



**Save the Children®**

# **Saving Brains: First Steps 0-3 Program in Rwanda Endline Report**

**First Steps towards quality Early Childhood Care and Development through Holistic Parenting Education: A Randomized Control Trial in Ngororero District, Rwanda**

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## **Executive summary**

First Steps (Intera za Mbere) is a nationally-scalable approach to promoting healthy early childhood development by offering holistic parenting education to parents of 0-3 year olds in Rwanda. First Steps focuses on parents' support for physical, socio-emotional, cognitive and language development, with additional emphasis on cultivating foundational skills for emergent literacy in the home. The pilot phase of First Steps is focused on determining the most feasible and cost-effective approach to delivering parenting education, suitable for national expansion in the Rwandan context and effective in achieving improvements in parenting practices, child development indicators and emergent literacy promotion in the home.

### ***Implementation***

Several logistical challenges were faced during the implementation of the First Steps program, but overall study results showed strong participation by caregivers in both intervention arms and little contamination of the control group. From monitoring data it was established that up to week 10 out of 17 weeks of Cohort 1 implementation, the two arms of the RCT study were almost identical, with the only difference in implementation being the presence of the extra salaried position of the Community Family Facilitator. After week 10, the full intervention condition was completely implemented, including the extra materials like book banks, and take home materials for parents. A study of families receiving a complete course of the full implementation condition (Cohort 2) will be shared in the future.

### ***Attrition***

The same children and families sampled at baseline in August 2015 were targeted for the follow-up study in September 2016. Overall, only 10 percent of families were not able to be located during the endline data collection. This is a relatively small attrition rate and falls within the sampling and attrition assumptions made at baseline. There were no significant differences between the attrition rates of different intervention groups. Looking at other variables, the only significant difference found between families who were found at endline and those who were not is that families who were not found at endline were more likely to be those with younger mothers.

### ***Participation***

Study results show strong up-take of the program in intervention areas and little contamination in control areas. On average, 95 percent of parents in the light touch and full intervention groups report having attended a community parenting session, compared to none of the control parents. Parents in the light and full intervention groups reported attending 12.1 or 11.2 sessions out of 17, respectively. There is no statistically significant difference between the proportion of parents in the light and full intervention groups who reported ever attending a parenting session or in the number of sessions attended.

Parents in the full intervention group reported receiving significantly more home visits than families in the light touch and control groups. Parents in the control group reported no participation suggesting no contamination of these activities. However, 68 percent of parents in the light touch group reported

receiving home visits when they were not supposed to receive this input from the First Steps program. More investigation is needed to determine whether other groups were visiting these homes for another purpose (e.g., community health workers) and parents were misreporting this answer during the endline study or if they were potentially reached by First Steps practitioners by mistake.

When asked about radio listening, a small proportion of parents in the control group reported hearing a program about child development (15 percent) compared to significantly larger proportions of the intervention group parents (54 percent and 63 percent), which suggests limited contamination between control and intervention groups. On average, light touch parents reported hearing 5.5 radio programs and full intervention parents reported hearing 6.1 out of 17. At endline, significantly more parents in the full intervention group reported listening to the radio program and discussing the shows with their spouse or neighbors compared to parents in the light touch group. More investigation into why radio programming was not present at all parenting sessions is warranted.

#### ***Impact – Health***

At baseline parents reported receiving health information most often from health workers. However at endline, parents in the light touch and full intervention groups reported significant increases in health messages from parenting session and NGOs compared to the control group. There was also an increase in health messages heard on the radio and even from friends. Given the randomized nature of the sample selection, it's reasonable to assume that these changes can be associated with First Steps activities (parenting sessions, home visits and radio programming) and that parents heard important health message through participation in these activities.

Significant gains in nutrition and health practices were also observed within First Steps intervention group parents. Parents in the light touch group reported breastfeeding more frequently than parents in the control or full intervention group. Parents in both intervention groups report giving children solid food more frequently than parents in the control group. Also on average, all parents reported more handwashing at endline than at baseline, but parents in the light touch and full intervention groups reported more handwashing activities than parents in the control group at both times. Similarly, all parents reported an increase of using soap when handwashing and parents in the light touch and full intervention groups were significantly more likely to use soap than parents in the control group.

#### ***Impact- Parenting attitudes and behaviors***

First Steps improved caregivers' parenting attitudes and practices with their children. At baseline, there were no significant differences between groups in parents' reported perception of their influence on their children or their frequencies of engaging in different activities with children. Over time, caregiver perception of parental importance in children development increased significantly in the intervention groups compared to the control group, and parents in the full intervention group gained significantly more in this area than parents in the light touch group. Also, both mothers and fathers in the light touch and full intervention groups reported engaging in significantly more learning/play and nurturing/care behaviors than parents in the control group. In addition, mothers in the light touch and full intervention groups reported engaging in fewer negative discipline behaviors with their children than mothers in the

control group. Further, mothers and fathers in the full intervention group reported engaging in significantly more learning/play activities with their children than parents in the light touch intervention group, and mothers in the full intervention group engaged in significantly more nurturing/care behaviors than mothers in the light touch group.

Taken together, this indicates that both the light touch and full intervention programs had a significant positive impact on mother-child and father-child interactions. These findings are especially exciting because engagement with fathers has been a high priority for Save the Children and Umuhuza and very few interventions in Rwanda or elsewhere have been able to show this type of substantial positive father-child behavior change.

Additionally, analyses found that attending more parenting sessions was positively related to parent attitudes toward child development, mother-child learning/play activities and maternal use of nurturing/care behaviors at endline. Further, mother's education and number of children at home were no longer significantly related to these outcomes as it was for the control group, which suggests that mothers of all education levels and those who have many children at home were able to benefit from parenting sessions. Family wealth remained a significant predictor of changes in mother-child activities, which suggests that poorer mothers may not be benefitting as much as wealthier mothers.

No significant relationships were found between the number of home visits received and parenting attitudes or behaviors at endline, but listening to more radio programs was significantly negatively related to mothers' and fathers' use of negative discipline at endline. That is, parents who reported listening to more radio programs also reported less negative discipline behavior (e.g., yelling, hitting, spanking) with children. Only two negative discipline activities were included in the caregiver questionnaire but more attention in this area in the future is warranted.

### ***Impact – Child development***

The First Steps program improved children's early learning and development. At endline, analyses that controlled for baseline differences as well as child age, child gender and maternal education found that children in the light touch and full intervention groups were significantly more likely to meet the ASQ benchmarks than children in the control group in all areas except gross motor development where the difference was only marginally significant for the full intervention group ( $p < .1$ ). The only difference between the intervention groups was that children in the light touch group were significantly more likely to meet the gross motor benchmark than full intervention children. Therefore, we can conclude that both the light touch and full intervention arms of the First Steps program supported significantly stronger child development than the status quo.

Looking at equity differences in children's development over time, several findings emerged. First, girls were more likely to reach ASQ benchmarks in communication than boys but less likely to achieve the gross motor benchmark. Both of these trends follow developmental norms are not cause for concern for children at this age. In the control group, mother's education was positively related to children meeting ASQ benchmarks in four of five domains (communication, gross motor, fine motor, and problem solving), but within the intervention groups mother's education was only positively related to children

meeting ASQ benchmarks in the communication domain. Conversely, greater family wealth was positively related to achieving ASQ benchmarks in one of the five domains in the control group, but four out of five domains in the intervention groups. This suggests that First Steps is effective mediating the relationship between maternal education and child outcomes, but there is still work to do be done to reach the poorest children in Ngororero communities.

Mother-child learning/play activities were significantly positively predictive of four out of five domains (all but fine motor), and father-child learning/play activities two out of five (fine motor and personal-social) which highlights the importance and increased stimulation at home from both caregivers for strong cognitive development. Finally, higher attendance at parenting sessions was significantly positively related to meeting the communication benchmark, and more radio listening was significantly positively related to meeting the communication and gross motor benchmarks which again highlight the positive impact of various components of the First Steps program on children's development. Future work in this area should investigate the lasting impact of the First Steps program as children continue through their early childhood and into primary school.

## Contents

Executive summary.....	2
Introduction .....	7
Context.....	9
Implementation Plan .....	9
Methods.....	10
Tools.....	10
Sampling.....	10
Data collection .....	12
Analysis .....	12
Limitations .....	12
Results – Program participation.....	12
Parenting sessions.....	13
Home visits.....	14
Radio program .....	14
Other community activities .....	16
Results - Parents and home environment .....	17
Background characteristics .....	17
Parent health knowledge and child feeding behaviors .....	18
Parent attitudes and behaviors .....	21
Predictors of changes in parent attitudes and behaviors.....	26
Ages and Stages Questionnaire .....	28
ASQ 16-21 Months.....	30
ASQ 21-27 Months.....	31
ASQ 28-33 Months.....	31
ASQ 34-40 Months.....	32
Predictors of child development.....	33
Conclusion.....	35
Appendix A. Tables.....	38
Appendix B. Regression results.....	42
Appendix C. Value for services.....	53

## **Introduction**

First Steps is offered through a series of weekly neighbourhood-level meetings guided by radio programming and local facilitators, envisioning a cost effective model that could be adopted for national expansion by the Government of Rwanda. The increased demand for emergent literacy materials created by First Steps is matched by a collaboration with local publishers, focused on publication of greater numbers of quality Kinyarwanda-language babies' and children's pre-literacy materials and books, and on encouraging the emergence of a new kind of entrepreneur operating book stalls in local shops and bring the books from the shop to the market on local market days.

This pilot phase of First Steps is focused on determining the most feasible and cost-effective approach to delivering parenting education, suitable for national expansion in the Rwandan context and effective in achieving improvements in parenting practices, child development indicators, and emergent literacy promotion in the home.

The pilot was built on a randomized control trial involving two arms of implementation and one control group. The trial conditions are as follows:

- Group (Arm) 1: Parents attend parenting education sessions facilitated by radio, supported by a local volunteer that has received three half-day trainings and a basic package of training materials;
- Group (Arm) 2: Parents attend parenting education sessions facilitated by radio, supported by a local volunteer that has received a more robust package of materials and an additional training for the volunteer on how to use them, book gifting to participating families, plus a salaried area facilitator supporting the local volunteers in guiding group sessions and conducting home visits.
- Group (Arm) 3: Control

There are four program components that were tested through this First Steps project: (1) radio programming to facilitate parent group sessions; (2) a package of materials including a facilitators' tool kit containing a guide, activity booklet, parenting session posters, parents' take home illustrated activity cards on parenting practices, one children's books per family, and a demonstration of home book-making using local supplies; (3) a trained area facilitator who can provide support to local volunteers in leading parenting sessions and conducting home visits; and (4) interventions to increase the availability of books and supplementary learning materials. A Randomized Controlled Trial with groups exposed to different combinations of these components determined the most cost-effective modality.

The key research questions to be explored in this report include:

1. What are the differences and changes in child development of in the three study groups between baseline and end line?
2. What are the differences and changes in knowledge, attitudes and behavior between parents in the three intervention groups between baseline and end line?
3. What are the primary drivers of child development between baseline and end line?
4. What are the primary drivers of change in knowledge, attitudes and behavior of parents between baseline and end line?

5. What are the differences in the book buying behaviors of families from the different intervention groups?

Proposed outcomes of this program include the following:

	<b>Objective</b>	<b>Indicator</b>
<b>Overall objective</b>	Children aged 0-3 years in intervention groups receive quality holistic early childhood care in the first 3 years of their lives	Children show gains in holistic early childhood development areas of physical, socio-emotional, cognitive and health as measured using ASQ questionnaires
<b>Specific objectives</b>	<p>2430 parents and 90 facilitators acquired knowledge and skills on holistic parenting</p> <p>27 local entrepreneurs, out of the 81 villages included in First Steps, start book selling businesses;</p> <p>10 additional staff members added to Rwandan publishing houses owing to increased demand</p> <p># of policies on holistic parenting developed and presented to key stakeholders through the project</p> <p>Evidence that there is an increased community involvement, participation and support of the project and its purposes</p>	<p>Parents who will have attended 3/4 or more of 17 sessions will have acquired benefit</p> <p>At least 75% of beneficiary parents experience improved parenting practices and group's average, across all measured indicators</p> <p>Book selling business is undertaken by local entrepreneurs and Rwandan publishing houses hire additional staff members owing to increased demand</p> <p>Publicly-available policy documents relating to holistic parenting, ECCD, etc. at end of project implementation</p>
<b>Result 1</b>	<p>Children will display improved cognitive and motor skills, including emergent literacy</p> <p>Children will display improved social emotional behaviors</p> <p>Parents will increase and improve their knowledge on holistic childhood care and development</p>	<p>Children with increased cognitive development scores as measured by ASQ.</p> <p>Children with increased motor development scores as measured by ASQ.</p> <p>Children have improved social emotional skills as defined in the ASQ.</p> <p>Parents who report positive early childhood and development practices, for e.g., breastfeeding, positive discipline, playing with a child, etc.</p>
<b>Result 2</b>	<p>Increase of employment opportunities in the book sector within local community</p> <p>Increase of baby book titles locally produced</p>	<p>New book sector jobs created through First Steps project</p> <p>Due to high demand of baby books, the staff need of publishers increased</p> <p>Due to market extension, the increase of baby book titles locally produced</p>

## **Context**

The target population for First Steps is ultimately the entire population of expectant parents and parents with children aged 0-3 in Rwanda. Rwanda ranks in the “low human development” category internationally, as number 163 out of 188 countries in the world, according to the UN’s 2015 Human Development Report—with the most recent Integrated Household Living Conditions Survey (EICV 4) reporting 39.1% of the population at or below the national poverty line. First Steps will be piloted in the District of Ngororero, located in the Western Province of Rwanda. Ngororero is ranked the 6<sup>th</sup> poorest out of 30 districts, with 49.6% of its population classified as poor and 23.5% as extreme poor (NIS, 2015). In comparison to the national average, Ngororero’s population has more difficult access to primary schools and health centers; Ngororero is also the second lowest district in terms of literacy rates, at only 61% among the population aged 15 and above. This low-literacy context means that many parents feel ill-equipped to promote their children’s cognitive development—hence the need for First Steps to teach all parents how they can promote language development and emergent literacy at home through two-way talk, singing and storytelling, and exposing their children to a print-rich environment. Because First Steps envisions national expansion, the pilot phase will target residents from a range of socio-economic backgrounds in Ngororero District, rather than just the poorest; however, the overall development context demonstrates that the majority of beneficiaries of First Steps are disadvantaged in terms of poverty levels, education, health, and child development outcomes.

