

Providing Parenting Sessions to Slum-dwelling Teenage Mothers improves Early Child Developmental Outcomes: Case of HOPE worldwide Kenya BEGIN Project

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Abstract: This study examines the effect of attending 10 parenting sessions by slum-dwelling teenage mothers on developmental outcomes of their children in Nairobi, Kenya. Slum-dwelling teenage mothers of 547 children responded to Ages and Stages Questionnaires (ASQs) bi-monthly, while attending parenting skills sessions in this longitudinal study. Mothers of 502 of the children completed 10 sessions. A comparison group of 131 teenage mothers living in similar settings responded to ASQs at end-line and the results obtained compared among the three groups using binary logistics regression models. The intervention end-line group had the highest average score in each of the five ECD domains, and the lowest proportion of children delayed in each of the domains. Compared to the intervention end-line group, the comparison group was significantly more likely to be delayed (R.R 1.319 (95% C.I 1.139-1.539), $p=0.0002$). Similar results were obtained even after adjusting for social-demographic variables that differed between them. The results show that providing the parenting sessions to slum-dwelling teenage mothers is associated with improved developmental outcomes for their children. We recommend that policy makers and program developers targeting this sub-population consider provision of parenting skills; opportunities for going back to school; and incorporate economic empowerment interventions.

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I. Introduction

All children deserve a chance to grow into healthy, educated, and competent people, no matter where and when they were born. While parents bear most of the responsibility for raising their children, especially in the early years of life, governments also have an important role during this critical time of human capital accumulation (Naudeau et. al, 2011). More than 200 million children under 5 years worldwide are not fulfilling their potential for growth, cognition, or socio-emotional development according to Grantham-McGregor et. al., (2007). Most of these children are those growing up in poverty and those exposed to poor sanitation, crowded living conditions, lack of psychosocial stimulation and fewer household resources (Walker, et. al., 2007). Young children growing up in poverty are more likely to experience developmental delays and growth deficits than those from more privileged backgrounds because they are disproportionately exposed to a wide range of co-occurring risk factors that impact development (Bradley & Corwyn, 2002).

Shonkoff and Phillips (2000) say that the importance of sound early childhood development is emphasized by the fact that during the first five years of life, children lay the groundwork for lifelong development. It is therefore very important to assess early childhood development of children during this period. The assessment results illuminate if the children are developing appropriately and provide an opportunity to develop interventions that ensure optimal development for the children. Decrying the dearth of research into the effect of parenting skills training in parents in low and middle-income countries, Knerret. al. (2013) say that there is now an urgent need for more studies focusing on parenting adapted for contexts of considerable resource constraints.

Nairobi's informal settlement residents exhibit poor health outcomes at all stages of their life course, starting from childhood to adulthood. Zulu et. al. (2011) highlight three key characteristics of slum settlements that cause this: poor environmental conditions, infrastructure; and limited access to health services. About 25% of all the adolescent girls and young women who reside in urban informal settlements in Nairobi are out-of-school and are disproportionately vulnerable to early initiation of motherhood. Twenty four percent of unmarried girls below 20 years of age have initiated motherhood in Mukuru Slums, one of the target areas in this study. This rate is much higher than the Kenyan national rate of 14.5% according to the Demographic Health Survey of

2012. Due to low socio-economic capacity, only 1% of them earn more than CAD \$ 50 a month (Nguku et. al., 2016). Grantham-McGregor et. al (2007) say that most children living in absolute poverty are likely to do poorly in school and subsequently have low incomes, high fertility, and provide poor care for their children, thus contributing to the intergenerational transmission of poverty. Mejia et. al. (2012) say that many children in developing countries are at risk of emotional and behavioural difficulties, which are likely to be elevated due to the effects of poverty. The authors in this systematic review posit that parenting programs have shown to be effective preventative strategies in high-income countries but research on their effectiveness in lower-income countries is limited. To our knowledge there is no published work on the effect of parenting interventions on children's development outcomes in the urban informal settings in LMICs.

HOPE worldwide Kenya, an NGO, is implementing the Bridge to Empower Girls in Nairobi (BEGIN) project whose primary target population are the teenage mothers of children aged 0-3 years within the Mukuru, Landimawe, Tassia and Kiambio slums of Nairobi's Eastlands. The intervention is an adaptive intervention that include provision of 10 sessions of parenting skills training using a manual developed by the NGO. The parenting sessions are provided in groups of 10-15 teenage mothers and facilitated by two trained mentors. The sessions last for between one and one and half hours. The topics discussed during the sessions include: Self-esteem and Children's Rights; Health and Nutrition; Play and Creativity; Physical Development; Social development, Emotional development and Confidence building; Intellectual and Language Stimulation; Child Safety and Protection; Attachment Bonding; Grief and Bereavement and Positive Discipline. Besides the parenting skills training, other interventions in the BEGIN project include: nutritional support, economic empowerment through vocational and entrepreneurship skills training; SHRH interventions, HIV/STI prevention messaging, HIV testing and STI screening; and an opportunity to go back to school for the willing girls.

The objective of the study is to examine how children of slum-dwelling mothers who completed 10 Parenting Skills Sessions using the HOPE worldwide Parenting Skills Manual differ in developmental delays from comparison children of mothers who did not receive the intervention. This study will provide useful information to programmers and policy makers on the efficacy of parenting skills to reduce adverse child development outcomes in the resource-poor and marginalised urban informal settlements.

