

Promoting parent child relationships and preventing violence via home visiting: A pre-post cluster randomised trial among Rwandan families linked to social protection programs

Theresa S. Betancourt (✉ THERESA.BETANCOURT@BC.EDU)

<https://orcid.org/0000-0002-3683-4440>

Sarah K.G. Jensen

Boston College

Dale A. Barnhart

Harvard University T H Chan School of Public Health

Robert T. Brennan

Boston College

Shauna M. Murray

Boston College

Aisha K. Yousafzai

Harvard University T H Chan School of Public Health

Jordan Farrar

Boston College

Kalisa Godfroid

FXB Rwanda

Stephanie M. Bazubagira

FXB Rwanda

Laura B. Rawlings

World Bank

Briana Wilson

World Bank

Vincent Sezibera

University of Rwanda

Alex Kamurase

World Bank

Research article

Keywords: home-visiting, early childhood development (ECD), violence, social protection, father engagement

Posted Date: September 2nd, 2019

DOI: <https://doi.org/10.21203/rs.2.13621/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Version of Record: A version of this preprint was published at BMC Public Health on May 6th, 2020. See the published version at <https://doi.org/10.1186/s12889-020-08693-7>.

Abstract

Background: Sugira Muryango (SM) is an early child development and violence-prevention home-visiting program delivered by trained lay workers. This cluster-randomised trial evaluates whether families living in extreme poverty who receive SM in combination with government-provided social protection demonstrate greater responsive and positive caregiving, nutrition, care seeking, hygiene, and father involvement compared with control families receiving usual care (UC).

Methods: Sugira Muryango (SM) was delivered to families with children aged 6–36 months living in extreme poverty. We assessed changes in outcomes in intervention and UC control families using structured surveys and observation. Analyses were intent to treat using mixed models.

Results: Families receiving SM improved significantly on responsive caregiving using the Home Observation for Measurement of the Environment (Cohen's $d = 0.78$; $p < 0.001$) and the Observation of Mother-Child Interaction (Cohen's $d = 0.29$; $p < 0.001$) and showed decreased violent discipline (OR: 0.34; 95% CI: 0.22, 0.51) compared with UC. Children in families receiving SM also had a 0.44 higher increase in food groups consumed in the past 24 hours (Cohen's $d = 0.34$, $p < 0.001$), increased care seeking for diarrhoea (OR=2.2, 95% CI: 1.5, 3.1) and fever (OR: 3.3, 95% CI: 2.3, 4.8), and improved hygiene behaviours such as proper treatment of water (OR: 3.6; 95% CI: 2.4, 5.5) compared with UC. SM was also associated with a decreased intimate partner violence (OR=0.67, 95% CI: 0.33, 1.3) and caregiver depression and anxiety (OR=0.9, 95% 0.58, 1.4).

Conclusions: Sugira Muryango led to improvements in family functioning and caregiver behaviours linked to child development and health.

Background

Children in extreme poverty face multiple risks to healthy development including malnutrition, illness, under-stimulating environments, and violent discipline. Addressing these adversities is critical during early childhood. Social protection programs target poor households where early child development (ECD) deficits are concentrated and where income support can increase investment in dietary diversity, hygiene, and responsive caregiving. Previous ECD interventions conducted in low- and middle-income countries (LMICs) demonstrate the value of integrated interventions focusing on the home environment and parent-child relationships.¹ Engagement and education of caregivers can further improve child health and development through behavioural change.²

Although poverty rates in Rwanda have declined, 38% of Rwandans still live in poverty; 16% in extreme poverty.³ The Government of Rwanda is addressing poverty-related disparities in ECD via the Vision 2020 Umurenge Program (VUP), which targets nutrition and ECD among the poorest households, offering direct support (unconditional cash transfers), nutrition-sensitive direct support, and public works programming to vulnerable households.⁴ In this paper, we evaluate the *Sugira Muryango* (Strengthen the Family) home-visiting ECD coaching program delivered in combination with Rwanda's public works program by community-based coaches (CBCs). We report data from a cluster randomised trial of 1,049 families living in extreme poverty.

Methods

Study design

Between January and September 2018, we conducted the baseline and post-intervention assessments of a stratified cluster-randomised trial designed to test *Sugira Muryango's* effects on promoting ECD and preventing violence among families receiving VUP. The trial was conducted within three Rwandan districts with existing VUP programs selected to minimize the overlap with ECD interventions by government or nongovernmental organizations. All families in this study were eligible for one of two versions of the VUP program: classic public works (cPW), which provides cash for (typically hard) manual labour, or the newer expanded public works (ePW), which provides cash for (typically lighter) labour and also provides access to livestock. All procedures were approved by the Harvard T. H. Chan School of Public Health and

Boston College Institutional Review Boards as well as the Rwandan National Ethics Committee, Ministry of Education, and National Committee for Science and Technology.

Participants

Within selected clusters, families were eligible for inclusion in the study if they 1) belonged to the most extreme level of poverty in the government's household-ranking system (*Ubudehe* 1)⁵ and were eligible for the cPW or ePW program; 2) had at least one child 6–36 months; and 3) were willing to participate in a home-visiting intervention. Exclusion criteria were a severe, active crisis in the family such as psychosis or suicide attempts by a caregiver or severe mental impairment in the caregiver which may have affected their ability to benefit from the program. All caregivers gave written informed consent for themselves and their eligible children.