At its core, First Steps is a social innovation that transforms the Rwandan government’s nascent Parents’ Evening initiative into structured peer learning groups guided systematically through four sets of parenting topics: child development milestones; building positive relationships; creating an enabling environment for physical and socio-emotional health; and promoting emergent literacy in the home. This content is offered to parents’ groups through a highly-accessible and cost-effective technology in the Rwandan context—weekly participatory radio programming. Finally, First Steps includes a business innovation to bolster the focus on emergent literacy, by supporting improvements in the supply side capacities of the local publishing industry. In addition to promoting community libraries, First Steps leverages Save the Children Rwanda’s existing collaborations with the local publishing sector to encourage publishers to (1) develop a line of high-quality local language babies’ and children’s books (previously virtually non-existent, prior to Save the Children’s efforts in this area); and (2) offer local small business operators a low-risk “sale-or-return” arrangement to encourage them to sell books in areas where there has traditionally been low demand and access.

## **Implementation Plan**

A preparatory phase for First Steps began with Save the Children Rwanda’s existing project funding, and ended in April of 2015. This phase included the development of the content for seventeen weekly parenting education sessions, preparation of the draft evaluation tools for measuring parenting practices and child development indicators, and the trial of these two elements with 500 families. This preparatory phase also included initial discussions with MIGEPROF, and ongoing work with local publishers on creating a line of babies’ and children’s books in Kinyarwanda.

From May- August of 2015, the First Steps radio programming was created using the finalized session content. At the same time, collaborations with local publishers continued in order to finalize an initial set of Kinyarwanda babies' and children's books and educational posters in a range of quality and pricing options, and develop a credit-based "sale-or-return" system for incentivizing local bookseller entrepreneurs.

From November 2015 to March 2016, the randomized control trial (RCT) was being conducted with Cohort 1: 540 families in each of two different treatment conditions, plus the control. From May to September 2016 a second Cohort of 540 families received the heavy touch treatment condition. Proof of concept will be established using an RCT with Cohort 1 and Cohort 2. The three trial conditions (both intervention conditions and the control) will benefit from the same collaboration with local book publishers and booksellers, giving insight into which approach is most effective in stimulating demand. From October to December 2016, the control group will receive the heavy touch treatment condition as per ethical commitment to families that served as control during the RCT. This will be considered the 3<sup>rd</sup> Cohort of First Steps.

In April 2016, there was an initial evaluation (midline assessment) of parenting practices was conducted and in September 2016 the final evaluation was conducted. The end-line evaluation of parenting practices and child development indicators among participants in Cohort 1 and 2 was conducted in order to determine program, and in order to refine the model for the next level of scaled-up implementation. In October 2016, the final evaluation findings will be analysed to identify the likely preferred delivery mechanism for the program. This preferred approach will be adapted based on the Cohort 1, 2 and 3 experiences, and then will be implemented with a smaller Cohort 4: 540 families in 2017. The processes of raising local authorities' awareness, training local volunteers, and conducting the parents' meetings, will be filmed for distribution during later scale-up efforts in 2017.

## **Methods**

### **Tools**

Child development was measured through a Kinyarwanda-adaptation of the *Ages & Stages Questionnaires™* (ASQ), with additional questions introduced to measure parents' perception of children's physical development. A parenting practices survey based on the Home Observation Measurement of the Environment-Short Form (HOME-SF), adapted for the Rwandan context, focused on key practices in the areas of nutrition and hygiene, nurturing and discipline, and the home learning environment. Demand for children's books was measured according to the annual turnover of local booksellers.

### **Sampling**

The study population for this RCT was all children ages 6 to 24 months at baseline in the Ngororero District of Rwanda. Due to contamination concerns, randomization began with stratification at the sector level within Ngororero and 9 of the 13 sectors (excluding Matyazo because it had no market at which to sell books and the sectors of Ngororero, and Muhororo and Hindiro where a similar

intervention called First Read was being implemented) were included. The remaining 9 sectors were randomized into the three study arms and within each sector, three cells were randomly chosen and then three villages within those cells. Finally 20 families with eligible children from each village were chosen (1,620 children in total). In order to select families, all parents who had a child aged 6 – 24 months were invited to a Parents' Evening session and asked to participate in the study. If more than 20 families attended the Parents' Evening session, the additional families were put on the waiting list for cohort 2 and 3 implementation.

In addition to the RCT sample, an extra sample of 540 families from Cohort 2 were added to the families evaluated at endline in September 2016. This extra sample was included in order to try and compare the impact of the heavy touch treatment condition on the second cohort of families that got a better implementation experience in comparison to Cohort 1 that had a challenging and difficult start. From monitoring data it was established that up to week 10 out of 17 weeks of Cohort 1 implementation, the two arms of the RCT study were almost identical in terms of materials. The only difference in implementation at that time was the presence of the extra salaried position of the Community Family Facilitator. After week 10, the full implementation condition was truly different as they had a fully implemented experience complete with extra materials like book banks, and parents' take home materials. The results of Cohort 2 will not be shown here, but will be shared in a separate report in the future.

The same children and families sampled at baseline in August 2015 were targeted for the follow-up study in September 2016. Overall, only 10 percent of families were not able to be located during the endline data collection. This is a relatively small attrition rate and falls within the sampling and attrition assumptions made at baseline, confirming that the sample size is large enough to test program impact as intended.

There were no significant differences between the attrition rates of different intervention groups. Looking at other variables, the only significant difference found between families who were found at endline and those who were not is that families who were not found at endline were more likely to have been those with younger mothers. Tables 1a and 1b display the final endline sample by study group and child age.

Table 1a. Study sample with attrition

	<b>Missing at Endline</b>	<b>Found at Endline</b>	<b>Total</b>	<b>% Missing</b>
<b>Control</b>	65	483	548	12%
<b>Light touch</b>	58	482	540	11%
<b>Full intervention</b>	44	482	526	8%
<b>Total</b>	167	1447	1614	10%

Table 1b. Endline study sample distribution by age

Child age at endline	Control	Light touch	Full intervention
<b>17-21 months</b>	69	63	83
<b>22-27 months</b>	161	163	194
<b>28-33 months</b>	122	137	128
<b>34-40months</b>	104	91	60

## Data collection

In order to collect the data, 36 assessors (graduates in sociology and social sciences mainly from former University of Rwanda) were recruited and grouped into teams. Each team was composed of six assessors and one team leader. Assessors participated in an intensive five-day training where they were trained in research ethics (including principles of ethical research, consent and assent processes), child safeguarding and how to put children and parents at ease as best as possible to collect the most reliable data. Training sessions involved an explanation of assessment tools, practicing assessment strategies using role-play. All instruments were digitized using Tangerine, a data collection software developed by Research Triangle Institute (RTI). Collection of data with this software on Samsung tablets is more efficient and effective compared to paper and pencil tools as it saves time and the costs involved in data entry. Data were uploaded on a daily basis and ultimately downloaded in .csv format for analysis. Checking of quality data entry was done on a daily basis and any missing or wrong data entry concerns were addressed immediately on the field to ensure that data was of good quality.

## Analysis

The main purpose of this analysis is investigating the effect of the First Steps program on parenting practices, attitudes and behaviors, and child development in Ngororero District, Rwanda. In addition, parent participation in different aspects of the program and significant drivers of changes in child development over time will be investigated. To test the comparability of participants in the intervention and control groups, clustered t-tests and multivariate regression analysis were used to determine statistical significance.

## Limitations

There are several limitations to this study. First, the age ranges used with the ASQ questionnaires were not aligned with the author's recommendations. A different ASQ module is supposed to be administered in 2-month increments but the age ranges per module for this study ranged from 3 – 6 months. For example, the 24-month ASQ module was used for children ranging from 22 – 27 months. In addition, the age ranges used changed slightly from baseline to endline. At baseline, 21-month-old children received the 24-month ASQ module and at endline they received the 18-month module.

## Results – Program participation

The section will explore parents' reported participation in the different components of the First Steps program.

## Parenting sessions

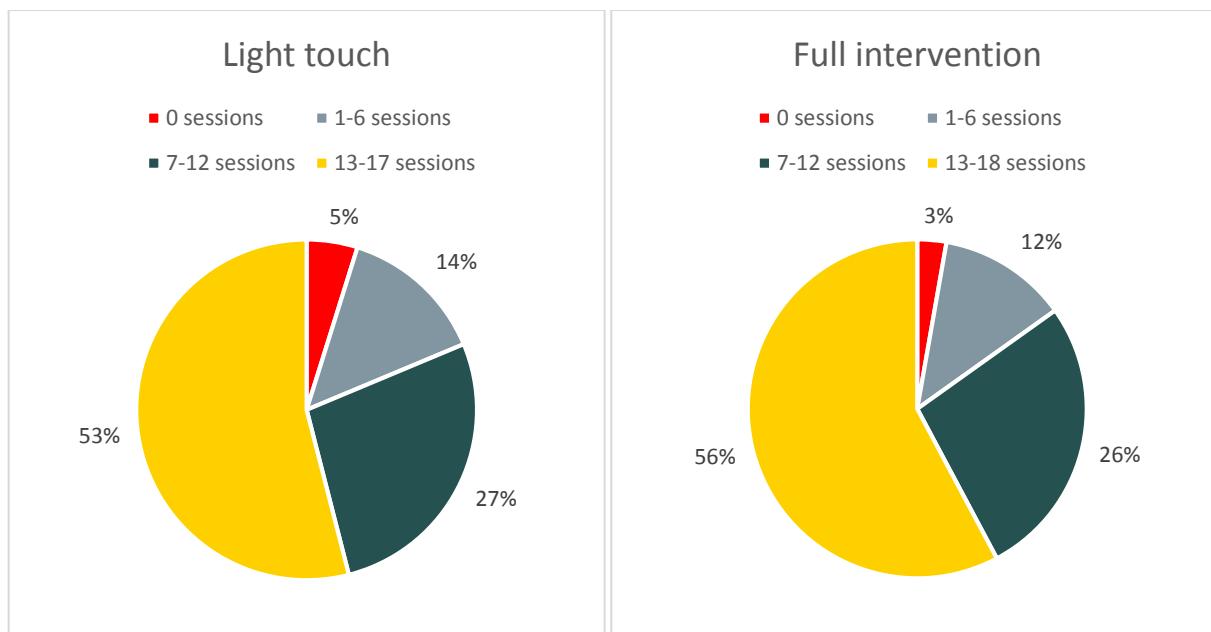
Ninety-five percent of parents in the light touch and full intervention groups report having attended a community parenting session, compared to none of the control parents. This indicates strong take-up of the program in intervention areas and little contamination in control areas. On average, parents in the light and intervention groups report attending 12.1 or 11.2 sessions out of 17, respectively. **There is no statistically significant difference between the proportion of parents in the light and full intervention groups who reported ever attending a parenting session or in the number of sessions attended.**

Table 2. Parenting education session participation

	Control (N=479)	Light touch (N=485)	Full intervention (N=486)	Significant difference (light v. full intervention)
<b>Ever attended parenting session</b>	0%	95%	95%	
<b>No. parenting sessions attended (out of 18)</b>	NA	12.1	11.2	

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

Figure 1a and 1b. Parenting session participation



Parents were also asked to recall the topics that were covered during the parenting sessions they attended. **On average, the most remembered topic was child development, followed by responsive caring, and play. The least remembered topics were early math, and positive discipline.**

Table 3. Reported topics covered during parenting sessions

Topics covered	Light touch (N=485)	Full intervention (N=486)
<b>Child development</b>	67%	74%
<b>Responsive Caring</b>	53%	60%
<b>Play</b>	55%	51%
<b>Health</b>	42%	49%
<b>Early Literacy</b>	30%	41%
<b>Positive discipline</b>	33%	40%
<b>Early Math</b>	16%	21%
<b>Other</b>	7%	11%
<b>Don't know</b>	3%	2%

## Home visits

**Parents in the full intervention group reported receiving significantly more home visits than families in the light touch and control groups.** Parents in the control group reported no home visits suggesting no contamination of these activities. However, 68 percent of parents in the light touch group reported receiving home visits and they were not supposed to receive this input from the First Steps program. More investigation is needed to determine whether parents were misreporting this information during the endline study. It is possible that other groups were visiting these homes for another purpose (e.g., community health workers), or that parents mistook reminders from community volunteers to attending parenting sessions as home visits, or that they were reached by First Steps practitioners by mistake.

Table 5. Home visit participation

	Control (N=479)	Light touch (N=485)	Full intervention (N=486)	Significant difference (light v. full intervention)
<b>Ever attended parenting session</b>	0%	68%	83%	***
<b>No. parenting sessions attended</b>	NA	2.4	2.4	

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

## Radio program

When asked about radio listening, a small proportion of parents in the control group reported hearing a program about child development (15 percent), compared to significantly larger proportions of the intervention group parents (54 and 63 percent, respectively), which suggests limited contamination between control and intervention groups. On average at endline, light touch parents reported hearing 5.5 radio programs and full intervention parents reported hearing 6.1 out of 17, and **significantly more parents in the full intervention group reported listening to the radio program and discussing the shows with their spouse or neighbors compared to parents in the light touch group.**

Interestingly, there was a decrease in reported radio program participation from midline to endline for both intervention groups. However, there was less of a decrease in reports of discussing the radio sessions with a spouse or neighbor. The decrease in reported radio program participation could be due to parents forgetting about the radio program over time; during the time of the midline the radio sessions were active but they had ended by the time of the endline. Also, the weaker decrease in reported discussion of radio program topics with others could perhaps be corroborating the qualitative finding that parents reported continuing to meet in groups to discuss child development. **More investigation is needed to understand total exposure of intervention group parents to radio programming, and also why parents' reports of hearing radio programming was not as high as their reported attendance at parenting sessions.**

Table 6a. Radio program participation at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>	<b>Full intervention (N=486)</b>	<b>Significant difference (light v. full intervention)</b>
<b>Ever heard radio program</b>	15%	54%	63%	*
<b>No. radio programs heard</b>	3.7	5.5	6.1	
<b>Ever shared lessons with spouse</b>	63%	66%	77%	**
<b>Ever shared lessons with neighbor</b>	28%	55%	62%	*

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

Table 6b. Radio program participation at midline and endline

	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>	
	Midline	Endline	Midline	Endline
<b>Ever heard radio program</b>	80%	54%	81%	63%
<b>No. radio programs heard</b>	6.5	5.5	7.1	6.1
<b>Ever shared lessons with spouse</b>	71%	66%	79%	77%
<b>Ever shared lessons with neighbor</b>	57%	55%	65%	62%

Parents were also asked to recall the topics that were covered during the radio programs they heard. **On average, the most remembered topic was responding and bonding and playing with a child. The least remembered topics were literacy in the community and creative play.**

Table 7. Parent reported radio program topics

	<b>Light touch (N=485)</b>	<b>Full intervention (N=486)</b>
<b>Responding and bonding</b>	28%	36%
<b>Feeding with care</b>	21%	28%
<b>Talk and read</b>	16%	24%
<b>Playing with a child</b>	22%	21%
<b>Positive discipline</b>	13%	19%
<b>Materials at home for play</b>	7%	14%
<b>Health clinic now</b>	10%	14%
<b>Calming and soothing</b>	9%	13%
<b>How you promote literacy</b>	7%	12%
<b>Making home books</b>	5%	12%
<b>Developing through play</b>	9%	11%
<b>Early language an communications</b>	5%	10%
<b>Literacy alive in home and community</b>	2%	10%
<b>Partners for a healthy pregnancy</b>	5%	10%
<b>Routines</b>	7%	9%
<b>Health baby: pound of prevention</b>	7%	9%
<b>Creative play</b>	4%	5%

### Other community activities

In addition to being asked about participation in First Steps activities, caregivers were also asked about their participation in other existing parenting programs in their communities. One such activity is a community parenting program supported by the government called Umugoroba w'Ababyeyi. In addition, community health workers in Rwanda sometimes visit families at home.