II. Method

i) Study Setting

The study area includes Mukuru, Landimawe, Tassia and Kiambio slums of Nairobi's Eastlands. These informal settlements are characterised by pervasive poverty. According to Berkowitz et. al. (2015), some of the slum dwellers operate small-scale businesses selling vegetables and fruit or hawking various items. Earnings are pitifully low and inadequate to feed their families. Consequently, young people, including women look to other means of survival such as prostitution, drug peddling, begging and criminal activities. Families live in corrugated iron shacks measuring 10' X 10'. Large families averaging seven people are crammed into this tiny space to survive. The people are landless and residents are squatters on land with no legal rights. About seventeen percent of the population falls within the 15-19 years' age bracket (Berkowitz et. al., 2015). A study conducted by the African Population and Health Research Centre (APHRC) on Population and Health Dynamics in Nairobi's Informal Settlements in 2012 show Nairobi's slums are characterized by abject poverty, overcrowding and lack of access to water. About two thirds of Nairobi slum-dwellers are surviving on less than one dollar a day. The study found that lack of toilets, proper drainage and health services were the most commonly cited critical health problems while unwanted pregnancies and abortion are key reproductive health issues faced by slum residents. The study reveals that adolescents in the slums also experience far worse health outcomes than their counterparts elsewhere in Kenya (APHRC, 2014).

ii) Study Design

The study design is a longitudinal follow up of mothers and their children enrolled in the BEGIN program. The BEGIN project contacted 630 teenage mothers out of whom 589 were enrolled after obtaining informed consent for those older than 18 years; and assent from the younger girls plus informed consent from their parents or guardians. Thus, consent to participate in the program/study was not obtained for 41 teenage mothers. This represents 93.5% response rate. Out of 41 participants for whom consent was not obtained, 34 (83%) were from parents and/or guardians of girls under 18 years and 3 from the girls themselves. The 589 teenage mothers had 620 children aged below 3 years for whom the Ages and Stages questionnaires were filled by the mothers at enrolment for baseline measurement. The baseline measurements lasted up to 5 months after the beginning of the Project. The questionnaires collect information on child development outcomes based on five child development domains: communication, gross motor, fine motor, problem solving and personal social. Out of the 620 children enrolled, 73 set of ASQs were incomplete or had errors leaving 547 ASQs for analysis at baseline. Mothers of 519 children completed the 10 parenting sessions conducted monthly. Out of the 519 ASQs of the children at end-line, seventeen (17) ASQs had missing data and were therefore excluded from

analysis, leaving 502 ASQs for end-line analysis. A comparison group of 146 children living in settings similar to those of the intervention group were enrolled at end-line. Out of these, 15 did not complete the questionnaires and were thus excluded from analysis, leaving 131 ASQs to be analysed for the comparison group. The diagram of the study is shown in Figure 1. The results obtained were compared among the three groups: intervention baseline, intervention end-line and comparison group.

iii) Inclusion and Exclusion Criteria

a) Inclusion criteria for Study participants

- i. Adolescent girls aged 15-19 years old
- ii. Resident in one of the targeted informal settlements in Nairobi: Mukuru, Tassia, Landimawe and Kiambio
- iii. Mother to at least one child aged below 3 years of age
- iv. Gave consent (if older than 18 years) or assent (if younger than 18 years) to participate in the study and parent/guardian give consent
- v. Beneficiary of the HWWK BEGIN Program

b) Inclusion Criteria for Comparison Group

- i. Adolescent girls aged 15-19 years old
- ii. Resident in one of the targeted informal settlements in Nairobi: Mukuru, Tassia, Landimawe and Kiambio or other similar setting
- iii. Mother to at least one child aged below 3 years of age
- iv. Give consent (if older than 18 years) or assent (if younger than 18 years) to participate in the study and parent/guardian give consent
- v. Not a beneficiary of the HWWK BEGIN Program or any other ECD program

Exclusion: Any other person was excluded from the study.