The caregiver who stated that he or she knew the child best—typically the mother—provided reports on child development and health, the home environment, caregiver-child relationships, caregiving practices, feeding practices, child health, as well as information about the household, including family composition and assets. All caregivers provided self-reports on mental health and victimization and perpetration of intimate partner violence. Questionnaires, child assessments, and mother-child observation were conducted in Kinyarwanda in the family's home. Data were entered on Android tablets by independent local enumerators blinded to intervention status.

The intervention

Sugira Muryango comprises twelve modules (see Table 1) that were delivered by well-trained, supervised CBCs in the families' home at a pace of about one module per week (average 90-minute sessions) between May and August 2018. *Sugira Muryango* offers active coaching of caregivers to promote early stimulation, play, nutrition, hygiene, responsive parenting, nonviolent interactions among household members, and engagement of both female and male caregivers. CBCs also help families navigate formal and nonformal resources (e.g., health and nutrition services and social support). *Sugira Muryango* was originally developed and tested in Rwanda for families affected by HIV/AIDS.⁶ During two previous pilot studies, an ECD version not specific to HIV/AIDS was developed by integrating UNICEF/World Health Organization Care for Child Development materials.⁷

The CBCs were selected from the local community (Table 2 for training, supervision, and incentives of CBCs). Primary caregivers participated in the modules in interaction with their child(ren); other caregivers and older children were welcome to participate. Visits included a 15-minute "active play and communication" session where caregivers received live feedback on parent-child interactions. Sessions were carried out in participants' homes, unless contraindicated due to illness or privacy concerns. The UC received VUP services and health services as usual from the Rwandan government and its partners. Intervention and UC families received a stipend (5,000 Rwandan Francs equal to 3 kilos of rice) after each data collection.

Outcomes

Per our theory of change (Figure 1), immediately following 12 modules of intervention delivered weekly over a 3–4 month period, the primary outcomes were behavioural change in parents relating to responsive care, reduced violence in the household, dietary diversity, hygiene, and care seeking for child health problems. Secondary outcomes were shared decision making among parents, and caregiver mental health.

Questionnaires were developed from pilot intervention research and followed a forward- and back-translation protocol from English to Kinyarwanda.⁶

Responsive caregiving was assessed by trained enumerators using three tools, the Observation of Mother-Child Interaction (OMCI), an adapted 43-item version of the infant/toddler Home Observation for Measurement of the Environment (HOME) Inventory,^{8,9} and the Multiple Cluster Survey (MICS) Family Care Indicators (FCI).¹⁰ The OMCI assesses a five-minute interaction that is scored according to published guidelines (maximum 57; Cronbach's $\alpha=0.91$). The HOME combines observation of parenting behaviours and household conditions with caregiver report. Items were summed to derive a total score (maximum 43; Cronbach's $\alpha=0.76$). The MICS FCI¹⁰ is a cumulative score of caregivers' self-reported engagement in stimulating activities with the child during the prior three days (maximum 6; Cronbach's $\alpha=0.74$). Children's nutritional intake was assessed by parent-reported dietary diversity reflecting the number of food groups (out of 7) the child consumed in the past 24 hours (Cronbach's $\alpha=0.45$).¹¹ Children's health status was measured using standard Demographic and Health Survey (DHS) questions reporting the prevalence of diarrhoea, fever, and cough in the seven days preceding the survey.¹² Care seeking at a health facility was defined following DHS guidelines and was assessed only among parents of children who experienced illness. Water, sanitation, and hygiene practices were assessed using items from the DHS WASH module.¹² Indicators included clean water, safe treatment of water, and hand-washing facility with soap.

Children's exposure to violent and nonviolent discipline was assessed using the MICS Child Development and Child Disciplinary modules.¹⁰ Exposure to violent disciplinary practices was defined as having experienced being shouted or screamed at, called demeaning names, shaken, spanked, slapped, or beaten. Exclusive exposure to nonviolent disciplinary practices was defined as the child having experienced no forms of violent discipline and at least one nonviolent disciplinary practice, including restricting the child's privileges or explaining what the child did wrong.¹³ Intimate partner violence among parents who were currently married, cohabitating, or in a relationship was assessed using items from DHS Domestic Violence Module¹⁴ to assess emotional, physical, and sexual abuse within the last three months.

As secondary outcomes related to overall family functioning we report experience of abuse among female caregivers and perpetration of abuse among male caregivers. Among households with a mother-father structure, we assessed whether caregivers reported equal involvement in decision making about care for the young child including decisions related to feeding and medical care for illness.¹⁵ Caregivers' mental health was assessed using the Hopkins Symptom Checklist-25 (HSCL-25), a measure of depression and anxiety symptoms validated for use among adults in Rwanda¹⁶ ($\alpha=0.93$). A mean score ≥ 1.75 was used to define likely clinical depression.

[Figure 1]

Power calculation

Power calculations drew on two previously conducted pilot studies and estimated the required sample size for a 0.18 minimum detectable standardized effect size on parenting outcomes and child development outcomes for the 3- and 12-month follow-up period assuming power of 0.8 and a standard alpha level of $p<0.05$. The 3-month follow up is reported here. We used an estimated intraclass correlation as 0.03 for parent-child interactions based on pilot data. The ePW program was being rolled out during the design phase of the program, and we assumed based on estimates available to us it would be too scarce to constitute one half of an ideal sample size, so calculations were based on an assumption of 91 ePW clusters and 104 cPW clusters with five households per cluster to be assigned to treatment and control conditions.

Because the target number of all ePW clusters did not exist, further adjustments were made, by adding combined clusters, and ultimately adding more cPW clusters to maintain power to test *Sugira Muryango* versus UC hypotheses.