On average, 20 percent of parents reported having attended an Umugoroba w'Ababyeyi session and those who had participated reported attending at least 4 sessions. Families in the light touch group were significantly less likely to have attended these sessions than parents in the control or full intervention groups. Parents in the light and full intervention groups reported receiving home visits during the year, but no control families reported receiving these visits. It's not clear how well parents were able to differentiate between the First Steps home visits and visits from other community members (e.g., health workers) during the endline interview. Further investigation into home visiting by different practitioners is warranted.

Table 8. Participation in other community parenting activities

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>	<b>Full intervention (N=486)</b>
<b>Ever attended parenting session</b>	23%	13%	25%
<b>No. parenting sessions attended</b>	3.0	5.1	4.9
<b>Ever received a home visit</b>	0%	45%	59%
<b>No. home visits</b>	1.7	2.0	2.2

## Results - Parents and home environment

This section will detail the parents and home environments in this study and changes from the baseline in August 2015 to the follow-up study in September 2016, including background characteristics, program participation, knowledge of positive parenting behaviors, attitudes about parenting, and behaviors with children.

When assessing impact of the First Steps program, several variables were included as controls in the calculations. Children's age and gender were included in all calculations, as well as maternal education due to the significant differences found between the education levels of parents in the light touch group and that of other parents. Also, the ASQ form a child received is controlled for due to the wide age bands used with each form. Finally, regressions will cluster standard errors at the village level to account for the clustered delivery of programming at the village level.

## Background characteristics

At endline, mothers in this study were 31 years old and fathers were 36 years old. Households had an average of three children, 1.5 were under the age of 3. The majority of mothers and fathers reported an average combined family income was 20,669 Rwandan francs (RWF) (about \$25.50 USD) and owning either a TV or a radio but not both. **Families in the light touch group reported having significantly fewer children at home than parents in the control and full intervention groups. Also, mothers and fathers in the light touch intervention group had significantly higher education than parents in the control and full intervention groups. However, the majority parents in all study groups were not educated past primary school.**

Table 9. Family characteristics at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>No. Children at home</b>	3.3	2.9	**	3.2		*
<b>No. children under 3 years</b>	1.7	1.4	*	1.6		
<b>Mother age</b>	30.9	31.5		30.9		
<b>Father age</b>	34.0	38.4		35.1		
<b>Mother education</b>			**			*
<b>No formal education</b>	48%	33%		51%		
<b>Primary</b>	48%	62%		45%		
<b>Secondary</b>	3%	4%		3%		
<b>Vocational training</b>	1%	0%		0%		
<b>Ordinary level</b>	1%	0%		0%		
<b>Father education</b>			*			*
<b>No formal education</b>	45%	33%		43%		
<b>Primary</b>	51%	61%		53%		
<b>Secondary</b>	2%	4%		3%		
<b>Vocational training</b>	1%	1%		0%		
<b>Ordinary level</b>	0.0	0.0		0.0		
<b>Family income</b>	17996.2	21666.8		21223.0		
<b>Home possessions (TV &amp; radio)</b>	0.9	1.0		0.9		

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

## Parent health knowledge and child feeding behaviors

This section describes various aspects of parents' health knowledge and behavior, including where they hear health information, child feeding activities and hand washing habits. **At baseline parents reported receiving health information most often from health workers. However, at endline parents in the light touch and full intervention groups reported large increases in health messages from parenting session and NGOs. There was also an increase in health messages heard on the radio and even from friends.**

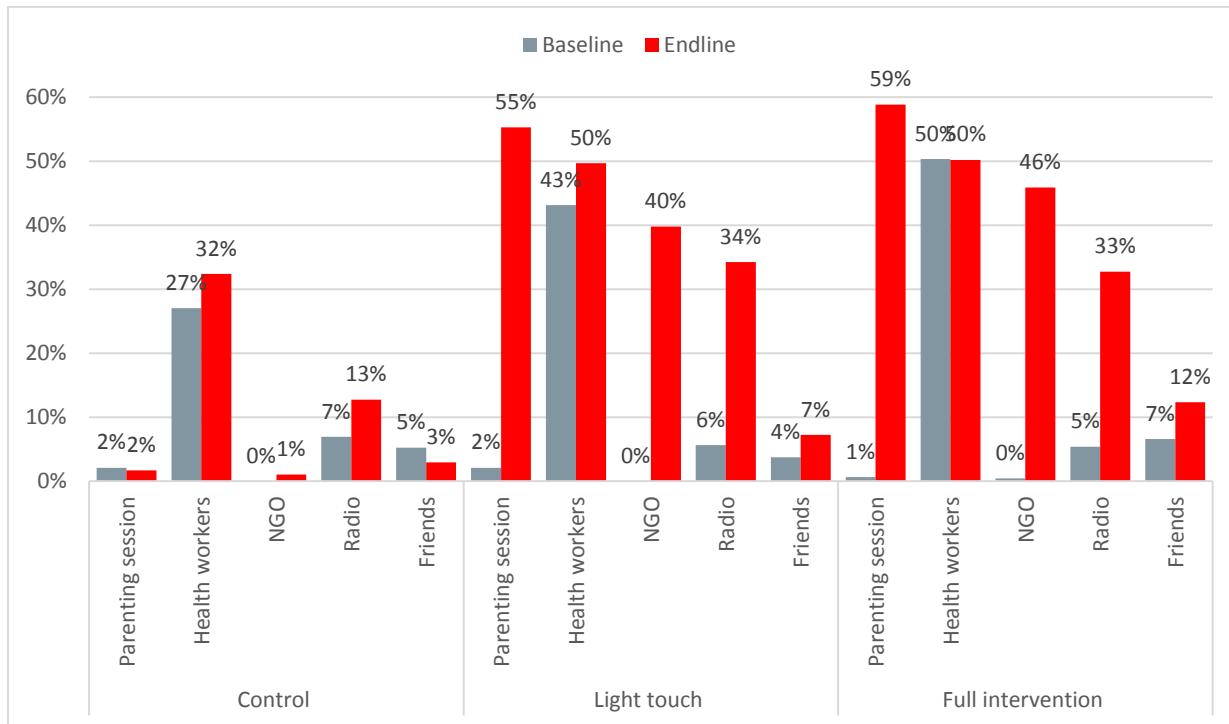
Given the randomized nature of the sample selection, it's reasonable to assume that these changes can be associated with First Steps activities (parenting sessions, home visits and radio programming) and that parents heard important health message through participation in these activities.

Table 10. Sources of information about how to care for and feed young children

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>Parenting session</b>	2%	55%	***	59%	***	
<b>Health workers</b>	32%	50%	***	50%	***	
<b>NGO</b>	1%	40%	***	46%	***	
<b>Radio</b>	13%	34%	***	33%	***	
<b>Friends</b>	3%	7%	*	12%	***	*
<b>Nutrition program</b>	1%	6%	***	11%	***	*
<b>Family members</b>	2%	6%	*	10%	***	*
<b>Other</b>	4%	2%		3%		
<b>Poster</b>	1%	3%	*	3%	*	
<b>Newspaper</b>	0%	1%		1%		
<b>Television</b>	0%	0%		0%		
<b>Internet</b>	0%	0%		0%		

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

Figure 2. Sources of health information at endline



Almost all parents in all study groups reported that their child had received a vitamin A drop in the past year, and that they had once breastfed their child. Breastfeeding decreased in all groups over time

which follows recommended practices, but 62 percent of parents reported still breastfeeding at endline. On average, parents reported breastfeeding their child 6 times per days and giving their child between 2-3 types of solid food in a day at endline. **Parents in the light touch group reported breastfeeding more frequently than parents in the control or full intervention group. Parents in both intervention groups report giving children solid food more frequently than parents in the control group.**

Table 11. Health and feeding activities at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>Vitamin A drop received</b>	96%	98%		98%		
<b>Ever breastfed child</b>	93%	94%		92%		
<b>Currently breastfeeding</b>	58%	64%		65%		
<b>No. times breast feeding (past 24 hours)</b>	5.7	6.6	**	5.8		**
<b>No. times child given solid food (last 24 hours)</b>	2.4	2.9	***	2.8		**

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

Parents report washing their hands most frequently before eating, followed by before feeding children. The least common time for parents to wash their hands was after cleaning the home or after cleaning the child's bottom. **On average, all parents reported more handwashing at endline than at baseline, and parents in the light touch and full intervention groups reported more handwashing activities than parents in the control group at both times. Similarly, all parents reported an increase of using soap when handwashing and parents in the light touch and full intervention groups were significantly more likely to use soap than parents in the control group.**

Table 11. Frequency of hand washing at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>Before eating</b>	88%	89%		91%		
<b>Before feeding children</b>	53%	70%	***	69%	***	
<b>After toilet</b>	37%	58%	***	58%	***	
<b>After eating</b>	53%	57%		57%		
<b>Before cooking</b>	35%	47%	**	50%	**	
<b>After cleaning child's bottom</b>	30%	42%	**	44%	***	
<b>After cleaning home</b>	27%	34%	*	32%		
<b># handwashing activities</b>	3.3	4.1	***	4.1	***	
<b>Uses soap and water to wash hands</b>	83%	94%	***	88%	*	

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

## Parent attitudes and behaviors

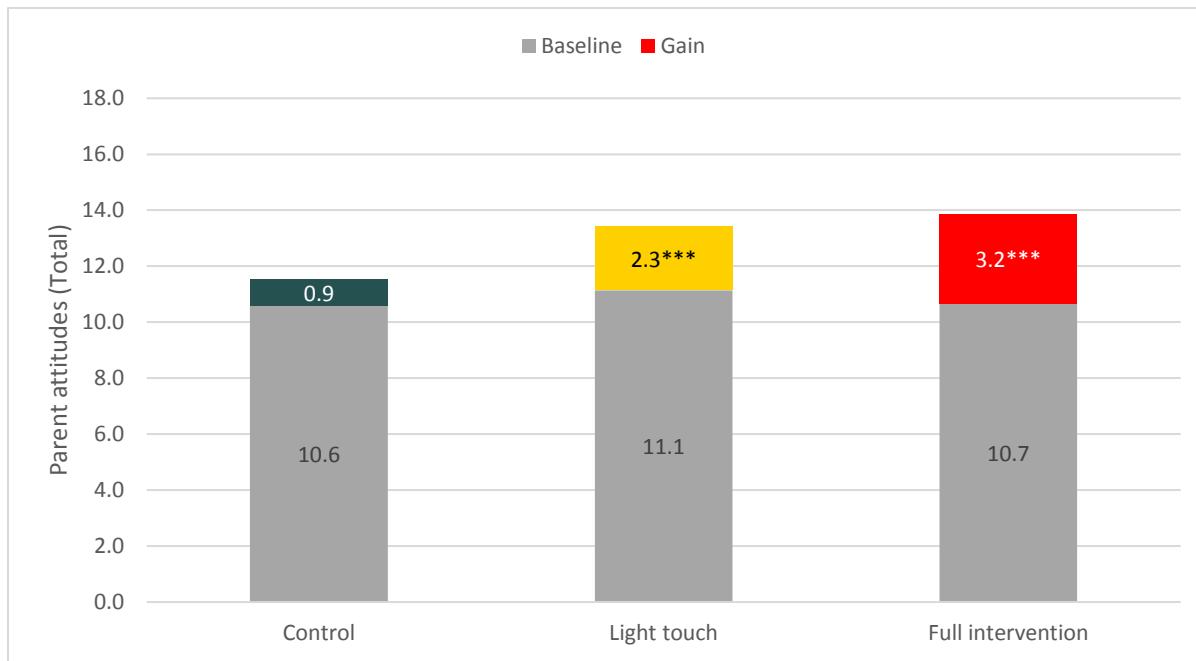
This section includes information about parents' attitudes and behaviors with their children. Parents were asked how much influence they felt that they had on various aspects of their children's lives, 0 meaning "No influence" and 3 meaning "A lot of influence". At baseline, there were no significant differences in parents' perception of their influence on their children between groups. **Over time, parents' perception of their importance in children's development increased significantly in the intervention groups compared to the control group, and parents in the full intervention group gained significantly more than parents in the light touch group.**

Table 12. Parents' attitudes about their influence on their child at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>Learning</b>	1.8	2.2	***	2.3	***	*
<b>Development</b>	1.9	2.2	***	2.3	***	*
<b>Nutrition</b>	1.8	2.2	***	2.2	***	
<b>Care</b>	1.9	2.2	***	2.3	***	*
<b>Discipline</b>	2.0	2.3	***	2.3	***	
<b>Health</b>	2.1	2.3	***	2.4	***	*
<b>Total influence (0-18)</b>	11.5	13.4	***	13.9	***	*