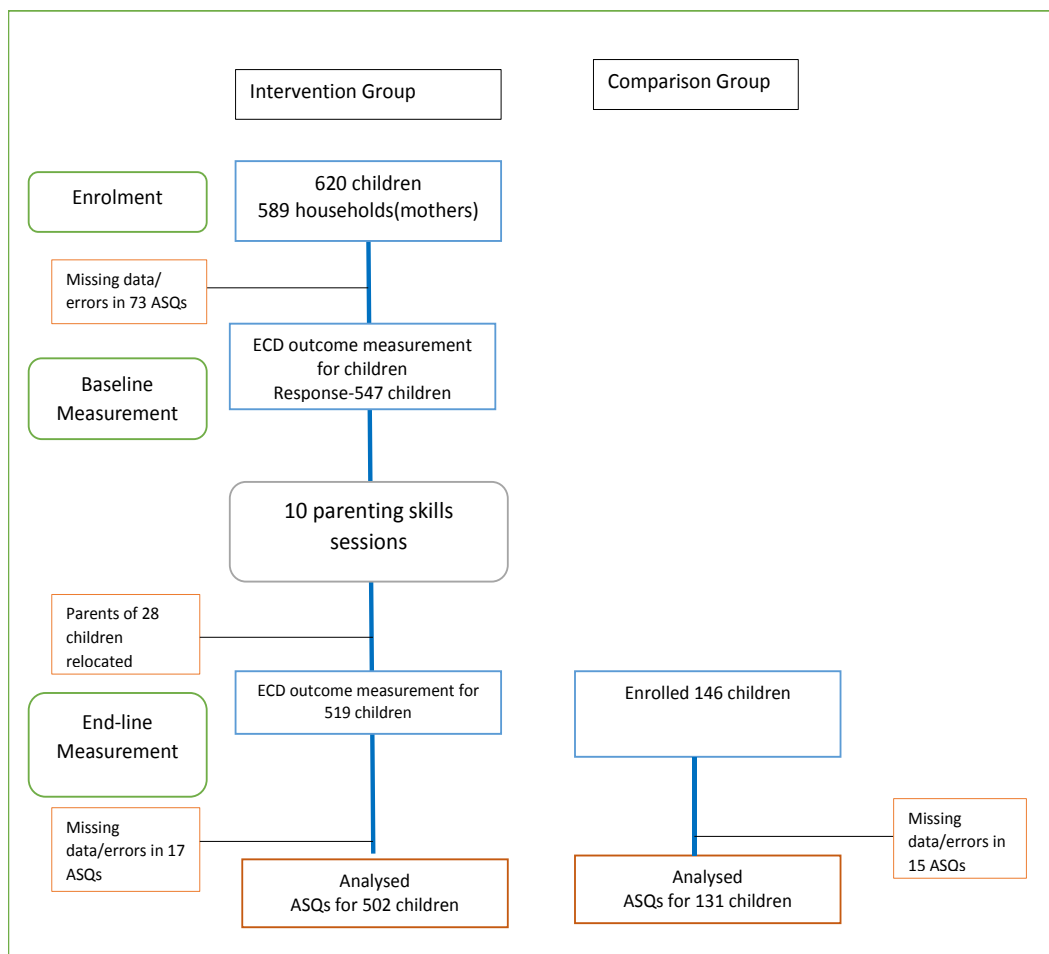


Figure 1: Study Diagram

iv) Variables

The variables in this study include:

Predictor variables: Age of the mother, age of the child, sex of the baby, education level of the mother; and Social Economic status of the mother; and participating in 10 parenting skills sessions.

Outcome variables are the ECD scores of the children on the five ASQ domains and computed delay status on the domains and delay in two or more domains.

v) Assessment Tools and Measurements

The Ages and Stages Questionnaire- is a set of age-specific parent-completed questionnaires aimed at assessing the developmental status of infants and young children up to 5 years of age. Each questionnaire is valid for 1 month on either side of the target age and consists of 30 simple worded developmental items, equally divided into five domains of child development: communication, gross motor, fine motor, problem solving and personal social skills. For each item, there is a choice of three responses: 'Yes', 'Sometimes', or 'Not yet', which are scored as 10, 5, or 0, respectively. Domain scores are then obtained by the sum of the items. Children with ASQ score below cut-off scores prescribed for every domain by age of the child determine if the child is delayed in the particular domain (Bricker, 1999).

For the present study, questionnaires for children aged from 2 months to 36 months were used. The questionnaires were administered through a facilitator-assisted process as the respondents are usually semi-literate and also to ensure completion and return of the questionnaires. The facilitators underwent a 2-day training on Basic Research Ethics, Interviewing Procedures, non-judgmental approaches and informed consenting procedure conducted by Deputy Principle Investigator. Each ASQ takes about one hour to fill between the facilitator and the mother. Each facilitator is expected to do a maximum of 6 ASQs per day and each filled questionnaire is reviewed by program M&E officer to ensure quality.

vi) Statistical Methods

The differences in ECD outcomes between the intervention baseline and intervention end-line levels were determined by using a logistic regression model with the mean age of the mother, mean age of the children, sex of the children, marital education level, marital income status as predictor variables and ECD delayed or not delayed scores as outcome. Similarly, ECD outcomes at intervention end-line and comparison groups were compared. Cluster regression was done to adjust for predictor variables that were different between the two groups. These predictor variables were mothers' schooling status, children's ages and mothers' income status.

vii) Ethical Considerations

Ethical approval was obtained from the Great Lakes University of Kisumu Ethical Research Committee (GREC). The Certificate of Approval of Research Protocol (Ref: No. **Ref: No. GERC/012/018/2017**).

All the girls participating were only recruited into the programme if they assented to the informed written consent. For the girls aged below 18 years, both their assent and the consent of their parents/guardians were obtained before being included. Before they gave the consent, the programme/study was explained clearly including: the goal and objectives of the study; duration of the study; the benefits and risks of being part of the study; and that they could withdraw at any time during the study. When they had clearly understood, they signed the 'informed consent' form.

Data collected as part of the study were kept confidential. Any hard copies bearing personal identifiers were locked away and only the M&E officer, the Principle Investigator and the Deputy Principle Investigator had access to it. Soft copies of data were kept in password-protected folders. Personal identifiers were stripped off the analytic database to ensure that any information in the databases cannot be linked to any individual.

Compensation was not provided for the participants, but they were facilitated to travel to the interview venue. The participants were given contact information for the Researcher, the supervisors and the secretary to the Ethics and Research Committee that approved the research protocol. The participants were informed that they could contact any of the individuals to bring to their attention anything they considered important or concerns with respect to the way the research was being conducted.

viii) Assumptions and Limitation of the Study

The assumptions made in the conduct of this study included:

- i) The conditions in all the four Nairobi informal settlements were assumed to be similar
- ii) Participants aged less than 18 years of age would give assent and their guardians consent to participate in the study.
- iii) We assumed minimal confounding effect on the results especially among the comparison group as we were not aware of any other parenting programs for teenage mothers in Nairobi informal settlements

- iv) All the respondents would give truthful and precise information upon which the study findings would be based to arrive at objective conclusions

The limitation in this study is the use of the parent-reported Ages and Stages Questionnaires. The questionnaires are administered to parents of the children who give information about achievement or otherwise of the development outcomes of their children. The mothers may have given inaccurate information about their children's milestones due to social desirability. Besides the self-reporting nature of the ASQ, the tool is more indicated for screening, identifying young children who are in need of further evaluation to determine whether they are eligible for early intervention services, according to Sarameintoet. al. (2011).