Randomisation

Families were enrolled between February and March 2018. Government staff in Nyanza, Ngoma, and Rubavu districts provided lists of households participating in cPW or ePW. Families' participation in the VUP was determined by governmental policies and was not under the control of the researchers. Non-overlapping, geographically defined clusters were created comprising at least 30 families participating in the cPW program or 10 families participating in the ePW program, with some clusters containing both ≥ 30 cPW and ≥ 10 ePW households. Clusters were formed from one or more contiguous villages such that one CBC could provide services to all participating families in the cluster. Villages within the same cluster were selected to be as close to each other and as far apart from other clusters as possible. Due to the relative scarcity of the ePW families, 100% of clusters containing at least 10 ePW families were sampled for participation in the study. Clusters which contained cPW families (including combined clusters containing ePW families) were randomly sampled for inclusion into our study until we reached our target sample size of $\geq 1,040$ households. Randomisation was performed by a data collection contractor and occurred at the cluster level within strata defined by public works type (ePW only, combined ePW/cPW, and cPW only) and geographic sector. Within strata, clusters were assigned random numbers and placed on a ranked list. The first half of clusters on the randomly ranked list were assigned to treatment. In case of an uneven number of clusters per strata, a lottery was used to round the number assigned to treatment up or down. After assignment of the cluster, households were contacted by the data collection contractor and invited to participate in the study. Clusters were retained if at least five families in the cPW strata or at least one family in the ePW strata enrolled and had at least one child aged 6–36 months. We retained 48 ePW-only clusters, 38 ePW/cPW clusters, and 112 cPW-only clusters (Cluster sampling strategy, Figure 1). Neither the caregivers nor enumerators knew the family's assignment status at the time of the baseline assessments. Enumerators were also not informed about the family's assignment status during the post-intervention assessment although caregivers' responses to fidelity questions about the program at the end of the session may have revealed their treatment status. In total, 1,049 households were enrolled at baseline. After the randomisation $n=508$ families were allocated to UC and $n=541$ families were allocated to treatment. Baseline data collection occurred in May 2018 and post-intervention data were collected in August-September 2018.

[Figure 2]

Statistical analysis

We compared trajectories of outcomes over time among families receiving the *Sugira Muryango* intervention with UC using linear mixed models for continuous outcomes and generalized linear mixed models with a logit link for binary outcomes. To account for clustering, we included random effects for randomisation cluster and child for outcomes assessed at the child level. For outcomes assessed at the caregiver level we included random effects for cluster and caregiver, and for outcomes assessed at the household level we included random effects for cluster and household. Instances of loss-to-follow-up ($<2.5\%$) and item-level missing data were low ($<1\%$). Following intention-to-treat analysis, we used chained equation imputations in STATA to account for missing data.¹⁷ Significance was defined as observing $p < 0.05$ for the interaction term between treatment condition and time. We examined whether primary outcomes related to parental behaviour and violent discipline differed between families who received *Sugira Muryango* and control families. For continuous outcomes with statistically significant changes we report standardized effect sizes (Cohen's d) for the time-by-treatment interaction term. Analyses were conducted using STATA version 15 (Statacorp, College Station, TX).

Adverse events in intervention and control households

During the interval between baseline and post-intervention “risk of harm”, cases were reported in 12 families (2.2%) in the intervention group and 12 families (2.4%) in the control group [see Additional File 1].

Results

Baseline data were collected on 1,084 children, and 1,498 caregivers and their intimate partners were enrolled in the trial. Three households (0.3%), 36 caregivers (2.4%), and six children (0.5%) did not complete the post-intervention assessment and had post-intervention data imputed.

Demographics of the samples

Descriptive statistics are provided in Table 3. Caregivers ranged in age 18–79 years and were most frequently the biological mother (n=950), the biological father (n=433), or a grandparent (n=96). Sixty-four percent (n=953) of the caregivers were married or cohabitating. At enrolment, 61% of the families reported high levels of food insecurity and 48% of the children were stunted as defined by a standardized height-for-age (HAZ) score below 2.

[Table 3.]

Positive parenting and responsive care

Results from the generalized linear mixed models are shown in Table 4. Compared with UC, children receiving *Sugira Muryango* experienced significant improvements in caregiver engagement scored on the HOME, the OMCI, and the FCI. Improvements on the HOME inventory were 3.9 points greater among intervention families compared with UC (Cohen's $d=0.78$, $p<0.001$). Improvements on the OMCI total score were 3.1 points greater among intervention families than UC (Cohen's $d=0.29$, $p<0.001$). The increase in stimulating caregiving activities (FCI) was 1.2 activities greater in intervention families compared with UC (Cohen's $d=0.71$, $p<0.001$).

Dietary diversity, child health, care seeking, and hygiene

Pre- to post-intervention, families receiving *Sugira Muryango* reported a significant increase in children's dietary diversity compared to UC (0.44 additional food groups, 95% CI: 0.27, 0.61, $p<0.001$). Pre- to post-intervention prevalence of acute childhood illnesses was unchanged, however, at post-intervention, families receiving *Sugira Muryango* were twice as likely to seek care for child diarrhoea (OR:2.2, 95% CI: 1.5, 3.1) and three times as likely to report care seeking for child fever (OR:3.3, 95% CI:2.3, 4.8). Changes in care seeking behaviours over time were significantly greater in intervention households compared with UC ($p=0.005$ and $p<0.001$ respectively). Intervention households also had greater odds of engaging in safe water treatment (OR=3.6, 95% CI: 2.4, 5.5) and handwashing with soap (OR=1.7, 95% CI:1.2, 2.5) following the intervention. We also observe significantly greater improvements in access to clean water in the intervention group relative to UC ($p=0.047$).