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

Figure 3. Changes in parents' attitudes about their influence on their child

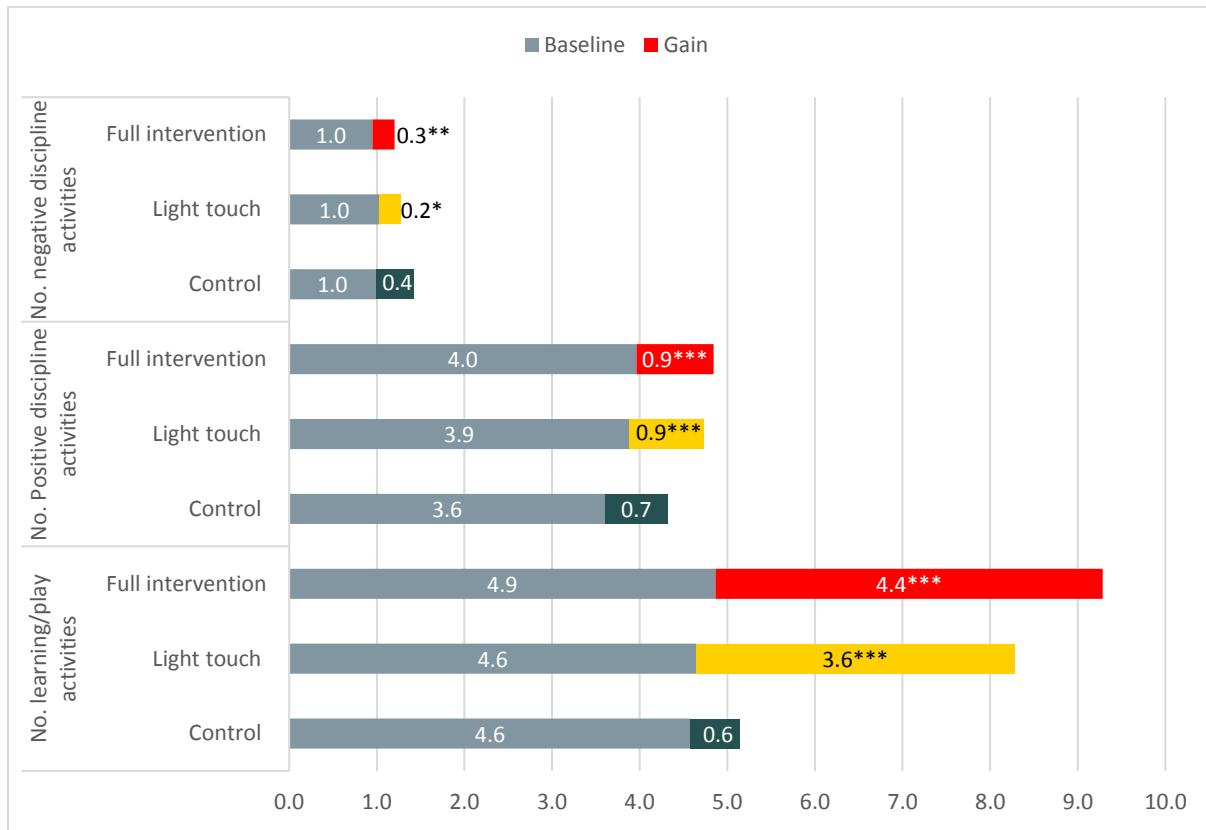


Note: \*p < .05, \*\*p < .01, \*\*\*p < .001, compared to control group

Both mothers and fathers were asked about the frequency with which they engage in different types of activities with their children. At baseline, there were no significant differences between the frequencies of engaging in these activities with children between groups. **At endine, both mothers and fathers in the light touch and full intervention groups reported engaging in significantly more learning/play and nurturing/care behaviors than parents in the control group. In addition, mothers in the light touch and full intervention groups reported engaging in fewer negative discipline behaviors with their children than mothers in the control group. Further, mothers and fathers in the full intervention group reported engaging in significantly more learning/play activities with their children than parents in the light touch intervention group, and mothers in the full intervention group engaged in significantly more nurturing/care behaviors than mothers in the light touch group.**

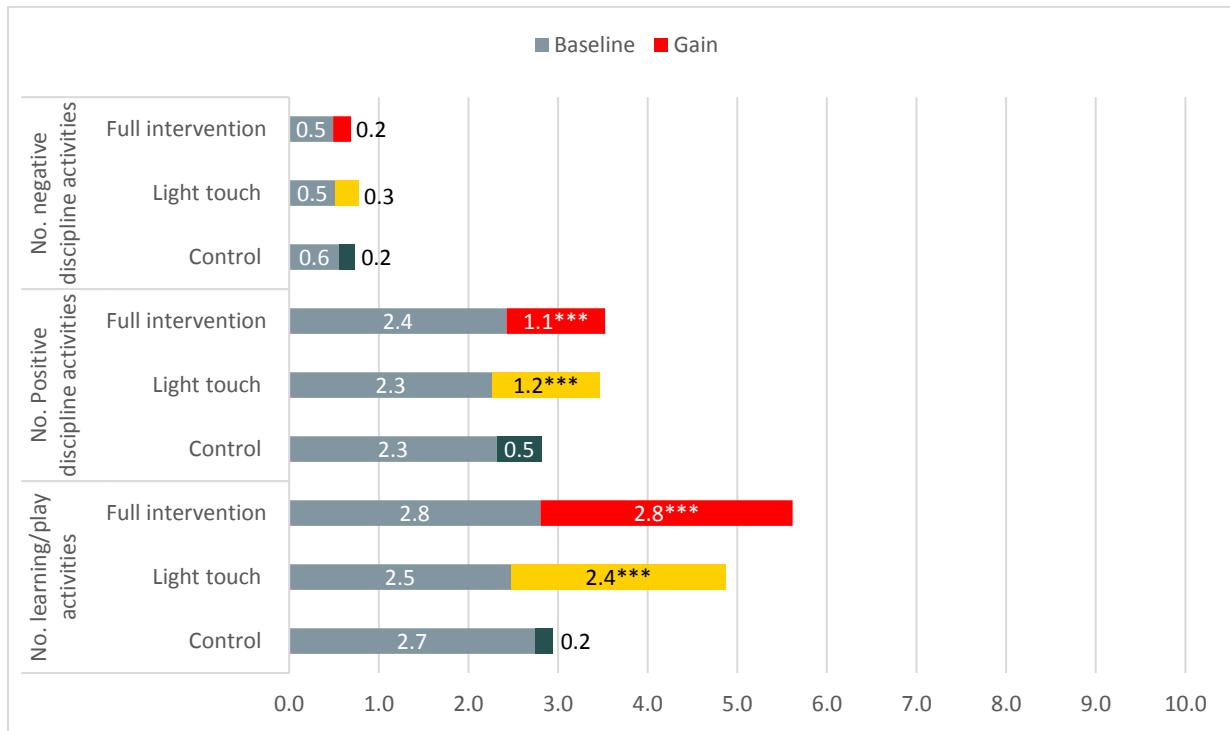
**Taken together, this indicates that both the light touch and full intervention programs had a significant positive impact on mother-child and father-child interactions.** These findings are especially exciting because engagement with fathers has been a high priority for Save the Children and Umuhuza and very few interventions in Rwanda or elsewhere have been able to show this type of substantial positive father-child behavior change. Also, it should be noted that negative discipline behaviors tend to increase as children age and engage in more activities; this should not be taken as a results of the First Steps program.

Figure 4a. Mother-child activities



Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , compared to control group

Figures 4b. Father-child activities



Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , compared to control group

Table 13. Mother-child activities at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>Play</b>	84%	97%	***	97%	***	
<b>Sing</b>	70%	93%	***	96%	***	*
<b>Read books</b>	15%	57%	***	85%	***	***
<b>Tell stories</b>	39%	67%	***	78%	***	***
<b>Play inside with toys</b>	33%	79%	***	87%	***	***
<b>Take child outside to play</b>	57%	80%	***	83%	***	
<b>Show picture books/magazines</b>	15%	51%	***	79%	***	***
<b>Take to visit relatives</b>	38%	58%	***	65%	***	
<b>Show something new</b>	57%	81%	***	85%	***	
<b>Hug/kiss</b>	90%	97%	***	98%	***	
<b>Soothe</b>	93%	95%		99%	***	*
<b>Respond verbally to child's questions</b>	84%	93%	**	95%	***	
<b>Praise child</b>	80%	93%	***	95%	***	
<b>Name objects</b>	66%	91%	***	95%	***	*
<b>Count or sort objects</b>	41%	73%	***	78%	***	*
<b>Guide or give positive discipline</b>	85%	95%	***	98%	***	*
<b>Criticize/shout</b>	82%	83%		78%		
<b>Threaten/hit/push/spank</b>	.59	.44	**	.42	***	
<b>No. learning/play activities</b>	5.1	8.3	***	9.3	***	***
<b>No. Positive discipline activities</b>	4.3	4.7	***	4.8	***	*

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

Table 14. Father-child activities at endline

	<b>Control (N=479)</b>	<b>Light touch (N=485)</b>		<b>Full intervention (N=486)</b>		<b>Significant difference (light v. full intervention)</b>
	Average	Average	Significant difference (v. control)	Average	Significant difference (v. control)	
<b>Play</b>	53%	70%	***	69%	***	
<b>Sing</b>	35%	52%	***	59%	***	
<b>Read books</b>	10%	32%	***	50%	***	***
<b>Tell stories</b>	25%	39%	***	47%	***	
<b>Play inside with toys</b>	21%	47%	**	51%	***	
<b>Take child outside to play</b>	27%	40%	***	44%	***	***
<b>Show picture books/magazines</b>	9%	30%	***	47%	***	
<b>Take to visit relatives</b>	14%	29%	***	31%	***	
<b>Show something new</b>	36%	51%	***	57%	***	
<b>Hug/kiss</b>	59%	71%	**	73%	**	
<b>Soothe</b>	61%	71%	***	72%	***	
<b>Respond verbally to child's questions</b>	54%	67%	***	68%	***	
<b>Praise child</b>	51%	68%	***	69%	***	
<b>Name objects</b>	41%	59%	***	61%	***	*
<b>Count or sort objects</b>	23%	38%	**	45%	***	
<b>Guide or give positive discipline</b>	57%	69%		71%		
<b>Criticize/shout</b>	46%	54%		51%	*	
<b>Threaten/hit/push/spank</b>	.27	.24		.18		
<b>No. learning/play activities</b>	2.9	4.9	***	5.6	***	*
<b>No. Positive discipline activities</b>	2.8	3.5	***	3.5	***	
<b>No. negative discipline activities</b>	0.7	0.8		0.7		

Note: \*p < .05, \*\*p < .01, \*\*\*p < .001

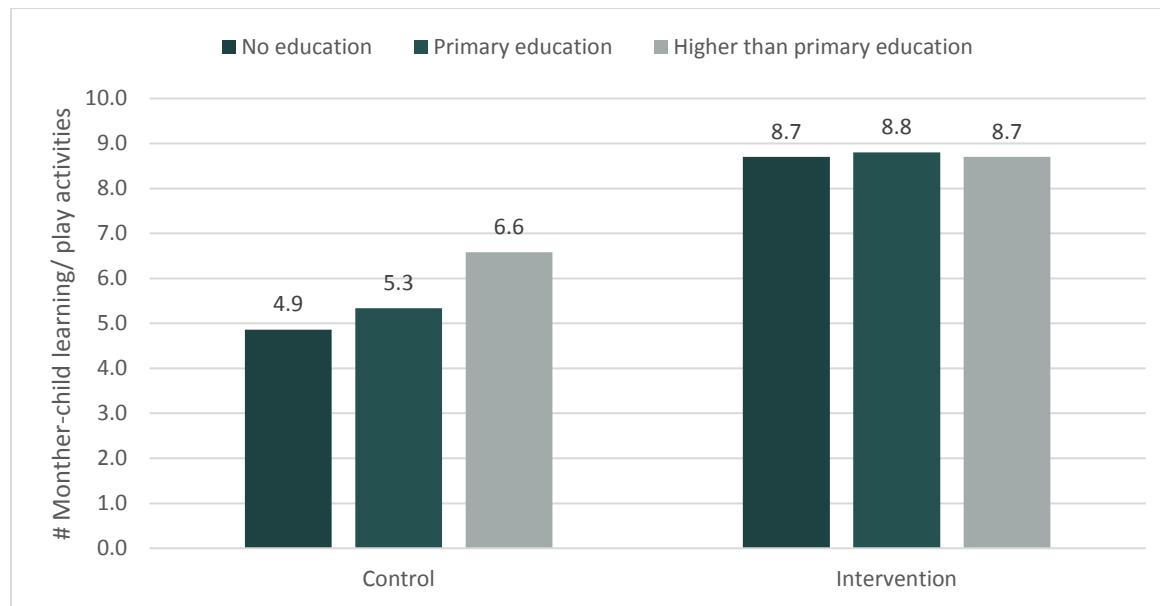
### Predictors of changes in parent attitudes and behaviors

This section digs deeper into the caregiver questionnaire to investigate important activities and characteristics related to changes in parental attitudes and practices. Multivariate regression analyses find that mother's education is significantly positively related to positive parent attitudes toward child development, mother-child learning/play activities and maternal use of nurturing/care behaviors at endline which suggests that more educated mothers have more skills in these areas than less educated mothers. In addition, having more children at home is negatively related to attitudes and behaviors in all

of these areas, suggesting that parents with more children at home are also more disadvantaged in these areas. Finally, family wealth (more home possessions) is significantly positively related to both mother-child and father-child learning/play activities and use of nurturing/care at endline.

After incorporating First Steps participation variables, **analyses found that attending more parenting sessions was positively related to parent attitudes toward child development, mother-child learning/play activities and maternal use of nurturing/care behaviors at endline. Further, mother's education and number of children at home were no longer significantly related to these outcomes, which suggests that mothers of all education levels and those who have many children at home are able to benefit from parenting sessions. Family wealth remains a significant predictor of changes in mother-child activities, which suggests that poorer mothers may not be benefitting as much as wealthier mothers.**

Figure 5. Relationships of mother education and endline mother-child activities



Note: Relationship between education levels and mother-child activities in the control group is marginally significant ( $p < .1$ ).

No significant relationships was found between the number of home visits received and parenting attitudes or behaviors at endline, but **listening to more radio programs was significantly negatively related to mothers' and fathers' use of negative discipline at endline. This suggests that parents who reported listening to more radio programs also reported with less negative discipline behavior with their children.** Only two negative discipline activities were included in the caregiver questionnaire but more attention in this area in the future is warranted.

