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Evaluating the impact of support services on health and behavioral outcomes among adolescent mothers and their children in Mexico and Chile

By

Rose Mary Kagawa

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Epidemiology

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Lia Fernald, Chair
Professor Julianna Deardorff
Professor Nicholas Jewell

Spring 2016

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By

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Abstract

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Doctor of Philosophy in Epidemiology

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Globally, 16 million children, about 11% of all births, are born to women aged 15 to 19 each year. Young mothers and their children bear a heavier burden of poor health and social outcomes compared to families in which the mother began childbearing later in life. The majority of teenage births occur in low- and middle-income countries. However, most research on interventions to improve outcomes among teenage mothers and their children is completed in high-income, Western countries. The social, economic and cultural contexts surrounding adolescent pregnancy and parenthood vary widely across countries. As a result, it is important to assess whether programs and policies that appear effective in high-income, Western countries maintain their effectiveness in other settings, where the majority of early childbearing occurs.

The goal of this dissertation is to identify programs and policies that improve outcomes for adolescent mothers and their children. The first paper explores what it means to be an adolescent mother in rural Mexico by comparing indicators of socioeconomic status, maternal wellbeing and parenting practices of adolescent and older mothers, documenting social perceptions of young motherhood, and understanding young mothers' perceptions of motherhood using quantitative and qualitative methods. The second paper uses a cluster-randomized controlled trial of a parenting education program, *Educación Inical,* in Mexico to assess whether the estimated effect of the parenting program on parenting behaviors and child cognitive development varies by the age at which the mother began childbearing. The final paper explores the association between having a child in center-based child care and parenting stress and child behavior among adolescent mothers and their children in Chile.

The studies presented here find no evidence of improved outcomes among adolescent parents or their children of a parenting education program or center-based child care support. As such, interventions that have shown promise in Western countries and among populations not limited by age at first birth may not be easily transferable to young mothers in other settings. This research highlights an important gap in understanding how best to support adolescent mothers and their children. These studies also point to the need for research that clarifies adolescent mothers' sources of adversity and opportunity in varying cultural, social and economic settings in order to appropriately target programs and policies. Additionally, it is critical that research on

the impact of programs and policies that are hypothesized to improve outcomes for adolescent mothers and their children take place in locations where the majority of adolescent pregnancy and parenting occurs. Understanding what works to improve outcomes for adolescent mothers and their children across a range of contexts is necessary to meet the needs of millions of families who reside outside of where the evidence base has traditionally focused.

For my husband Scott, who fills my life with joy.

For my parents, who raised me to love learning.

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Chapter 1. Introduction

Globally, 16 million births are to women aged 15 to19 each year, with 95% of these births occurring in low- and middle-income (LAMI) countries.(1) Young mothers and their children bear a heavier burden of poor health and social outcomes compared to families in which the mother began childbearing later in life.(2-5) This dissertation explores the parenting experience of adolescent mothers and estimates the effect of support services on health and behavioral outcomes among women who began childbearing in adolescence and their children.

The United Nations Population Division calculates the global adolescent birth rate at 49 births per 1000 women aged 15 to 19.(6) For comparison, the general fertility rate in 2011 in the United States was 63.2 births per 1000 women aged 15 to 44.(7) The adolescent birth rate is significantly higher in developing regions (53 per 1000) compared to developed regions (24 per 1000). Sub-Saharan Africa has the highest adolescent birth rates, ranging by country from 111 to 144 births per 1000 women aged 15 to 19, followed by Latin America and the Caribbean, with an average rate of 73 per 1000. Countries with the lowest adolescent birth rates are concentrated in Europe, North Africa and Asia.(6, 8) Since the 1970s, declines in the proportion of women having children before age 20 were greatest in North African and Asian countries, and the smallest in Latin American countries.(8, 9) Declines in adolescent fertility have lagged behind declines in overall fertility in Latin America.(10)

In many cases, adolescent childbearing is a consequence of social, economic and gender inequality.(11) In the United States, adolescent childbirth is more common among girls from low-income families, especially among those living in areas marked by high economic inequality.(12) When economic success is perceived as unattainable, girls are more likely to begin childbearing at an earlier age.(13) Globally, countries with low levels of economic development have higher rates of early marriage, often resulting from a lack of alternatives for daughters and adherence to traditional gender roles.(11) The World Health Organization estimates that 30% of girls in developing countries are married before reaching the age of 18.(1)

Pregnancy and childbearing in adolescence, particularly before the age of 16, carry with them reproductive health risks, including maternal death, low birth weight and neonatal death.(14, 15) Complications of pregnancy and childbirth are the leading cause of death among women aged 15 to 19 in many low- and middle-income countries.(16) Early motherhood is often accompanied by a higher social risk profile as well. Young mothers are more likely to live in poverty, complete less education than their non-parenting peers, and suffer from depression.(2-4) In addition to impacting the mother's health and quality of life, these factors define the environment into which a child is born and can have important consequences for a child's health and development.(17-19)

While the majority of adolescent childbearing takes place in low- and middle-income countries,(1) research on the impact of programs and policies among adolescent mothers and their children has historically focused on populations in high-income, Western countries.(20) Adolescent childbearing takes place within varying social, economic and cultural contexts, which can impact the consequences of adolescent childbearing and may influence the effectiveness of programs and policies.(21, 22) In order to understand how best to support adolescent mothers and their children, it is critical to understand adolescent parenthood in context and to evaluate programs and policies in settings outside of high-income, Western countries.