Violence, parental mental health and shared decision making

Following the 12-module intervention, children whose families received *Sugira Muryango* had 66% lower odds of exposure to violent child discipline (OR:0.34, 95% CI:0.22, 0.51) and almost twice the odds of being exclusively exposed to nonviolent forms of discipline (OR:1.9, 95% CI:1.3, 3.0). Female caregivers receiving *Sugira Muryango* had 33% lower odds of exposure to intimate partner violence (OR=0.67, 95% CI: 0.33, 1.3, $p=0.048$). We did not observe significant changes in father reports of intimate partner violence perpetration. The intervention was associated with significant improvement in both maternal and paternal anxiety and depression symptoms compared to UC (OR=0.9, 95% 0.58, 1.4, $p=0.010$). Dual-caregiver dyads receiving *Sugira Muryango* did not show increased shared decision-making regarding child feeding but had twice the odds of jointly deciding what to do when the child was sick (OR: 2.0, 95% CI:1.3, 2.9). Auxiliary analyses examined whether a family's enrolment in either ePW or cPW moderated intervention effects [see Additional File 2 for].

Discussion

Sugira Muryango was designed to address the needs of Rwanda's most vulnerable families. Through home visiting, we involved a range of family members in nurturing care including fathers. We observed that active coaching, play, alternatives to harsh discipline and violence, and encouragement of family strengths can help vulnerable households draw on formal and non-formal resources. Results indicate that this brief (12–16 week) intervention led to improvements in caregiving practices related to child development including parent-child interactions and stimulation, nutrition, care seeking, and reduced violence. The observed effect sizes for changes in ECD-related parent behaviours fall within the range found in other home-visiting ECD interventions in LMICs. For example, our effect size for the HOME ($d=0.78$) is comparable to effect sizes reported in previous studies in Pakistan¹⁸ ($d=0.30$) Uganda⁹ ($d=1.1$) and Bangladesh¹⁹ ($d=0.55$ to $d=0.68$), and our effect size for the OMCI ($d=0.29$) is comparable to that reported in Pakistan (0.20 to 0.80).¹⁸ The observed effect size for dietary diversity ($d=0.34$) is also comparable to effect sizes of 0.54 in a parenting intervention in Uganda⁹ and 0.40 in Bangladesh.¹⁹ We also saw improvements related to care seeking if children were sick. *Sugira Muryango* was also associated with reductions in family violence—reduced use of harsh punishment practices and victimization of mothers by intimate partner violence. Moreover, increased shared decision making about what to do if a child was sick were indicative of increased father involvement in care.

Study limitations must be noted. First, in this brief assessment period, we did not explore physical and cognitive development outcomes; these will be examined at 12-month follow up. Second, some measures relied on parent-reported measures, which could suffer from differential bias because parents who are exposed to the intervention may be more aware of socially desirable responses. Nonetheless, the OMCI and the HOME relied on the report of a blinded, trained observer. Third, *Sugira Muryango* was delivered to vulnerable households categorized as extremely poor. Future studies may examine how families of different socio-economic status may benefit from the program

Conclusions

Family home-visiting interventions like *Sugira Muryango* have an important role to play in promoting ECD and preventing family violence globally. The integration of ECD programs and social protection agendas is a promising area for helping vulnerable children and families break intergenerational cycles of poverty and violence.

Abbreviations

CBC: Community-based coach

cPW: classic public works program

ePW: expanded public works program

ECD: Early child development

LMICs: Low- and middle-income countries

UC: Usual Care

VUP: Vision 2020 Umurenge Program

HOME: Home Observation for Measurement of the Environment

OMCI: Observation of Mother Child Interaction

FCI: Family Care Indicators

MICS: Multiple Indicator Cluster Survey

DHS: Demographics Health Survey

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the institutional review boards of the Harvard T. H. Chan School of Public Health and Boston College and well as the Rwandan National Ethics Committee, Ministry of Education, and National Committee for Science and Technology. De-identified data will be available from the authors six months after collection of the 12-month follow-up. All adult study participants provided written informed consent for their own participation and primary caregivers gave written consent for participation of their children.

Consent for publication

Not applicable

Availability of data and materials

Deidentified individual participant data will not be made available since this is an ongoing trial. De-identified data will be available from the authors six months after collection of the 12-month follow-up. The dataset supporting the conclusions of this article are included within the article (and its additional files).

Competing interests

Not applicable

Funding

This study was funded by The World Bank Early Learning Partnership (Grant Number 7170035), the Strategic Impact Evaluation Fund and the Japan Trust (Grant Number 7186617), USAID Rwanda (Grant Number AID-696-A-16-00003), the Network of European Foundations (CVECF-BOSTON COLLEGE_2017), ELMA Philanthropies (Grant number 16-F0018-BC), and Wellspring Advisors (Grant number 12831). Co-authors from the World Bank were involved in the study design, interpretation of data, and writing of the manuscript. None of the other funders were involved in study design, data collection, data analysis, data interpretation, or writing. This work does not necessarily reflect the views of the World Bank, its Board of Executive Directors, or the governments they represent. The World Bank does not guarantee the accuracy of the information included in this work. Dr Betancourt maintained authority over all decision making over design, analysis, interpretation, and publication. All authors have indicated they have no financial relationships relevant to this article to disclose and **have no conflicts of interest relevant to this article to disclose.**