## Ages and Stages Questionnaire

This section will describe baseline and endline results of the Ages and Stages Questionnaire (ASQ) by study group and age. At baseline, a few significant differences in children's development were identified. Specifically, children in the light touch group had significantly stronger skills than children in the control group in fine motor, problem solving and personal-social development. Also, children in the full intervention group had significantly stronger skills than children in the control group in fine motor development. However, there were no significant differences between the development of children in the light and full intervention groups.

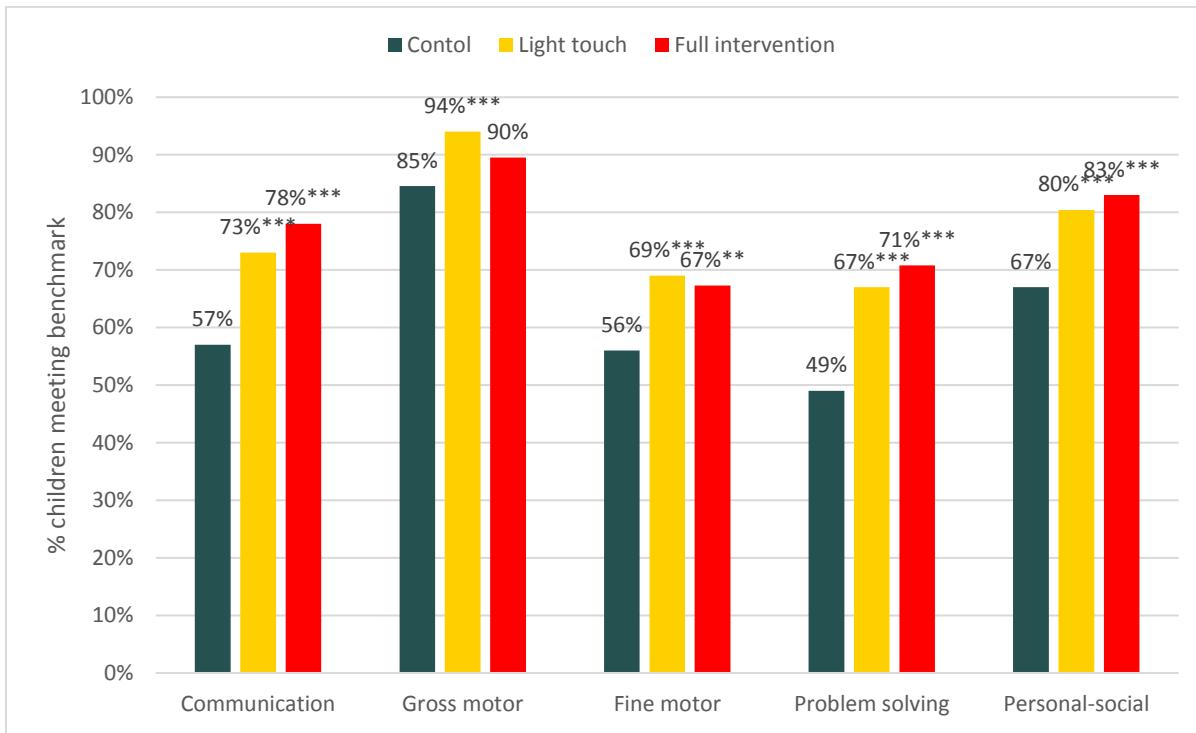
**At endline, analyses that controlled for baseline differences as well as child age, child gender and maternal education found that children in the light touch and full intervention groups were significantly more likely to meet the ASQ benchmarks than children in the control group in all areas except gross motor development where the difference was only marginally significant for the full intervention group ( $p < .1$ ). The only difference between the intervention groups was that children in the light touch group were significantly more likely to meet the gross motor benchmark than full intervention children.**

**Therefore, we can conclude that both the light touch and full intervention arms of the First Steps program supported significantly stronger child development than the status quo.**

Table 15. Proportion of children meeting ASQ benchmarks, all children

ASQ Benchmark	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Communication	77%	57%	80%	73%	81%	78%
Gross motor	81%	85%	85%	94%	84%	90%
Fine motor	62%	56%	73%	69%	74%	67%
Problem solving	57%	49%	68%	67%	64%	71%
Personal-social	77%	67%	84%	80%	83%	83%

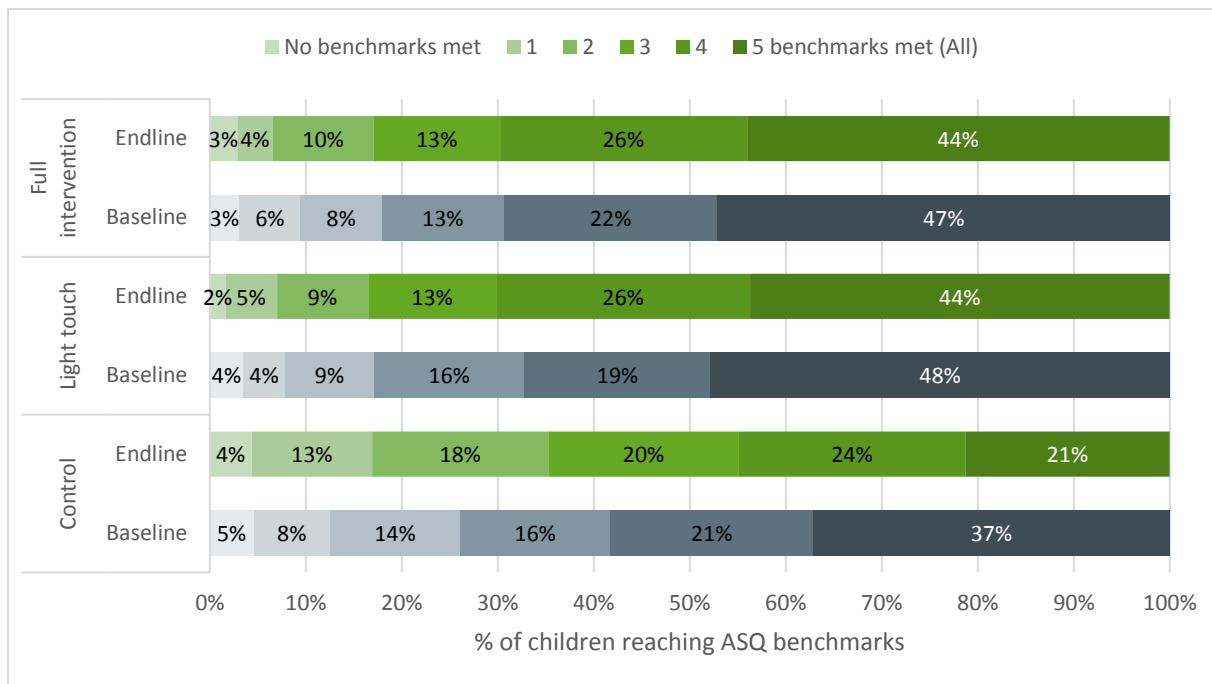
Figure 6. Summary ASQ results



Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , compared to control group

In addition, figure 7 below displays a summary of the proportion of children meeting the ASQ established benchmarks for age for all domains. This clearly shows the decrease in the proportion of children in the control group maintaining on-track development compared to those in the intervention groups (differences are statistically significant  $p < .01$ ). However, even in intervention groups there are a small proportion of children for whom the First Steps intervention was not able to improve their achievement of developmental milestones. Further research is needed to determine who these neediest children are and how to effectively reach them with programming.

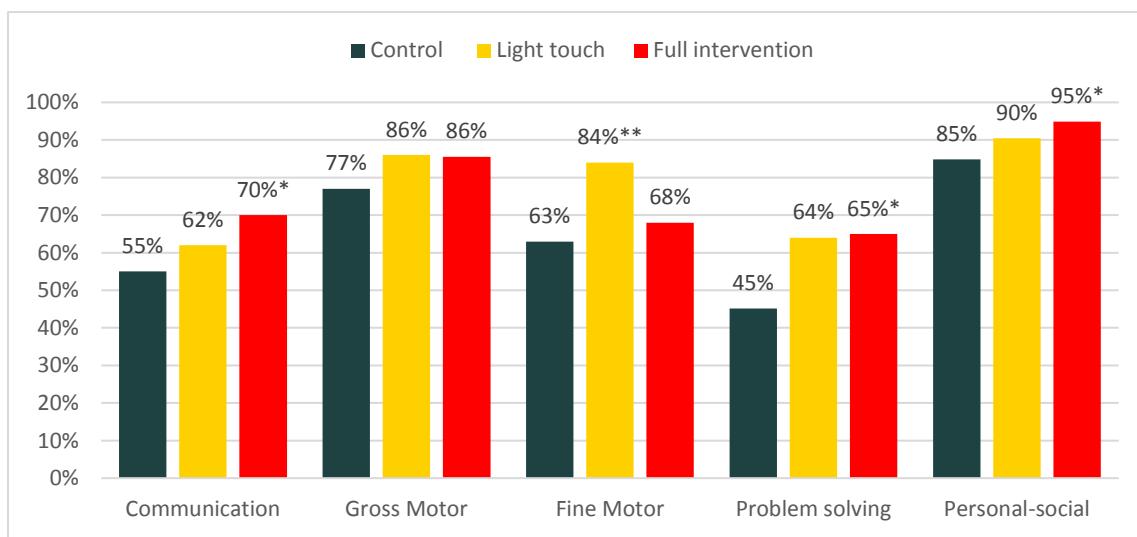
Figure 7. Proportion of children meeting total ASQ benchmarks at baseline and endline



### ASQ 16-21 Months

Looking specifically at children aged 16 – 21 months, children in the full intervention displayed significantly stronger skills in communication, problem solving and personal-social skills compared to children in the control group. Children in the light touch group had significantly stronger skills than both the full intervention and control group in the area of fine motor skills. There were no significant differences between children's gross motor skills.

Figure 8. Proportion of children meeting 18-month ASQ benchmark



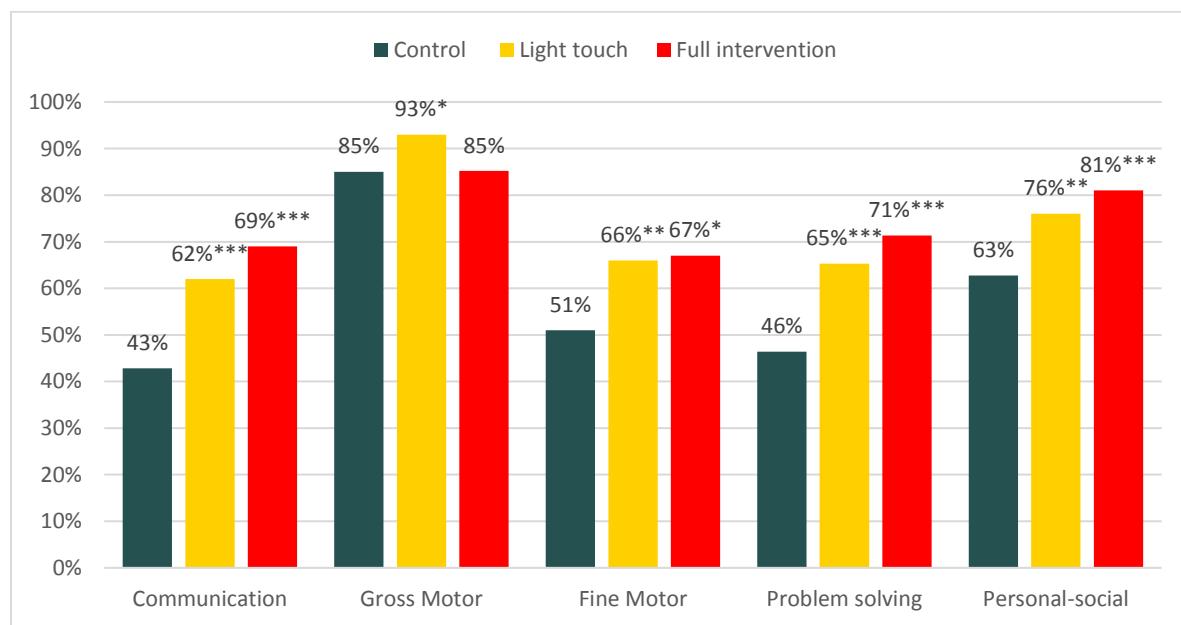
Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , compared to control group

Children were given the 18-month ASQ module at both baseline and endline and therefore we can look at a cross-section of the proportion of children who achieved the 18-month benchmarks at both points in time. It should be noted that children ages 16-20 months received the 18-month questionnaire at baseline and children aged 16-21 months received this questionnaire at endline. This figure displays that children in the both intervention groups are more likely to achievement the ASQ designated benchmarked than children in the control group and children in this age range at baseline.

### **ASQ 21-27 Months**

Children aged 21-27 months were given the 24-month ASQ assessment. In this age group, children in the full and light touch intervention groups were significantly more likely to reach the ASQ identified benchmarks in all domains except gross motor development where only the light touch group significantly outperformed the control group.

Figure 9. Proportion of children meeting 24-month ASQ benchmark

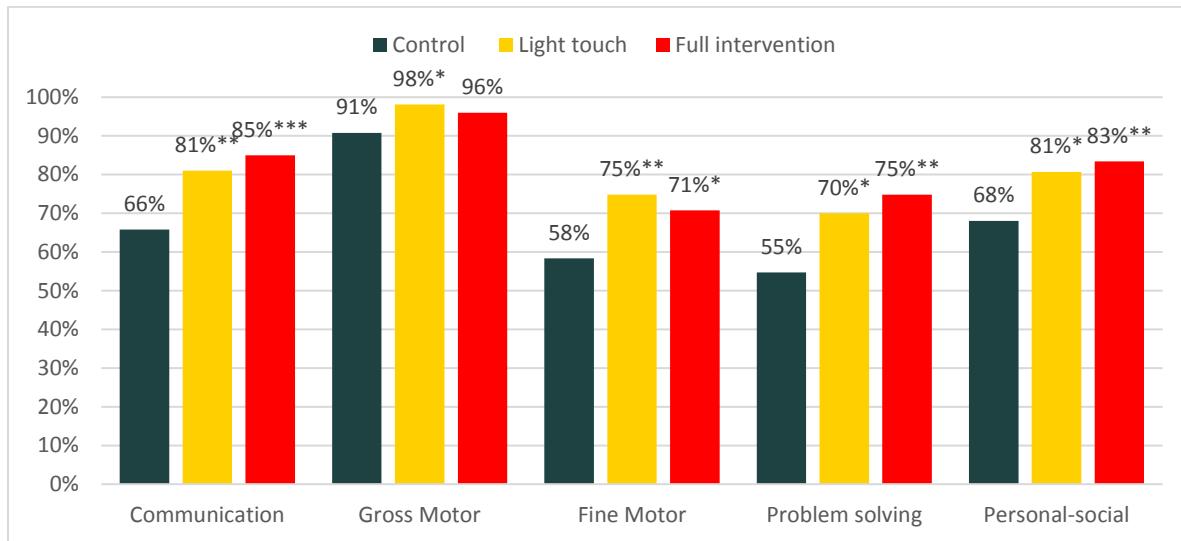


Note: \*p < .05, \*\*p < .01, \*\*\*p < .001, compared to control group

### **ASQ 28-33 Months**

Children aged 28-33 months received the 30-month ASQ module. In this age group, children in the full and light touch intervention groups were significantly more likely to reach the ASQ identified benchmarks in all domains except gross motor development where only the light touch group significantly outperformed the control group.