To minimise the effect of self-reported information, research assistants had been trained to use non-judgemental approaches and emphasize to the mothers the need to provide accurate information. While responding to the questionnaires, the teenage mothers were requested to come with their children so that, when necessary and possible, the facilitators could confirm the mother's response to the questions with the child's ability. When applied in similar low-resource settings, ASQs have shown good correlations with other tests that employ direct observation of the children (Junejaet. al., 2012).

III. Results

i) Socio-demographic factors of the participating teenage mothers and ECD scores

Among the three groups: intervention baseline, intervention end-line and comparison groups, the mothers' mean ages were comparable at 17.68 years, 17.67 years and 17.62 years, respectively. Similarly, maternal education levels were comparable with those with maximum primary level education being, respectively, 42.8%, 43.0% and 44.3%. The children's sex was also comparable. The proportion of girls was 54.3%, 53.6% and 49.6%, respectively.

The mothers' schooling status was comparable between Intervention baseline and intervention end-line being 7.3% and 7.8% for those in-school but not comparable for the comparison group with only 3.1% of them being in school. The mothers' incomes were not comparable among the three groups with those with income being 8.7%, 19.7% and 10.7% among baseline, end-line and comparison groups, respectively. Similarly, incomparable were the children's mean age being 14.7 months, 23.9 months and 11.7 months, respectively, among the three groups. Thus, there was need to adjust for mothers' schooling status, mothers' income and children's ages in regression analysis (sections 3.4.1, 3.4.2, 3.4.3). While adjusting for mothers' schooling status, Fisher's exact tests were conducted to determine the associations between the variables in the three groups because the number of observations obtained for analysis was small (below 20). Table 1 shows the social demographic profiles of the participating teenage mothers and ECD scores of the children.

ii) Comparing Average scores on all the Domains for the three Groups

As shown in Figure 2, the mean scores on all 5 domains for comparison group, intervention baseline and intervention end-line were 35.8, 40.8 and 49.2, respectively. The maximum total score per domain is 60, a score of 10 for each of the 6 questions.

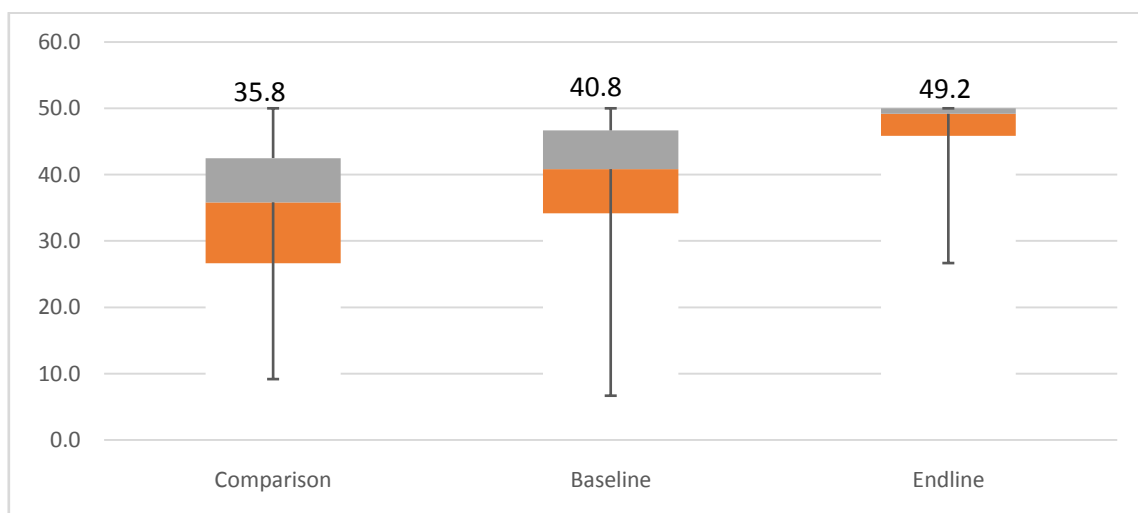


Figure 2: Mean scores on all 5 domains for Comparison Group, Intervention baseline and intervention end-line

iii) Delayed and Not Delayed status of children in the five Domains

a) Comparing Proportion of Children Delayed in various Domains in the Three Groups

The average proportion of children with delayed developmental outcomes in the 5 domains for the Comparison Group, Intervention baseline and intervention end-line were 27.8%, 17.0% and 2.6% respectively. Compared to the intervention end-line group, the comparison group was significantly more likely to be delayed (R.R 1.319 (95% C.I 1.139-1.539), p=0.0002).

The biggest improvement between intervention baseline and intervention end-line was observed in the communication domain with the proportion delayed decreasing from 20% to 0%. The lowest improvement was in the Fine Motor domain being 21% at baseline and 8% at end-line. Figure 3 shows the comparison of the proportions of children delayed in the 5 domains in the three groups.