My dissertation explores what it means to be a young mother in rural, resource poor areas of Southern Mexico, and evaluates services, including parenting education and child care, that are hypothesized to improve outcomes for women who began childbearing in adolescence and their children in Mexico and Chile. The goal is to find ways to break the cycle of poverty often associated with early childbearing by improving the health and quality of life of young mothers and ensuring that children born to adolescent mothers are healthy and prepared for success in school and life. My dissertation answers three main research questions: 1) What is the experience of motherhood among adolescent mothers living in rural, resource poor areas of Southern Mexico? 2) Do the effects of a parenting education program on parenting behaviors and child cognitive development vary by the age at which mothers begin childbearing? and 3) What is the association between using center-based child care and parenting stress and child behavior among adolescent mothers and their children?

The second chapter uses a mixed methods approach (quantitative and qualitative) to understand the parenting experience of adolescent mothers in rural, impoverished communities in Southern Mexico. Quantitative data are from a cluster-random sample of mothers with young children in rural, impoverished towns in Chiapas, Oaxaca and Puebla, Mexico. These data provide evidence of the relative economic and social context of motherhood among current and former adolescent mothers and women who began childbearing after their teenage years as well as measures of parenting strategies and maternal wellbeing. Data from 30 in-depth interviews with mothers representing a range of ages and living in similar towns to those included in the quantitative sample provide an understanding of social perceptions of adolescent motherhood and adolescent mothers' perceptions of motherhood. Based on the findings, I discuss opportunities for supporting adolescent mothers and their children in the sampled and similar communities.

The third chapter evaluates whether the effect of a parenting education program on parenting practices and child cognitive development varies by the age at which mothers first gave birth. *Educación Inicial* (EI) is a parenting education program implemented in resource poor rural areas throughout Mexico. The program is designed to build parenting knowledge and skills through weekly interactive training sessions. Parenting education programs have been shown to benefit parenting behaviors and child development in low- and middle-income country settings.(23-26) Less is known, however, about whether parenting education programs are as effective among women who began childbearing in adolescence in LAMI countries.(27) This study uses data from a cluster-randomized controlled effectiveness trial of *Educación Inicial* to assess whether community availability of the program has differential effects on parenting behaviors and child development depending on the age at which mothers first gave birth.

Finally, the fourth chapter of this dissertation assesses the impact of using daycare or preschool services (referred to as center-based care) on parenting stress and child behavior among families in which the mother gave birth to the target child as a teenager in Chile. Daycare services are positively associated with maternal education and employment as well as child development and school success.(28) Using the *Encuesta Longitudinal de la Primara Infancia*, a nationally representative sample of children and their families in Chile, I assess the impact of using center-based care services on maternal parenting stress and child behavior among families in which the mother began childbearing as an adolescent.

The goal of this dissertation is to gain a deeper understanding of the social and economic context of adolescent childbearing and to estimate the effect of interventions among current and former adolescent mothers and their children in two Latin American countries: Mexico and

Chile. A deeper understanding of the factors that differentiate adolescent and older mothers in terms of parenting behaviors, family circumstances and socioeconomic position can inform policies and interventions aimed at improving outcomes for adolescent mothers and their children. The evaluation of specific programs, including a parenting education program and center-based child care services, provide evidence of their effectiveness in Latin American settings.

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Chapter 2. The Experience of Adolescent Motherhood in Rural Mexico: An Exploratory Mixed Methods Study

Introduction

Becoming a mother is a complex and dynamic process that requires reorganizing conceptualizations of self, adapting relationships with the mother's partner, family, and friends, taking on new caretaking tasks, and fostering a relationship with the newborn.(1) Adolescent mothers have the added challenges of simultaneously adapting to more mature social roles and responsibilities,(2) responding to the physical changes of puberty,(3) and undergoing brain development that affects cognitive abilities and emotional and behavioral regulation.(4) To add to this multitude of changes and challenges, teenage parenthood frequently takes place against a backdrop of poverty and reduced opportunities, which can impact the health and wellbeing of young mothers and their children.(5-7)

In Mexico, the teenage birth rate was 63 per 1000 in 2014.(8) The high rate of teenage birth coupled with the large population size gives Mexico one of the highest total number of teenage births (677,000 in 2009).(9) Compared with older mothers, young mothers have the highest proportions of unplanned (27.8%) or unwanted pregnancy (12.8%) in Mexico.(10) Reflecting global patterns, adolescent mothers in Mexico tend to have lower levels of educational attainment and come from households marked by lower socioeconomic status and overcrowding.(11, 12) These factors, coupled with the mother's stage of emotional and cognitive development, can affect the timing and process of developing a maternal identity.(13)

In spite of this high birth rate among adolescents in Mexico, there is very little individual level data relating to adolescent mothers living in remote regions. Furthermore, there is limited information on the social context of adolescent motherhood and young mothers' self perceptions of parenting in rural Mexico. Thus, the aim of this study was to fill these research gaps by using a mixed methods approach to look specifically at 1) indicators of socioeconomic status, maternal wellbeing and parenting practices, 2) social perceptions of early motherhood among local mothers, and 3) adolescent mothers' perceptions of motherhood, including their sources of social support and the challenges they face. We hypothesized that women who began childbearing at younger ages face more economic adversity than women who began childbearing at older ages. Given the normalcy of early childbearing in rural Mexico, we hypothesized that young mothers would have high levels of social support and acceptance, which could buffer the negative effects of poverty and associated contextual factors.