Figure 10. Proportion of children meeting 30-month ASQ benchmark

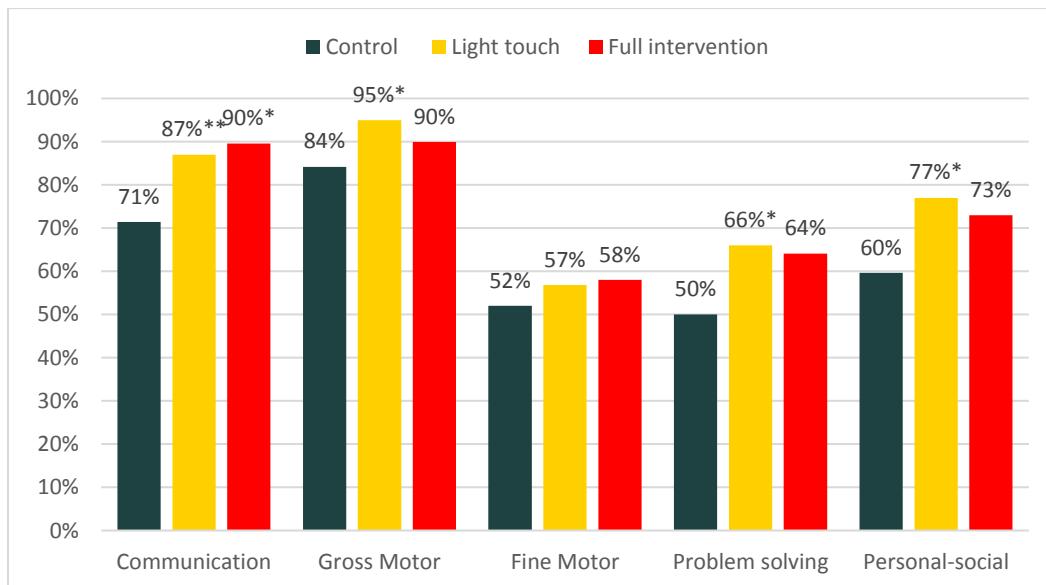


Note: \*p < .05, \*\*p < .01, \*\*\*p < .001, compared to control group

### ASQ 34-40 Months

Children aged 34-40 months received the 36-month ASQ module. In this age group, children in the light touch intervention group were significantly more likely to reach the ASQ identified benchmarks in all domains except fine motor development compared to the children in the control group. Children in the full intervention group were more likely to meet the ASQ communication benchmark compared to children in the control group.

Figure 11. Proportion of children meeting 36-month ASQ benchmark

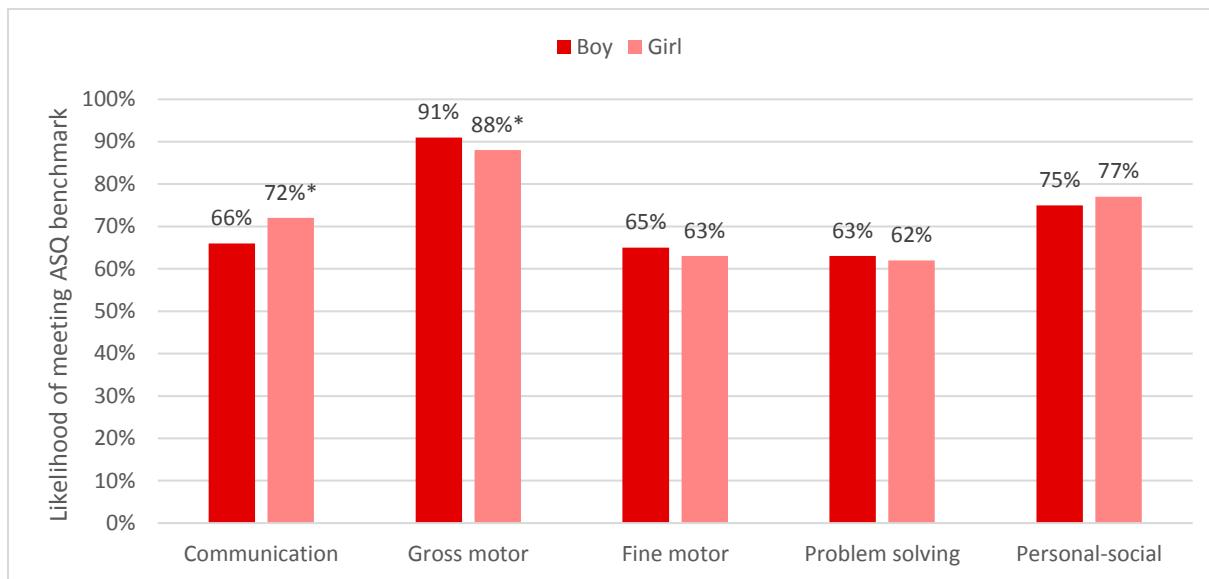


Note: \*p < .05, \*\*p < .01, \*\*\*p < .001, compared to control group

## Predictors of child development

Taken together, responses to the caregiver questionnaire and ASQ modules can be analyzed to identify important activities and characteristics related to changes in child development. **First, girls were more likely to reach ASQ benchmarks in communication than boys but less likely to achieve the gross motor benchmark.** These are developmentally appropriate differences at these ages.

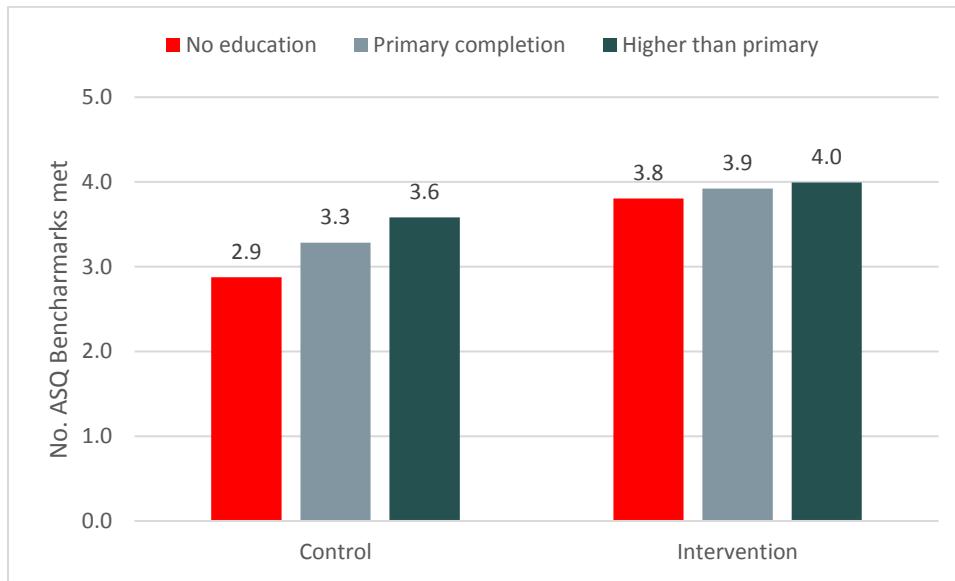
Figure 12. Predicted gender differences in ASQ endline scores



Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

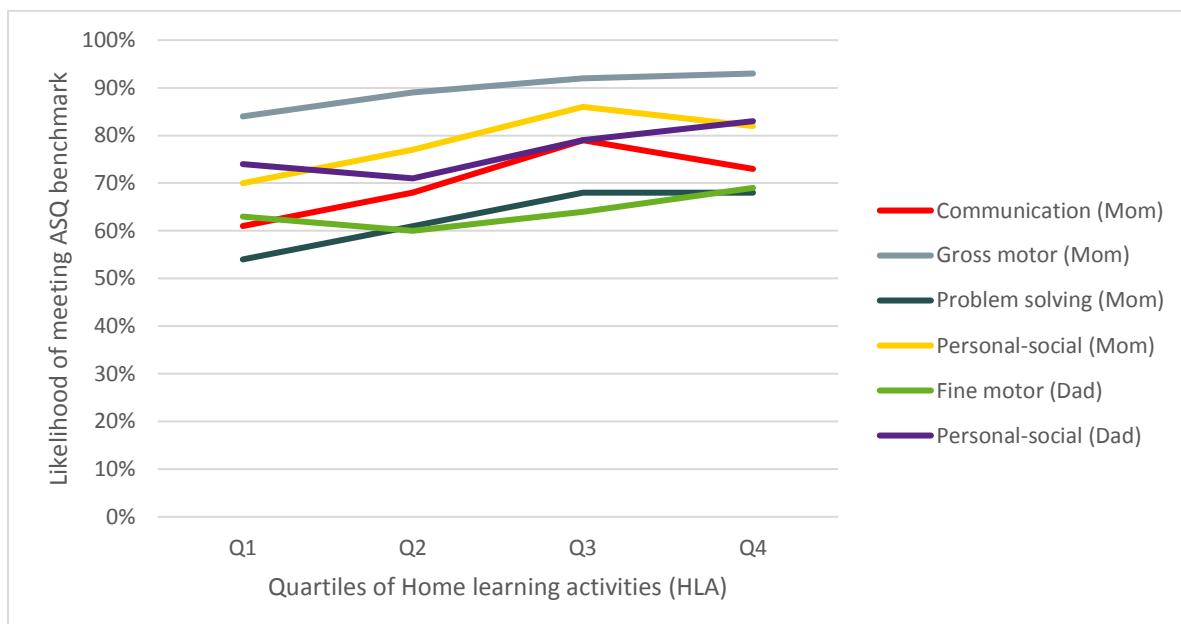
In the control group, mother's education was positively related to children meeting ASQ benchmarks in four of five domains (communication, gross motor, fine motor, and problem solving), but within the intervention groups mother's education was only positively related to children meeting ASQ benchmarks in the communication domain. Conversely, greater family wealth was not related to achieving ASQ benchmarks in the control group, but was positively related in four out of five domains in the intervention groups. This suggests that First Steps is effective mediating the relationship between maternal education and child outcomes, but there is still work to do to reach the poorest children in Ngororero communities.

Figure 13. Predicted ASQ benchmark achievement at endline by maternal education



Mother-child learning/play activities were significantly positively predictive of four out of five domains (all but fine motor), and father-child learning/play activities two out of five (fine motor and personal-social) which highlights the importance and increased stimulation at home for strong cognitive development. Finally, higher attendance at parenting sessions was significantly positively related to meeting the communication benchmark, and more radio listening was significantly positively related to meeting the communication and gross motor benchmarks which again highlight the positive impact of various components of the First Steps program on children's development.

Figure 14. Predicted relationship of home learning activities (HLA) with ASQ benchmark achievement at endline



## **Conclusion**

First Steps improved caregivers' health and nutrition practices, attitudes toward parenting and positive parenting practices, as well as children's early development. At this stage it is difficult to make conclusions about the differential contribution of the light touch program compared to the full intervention program due to the delayed implementation of the full intervention but further research will attempt to answer this question. The current study concludes that the light touch intervention and the full touch intervention as they were implemented with this cohort of children had strong significant impact on both parents and children in Ngororero.

The positive results of the intervention are rooted strong caregiver participation, especially in the parenting education sessions. Almost all parents reported having attending a parenting education session (95 percent) and parents in the light touch and full intervention groups reported attending more than half of the sessions offered (12.1 or 11.2 sessions out of 17, respectively). In addition, while more investigation is needed into the light touch parents' responses about home visits, full intervention families reported receiving at least 2 home visits which was the goal of that component of the program.

Caregiver responses about radio program exposure were positive in that there was little contamination with the control group, and numerous parents reported sharing messages with their spouse or other family members which were both strong focuses of this program component. More research is suggested to determine the barriers that existed for tuning into the radio program as the number of sessions heard was not as high as the parenting sessions attendance. Alternative approaches to radio programming like offering the same program at multiple times in days following parenting sessions or sending parenting session facilitators with mp3 recordings in case of bad service at the time of the parenting sessions could be considered for future programming.

Significant gains in nutrition and health practices were also observed within First Steps intervention parents which is something not observed with previous 0-3 SC programs in Rwanda. Parents in the light touch group reported breastfeeding more frequently than parents in the control or full intervention group, and parents in both intervention groups report giving children solid food more frequently than parents in the control group. Also, parents in the light touch and full intervention groups reported more handwashing activities than parents in the control group and were significantly more likely to use soap than parents in the control group.

First Steps improved caregivers' parenting attitudes and practices with their children. Parents' perception of their importance in children's development increased significantly in the intervention groups compared to the control group, and parents in the full intervention group gained significantly more in this area than parents in the light touch group.

Both mothers and fathers in the light touch and full intervention groups reported engaging in significantly more learning/play and nurturing/care behaviors than parents in the control group. In addition, mothers in the light touch and full intervention groups reported engaging in fewer negative discipline behaviors with their children than mothers in the control group. Further, mothers and fathers in the full intervention group reported engaging in significantly more learning/play activities with their

children than parents in the light touch intervention group, and mothers in the full intervention group engaged in significantly more nurturing/care behaviors than mothers in the light touch group. This indicates that First Steps had a significant positive impact on mother-child and father-child interactions. These findings are especially exciting because engagement with fathers has been a high priority for Save the Children and Umuhuza and very few interventions in Rwanda or elsewhere have been able to show this type of substantial positive father-child behavior change.

Analyses also found that improvements in mother-child activities were equitable across two major factors in Ngororero communities. Mother's education and number of children at home were no longer significantly related to mother-child activities in the intervention groups as they were for the control group, which suggests that mothers of all education levels and those who have many children at home were able to benefit from parenting sessions. Family wealth remained a significant predictor of changes in mother-child activities, which suggests that poorer mothers may not be benefitting as much as wealthier mothers. This should be a continued area of focus.