Authors' contributions

Theresa S. Betancourt conceptualized the study, obtained funding, led intervention development and interpretation of the data, and provided supervision. Alex Kamurase, Laura Rawlings, and Briana Wilson contributed to policy dialogue management with government counterparts, study design, significantly securing funding and writing and data interpretation. Shauna M. Murray oversaw intervention implementation and data collection and made significant intellectual contributions to the manuscript content. Dr Vincent Sezibera supported clinical supervision during intervention delivery, contributed to intervention adaptation and made significant intellectual contributions to the intervention and manuscript content. Dr Robert T. Brennan contributed to study concept and design, data analysis, interpretation of the data, and drafting of the manuscript. Dr Sarah Jensen and Dr Dale Barnhart conducted data analyses and contributed to data interpretation and writing. Dr Aisha Yousafzai assisted in further curriculum refinements and contributed to the manuscript writing. Dr Jordan Farrar oversaw the fidelity monitoring process and provided input during intervention development. Kalisa Godfroid, Odette Uwimana, and Stephanie Bazubagira helped refine the curriculum and were engaged in direct supervision of the community-based coaches and families.

Acknowledgements

The work was made possible by the collaboration of the University of Rwanda Center for Mental Health, Ministry of Gender and Family Promotion and the National Early Childhood Development Program under the direction of National Coordinator Dr Anita Aismwee and the advisory committee comprised of representatives from the Ministry of Local Government, National Children's Commission, Rwanda Biomedical Centre, and the University of Rwanda School of Nursing.

References

- 1 Richter LM, Daelmans B, Lombardi J, *et al.* Investing in the foundation of sustainable development: pathways to scale up for early childhood development. *Lancet* 2017; **389**: 103–18.
- 2 Britto PR, Lye SJ, Proulx K, *et al.* Nurturing care: promoting early childhood development. *Lancet* 2017; **389**: 91–102.
- 3 National Institute of Statistics of Rwanda. The fifth integrated household living survey (EICV5) Rwanda poverty profile report, 2016/17. 2018 <http://www.statistics.gov.rw/publication/eicv-5-rwanda-poverty-profile-report-201617>.
- 4 Republic of Rwanda Local Administrative Entities Development Agency (LODA). Environmental and social management framework for the social protection investment project financing operation. 2018

- https://loda.gov.rw/fileadmin/user_upload/documents/2014_PRO/Documents/Revised_SP_IPF_ESMF_for_Disclosure_March_2018.pdf.
- 5 Republic of Rwanda Local Administrative Entities Development Agency (LODA). Ubudehe social categorization report. 2016.
 - 6 Betancourt TS, Ng LC, Kirk CM, *et al*. Family-based promotion of mental health in children affected by HIV: a pilot randomized controlled trial. *J Child Psychol Psychiatry* 2017; **58**: 922–30.
 - 7 World Health Organization, UNICEF. Care for child development: improving the care for young children. 2012
https://www.who.int/maternal_child_adolescent/documents/care_child_development/en/.
 - 8 Caldwell BM, Bradley RH. Home Observation for Measurement of the Environment: administration manual. 2003.
 - 9 Singla DR, Kumbakumba E, Aboud FE. Effects of a parenting intervention to address maternal psychological wellbeing and child development and growth in rural Uganda: a community-based, cluster-randomised trial. *Lancet Glob Heal* 2015; **3**: e458–69.
 - 10 UNICEF. MICS5 questionnaire for children under five. 2013. <http://mics.unicef.org/tools?round=mics5>.
 - 11 USAID, AED, Food and Nutrition Technical Assistance, UC Davis, International Food Policy Research Institute, WHO. Indicators for assessing infant and young child feeding practices. Geneva, 2008
http://whqlibdoc.who.int/publications/2008/9789241596664_eng.pdf.
 - 12 National Institute of Statistics of Rwanda, Ministry of Finance and Economic Planning, Ministry of Health, ICF International. Rwanda Demographic and Health Survey 2014-15. Kigali, Rwanda, 2016 <https://dhsprogram.com/pubs/pdf/FR316/FR316.pdf>.
 - 13 UNICEF. Child disciplinary practices at home: evidence from a range of low- and middle-income countries. 2010.
 - 14 National Institute of Statistics of Rwanda, ORC Macro. Rwanda Demographic and Health Survey 2005. Kigali, Rwanda, 2006
<https://dhsprogram.com/pubs/pdf/FR183/FR183.pdf>.
 - 15 UNICEF, Imbuto Foundation. Early Childhood Development and Family Services: baseline evaluation in 20 sites in Rwanda. 2015
https://www.unicef.org/evaldatabase/files/ECD_and_F_Baseline_Evaluation_Rwanda.pdf.
 - 16 Bolton P. Local perceptions of the mental health effects of the Rwandan genocide. *J Nerv Ment Dis* 2001; **189**: 243–8.
 - 17 Plumptre CO, Morris T, Hughes DA, White IR. Multiple imputation of multiple multi-item scales when a full imputation model is infeasible. *BMC Res Notes* 2016; **9**: 45.
 - 18 Yousafzai AK, Rasheed MA, Rizvi A, Armstrong R, Bhutta ZA. Effect of integrated responsive stimulation and nutrition interventions in the Lady Health Worker programme in Pakistan on child development, growth, and health outcomes: a cluster-randomised factorial effectiveness trial. *Lancet* 2014; **384**: 1282–93.
 - 19 Aboud FE, Singla DR, Nahil MI, Borisova I. Effectiveness of a parenting program in Bangladesh to address early childhood health, growth and development. *Soc Sci Med* 2013; **97**: 250–8.