Maternal role attainment theory, first introduced by Reva Rubin, describes the transition to motherhood as a cognitive and social process beginning at the discovery of pregnancy, continuing through the postpartum period and ideally ending with the adoption of the maternal identity (i.e. achievement of a sense of comfort and competence in the maternal role).(1) Mercer, a student of Rubin's, later suggested replacing maternal role attainment theory with "becoming a mother" (BAM) to emphasize the evolving and dynamic nature of motherhood over the life course rather than the more static description implied by the original theory.(13) According to Mercer, the process of becoming a mother includes four stages: 1) commitment, attachment and preparation, in which the pregnant woman imagines herself as a parent and prepares psychologically for her new role; 2) acquaintance, learning and physical restoration, in which the mother becomes acquainted with her infant and begins learning to care for it through trial and error; 3) moving toward a "new normal," in which the mother begins to incorporate her new role

into her past self and future expectations; and 4) achievement of the maternal identity, described as "settling in", in which the mother feels confident and competent in her new role. BAM emphasizes the need to reiterate this process as infants become children, adolescents and then adults. Additionally, BAM suggests whether and when a woman transitions from each stage to the next is highly dependent on individual mothers, infants and their social and environmental contexts.(13)

The physical changes of puberty begin before psychosocial maturity, resulting in reproductive capabilities that precede emotional and cognitive maturity.(14) In Latin America, the combination of increasingly early menarche and sexual initiation, and low rates of contraceptive use among adolescents has resulted in stubbornly steady adolescent birth rates, even while total births have declined in the region.(15) Continued psychosocial development in adolescence can make the tasks of parenthood more difficult for young mothers.(16) For example, while parenthood requires empathy for the infant, early adolescence is marked by a degree of normative self-centeredness.(17) During this period, there is a transition from concrete thinking to formal operations, a process through which adolescents move from egocentric thinking to being able to understand others' perspectives and needs.(18) Additionally, young people develop the ability to think in more abstract terms and to weigh decisions, skills that are central to problem solving and future planning, and crucial for caring for young children.(16) The mismatch in timing of childbirth and ongoing psychosocial development could have important implications for parenting effectiveness among adolescent parents. For example, research suggests adolescent parents tend to have expectations of their children that are in advance of (and sometimes behind) their children's developmental stage.(19, 20) The achievement of the developmental tasks of adolescence, such as abstract reasoning and perspective taking, has been shown to correlate with more abstract as opposed to concrete, and realistic conceptualizations of motherhood (21) and more sensitive parenting practices.(22)

Perhaps the greatest challenge facing many adolescent mothers and their children is environmental adversity, including poverty. Evidence shows that many of the poor maternal and child outcomes often associated with early childbearing are due to background disadvantage and low socioeconomic position rather than to maternal age at birth.(6, 7) In Latin America and the Caribbean, teenage childbearing is concentrated among the disadvantaged (e.g. rural poor women living in areas of high unemployment) and as a result, early motherhood is often accompanied by a higher social risk profile.(23)

A lack of alternative opportunities in rural Latin America leads many women to conceive of motherhood as their end goal.(24) Many adolescents leave school early in large part because of financial pressures and a sense that pursuing an education will not help them find paid work.(15, 25) In Mexico, over 25% of girls aged 15 to 19 are neither employed nor in education or training. Among women aged 25 to 29, 47.3% of women fall into this category, ultimately limiting their economic independence.(26) Structural factors such as poverty and low educational attainment are also linked to relatively high rates of depressive symptoms among women in rural Mexico (51% according to one study).(27) In addition to impacting the mother's health and quality of life, these factors shape the environment into which a child is born and can have important consequences for a child's health and development.

The social, economic and cultural contexts surrounding adolescent pregnancy and parenthood vary widely between and even within countries.(28) Cultural context and social norms influence maternal identity development.(29) As a result, differences in family structure, the availability and type of social support, and community norms around adolescence and

childbearing could offer unique opportunities for fostering positive maternal identity development among young mothers. In order to understand how best to support adolescent mothers and their children, it is important to understand adolescent parenthood in context.

In this study, we explored the social and economic context of motherhood among current and former adolescent mothers living in rural areas of southern Mexico. Specifically, we used a mixed methods approach to conduct a multidimensional exploration of the experience of motherhood in rural, impoverished communities in Mexico. We used quantitative data collected in indigenous and non-indigenous communities in the states of Oaxaca, Puebla and Chiapas to develop a broad overview of the relative social and economic positions of young mothers in these communities as well as measures of parenting strategies and maternal wellbeing. We gathered qualitative data from women living in four towns in Southern Oaxaca, two towns in Central Oaxaca and six towns in Southern Puebla to gain an in-depth understanding of the lived experience and social perceptions of adolescent motherhood in these communities. We used this information to address our three aims of comparing indicators of socioeconomic status, maternal wellbeing and parenting practices across categories of maternal age at first birth, understanding social perceptions of early motherhood, and understanding adolescent mothers' perceptions of motherhood.

Methods

Quantitative Data

Participant Recruitment and Data Collection

We collected quantitative data from 1,381 mothers in 189 communities in Oaxaca, Puebla and Chiapas. Study participants included women aged 30 or under with at least one child under the age of 2 years at the time of data collection. We included women who began childbearing during adolescence, and for comparison, after age 19. Participants were identified from an existing cohort recruited for the evaluation of a parenting education program in Mexico. The original study was organized by researchers at the Instituto Nacional de Salud Pública [National Institute of Public Health] (INSP) in Cuernavaca, Mexico and the School of Public Health at the University of California, Berkeley. A detailed description of the study design is available in the evaluation results of primary (30) and secondary outcomes.(31)

Researchers at INSP identified all rural (fewer than 2500 inhabitants) and impoverished communities (over 70% participation in *Prospera*, a welfare program with eligibility criteria based on household wealth) in the states of Chiapas and Oaxaca and the southern regions of Puebla for inclusion in the sampling frame. They then took a random sample, stratified by characterization of the communities as indigenous (over 80% of the population spoke an indigenous language) from the eligible communities, resulting in 204 communities (**Figure 1**). Of these, 12 communities could not be reached or refused to participate, resulting in a sample of 192. All families in the selected communities that met income eligibility criteria (i.e. were *Prospera* beneficiaries) and had children under the age of 2 years were invited to participate in the study at baseline. Informed consent was obtained from all adult participants, and children provided their assent.