No significant relationships was found between the number of home visits received and parenting attitudes or behaviors at endline, but listening to more radio programs was significantly negatively related to mothers' and fathers' use of negative discipline at endline. That is, more radio program exposure was related to fewer yelling/spanking/hitting behaviors with children. Only two negative discipline activities were included in the caregiver questionnaire but more attention in this area in the future is warranted.

The First Steps program improved children's early learning and development. At endline, children in the light touch and full intervention groups were significantly more likely to meet the ASQ benchmarks than children in the control group in all areas except gross motor development where the difference was only marginally significant for the full intervention group ( $p < .1$ ). In addition, children in the intervention groups met significantly more ASQ benchmarks than children in the control group, suggesting that the First Steps program helped children stay on track for successful holistic development.

Looking at equity differences in children's development over time, several findings emerged. Girls were more likely to reach ASQ benchmarks in communication than boys but less likely to achieve the gross motor benchmark. Both of these trends follow developmental norms are not cause for concern for children at this age. In the control group, mother's education was positively related to children meeting ASQ benchmarks in four of five domains (communication, gross motor, fine motor, and problem solving), but within the intervention groups mother's education was only positively related to children meeting ASQ benchmarks in the communication domain. Conversely, greater family wealth was positively related to achieving ASQ benchmarks in one of the five domains in the control group, but four out of five domains in the intervention groups. This suggests that First Steps is effective mediating the relationship between maternal education and child outcomes, but there is still work to do be done to reach the poorest children in Ngororero communities.

Mother-child learning/play activities were significantly positively predictive of four out of five domains (all but fine motor), and father-child learning/play activities two out of five (fine motor and personal-

social) which highlights the importance of increased stimulation at home for strong cognitive development. Finally, higher attendance at parenting sessions was significantly positively related to meeting the communication benchmark, and more radio listening was significantly positively related to meeting the communication and gross motor benchmarks which again highlight the positive impact of various components of the First Steps program on children's development. Future work in this area should investigate the lasting impact of the First Steps program as children continue through their early childhood and into primary school.

## Appendix A. Tables

Table A1. Sources of health information baseline and endline

	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
<b>Parenting session</b>	2%	2%	2%	55%	1%	59%
<b>Health workers</b>	27%	32%	43%	50%	50%	50%
<b>NGO</b>	0%	1%	0%	40%	0%	46%
<b>Radio</b>	7%	13%	6%	34%	5%	33%
<b>Friends</b>	5%	3%	4%	7%	7%	12%
<b>Nutrition program</b>	3%	1%	5%	6%	3%	11%
<b>Family members</b>	5%	2%	4%	6%	8%	10%
<b>Other</b>	4%	4%	6%	2%	4%	3%
<b>Poster</b>	0%	1%	0%	3%	0%	3%
<b>Newspaper</b>	0%	0%	1%	1%	0%	1%
<b>Television</b>	0%	0%	0%	0%	0%	0%
<b>Internet</b>	0%	0%	0%	0%	0%	0%

Table A2. Nutrition factors at baseline and endline

	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
<b>Vitamin A drop received</b>	95%	96%	99%	98%	97%	98%
<b>Ever breastfed child</b>	98%	93%	98%	94%	100%	92%
<b>Currently breastfeeding</b>	95%	58%	95%	64%	94%	65%
<b>No. times breast feeding (past 24 hours)</b>	7.4	5.7	7.7	6.6	7.7	5.8
<b>No. times child given solid food (last 24 hours)</b>	2.3	2.4	2.6	2.9	2.5	2.8

Table A3. Frequency of hand washing at baseline and endline

	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
<b>Before eating</b>	85%	88%	86%	89%	88%	91%
<b>Before feeding children</b>	48%	53%	64%	70%	63%	69%
<b>After toilet</b>	41%	37%	52%	58%	54%	58%
<b>After eating</b>	46%	53%	54%	57%	63%	57%
<b>Before cooking</b>	38%	35%	40%	47%	40%	50%
<b>After cleaning child's bottom</b>	35%	30%	44%	42%	45%	44%
<b>After cleaning home</b>	21%	27%	28%	34%	28%	32%
<b># handwashing activities</b>	3.3	3.3	3.8	4.1	3.9	4.1
<b>Uses soap and water to wash hands</b>	75%	83%	81%	94%	74%	88%

Table A4. Caregiver attitudes toward parent contributions to child development

	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
<b>Learning</b>	1.9	1.8	1.8	2.2	1.8	2.3
<b>Development</b>	1.8	1.9	1.9	2.2	1.8	2.3
<b>Nutrition</b>	1.9	1.8	1.9	2.2	1.9	2.2
<b>Care</b>	1.7	1.9	1.8	2.2	1.8	2.3
<b>Discipline</b>	1.7	2.0	1.8	2.3	1.8	2.3
<b>Health</b>	1.6	2.1	1.8	2.3	1.7	2.4
<b>Total influence (0-18)</b>	10.6	11.5	11.1	13.4	10.7	13.9

Table A5. Summary of mother-child activities

	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
<b>Play</b>	90%	84%	89%	97%	93%	97%
<b>Sing</b>	73%	70%	69%	93%	76%	96%
<b>Read books</b>	12%	15%	13%	57%	11%	85%
<b>Tell stories</b>	24%	39%	25%	67%	29%	78%
<b>Play inside with toys</b>	30%	33%	36%	79%	32%	87%
<b>Take child outside to play</b>	63%	57%	58%	80%	65%	83%
<b>Show picture books/magazines</b>	12%	15%	16%	51%	12%	79%
<b>Take to visit relatives</b>	56%	38%	49%	58%	57%	65%
<b>Show something new</b>	36%	57%	39%	81%	41%	85%
<b>Hug/kiss</b>	86%	90%	91%	97%	94%	98%
<b>Soothe</b>	90%	93%	91%	95%	93%	99%
<b>Respond verbally to child's questions</b>	51%	84%	63%	93%	62%	95%
<b>Praise child</b>	66%	80%	74%	93%	74%	95%
<b>Name objects</b>	40%	66%	45%	91%	46%	95%
<b>Count or sort objects</b>	24%	41%	25%	73%	25%	78%
<b>Guide or give positive discipline</b>	68%	85%	70%	95%	73%	98%
<b>Criticize/shout</b>	63%	82%	65%	83%	64%	78%
<b>Threaten/hit/push/spank</b>	36%	59%	38%	44%	31%	42%
<b>No. learning/play activities (out of 11)</b>	4.6	5.1	4.6	8.3	4.9	9.3
<b>No. nurturing/care activities (out of 4)</b>	3.6	4.3	3.9	4.7	4.0	4.8
<b>No. negative discipline activities (out of 2)</b>	1.0	1.4	1.0	1.3	1.0	1.2

Table A6. Summary of father-child activities

	Control (N=479)		Light touch (N=485)		Full intervention (N=486)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
<b>Play</b>	58%	53%	58%	70%	66%	69%
<b>Sing</b>	41%	35%	34%	52%	42%	59%
<b>Read books</b>	12%	10%	12%	32%	11%	50%
<b>Tell stories</b>	18%	25%	14%	39%	17%	47%
<b>Play inside with toys</b>	21%	21%	22%	47%	24%	51%
<b>Take child outside to play</b>	30%	27%	23%	40%	25%	44%
<b>Show picture books/magazines</b>	11%	9%	11%	30%	9%	47%
<b>Take to visit relatives</b>	24%	14%	17%	29%	17%	31%
<b>Show something new</b>	20%	36%	20%	51%	25%	57%
<b>Hug/kiss</b>	60%	59%	56%	71%	60%	73%
<b>Soothe</b>	55%	61%	52%	71%	56%	72%
<b>Respond verbally to child's questions</b>	30%	54%	30%	67%	33%	68%
<b>Praise child</b>	44%	51%	45%	68%	49%	69%
<b>Name objects</b>	24%	41%	23%	59%	29%	61%
<b>Count or sort objects</b>	15%	23%	14%	38%	14%	45%
<b>Guide or give positive discipline</b>	42%	57%	43%	69%	44%	71%
<b>Criticize/shout</b>	38%	46%	35%	54%	35%	51%
<b>Threaten/hit/push/spank</b>	18%	27%	17%	24%	14%	18%
<b>No. learning/play activities (out of 11)</b>	2.7	2.9	2.5	4.9	2.8	5.6
<b>No. nurturing/care activities (out of 4)</b>	2.3	2.8	2.3	3.5	2.4	3.5
<b>No. negative discipline activities (out of 2)</b>	0.6	0.7	0.5	0.8	0.5	0.7

## Appendix B. Regression results

Table B1. Predicted parenting attitudes and mother-child behaviors at endline

VARIABLES	(1) Parenting Attitudes	(2) Home learning activities (Mother)	(3) Positive discipline (Mother)	(4) Negative discipline (Mother)
Child age (months)	0.0200 (0.0138)	-0.0114 (0.0129)	0.00337 (0.00392)	0.00309 (0.00351)
Child is female	0.0130 (0.171)	0.0300 (0.112)	0.0458 (0.0378)	-0.0158 (0.0367)
Mother education	0.296* (0.139)	0.300** (0.105)	0.0560* (0.0259)	0.0366 (0.0304)
No. children at home	-0.144** (0.0480)	-0.130*** (0.0372)	-0.0253* (0.0110)	-0.0111 (0.0109)
Home possessions (tv/radio)	0.584*** (0.104)	0.216** (0.0796)	0.0447* (0.0213)	-0.00713 (0.0266)
Control Group	Reference	Reference	Reference	Reference
Light Touch Intervention	1.739*** (0.276)	2.996*** (0.201)	0.397*** (0.0667)	-0.158* (0.0695)
Full Intervention	2.455*** (0.302)	4.119*** (0.200)	0.528*** (0.0523)	-0.220** (0.0720)
Constant	10.47*** (0.552)	5.221*** (0.406)	4.157*** (0.132)	1.329*** (0.133)
Observations	1,443	1,443	1,443	1,443
R-squared	0.132	0.368	0.088	0.018
Adjusted R-squared	0.128	0.365	0.0832	0.0133

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B2. Predicted father-child behaviors at endline

VARIABLES	(1) Home learning activities (Father)	(2) Positive discipline (Father)	(3) Negative discipline (Father)
Child age (months)	0.00556 (0.0216)	-0.00259 (0.0116)	0.00489 (0.00410)
Child is female	-0.192 (0.169)	0.0413 (0.0921)	-0.0302 (0.0407)
Mother education	-0.0883 (0.171)	-0.155 (0.0902)	0.00288 (0.0288)
No. children at home	0.00239 (0.0562)	0.0641* (0.0314)	0.00970 (0.0115)
Home possessions (tv/radio)	0.654*** (0.136)	0.399*** (0.0725)	0.0467 (0.0283)
Control Group	Reference	Reference	Reference
Light Touch Intervention	1.847*** (0.271)	0.660*** (0.161)	0.0442 (0.0672)
Full Intervention	2.643*** (0.313)	0.683*** (0.164)	-0.0421 (0.0725)
Constant	2.456*** (0.665)	2.557*** (0.428)	0.537*** (0.139)
Observations	1,443	1,443	1,443
R-squared	0.103	0.053	0.007
Adjusted R-squared	0.0985	0.0480	0.00188

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B3. Predicted parenting attitudes and mother-child behaviors at endline with parenting session participation

VARIABLES	(1)	(2)	(3)	(4)
	Parenting Attitudes	Home learning activities (Mother)	Positive discipline (Mother)	Negative discipline (Mother)
No. parenting sessions attended	0.0885** (0.0273)	0.0644** (0.0200)	0.0105* (0.00455)	-0.00176 (0.00682)
Child age (months)	0.0317* (0.0155)	-0.0263 (0.0149)	0.00403 (0.00354)	-0.00254 (0.00411)
Child is female	-0.0206 (0.221)	-0.0337 (0.147)	0.0178 (0.0406)	-0.0363 (0.0466)
Mother education	0.133 (0.173)	0.0845 (0.0937)	0.0242 (0.0207)	0.0712 (0.0424)
No. children at home	-0.106 (0.0591)	-0.0305 (0.0442)	-0.00633 (0.0101)	-0.00905 (0.0152)
Home possessions (tv/radio)	0.533*** (0.142)	0.203* (0.100)	0.0453* (0.0222)	0.0159 (0.0322)
Constant	11.38*** (0.683)	8.538*** (0.507)	4.480*** (0.129)	1.241*** (0.176)
Observations	929	929	929	929
R-squared	0.044	0.028	0.014	0.007
Adjusted R-squared	0.0374	0.0218	0.00741	0.000466

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B4. Predicted parenting attitudes and behaviors at endline with radio session participation

VARIABLES	(16) Home learning activities (Mother)	(17) Positive discipline (Mother)	(18) Negative discipline (Mother)	(19) Home learning activities (Father)	(20) Positive discipline (Father)	(21) Negative discipline (Father)
Child age (months)	-0.0322* (0.0159)	0.00256 (0.00437)	0.00433 (0.00526)	-0.0164 (0.0337)	-0.00540 (0.0174)	-0.00142 (0.00667)
Child is female	0.115 (0.156)	0.0438 (0.0414)	-0.0218 (0.0608)	0.141 (0.322)	0.150 (0.161)	-0.0123 (0.0651)
Mother education	-0.110 (0.122)	0.00526 (0.0240)	0.0653 (0.0512)	-0.578 (0.329)	-0.282 (0.159)	-0.0449 (0.0354)
No. children at home	-0.0168 (0.0533)	-0.000293 (0.0104)	-0.0162 (0.0165)	0.165 (0.0946)	0.142** (0.0438)	0.0198 (0.0175)
Home possessions (tv/radio)	0.205 (0.141)	0.0542* (0.0209)	0.0838 (0.0428)	0.576* (0.279)	0.366** (0.125)	0.0813 (0.0457)
No. radio programs	0.00605 (0.0213)	0.000797 (0.00561)	-0.0234*** (0.00613)	0.0216 (0.0365)	0.00287 (0.0150)	-0.0169* (0.00685)
Constant	9.937*** (0.483)	4.682*** (0.168)	1.055*** (0.190)	5.682*** (1.110)	3.275*** (0.579)	0.772** (0.224)
Observations	571	571	571	571	571	571
R-squared	0.014	0.010	0.035	0.027	0.048	0.021
Adjusted R- squared	0.00342	-0.000386	0.0250	0.0170	0.0381	0.0105

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B5. Predicted likelihood of meeting ASQ Benchmark at endline

VARIABLES	(1) ASQ Communication	(2) ASQ Gross motor	(3) ASQ Fine motor	(4) ASQ Problem solving	(5) ASQ Personal- social
Child age (month)	0.265*** (0.0381)	0.0988 (0.0603)	0.207*** (0.0348)	0.198*** (0.0302)	0.204*** (0.0493)
ASQ Form given	-0.864*** (0.204)	-0.151 (0.325)	-1.181*** (0.183)	-0.968*** (0.186)	-1.359*** (0.279)
Child is female	0.243 (0.132)	-0.410* (0.171)	-0.0801 (0.115)	-0.101 (0.107)	0.119 (0.137)
Control	Reference	Reference	Reference	Reference	Reference
Light touch intervention	0.832*** (0.172)	1.159*** (0.216)	0.654*** (0.138)	0.783*** (0.153)	0.711*** (0.172)
Full intervention	1.018*** (0.188)	0.443 (0.242)	0.472** (0.163)	0.932*** (0.171)	0.878*** (0.179)
ASQ Communication (baseline)	0.408** (0.149)				
ASQ Gross motor (baseline)		0.589** (0.219)			
ASQ Fine motor (baseline)			0.484*** (0.122)		
ASQ Problem solving (baseline)				0.290** (0.108)	
ASQ Personal- social (baseline)					0.595*** (0.146)
Constant	-3.578*** (0.443)	-0.532 (0.574)	-0.450 (0.378)	-1.267*** (0.381)	0.712 (0.397)
Observations	1,447	1,447	1,447	1,447	1,447
r2_a	.	.	.	.	.