Table 1: Social Demographic Profiles of the Participating Teenage Mothers and ECD Scores of the Children

| Characteristic | Intervention | | | | Comparison | | | |
|----------------------------|------------------------------|-------------|------------------|----------|------------------|----------|-------|-------|
| | Baseline (n=547) | | End-line (n=502) | | End-line(n=131) | | | |
| Mother's mean age (years) | 17.68 (sd. 1.29) | | 17.67(sd. 1.30) | | 17.62(sd. 1.88) | | | |
| | n | % | n | % | n | % | | |
| Maternal Education | Maximum Primary | 234 | 42.8% | 216 | 43.0% | 58 | 44.3% | |
| | Minimum secondary | 313 | 57.2% | 286 | 57.0% | 73 | 55.7% | |
| Schooling status | In school | 40 | 7.3% | 39 | 7.8% | 4 | 3.1% | |
| | Out of school | 507 | 92.7% | 463 | 92.2% | 127 | 96.9% | |
| Mothers' Income Status | No income | 499 | 91.3% | 353 | 70.3% | 117 | 89.3% | |
| | With income | 48 | 8.7% | 149 | 19.7% | 14 | 10.7% | |
| Children mean age (months) | 14.7 (sd. 10.8) | | 23.9 (sd. 8.27) | | 11.7 (sd. 10.17) | | | |
| Children sex | Female | 297 | 54.3% | 278 | 53.6% | 65 | 49.6% | |
| | Male | 250 | 45.7% | 241 | 46.4% | 66 | 50.4% | |
| Child Development Outcomes | Communication | Delayed | 108 | 19.7% | 1 | 0% | 33 | 25.2% |
| | | Not delayed | 439 | 80.3% | 518 | 100.0% | 98 | 74.8% |
| | Gross Motor | Delayed | 81 | 14.8% | 13 | 2% | 30 | 22.9% |
| | | Not delayed | 466 | 85.2% | 506 | 98.0% | 101 | 77.1% |
| | Fine Motor | Delayed | 114 | 20.8% | 42 | 7.7% | 45 | 34.3% |
| | | Not Delayed | 433 | 79.2% | 477 | 92.3% | 86 | 65.7% |
| | Problem Solving | Delayed | 87 | 15.9% | 12 | 2.3% | 43 | 32.8% |
| | | Not delayed | 460 | 84.1% | 507 | 97.7% | 88 | 67.2% |
| | Personal Social | Delayed | 69 | 12.6% | 6 | 1.2% | 31 | 23.7% |
| | | Not delayed | 478 | 87.4% | 513 | 98.8% | 100 | 76.3% |
| | Delayed on 2 or more domains | Delayed | 99 | 18.1% | 13 | 2.6% | 30 | 22.9% |
| | | Not delayed | 448 | 85.6% | 489 | 97.4% | 101 | 77.1% |

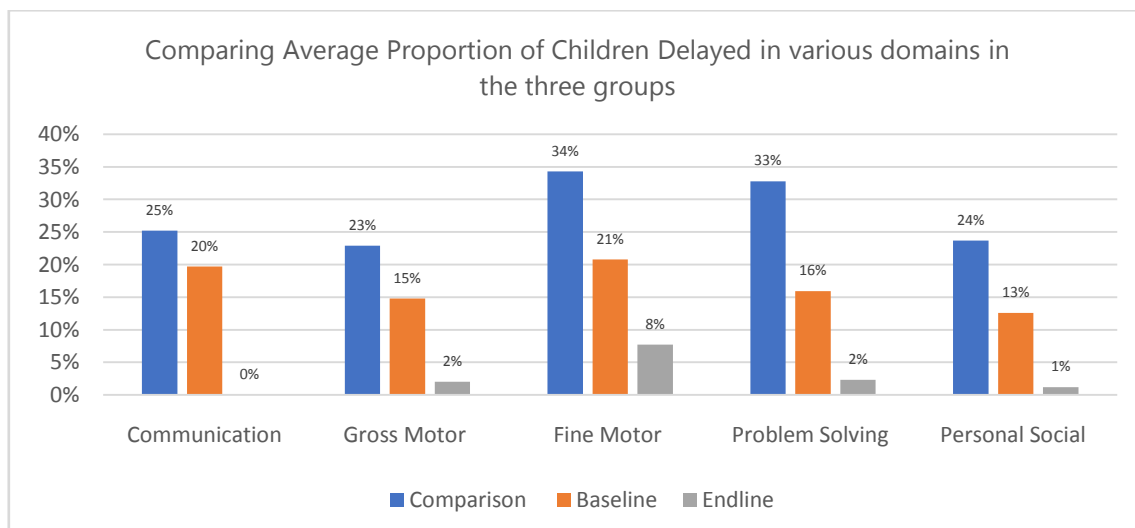


Figure 3: Proportion of children with delayed development on ECD domains for Baseline, End-line and Comparison Groups

b) Comparing Delayed/Not Delayed Status among intervention and comparison groups

A binary logistics model was designed to compare the risk ratios among intervention end-line, intervention baseline and comparison group with the latter being the reference. 95% confidence intervals were calculated and p-values used to determine the statistical difference in the delayed status between the pairs. The results are as shown in Table 2.

For all the domains, the proportion of the children with delayed developmental outcomes at end-line were lower and the differences statistically very significant ($p < 0.0001$) compared to the comparison group. This include the proportion of children delayed in two or more of the domains. Between intervention baseline and comparison groups, the differences were all statistically significant at $p < 0.05$ for all domains except for Communication ($p = 0.16$). The observed statistically significant differences between intervention baseline and comparison groups could be caused by the fact that baseline measurements were taken up-to five months into the program.