Tables

Table 1. The twelve *Sugira Muryango* modules

- Module 1: Family Narrative
- Module 2: The importance of early stimulation and play
- Module 3: Building early communication skills
- Module 4: The importance of good nutrition
- Module 5: The importance of good hygiene
- Module 6: The importance of good health
- Module 7: Managing the stresses of parenting and family life
- Module 8: Resolving conflicts in the home
- Module 9: The important role that everyone plays in raising a baby well
- Module 10: Good parenting is better than being born well

- Module 11: Making the home a place where a baby’s brain can grow
- Module 12: With a united family, anything is possible

Table 2. Community Based Coaches (CBCs): training, supervision and incentives

- Three-week training session delivered by trained supervisors.
- Training included role-play-based learning, active coaching practice, techniques for engaging fathers, strategies for providing feedback to caregivers on early stimulation, conflict resolution, problem solving, and resource navigation.
- Supervision provided by *Sugira Muryango* supervisors who had been involved in previous pilot work.
- Supervision took the form of in-person supervision of the CBCs during the first three weeks of the intervention, and each supervisor shadowed each CBC once in the home. Telephone supervision and peer support groups occurred weekly, and group supervision was held once a month.
- CBCs audiotaped the home-based sessions, which were reviewed by a supervisor for fidelity monitoring.

CBCs were stipended according to local practices (28,000 Rwandan Francs per month for a caseload of five families), visiting weekly for a period of three months and participating in all training and supervision.

Table 3. Descriptive statistics of study participants at enrolment. Continuous variables reported as [mean (SD)]. Binary variables reported as [frequency (%)].

	CLASSIC PUBLIC WORKS (cPW)		EXPANDED PUBLIC WORKS (ePW)	
	Sugira Muryango + cPW	cPW only	Sugira Muryango + ePW	ePW only
HOUSEHOLDS (N=1,049)	n=374	n=374	n=167	n=134
High food insecurity	239 (63.9%)	229 (61.2%)	104 (62.3%)	70 (52.2%)
CHILDREN (N=1084)	n=386	n=384	n=173	n=141
Average age in months	21.0 (8.14)	21.8 (8.6)	20.8 (8.2)	22.3 (8.4)
Health status and wellbeing				
Stunted (HAZ <2)	184 (47.7%)	178 (46.4%)	85 (49.1%)	75 (53.2%)
Wasted (WHZ <2)	13 (3.4%)	9 (2.3%)	8 (4.6%)	2 (1.4%)
Underweight (WAZ <2)	63 (16.3%)	71 (18.5%)	30 (17.3%)	27 (19.1%)
Screens positive, disability or developmental delay	110 (28.6%)	111 (29.0%)	57 (32.9%)	38 (27.1%)
Any violent punishment	184 (47.7%)	180 (47.0%)	83 (48.0%)	59 (41.8%)
CAREGIVERS (N=1498)	n=555	n=564	n=211	n=168
Average age in years [range]	34.5 (9.7) [18-79]	35.7 (10.3) [19-75]	36.3 (10.6) [18-79]	37.5 (12.7) [18-84]
Marital Status				
Single, separated, divorced, widowed	171 (30.8%)	166 (29.43%)	117 (55.5%)	91 (54%)
Married/cohabitating	384 (69.2%)	398 (70.6%)	94 (44.5%)	77 (45.8%)
Relationship with child				
Biological mother	341 (61.4%)	338 (59.9%)	152 (72.0%)	119 (70.8%)
Biological father	179 (32.3%)	183 (32.4%)	44 (20.9%)	27 (16.1%)
Adoptive mother	2 (0.4%)	1 (0.2%)	0 (0.0%)	0 (0.0%)
Stepfather	1 (0.2%)	4 (0.7%)	0 (0.0%)	5 (3.0%)
Stepmother	1 (0.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Aunt/uncle	3 (0.5%)	2 (0.4%)	0 (0.0%)	0 (0.0%)
Grandparents	28 (5.0%)	36 (6.4%)	15 (7.1%)	17 (10.1%)
Educational Attainment				
No school/Don't know	112 (20.2%)	132 (23.4%)	60 (28.4%)	38 (22.6%)
<6 years	275 (49.5%)	252 (44.7%)	97 (46.0%)	88 (52.4%)
≥6yrs Primary	88 (15.9%)	89 (15.8%)	26 (12.3%)	21 (12.5%)
Secondary/vocational school	80 (14.4%)	91 (16.1%)	28 (13.3%)	21 (12.5%)
Health and safety				
Screens positive, disability	60 (10.8%)	63 (11.2%)	36 (17.1%)	26 (15.5%)
Screens positive, depression or anxiety	275 (49.5%)	248 (44.0%)	117 (55.5%)	83 (49.4%)
Maternal victimization violence, last three months*	78 (39.8%)	73 (35.3%)	15 (29.4%)	15 (36.6%)
Paternal perpetration violence, last 3 months*	38 (21.2%)	41 (22.3%)	10 (23.3%)	4 (12.5%)

* among mothers (n=495) and fathers (n=438) who are married or cohabitating

HAZ = Height-for-age; WHZ = weight-for-height; WAZ = Weight-for-age

Table 4. Model-based estimates and effect sizes for primary child development outcomes.