Robust standard errors in  
parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B6. Predicted likelihood of meeting ASQ Benchmark at endline with equity variables (mother)

VARIABLES	(1) ASQ Communication	(2) ASQ Gross motor	(3) ASQ Fine motor	(4) ASQ Problem solving	(5) ASQ Personal- social
Child age (month)	0.273*** (0.0379)	0.0978 (0.0597)	0.210*** (0.0357)	0.200*** (0.0302)	0.208*** (0.0492)
No. HLA (Mother)	0.0825** (0.0258)	0.118** (0.0387)	0.0433 (0.0298)	0.0718** (0.0245)	0.112*** (0.0303)
ASQ Form given	-0.898*** (0.204)	-0.139 (0.322)	-1.207*** (0.189)	-0.978*** (0.186)	-1.373*** (0.280)
Child is female	0.289* (0.136)	-0.407* (0.169)	-0.0577 (0.115)	-0.0829 (0.107)	0.124 (0.137)
Mother education	0.336** (0.110)	0.252 (0.146)	0.222** (0.0812)	0.205* (0.0982)	0.106 (0.0945)
Home possessions (tv/radio)	0.369*** (0.0937)	0.408** (0.149)	0.255** (0.0795)	0.227*** (0.0669)	0.0679 (0.0791)
Control	Reference	Reference	Reference	Reference	Reference
Light touch intervention	0.520** (0.198)	0.735** (0.243)	0.492** (0.164)	0.535** (0.167)	0.360 (0.193)
Full intervention	0.701*** (0.210)	-0.0668 (0.286)	0.305 (0.194)	0.648** (0.200)	0.415* (0.209)
ASQ Communication (baseline)	0.319* (0.150)				
ASQ Gross motor (baseline)		0.450* (0.228)			
ASQ Fine motor (baseline)			0.416*** (0.124)		
ASQ Problem solving (baseline)				0.192 (0.112)	
ASQ Personal-social (baseline)					0.551*** (0.143)
Constant	-4.858*** (0.506)	-1.718** (0.650)	-1.181** (0.401)	-2.113*** (0.423)	-0.104 (0.403)
Observations	1,443	1,443	1,443	1,443	1,443
r2_a	.	.	.	.	.

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B7. Predicted likelihood of meeting ASQ Benchmark at endline with equity variables

VARIABLES	(1) ASQ Communication	(2) ASQ Gross motor	(3) ASQ Fine motor	(4) ASQ Problem solving	(5) ASQ Personal- social
Child age (month)	0.273*** (0.0391)	0.0986 (0.0614)	0.212*** (0.0361)	0.201*** (0.0310)	0.212*** (0.0508)
No. HLA (Father)	0.0304 (0.0181)	0.0394 (0.0222)	0.0336* (0.0156)	0.0276 (0.0176)	0.0719** (0.0223)
ASQ Form given	-0.909*** (0.210)	-0.160 (0.332)	-1.224*** (0.193)	-0.991*** (0.190)	-1.406*** (0.289)
Child is female	0.297* (0.137)	-0.385* (0.170)	-0.0504 (0.114)	-0.0747 (0.107)	0.142 (0.137)
Mother education	0.372*** (0.110)	0.302* (0.145)	0.242** (0.0783)	0.234* (0.0979)	0.155 (0.0937)
Home possessions (tv/radio)	0.362*** (0.0963)	0.397* (0.155)	0.240** (0.0808)	0.221*** (0.0669)	0.0426 (0.0832)
Control	Reference	Reference	Reference	Reference	Reference
Light touch intervention	0.712*** (0.178)	1.019*** (0.224)	0.562*** (0.143)	0.700*** (0.159)	0.575*** (0.173)
Full intervention	0.963*** (0.188)	0.332 (0.250)	0.397* (0.156)	0.870*** (0.177)	0.711*** (0.183)
ASQ Communication (baseline)	0.335* (0.152)				
ASQ Gross motor (baseline)		0.482* (0.231)			
ASQ Fine motor (baseline)			0.419*** (0.126)		
ASQ Problem solving (baseline)				0.193 (0.112)	
ASQ Personal-social (baseline)					0.539*** (0.146)
Constant	-4.553*** (0.518)	-1.291* (0.614)	-1.065** (0.383)	-1.833*** (0.408)	0.258 (0.414)
Observations	1,443	1,443	1,443	1,443	1,443
r2_a	.	.	.	.	.

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B8. Predicted likelihood of meeting all ASQ Benchmark at endline

VARIABLES	(1) ASQ Benchmarks met	(2) ASQ Benchmarks met (Control only)	(3) ASQ Benchmarks met (Intervention only)
Child age (month)	0.177*** (0.0194)	0.173*** (0.0418)	0.175*** (0.0221)
No. HLA (Mother)	0.0726*** (0.0173)	0.0543* (0.0214)	0.0810** (0.0256)
ASQ Form given	-0.822*** (0.110)	-0.783** (0.221)	-0.818*** (0.129)
Child is female	0.00643 (0.0671)	-0.0396 (0.124)	0.0429 (0.0802)
Mother education	0.199** (0.0595)	0.389*** (0.0972)	0.108 (0.0732)
Home possessions (tv/radio)	0.196*** (0.0464)	0.151 (0.0953)	0.223***
Control	Reference		
Light touch intervention	0.430*** (0.108)		
Full intervention	0.419** (0.129)		
ASQ Benchmarks met (baseline)	0.139*** (0.0276)	0.154** (0.0440)	0.133*** (0.0348)
Constant	0.782** (0.256)	0.717 (0.451)	1.201*** (0.333)
Observations	1,443	478	965
R-squared	0.176	0.121	0.121
r2_a	0.171	0.108	0.114

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B9. Predicted likelihood of meeting ASQ Benchmark at endline with equity and participation variables: Intervention groups only

VARIABLES	(1) ASQ Communication	(2) ASQ Gross motor	(3) ASQ Fine motor	(4) ASQ Problem solving	(5) ASQ Personal- social
No. parenting sessions attended	0.0426* (0.0185)	0.0540 (0.0282)	0.00991 (0.0185)	0.0259 (0.0160)	0.0350 (0.0192)
Child age (month)	0.266*** (0.0453)	0.107 (0.0818)	0.217*** (0.0442)	0.225*** (0.0359)	0.219*** (0.0620)
No. HLA (Father)	0.0278 (0.0330)	0.0716 (0.0432)	0.0615* (0.0312)	0.0433 (0.0297)	0.0722 (0.0381)
ASQ Form given	-0.841*** (0.242)	-0.129 (0.446)	-1.307*** (0.251)	-1.165*** (0.225)	-1.490*** (0.351)
Child is female	0.325* (0.160)	-0.647** (0.240)	0.00804 (0.143)	0.0181 (0.142)	0.00880 (0.192)
Mother education	0.319 (0.176)	0.0528 (0.214)	0.140 (0.119)	0.139 (0.128)	0.0773 (0.0966)
Home possessions (tv/radio)	0.446*** (0.121)	0.464* (0.206)	0.382*** (0.0865)	0.275** (0.0903)	0.0722 (0.108)
Light touch	Reference	Reference	Reference	Reference	Reference
Full intervention	0.234 (0.176)	-0.811** (0.294)	-0.200 (0.154)	0.0658 (0.181)	0.102 (0.196)
ASQ Communication (baseline)	0.377 (0.223)				
ASQ Gross motor (baseline)		0.626* (0.261)			
ASQ Fine motor (baseline)			0.461** (0.175)		
ASQ Problem solving (baseline)				0.186 (0.151)	
ASQ Personal-social (baseline)					0.440* (0.216)
Constant	-4.414*** (0.720)	-0.917 (0.943)	-0.502 (0.535)	-1.258* (0.517)	0.867 (0.603)
Observations	929	929	929	929	929
r <sup>2</sup> _a	.	.	.	.	.

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Table B10. Predicted likelihood of meeting ASQ Benchmark at endline with equity and participation variables: Intervention groups only

VARIABLES	(1) ASQ Communication	(2) ASQ Gross motor	(3) ASQ Fine motor	(4) ASQ Problem solving	(5) ASQ Personal- social
No. radio programs	0.0753* (0.0304)	0.0948* (0.0424)	-0.00234 (0.0217)	0.0227 (0.0202)	0.0370 (0.0304)
Child age (month)	0.280*** (0.0541)	0.0935 (0.131)	0.221*** (0.0608)	0.205*** (0.0494)	0.315*** (0.0786)
No. HLA (Father)	0.107* (0.0464)	0.126* (0.0556)	0.0411 (0.0357)	0.0713 (0.0401)	0.0726 (0.0518)
ASQ Form given	-1.017** (0.314)	-0.187 (0.671)	-1.308*** (0.369)	-0.963*** (0.290)	-1.950*** (0.451)
Child is female	0.221 (0.211)	-0.470 (0.347)	0.195 (0.197)	0.105 (0.196)	-0.119 (0.253)
Mother education	0.504 (0.277)	0.161 (0.256)	0.152 (0.165)	0.218 (0.165)	-0.0614 (0.143)
Home possessions (tv/radio)	0.294 (0.153)	0.416* (0.177)	0.462*** (0.117)	0.176 (0.110)	-0.0788 (0.164)
Light touch	Reference	Reference	Reference	Reference	Reference
Full intervention	0.223 (0.243)	-0.873* (0.433)	-0.257 (0.193)	0.190 (0.210)	0.0425 (0.286)
ASQ Communication (baseline)	-0.150 (0.357)				
ASQ Gross motor (baseline)		0.255 (0.396)			
ASQ Fine motor (baseline)			0.661** (0.243)		
ASQ Problem solving (baseline)				0.226 (0.211)	
ASQ Personal-social (baseline)					0.573 (0.315)
Constant	-3.811*** (1.068)	-0.209 (1.550)	-0.697 (0.628)	-1.699** (0.637)	1.147 (0.798)
Observations	571	571	571	571	571
r2_a	.	.	.	.	.

Robust standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05



## Appendix C. Value for services

This tables below detail caregivers responses to the value placed on services and products related to the First Steps project.

Table C1. Willingness to travel

Question	Minimum	Maximum	Mean	Standard deviation	25th percentile	50th percentile	75th percentile
How much time walking on foot would you perceive the distance between your home and the training venue as so far that you are not willing to travel to attend parenting training sessions? (minutes)							
	0	720	129.9	86.02	60	120	180
How much time walking on foot would you begin to perceive the distance between your home and the training venue as so near that the distance is very short to attend parenting training sessions? (minutes)							
	0	500	26.6	30.21	10	20	30
How much time walking on foot would you begin to perceive the distance between your home and training venue starts getting far to the extent that you need to think about going to attend parenting training? (minutes)							
	0	600	73.5	47.63	45	60	90
How much time walking on foot would you begin to perceive the distance between your home and the training venue as so near that the distance is reasonable that it is worth travelling to attend parenting training sessions? (minutes)							
	0	180	32.6	19.74	20	30	40
How much time does it take you currently to reach the venue where parenting training sessions are held? (minutes)							
	0	120	18.3	14.74	7	15	30
If you can afford, at what price can you rate the skills gained through holistic emergent literacy and development training given by SCI/Umuhuza? (RWF)							
	0	1300000	43262.5	106796.90	5000	15000	50000

Table C2. Availability of toys and books

	Mean	Standard deviation	Minimum	Maximum
Do you have child toys at home?	44%	0.50	0	1
If yes, how many?	2.0	1.06	1	6
Do you have a child book?	42%	0.49	0	1
If yes, how many?	2.1	1.63	1	6

Table C3. Willingness to pay for books

Question	Minimum	Maximum	Mean	Standard deviation	25th percentile	50th percentile	75th percentile
Are you willing to buy books for your child?							
	0	1	90%	0.30	1	1	1
If you can afford, at what price do you begin to perceive a typical child storybook as so expensive that you would not consider buying it? (RWF)							
	0	50000	2095.2	3037.72	1000	1000	2000
If you can afford, at what price do you begin to perceive a typical child storybook as so inexpensive that you would feel that the quality cannot be very good? (RWF)							
	0	5000	177.1	257.22	50	100	200
If you can afford, at what price do you perceive that a typical child storybook is beginning to get expensive, so that it is not out of the question, but you would have to give some thought to buying it? (RWF)							
	0	30000	1050.0	1372.63	500	700	1000
If you can afford, at what price do you perceive a typical child storybook to be a bargain – a great buy for the money? (RWF)							
	0	15000	538.1	702.61	200	500	500
Given the value of a child storybook, how much would you sell it for? (RWF)							
	0	20000	950.9	1339.56	300	500	1000

Table C4. Sources of books

	Mean	Standard deviation	Minimum	Maximum
Book bank	8%	0.28	0	1
Made by parents	19%	0.39	0	1
Gifted by Save the Children/Umuahuza	35%	0.48	0	1
Not reading books with children	46%	0.50	0	1