The original sample included 2,472 households. Of these, 1,415 mothers were aged 30 or younger at the time of interview (the youngest mother was 14 years old) and were the biological

mothers of their oldest child. In 34 of these households, it was impossible to identify the children of the target mothers due to complicated household structures. These households were excluded from the analysis. An additional 32 family structures were only identifiable with assumptions (e.g. children in a household were born to the only age eligible woman in the household and not to any age eligible men). We created two samples based on our confidence in our ability to correctly identify the children of the target mothers: a conservative sample of 1,349 that excluded the 32 households in which family structures were only identifiable with assumptions and an extended sample of 1,381 mothers that included these 32 households. These two samples were similar in terms of their distributions of maternal age at first birth and important risk and protective factors. As a result, we decided to use the extended sample for our analyses because it represented a wider range of family structures.

Interviewers visited the participants in their homes in pairs and collected data on family background, parenting techniques, mother's psychological status, and child development beginning in 2008. Data for the current investigation were collected at baseline, before the parenting program around which the original study was designed was implemented, therefore the intervention did not influence the indicators reported here.

Measures

Categories of maternal age at first birth included early adolescence (10-16 yrs), late adolescence (17-19 yrs) and early adulthood (20-30 yrs). We chose 16 as the upper cut-off for early adolescence because most adolescents would have completed middle school by this age and because pregnancy and childbirth before the age of 16 has a slightly higher risk profile.(32) We chose 19 as the upper cut-off for adolescent childbearing because the World Health Organization defines teenage pregnancy as pregnancies occurring at or below age 19.(33)

The following variables were used to assess socioeconomic position and maternal wellbeing across the categories of maternal age at first birth: household wealth and demographics; and maternal education, depression, and indigenous ancestry. An asset index of twenty household items (e.g. computer, refrigerator, blender, microwave) was used to construct the wealth measure.(34) After conducting a principal components analysis, the first factor was rotated using the Varimax rotation and logged to correct for skewness. We then transformed the asset index into a binary variable split at the median value. Household demographics included who lived in the home, the mother's total number of children, and household crowding. Whether or not the father of the children lived in the household was assessed separately as a binary variable (yes/no). The total number of children the mother had at the time of interview included both adopted and biological children. This variable assumed that all the mother's children lived in the household, a reasonable assumption given that none of the women were over age 30. Household crowding was calculated by dividing the total number of household members by the number of rooms in the home. Educational attainment was explored as two binary variables: one indicating whether or not the mother completed primary school (grade 6) or higher and the other indicating completion of secondary school (grade 9) or higher. Maternal depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D), a 20-item questionnaire that measures depressive symptomology.(35) This scale has been validated in Mexican populations.(36-38) A score of 16 was used to classify mothers as having symptoms indicating a high risk for depression. This may overestimate the classification of women with depressive symptomatology (one validation paper suggested 35 as an equivalent cut-off for rural

Mexican populations).(37) However, studies continue to use the cut-off of 16,(39-41) and we have decided to follow suit in the interest of comparability across studies. Finally, mothers who reported speaking or understanding an indigenous language were defined as having indigenous ancestry.

Maternal caregiving and responsiveness was measured using the Home Observation for the Measurement of the Environment (HOME).(42) The HOME uses observation and interview to assess support for learning. This assessment was applied to one child under the age of two in each household. Six subscales comprise the HOME, including 1) Parental Responsivity, 2) Acceptance of Child, 3) Organization of the Environment, 4) Learning Materials, 5) Parental Involvement, and 6) Variety in Experience. The total HOME score and the six subscales were calculated by summing the individual items in each scale.

Statistical Analysis

The study was designed to describe the average characteristics of mothers that began childbearing at different life stages, not to examine the causal associations between age at first birth and maternal outcomes. Our quantitative analysis was based on descriptive statistics. We compared the prevalence of maternal factors and behaviors across the categories of maternal age at first birth. All results were stratified by maternal age at interview in order to compare mothers' experiences within similar life stages. To test whether differences were statistically significant, we used linear regression for continuous variables and logistic regression for categorical variables and controlled for mother's age at interview. Participants with missing values were not included in comparisons of that particular missing variable.

Qualitative Data

Participant Recruitment

We collected data from interviews with 30 women. As with the quantitative data, mothers were divided into categories based on the timing of their first birth and their age at the time of the interview. We were unable to recruit enough early adolescent mothers (≤16 at first birth) to justify separating this category in the qualitative analyses. Instead, we grouped the early and late adolescent mothers into one category: adolescent mothers (≤19 at first birth). We also categorized the participants based on their age at the time of the interview, resulting in three categories: young adolescent mothers (≤19 at first birth, <25 at time of interview), former adolescent mothers (≤19 at first birth, age 25-30 at time of interview), and never adolescent mothers (>19 at first birth, age 20-30 at time of interview). All mothers were required to have a child under the age of 5 at the time of the interview in order to ensure that the parenting experience was recent.

With assistance from researchers at the National Institute for Public Health in Cuernavaca, Mexico, we identified 12 towns in Oaxaca and Puebla in which to conduct interviews. We selected individuals purposively in order to include a balance of mothers in each of the three age categories at first birth and oversampled the young adolescent mothers (≤19 at first birth, <25 at time of interview). We also sought to interview an ethnically diverse population, including indigenous and non-indigenous mothers, with varying levels of literacy. The Institutional Review Boards (IRB) at the National Institute of Public Health in Mexico and

the University of California, Berkeley Committee for the Protection of Human Subjects approved this study (Protocol ID: 2010-05-1528).

