j} + ... + v_{1N} \times A_{Nj}$$

$$a_{Nj} = v_{N1} \times A_{1j} + v_{N2} \times A_{2j} + ... + v_{NN} \times A_{Nj} \tag{8}$$

where A_N denotes the components and v_N the coefficients for the components for each variable.

Principal component analysis is then used to find the linear combination of the individual variables with maximum variance yielding the first principal component A_{1j} and then finding a second linear combination with the maximum of the remaining variance, and so forth. The scoring factors are then retrieved by inverting the structure of Equation (8), thus producing estimates for the N principal components:

$$A_{1j} = f_{11} \times a_{1j} + f_{12} \times a_{2j} + ... + f_{1N} \times A_{Nj}$$

$$A_{Nj} = f_{N1} \times a_{1j} + f_{N2} \times a_{2j} + ... + f_{NN} \times a_{Nj} \tag{9}$$

Ultimately, the index for each respondent is given by the expression:

$$A_{1j} = f_{11} \times (a*_{1j} - a*_1)/(s*_1) + f_{1N} \times (a*_{Nj} - a*_N)/(s*_N) \tag{10}$$

whereby $a*_{1j}$ to $a*_{Nj}$ represent N items for individual j (e.g. access to N basic necessities) , $a*_1$ the mean of $a*_{1j}$ across respondents and $s*_1$ the standard deviation.

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