Table 2: ECD Scores among Intervention and Comparison Groups

| | | Delayed | Not Delayed | RR (95% C.I) | p-value |
|-----------------|-------------------------|------------|-------------|---------------------|-------------------|
| Communication | End-line (n= 502) | 1(0.2%) | 501(99.8%) | 0.007 (0.001-0.055) | $p < 0.0001^{**}$ |
| | Baseline (n=547) | 108(19.7%) | 439(80.3%) | 0.784 (0.558-1.101) | $p = 0.160$ |
| | Comparison (n=131) ref. | 33(25.2%) | 98(74.8%) | - | |
| Gross Motor | End-line (n= 502) | 13(2.6%) | 489(97.4%) | 0.085 (0.047-0.154) | $p < 0.0001^{**}$ |
| | Baseline (n=547) | 81(14.8%) | 466(85.2%) | 0.485 (0.349-0.673) | $p < 0.0001^{**}$ |
| | Comparison (n=131) ref. | 40(30.5%) | 91(69.5%) | ref | |
| Fine Motor | End-line (n= 502) | 42(8.4%) | 460(95.6%) | 0.261 (0.178-0.382) | $p < 0.0001^{**}$ |
| | Baseline (n=547) | 114(20.8%) | 433(79.1%) | 0.650 (0.483-0.876) | $p = 0.005^*$ |
| | Comparison (n=131) ref. | 42(32.1%) | 89(67.9%) | ref | |
| Problem Solving | End-line (n= 502) | 12(2.4%) | 490(97.6%) | 0.073 (0.040-0.134) | $p < 0.0001^{**}$ |
| | Baseline (n=547) | 87(15.9%) | 460(84.1%) | 0.485 (0.355-0.662) | $p < 0.0001^{**}$ |
| | Comparison (n=131) ref. | 42(32.1%) | 89(67.9%) | ref | |

| | | | | | |
|------------------------------|-------------------------|-----------|------------|---------------------|------------|
| | Comparison (n=131) ref. | 43(32.8%) | 88(67.2%) | ref | |
| Personal Social | End-line (n= 502) | 6(1.2%) | 496(98.8%) | 0.047 (0.002-0.107) | p<0.0001** |
| | Baseline (n=547) | 69(12.6%) | 478(87.4%) | 0.474 (0.329-0.683) | p=0.0001* |
| | Comparison (n=131) ref. | 34(25.9%) | 97(74.1%) | ref | |
| Delayed in 2 or more domains | End-line (n= 502) | 14(2.8%) | 488(97.2%) | 0.079 (0.045-0.139) | p<0.0001** |
| | Baseline (n=547) | 99(18.1%) | 448(81.9%) | 0.515 (0.384-0.691) | p<0.0001** |
| | Comparison (n=131) ref. | 46(35.1%) | 85(64.9%) | ref | |

*significant difference at p<0.05

**significant difference at p<0.0001

iv) Comparing Delay in Two or More Domains between Intervention and Comparison Groups

A binary logistic regression model was used to determine the differences in delay in two or more domains among the three groups with the intervention end-line as the reference group. Table 3 shows the results. The results show statistically highly significant (p<0.0001) differences between both the intervention baseline and comparison end-line groups compared to the intervention end-line group. The Odds Ratios were, respectively 10.03(95% C.I 5.68-17.71) and 24.51(95% CI 12.98-46.27).

Table 3: Comparing delayed in two or more domains among intervention baseline, comparison end-line and Intervention end-line groups

| | Delayed n (%) | Not Delayed n (%) | Odds Ratio | 95% C.I. for OR | | p-value |
|--------------------------------------|---------------|-------------------|------------|-----------------|--------|------------|
| | | | | Lower | Upper | |
| Intervention baseline(n=547) | 99(18.1%) | 448(81.9%) | 10.029 | 5.680 | 17.709 | p<0.0001** |
| Comparison-end-line (n=131) | 46(35.1%) | 85(64.9%) | 24.510 | 12.984 | 46.269 | p<0.0001** |
| Intervention- end-line (n=502) (ref) | 14(2.6%) | 488(97.4%) | -- | -- | - | - |

**significant difference at p<0.0001

a): Adjusting for children's age (months)

To adjust for the children's age, the variable was recoded into a binary variable with children aged 20 months and below as one category and children older than 20 months as the other. The results showed that even after adjusting for age of the child, the differences between the intervention baseline and comparison end-line and intervention end-line groups were still statistically significant are shown in Table 4.

Table 4: Adjusting for children's age

| | Delayed in 2 or more domains n (%) | Not Delayed n (%) | Odds Ratio | 95% C.I. for OR | | p-value |
|--|------------------------------------|-------------------|------------|-----------------|--------|------------|
| | | | | Lower | Upper | |
| Children aged 20 months or less | | | | | | |
| Intervention Baseline(n=369) | 77(20.9%) | 292(79.1%) | 8.087 | 3.453 | 18.939 | p<0.0001** |
| Comparison end-line (n=95) | 36(37.9%) | 59(62.1%) | 18.751 | 7.512 | 46.611 | p<0.0001** |
| Intervention end-line (n=190) (ref) | 6(3.2%) | 184(96.8%) | -- | - | - | - |

Children aged more than 20 months

| | | | | | | |
|-------------------------------|-----------|------------|--------|-------|--------|------------|
| Intervention Baseline(n=174) | 22(12.4%) | 156(87.6%) | 5.359 | 2.332 | 12.313 | p=0.0001* |
| Comparison end-line (n=36) | 10(27.8%) | 26(72.2%) | 14.615 | 5.311 | 40.220 | p<0.0001** |
| Intervention end-line (n=312) | 8(2.5%) | 304(97.5%) | - | - | - | - |
| (ref) | | | | | | |

*significant difference at p<0.05; **significant difference at p<0.0001

b) Adjusting for Mother’s Income Status

After adjusting for mothers’ income status, highly statistically significant (p<0.0001) differences were observed in delayed status between the intervention baseline and comparison end-line with intervention end-line groups for the mothers without an income. However, the differences between the three groups were not statistically significant for the mothers with income (see Table 5).