Interviews

All interviews were conducted in Spanish or in an indigenous language with the aid of a translator, and all interviews were recorded. A researcher at INSP transcribed the interviews in Spanish in order to ensure local idioms were recorded accurately. The interview guide elicited information about the circumstances of each woman's pregnancies; what they believed makes a good mother; their own feelings, challenges and strengths as a mother; and their hopes for their children's and their own futures (**Appendix A**). The author translated the interview guide into Spanish and received feedback from partners at INSP on the content as well as the translation. We pilot tested the interview guide with two mothers in order to assess the feasibility of the questions to elicit information that was relevant to the study goals. The content of these two pilot interviews was not included in the analysis but was used to modify and adapt the interview guide.

Analysis

The aim of the analysis was to elicit in-depth descriptions of the experience of motherhood particularly for women who began childbearing in adolescence, focusing on discussions of the role of age in motherhood, the mothers' perceptions of their own parenting experiences, and their aspirations for themselves and their children. Data were coded and analyzed using thematic analysis.(43) An initial set of codes was developed to identify areas of the text that related to these broad topics as well as topics based on prior hypotheses about common sources of social support and challenges among adolescent mothers. Additional codes were identified during an initial phase of gaining familiarity with the data that involved careful reading of the transcripts. Then, using the initial set of codes, two bi-lingual investigators coded the interviews independently using Atlas.ti (Version 1.0.31). The investigators met weekly to compare codes and resolved discrepancies through discussion. As new ways of organizing the data were identified, the investigators added new codes or adapted codes to reflect the data patterns more accurately. To begin analyzing the codes and identifying themes, the author mapped out the connections among the codes and drew life trajectories for each participant. This was helpful in identifying common as well as meaningful patterns in the timing of childbearing with other life events, social responses to adolescent childbearing, and individual perceptions of motherhood. Once candidate themes were identified from the coded data and the life trajectories, the investigators returned to the data to reassess support for the candidate themes and then determined the final set of themes. Investigators reread coded sections relevant to each theme to summarize commonalities as well as inconsistencies and identify representative quotations. During this process, the researchers sought to connect themes across participants, to understand how themes were associated with participant characteristics (e.g. high emotional support vs. low emotional support), and to understand the broader implications of these themes. The interviews were analyzed in Spanish to remain as true to the initial meanings as possible. Throughout the process, the two investigators shared their findings with each other to ensure that each individual's findings were similar to what the other would expect given her reading of the data.

Results

Quantitative Data

Study Population

In our sample of mothers who had a least one child under age 5 and lived in rural Mexico, 73% of women began childbearing before the age of 20. Many participants began childbearing between the ages of 17 and 19 (n=610; 44%) with the remaining split fairly evenly between early adolescence (age ≤16, n=399; 30%) and early adulthood (age 20-30, n=372; 27%). Table 1 shows this age breakdown and the ages at which they were interviewed.

The Distribution of Social, Economic and Health Factors

Women who began childbearing in early adolescence had the highest concentration of "hardship," e.g., the lowest levels of education and wealth, the most household crowding, and the highest proportion of depressive symptomatology (**Table 2**). They also had the greatest average total number of children. Women who began childbearing during early adolescence had the lowest levels of education even when measured after the age at which they could have completed secondary school. Contrary to this pattern of hardship, this group was the most likely to be living with the father of their children.

Women who began childbearing in early adulthood, compared with women who began childbearing at younger ages, had the highest concentrations of protective factors, e.g., the highest levels of education, lowest levels of household crowding, the fewest total children, and the fewest depressive symptoms. They were also most likely to be in the top median of household wealth but contrary to the trend in other factors, least likely to live with the father of their children.

Parenting Practices and the Home Environment

A similar trend emerged among the early adolescent, late adolescent and early adult mothers on measures of parenting, though differences across categories of age at first birth were small in magnitude (**Table 3**). Early adolescent mothers scored 0.5 points lower on the total HOME compared to late adolescent mothers and 1.1 points lower compared to early adult mothers (the total HOME score is out of 45 items). The latter difference reached statistical significance (p-value=0.003). The differences were greatest on the subscales of maternal responsivity and learning materials available to children in the home (maternal responsivity: early adolescent vs. late adolescent mothers=0.5 points lower (p-value=0.007), early adolescent vs. early adult mothers=0.6 points lower (p-value=0.003) (out of 11 points total); learning materials: early adolescent vs. late adolescent mothers=0.1 points lower (p-value=0.146), early adolescent vs. early adult mothers=0.2 points lower (p-value=0.043) (out of 9 points total)).

Qualitative Data

Study Population

Thirty-two mothers participated in the qualitative interviews. Two interviews were discarded because they had to be conducted in an indigenous language and the only translator available was a close relative of the two women, suggesting possible bias. Participants were split into three categories: 1) women who began childbearing in adolescence and were in their teens or early 20s at the time of the interview; 2) women who began childbearing during adolescence but had aged into adulthood; and 3) women who did not begin childbearing until age 20 to 30 (**Table 4**).

Based on our analyses, the themes around the experience of adolescent parenthood fell into five broad categories: 1) social perceptions of adolescent motherhood among mothers of all ages; 2) self perceptions of motherhood among adolescent mothers; 3) sources of social support in parenthood; 4) sources of challenges in parenthood; and 5) expectations for the future.