Outcomes Continuous [range] Binary (%)	Means and mean differences at post-intervention			Model for change over time	
	Sugira Muryango	Controls	Effect Size Continuous: Δ (95%) and Cohen's d Binary: OR (95%)	Difference-in-difference effect (95% CI)	p-value ¹
CHILD DEVELOPMENT (N=1,084)					
ECD stimulation in the home					
HOME [0-43]	28.9	25.4	3.5 (2.9, 4.2)	3.9 (3.2, 4.5)	<0.001
OMCI [0-57]	43.3	41.7	1.6 (0.14, 3.1)	3.1 (1.6, 4.6)	<0.001
FCI (ECD activities)	4.6	3.4	1.2 (0.99, 1.4)	1.2 (1, 1.5)	<0.001
Child nutrition, health and safety					
Dietary Diversity [0-7 food groups] groups]	3.46	3.02	0.44 (0.27, 0.61)	0.45 (0.26, 0.64)	<0.001
Diarrhoea prevalence (%)	0.32	0.35	0.9 (0.65, 1.2)	-0.28 (-0.67, 0.11)	0.158
Diarrhoea care seeking (%) ³	0.68	0.49	2.2 (1.5, 3.1)	0.75 (0.25, 1.2)	0.005
Fever and cough prevalence (%)	0.68	0.69	0.96 (.71, 1.3)	-0.18 (-0.56, 0.19)	0.345
Fever and cough care seeking (%) ⁴	0.71	0.42	3.3 (2.3, 4.8)	1.3 (0.76, 1.8)	<0.001
Child caretaking practices and child safety					
Use of any violent discipline (%)	0.21	0.43	0.34 (0.22, 0.51)	-1.2 (-1.7, -0.76)	<0.001
Exclusive non-violent discipline (%)	0.14	0.07	1.9 (1.3, 3.0)	0.92 (.17, 1.7)	0.019
CAREGIVER OUTCOMES (N=1,498)					
Caregiver mental health					
Screens for internalizing problems (%) ⁵	0.21	0.23	0.9 (.58, 1.4)	-0.54 (-0.96, -0.13)	0.010
Shared decision making⁶					
Action when child sick (%)	0.37	0.23	2.0 (1.3, 2.9)	0.72 (0.27, 1.2)	0.002
What child eats (%)	0.17	0.11	1.6 (1.0, 2.6)	0.35 (-0.18, 0.89)	0.193
Intimate partner violence					
Perpetration, male caregivers (%) ⁷	0.07	0.08	0.93 (0.42, 2.1)	-0.11 (-0.97, .75)	0.804
Victimization, female caregivers (%) ⁸	0.17	0.23	0.67 (0.33, 1.3)	-0.72 (-1.4, -.005)	0.048
HOUSEHOLD OUTCOMES (N=1,049)					
Water, hygiene and sanitation					
Place with soap to wash hands (%)	0.88	0.81	1.7 (1.2, 2.5)	0.86 (0.42, 1.3)	<0.001
Water treatment (%)	0.65	0.34	3.6 (2.4, 5.5)	1.2 (0.77, 1.7)	<0.001
Assessing clean water (%)	0.97	0.97	1.0 (0.43, 2.3)	0.65 (0.009, 1.3)	0.047

HOME =Home Observation for Measurement of the Environment; OMCI =The Observation of Mother-Child Interaction; FCI =Family Care Indicators.

1: Assesses the significance of the "difference-in-difference" or "time-by-treatment" interaction between the two groups.

2: Cohen's d is reported for continuous outcomes with statistically significant effect sizes at a $\alpha=0.05$ significance level and were calculated by dividing the difference-in-difference effect by the pooled standard deviation of the outcome at baseline

3: Among those with prevalent diarrhoea (N=376 at baseline and N=394 at post-intervention)

4: Among those with prevalent fever or cough (N=595 at baseline and N=707 at post-intervention)

5: Scored ≥ 1.75 on the Hopkins Symptom Checklist-25 Questionnaire

6: Among married or cohabitating mothers and fathers (N=913)

7: Among male caregivers reporting a current intimate partner at baseline (N=450)

8: Among female caregivers reporting a current intimate partner at baseline (N=523)