Table 5: Adjusting for Mother’s Income

| | Delayed n (%) | Not Delayed | Odds Ratio | 95% C.I. for OR | | p-value |
|-------------------------------|---------------|-------------|------------|-----------------|--------|------------|
| | | | | Lower | Upper | |
| Mothers with income | | | | | | |
| Intervention baseline(n=48) | 6(12.5%) | 42(87.5%) | 2.898 | 0.924 | 9.093 | p=0.0682 |
| Comparison end-line (n=14) | 2(14.3%) | 12(85.7%) | 3.381 | 0.631 | 18.110 | p=0.155 |
| Intervention end-line (n=149) | 7(4.7%) | 142(95.3%) | -- | - | - | - |
| (ref) | | | | | | |
| Mothers Without income | | | | | | |
| Intervention baseline(n=499) | 113(22.7%) | 386(77.3%) | 14.428 | 6.633 | 31.384 | p<0.0001** |
| Comparison end-line (n=117) | 51(43.6%) | 66(56.4%) | 38.08 | 16.561 | 87.579 | p<0.0001** |
| Intervention end-line (n=352) | 7(2.0%) | 345(98.0%) | - | - | - | - |
| (ref) | | | | | | |

*significant difference at p<0.05; **significant difference at p<0.0001

c) Adjusting for Mother’s schooling Status

After adjusting for the mother’s schooling status, highly statistically significant (p<0.0001) differences were observed in delayed status of their children between the intervention baseline and comparison end-line with intervention end-line groups for the out-of-school teenage mothers. For the in-school teenage mothers, Fisher’s exact tests were conducted to determine the associations between the variables in the three groups because the number of observations obtained for analysis was small in some cases (below 20).The results showed that the difference between the intervention baseline and intervention end-line was statistically significant ($\chi^2(2, n=40)=17.671$; p<0.0001). However, the difference between the comparison group and intervention end-line was not statistically significant ($\chi^2(2,n=4)= 6.244$; p=130) for in-school teenage mothers (see Table 6).

v) Regressing delay in two or more domains with select predictor variables

A binary logistics regression model was used to compare delay in two or more domains with respect to some social demographic factors: mother’s age, mother’s level of education, mother’s income status, mother’s marital status, mother’s schooling status, child age and child sex. The results showed that the characteristics of mothers whose children were statistically significantly likely to be delayed were: mothers 17 years and below compared to older mothers (OR 1.445; 95% C.I 1.028-2.031; p=0.034); mothers out-of-school compared to mothers in school (OR 5.798; 95% C.I 3.849-8.735; p<0.0001); mothers with up to primary school level of education compared to mothers with higher education (OR 2.359; 95% C.I 1.703-3.266; p<0.0001); mothers without an income compared to mothers with an income (OR 2.847; 95% C.I 1.642-4.933; p=0.002); and children aged below 20 months compared to older children (OR 1.892; 95% C.I 1.354-2.645; p=0.0002). The mothers’ marital status and children’s sex did not seem to be associated with delay in two or more domains as the differences were not statistically significant (see Table 7).

Table 6: Adjusting for mothers' schooling status

| | Delayed n (%) | Not Delayed | Odds Ratio | 95% C.I. for OR | | p-value |
|------------------------------------|------------------|-------------|--------------------|-----------------|------------------------|------------|
| | | | | Lower | Upper | |
| Mothers out-of-school | | | | | | |
| Intervention baseline(n=507) | 86(16.7%) | 421(83.3%) | 7.388 | 3.979 | 13.716 | p<0.0001** |
| Comparison end-line (n=127) | 45(35.4%) | 82(64.6%) | 19.848 | 10.064 | 39.142 | p<0.0001** |
| Intervention end-line (n=446)(ref) | 12(2.7%) | 434(97.3%) | -- | - | - | - |
| Mothers in-school | | | Pearson's χ^2 | | Fisher's Exact p-value | |
| Intervention baseline(n=40) | 13(32.5%) | 27(67.5%) | 17.679 | | | p<0.0001** |
| Comparison end-line (n=4) | 1(25.0%) | 3(75.0%) | 6.244 | | | p=0.130 |
| Intervention end-line (n=56)(ref) | 2(3.6w%) | 54(98.2%) | - | - | - | - |

**significant difference at p<0.0001

Table 7: Comparing delayed in two or more domains by Intervention groups and socio-demographic variables