Social Perceptions of Adolescent Motherhood Among Mothers of all Ages

Mothers who were interviewed tended to emphasize similarities rather than differences between adolescent and adult mothers, with few exceptions. While young motherhood was common and generally socially acceptable, women often described young mothers as "girls" or "young", indicating that adolescent motherhood was at least noteworthy. More explicit concerns about adolescent motherhood were relegated to the very young. These findings are described in more detail below.

Motherhood as a shared experience, regardless of age: Many participants said there was no difference between younger and older mothers, or that differences among mothers were more due to "character" than age at first birth. These women emphasized similarities rather than differences across age, for example, noting that every new mother must learn to care for her children, regardless of age. One woman described life in her town as "challenging", and she felt that all mothers, regardless of age faced these challenges. Another woman who had her first child at 15 and was 26 at the time of the interview said, "Even when one doesn't have the experience, when a child is born, I think one takes on this responsibility. I think it's the same love and the same responsibility."[1] Finally, when asked whether they felt like they were treated differently because of their young age, no mothers said this was the case.

The most common difference between adolescent and older mothers that women did mention was in childcare experience. Most participants described adult mothers as having more experience caring for children than adolescent mothers, but it was difficult to distinguish if participants were talking about women who began childbearing in their adult years or women who were simply adults and literally had had more child-care experience because they had had more children. Because adolescent childbearing was so common, older mothers also tended to be more experienced mothers.

Very few women held overtly negative perceptions of young mothers. Among this minority, their perceptions were that young mothers were impatient, quicker to frustration, and more interested in going to dances and discos than parenting when compared with older mothers. As one women said, "Over there in [town], I notice the younger the mother the less attention she pays to her kids, or they prefer to go to dances and discos."[2]

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[1] *Aunque uno no tenga, uno la experiencia pero, este, cuando nace un niño yo digo que adquiere uno esa responsabilidad. Yo digo que es el mismo amor y la misma responsabilidad.*

[2] *Allá en [pueblo] veo que las mamás, entre más jóvenes este, menos atención les ponen, o les gusta más andar así en bailes y discos.*

Subtle distinctions for the very young at first birth: There seemed to be an age, though not a concrete number, at which childbirth was considered younger than a socially defined "normal". This distinction often showed up in the adjectives women used to describe their own or others' age at first birth: "I was a girl, can you imagine?" "I was really little", "Since she got married early, she had her son young."[3] Parental advice and the repetition of common sentiments around early childbearing also hinted at this distinction. One girl had heard that childbirth while young was dangerous. Another girl described how at age 16, her partner and parents encouraged her to wait to begin childbearing. She said they felt she was still physically small and pregnancy and childbirth would lead to medical complications, and they felt she was not mentally prepared for motherhood: "You're still a girl they say, you still don't think well. You won't know how to care for a child they say. When you are bigger, then you will get the idea more or less."[4] This woman had had her first child two years later at age 18 and reported that her family and partner felt this was a more "appropriate" age.

Even childbearing at what many described as a "young" age (e.g. ≤19) elicited mostly positive reactions from the girl's partner and family. Among the few girls who described receiving a negative reaction from her parents, the reasons differed. One girl said her parents were worried the baby's father would leave her, saying it was the norm for boys to get girls pregnant and then leave. Another girl described her mother as sad at the news because her mother had hoped she would keep studying and have a career instead of having a baby.

Self Perceptions of Motherhood Among Adolescent Mothers

There was a wide variety in experiences and perceptions of motherhood among the adolescent mothers. A few found motherhood incredibly challenging and explicitly ascribed these challenges to their young age at initiation of childbearing. However, most expressed confidence and contentment in their role as mothers.

Motherhood as a learning process: The majority of the adolescent mothers who were still young at the time of the interview said they had more to learn, but seemed accepting of the idea of motherhood as a learning process. As one women said, "I am learning with my son, and if I don't know something, I go to my aunt."[5] Another woman described her experience similarly: "I feel good because, well, I now have my daughter, and with my daughter I am learning to do a lot of things. For example, when she was smaller, I didn't know how to hold her, carry her or bathe her. Now I carry her, we play, sometimes we sing, we dance, I teach her to count."[6] At the time of the interview, many of these women expressed confidence in their parenting after having learned with their first child. Having taken care of siblings and receiving help from family were both mentioned as important in learning to care for their children.

A minority of the adolescent mothers described adolescent parenting as extremely challenging due to insecurities around knowledge of child care and the overwhelming sense of

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[3] *"era yo una, una niña, se imagina?", "estaba yo bien chica", "como ella se casó chiquita pues tuvo joven a su niño"*

[4] *Estás pues chamaca dice, no todavía no piensas bien. No vas a saber dice el cuidado de un niño dice. Ya más grande pues ya te das la idea más o menos cómo.*

[5] *Voy aprendiendo con mi hijo y luego si yo no sé algo me dirijo a mi tía.*

[6] *Me siento bien porque, este, pues ya tengo a mi niña y con mi niña pues, voy a aprendiendo a, a hacer muchas cosas. Por decir este, de más chiquita, no sabía yo cómo agarrarla para, para cargarla o bañarla, y ahora pus (pues) ya, ya la cargo, jugamos, a veces nos ponemos a cantar, este, bailamos, le enseño a hacer, a contar las cosas y así.*

responsibility or frustration resulting from caring for children. Two respondents explicitly mentioned that they planned to tell their own children to wait until they were older to have children, because the participants did not want their children to go through what they had gone through. One woman who had her only daughter at 16 described how she would get exasperated and cry when her daughter was misbehaving. She felt that if she had waited until she was more mature, she would have been a different mother.