Figures

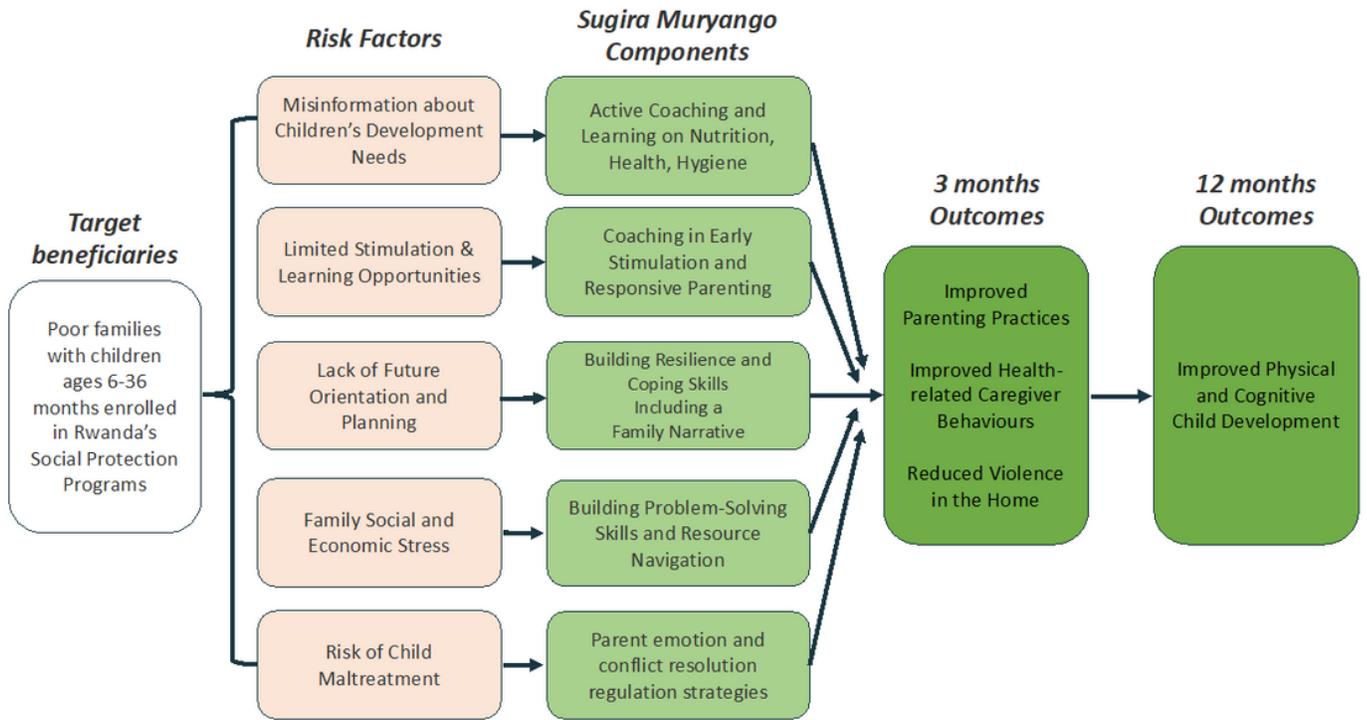
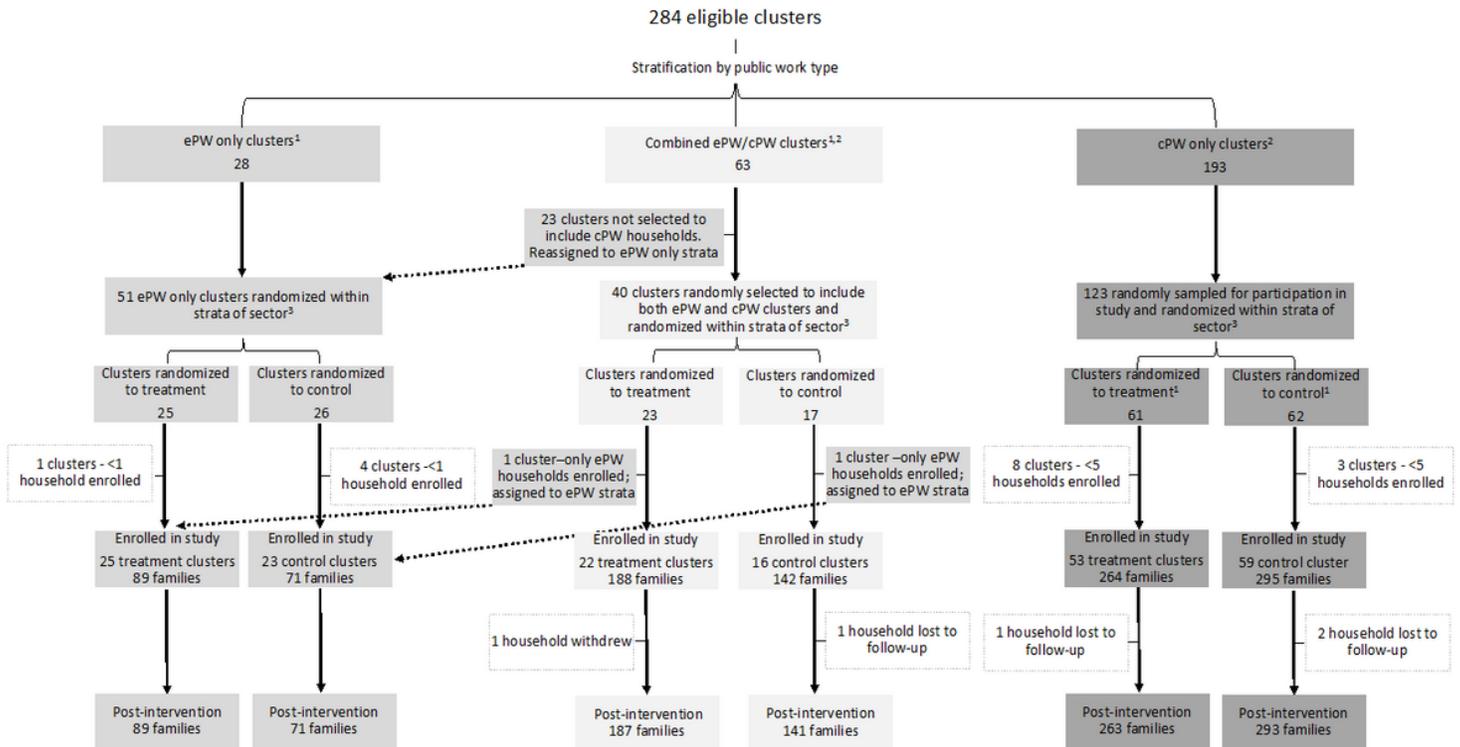


Figure 1

Sugira Muryango Conceptual Model



¹Clusters had to include ≥ 10 ePW households to be eligible as an ePW cluster. ²Clusters had to include ≥ 30 cPW households to be eligible as a cPW cluster. ³Randomization within strata of Public WorksXSector did not necessarily guarantee even numbers in the treatment and control arms.

Figure 2

Cluster sampling strategy and flow chart of participants in the Sugira Muryango trial. cPW = expanded public works; cPW = classic public works. Note: Although each cluster had a 50% chance of being assigned to receive treatment, we were not guaranteed an equal number of treatment and control clusters because randomisation occurred within relatively small strata that sometimes contained an odd number of clusters.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [supplement1.docx](#)
- [supplement2.docx](#)