| | | Delayed in 2 or more domains n (%) | Odds Ratio | 95% Confidence Interval | p-value | |
|-----------------------------|------------------------------|---------------------------------------|------------|-------------------------|---------|------------|
| Mothers' age (yrs) | 17 years and below (n=305) | 59(19.3%) | 1.445 | 1.028 | 2.031 | p=0.034* |
| | More than 17 years (n=892) | 127(14.2%) | | | | |
| Mother's marital status | Single (n=863) | 128(14.8%) | 0.829 | 0.590 | 1.164 | p=0.278 |
| | Married (n=334) | 58(17.4%) | | | | |
| Mother's schooling status | Out-of-school (634) | 156(24.6%) | 5.798 | 3.849 | 8.735 | p<0.0001** |
| | In-school (563) | 30(5.3%) | | | | |
| Mother's level of education | Maximum primary (n=315) | 78 (24.8%) | 2.359 | 1.703 | 3.266 | p<0.0001** |
| | Minimum secondary(n=882) | 108 (12.2%) | | | | |
| Mother's income status | Without income (n=980) | 171(17.4%) | 2.847 | 1.642 | 4.933 | p=0.002* |
| | With income (n=217) | 15 (6.9%) | | | | |
| Child sex | Female (546) | 94(14.6%) | 0.870 | 0.636 | 1.189 | p=0.384 |
| | Male (557) | 92(16.5%) | | | | |
| Child age(months) | Below 20 months (n=661) | 126(19.1%) | 1.892 | 1.354 | 2.645 | p=0.0002* |
| | Older than 20 months (n=524) | 58(11.1%) | | | | |

*significant difference at p<0.05

**significant difference at p<0.0001

IV. Discussion

i) ECD scores on the five ASQ domains for Children of slum-dwelling Teenage Mothers

The results in this study show that providing the ten parenting sessions using the HOPE worldwide Parenting Manual for teenage mothers in Nairobi Slums results in improved developmental outcomes for their children. This is evidenced by the observation that comparison group had the lowest average median scores on all 5 domains (scoring 35.8 out of a possible 60) followed by the intervention baseline (40.8) with the

intervention end-line scoring highest (49.2). In addition, the average proportion of children with delayed developmental outcomes in the 5 domains was highest for the comparison group (27.8%), followed by intervention baseline (17.0%) and lastly the intervention end-line (2.6%). In all the domains, the proportion of the children with delayed developmental outcomes at end-line were lower and the differences statistically very significant ($p < 0.0001$) compared to the comparison group. Similar results were observed even after adjusting for children's age, mother's schooling status and mothers' income status, the three variables that were incomparable between the intervention and comparison groups.

In this study, children in the comparison group were also significantly more likely to have delayed developmental outcomes than children in the intervention baseline group. This can be explained by the fact that that baseline measurements were taken up-to five months into the program and the benefits of the parenting sessions could have already been accrued by the mothers.

This finding agrees with a report by the Global Child Development Steering Group which posited that parenting support and preschool enrolment can improve early child development in low-income and middle-income countries with effects greater for the most vulnerable children (Engle et. al., 2011). Similarly, Knerret. al (2013) observed that parenting interventions may be feasible and effective in improving parent-child interaction and parental knowledge in relation to child development in low and middle income (LMICs) countries. The results are also similar to findings in an eight-session parenting program for African migrant and refugee parents living in Melbourne. This study found out that the program facilitated positive change in almost all parenting domains (Renzahoet. al., 2011).

The results in this study show that mothers and children socio-demographic factors associated with delay in developmental outcomes of children of teenagers in Nairobi's informal settlements include: mothers younger than 17 years; teenage mothers out-of-school; mothers with only up to primary school level of education; mothers without an income; children aged below 20 months. In this study, the mothers' marital status and children's sex did not seem to be associated with delay in two or more domains. Similar to the findings in this study, longitudinal follow-up studies among children exposed to poverty and other adverse conditions show beneficial effects of ECD outcomes from enhanced adult wage earning (Gertler et. al., 2014) and attainment of education (Walker et. al., 2011; Maluccioet. al., 2009). In the previously quoted systematic review by Mejia et. al. (2012), an association between poverty and poor child development outcomes was observed in developing countries. According to Hoddinottet.al. (2013), evidence from low-income and middle-income countries suggests that children's early exposure to stunting and poverty is closely associated with deficits in their subsequent cognitive and social-emotional development.

To our knowledge, this is the first study focusing on measuring developmental outcomes of children of teenage mothers in Nairobi's informal settings. The findings can inform program developers and policy makers in the field of Early Child Development. The validity of the results obtained through the use of ASQs in this study is the observation that ASQ has a strong test characteristic for detecting developmental delay in low resource settings (Junejaet. al., 2012). According to Squires et. al. (2013), a screening tool should be inexpensive, simple, accurate, valid, reliable, culturally appropriate, easy and quick to administer. In a study that assessed concurrent validity of the ASQ compared with Bayley Scales of Infant Development II (BSID II) amongst children aged 24 months, the results showed that ASQs had good correlation with corresponding domains in the BSID II, suggesting that ASQs can provide a simple, valid, and cost-effective method to identify developmentally delayed children (Gollenberget. al., 2010). In the Juneja et.al. (2012) study previously quoted, ASQ administered to parents in India had good correlations ($r, 0.76-0.80$) with standardized development assessment using Developmental Assessment Scale for Indian Infants (DASII) for all the ASQ domains.

V. Conclusion and Recommendations

Evidence from this study show that participation in the 10 parenting sessions implemented through the HOPE worldwide Parenting Manual by slum-dwelling teenage mothers is associated with improvement of their children's developmental outcomes. Other socio-demographic predictors of improved developmental outcomes of the children of slum-dwelling teenage mothers are: mothers older than 17 years; teenage mothers being in school; mothers with at least secondary school level of education; mothers with an income; children aged more than 20 months.

We recommend that policy makers and program developers targeting ECD for children of slum-dwelling teenage mothers to consider providing to the mothers with parenting skills; opportunities for going back to school for those willing and eligible; and incorporate economic empowerment interventions. From the findings of this study, we also recommend emphasis on mothers younger than 17 years and those with children younger than 20 months for ECD interventions.

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