> *When I had her, I didn't have experience, and take note, I was a girl. I had her when I was 16, almost 17 and now I am 18 years old, and I understand that if I had been a mother more, more, had I been more mature, I think I would have been a different mother. The truth is, sometimes I get distracted. See when I had her, she was very whiny and I was exasperated. I was exasperated until I cried at her, "Sara[7], enough!" But I think if I had gotten pregnant later, things would have been different.[8]*

Though this description suggests a difficult transition to parenthood, this woman said she felt very confident in her parenting at the time of the interview. Similarly, many of the women who began childbearing during adolescence and had aged into adulthood (27 to 42 years at time of interview) reported feeling extremely fortunate to be mothers. They frequently described motherhood using adjectives such as "nice" or "beautiful."

Sources of Social Support in Parenthood

Social support was found to be critical for having a positive maternal experience. The participants' mothers, mothers-in-law, and boyfriends or husbands (referred to as partners) were listed as the primary sources of social support in assisting the women in this study.

Participants' mothers and mothers-in-law as critical sources of instrumental and informational support: The women's mothers and mothers-in-law in particular played an important role in transferring child-care knowledge and parenting practices from generation to generation. One young adolescent mother described the transfer of knowledge as a long chain in the making, saying "They (older mothers) also suffered, but there was someone who taught them, and it's also a chain that is created in this way, they say. No one is born knowing how to be a mother."[9] Participants described their mothers and mothers-in-law as providing both concrete and informational support. Many participants described their own mothers and mothers-in-law as caring for them during pregnancy and childbirth, for example by helping with household chores. When the baby was born, participants described their mothers and mothers-in-law as sharing in the direct care of the infant, such as bathing and diapering. Participants also described their mothers and mothers-in-law as teaching them how to bathe, feed, and generally

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[7] Name changed for confidentiality.

[8] *Cuando la tuve pus (pues) yo no tenía experiencia, y haga de cuenta que era yo una niña. Pus (pues) la tuve a los 16, casi a los 17, ahorita ya tengo 18 años y yo comprendo que si fuera yo sido una mamá, más, más, que yo estuviera más madura, yo creo que hubiera sido diferente madre. Pus (pues) la verdad, a veces sí como que desconcentra. Haga de cuenta que cuando la tuve…ahm era muy chilloncita y me desesperaba. Me desesperaba, que hasta me ponía a llorar con ella digo "ay Sara! ya!" y… pero sí, yo digo que si me fuera yo, me fuera yo ha embarazado más para allá, iban a ser diferente las cosas.*

[9] *También ellos sufrieron, pero pus (pues) también hubo quien les ensenó y también es una cadena como que se va haciendo así dice. Nadie nace sabiendo ser mamá.*

care for their children. As their children aged, participants sometimes relied on their own mothers, mothers-in-law and sisters-in-law to watch the children, though many expressed hesitance to leave their children with another person, even members of their close family. The majority of participants reported having someone they could go to for advice or help, whether it was her mother, mother-in-law, partner, grandmother or aunt.

Partners less likely to provide direct child care support: The women frequently described their partners as happy when they were told the news of the pregnancy and committed to ensuring the wellbeing of their children. However, descriptions of this commitment often took place at a high level rather than through direct interaction. For example, a few women, though they wanted to work outside the home, said they were forced to quit because their partner felt it was best for the children: "I was working in a clothing store and well, we got married and he didn't want me to keep working… because he says, 'no, you're not going to neglect the children.'"[10] Families frequently followed traditional gender roles with the women caring for the home and family, and the partners making money. The participants described their partners as playing with the children, but only in their free moments, and sometimes not at all. For example, participants described their partners helping watch the kids while they made tortillas or took a shower. One woman explained why her husband did not play with their children: "He doesn't play with them almost at all because of his work; it's really hard, so he gets home and even though the kids want (to play), he says, 'I'm too tired.'"[11] However, this pattern was not universal. A few women described their partners as their greatest source of support and deeply involved in the care of their children.

Sources of Challenges in Parenthood

The economic context within which the participants lived and the related concept of household financial strain were frequently mentioned as sources of concern. The birth of many children compounded financial challenges. Additionally, it seemed there were limited opportunities for women outside of motherhood. Though not explicitly linked to challenges of motherhood, many mothers had experienced difficulties in completing their education, sometimes prior to forming a family of their own and sometimes because of pregnancy and the responsibilities of motherhood.

More children, less time and money: Women who began childbearing during adolescence and had aged into adulthood had between three and eight children at the time of the interview and ascribed difficulties in parenthood to the number of children rather than their age of initiation. They recalled caring for their first child as relatively easy, but the birth of subsequent children made their lives increasingly difficult. Their attention became more divided and money tighter. As one woman said, referring to her first son, "He was just one. If I went somewhere, wherever I went, I brought him with, and now it's harder because they are more. That's why I say it's more work now than before."[12] Interestingly, the one woman with eight children was the

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[10] *Estaba yo trabajando en una tienda de ropa y pues ya después nos casamos y él ya no quiso que siguiera trabajando… porque dice no, no vas a descuidar a los niños.*

[11] *Él casi no juega con ellos, porque… o sea por el trabajo, como es más pesado, entonces llega y, aunque los niños quieran, luego dice él, es que vengo muy cansado.*

[12] *Namas (nada más) era una. Así no si me iba yo, a donde me iba yo pus (pues) me la llevaba yo, y ahora me cuesta más porque ya son más. …por eso digo que es más trabajoso ahora, que antes.*

only mother who did not share this view, instead saying, "Here, we like babies. Those who have more children are the richest."[13]

Difficulty of completing education: For most of the adolescent mothers, their life trajectories suggested that making money or forming a family were more viable options than completing school. Many of the women reported leaving school well before meeting their partners or having a child, often for financial reasons: either they or their family wanted them to begin working or the family did not have the resources to support their continued education. Other reasons for leaving school included disliking school and deciding to quit or quitting because they got married, entered into an informal union or got pregnant. Additionally, in many towns, educational offerings only extended to primary school. One of the women who originally quit school to have her baby returned to finish high school two years later. This woman was one of only two that reported finishing high school. These two women had an unusual level of support from their families and partners. One women's husband had a college degree and worked as a lawyer. The other woman's mother-in-law was insistent that she finish school and watched the child with help from her own daughters.

Education seen as unnecessary: Some women spoke about how once they had met their partner, school was no longer necessary. As one woman said, "I was still going to school when I got with him, but after two months, I didn't go anymore. What do I gain from going?"[14] Another woman said her mother sent her to high school, but she met her partner and decided to get married instead: "It's complicated too. My parents don't have a lot of money, for this reason, it's better that I decided not to keep studying, to get married."[15]

Expectations for the Future

As evidenced by the number of women forming families during adolescence and the life narratives described by some of the participants, early motherhood was a common life trajectory for women in the selected rural towns. Oftentimes, motherhood superseded other options including pursuing an education or a career.

Prioritization of children and motherhood over personal goals: The majority of the women focused on their children's futures in place of their own. All the women who began childbearing in adolescence but were adults at the time of the interview described future goals for themselves that centered entirely on their children. One woman summed this up well by saying, "As a mother, my priority is my children. Even if I don't accomplish anything, I hope I accomplish helping my children get ahead in life."[16] The same sentiment was common among the young adolescent mothers as well, but unlike the older adolescent mothers, many also spoke about the remnants of ambitions they had for themselves. Some of the adolescent mothers who were still young at the time of the interview spoke about wanting to return to school, but they listed many barriers including lack of financial resources, the absence of a local adult education program, fear of taking time away from their children, and feeling like their own time had

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[13] *Aquí nos gustan los bebés. Los que tenemos más hijos somos más ricos.*

[14] *Todavía cuando me junté todavía estuve yendo dos meses y ya de ahí ya no fui, y ya no. Qué gano con ir.*

[15] *Porque es complicado también. Como mi papás no tienen mucho recurso…por eso es que, mejor… decidí, ya no seguir estudiando, casarme.*

[16] *Como mamá, mi prioridad son mis hijos. … aunque para mí ya, ya no logre yo nada pero, que logre yo sacar adelante a mis hijos.*

passed. Only a few of the women expressed hope for achieving their educational and career goals in the end.

Nearly all the women expressed great hopes for their children, which frequently included getting an education and a career and "becoming someone" or "getting ahead in life." Many of the women talked about wanting their children to succeed where they had not. However, they also frequently spoke about the limited job opportunities in their towns.

Discussion

Using a mixed methods approach, this study demonstrated that adolescent motherhood, especially during late adolescence, is both common and socially acceptable among the rural poor in Mexico, but that the youngest mothers often occupied the most economically disadvantaged positions in these communities. Adolescent mothers frequently described the transition to motherhood as a learning process in which mostly their mothers or mothers-in-law provided instrumental support during the perinatal period and continued guidance as the children grew. Women saw their partners as sources of support as well, though descriptions of the partners' involvement often had them supporting the family financially, with limited direct child care help. The greatest challenges, reflected in both qualitative and quantitative data, stemmed from the economic environment and the birth of more children than the mother had planned or wanted. The life trajectories of the women suggested there were few opportunities for women outside of motherhood, and financial stability was frequently listed as a challenge. The birth of additional children on the heels of a prior birth or in large numbers added to the challenges as responsibilities multiplied.

Adolescent Parenting in Context

Our findings on the frequency and acceptability of adolescent motherhood are in line with previous research. In our quantitative sample of mothers who had a least one child under age 5 and lived in rural Mexico, 73% of women began childbearing before the age of 20. Most of the women in our sample lived in Chiapas, the poorest state in Mexico (44) with one of the highest rates of adolescent childbearing (20.1% of births were to adolescent mothers in 2014).(45) Previous research suggests female adolescents living in rural Mexico are taught that motherhood is the path to adulthood, and becoming a mother bestows upon them a valued place in the social fabric of the community.(24)

Similar to findings from other countries and previous studies in Mexico, adolescent mothers tended to live in situations of greater disadvantage than women who began childbearing later in life. In this sample of women representing the rural poor, adolescent mothers had the lowest levels of education and wealth and the most depressive symptoms compared with older mothers. Many of the women quit school to work or become more serious with a boyfriend, because of pressure from their families or an awareness that their continued school attendance was a strain on their parents' resources. In turn, financial pressure was frequently mentioned as a challenge to optimal parenting, illustrating a cycle of poverty. Previous studies have found that young women in rural areas are often encouraged to leave school and marry or form a union at a young age so that their families no longer have to support them.(24) This further limits young mothers' chances for economic independence or stability and reinforces the intergenerational transfer of poverty.

The Transition to Motherhood

Adding to the sense that motherhood is equated with adulthood, very few of the girls and women interviewed described adolescent mothers in a way that would suggest they exhibited the characteristics often ascribed to the developing adolescent, such as egocentric thinking. Themes of refocusing attention from the self to the child were more common. A minority of women described adolescent mothers as quicker to become frustrated and more interested in going to discos than older mothers. These characteristics may be related to underdeveloped problem solving skills and more egocentric behaviors associated with early adolescence.(16) However, the scarcity with which these descriptions arose was notable.

Many of the women interviewed, regardless of their age at childbirth initiation, seemed to have reached the final stage of "becoming a mother," portraying a sense of confidence and competence in their skills as a parent. Others, more new to parenting or adjusting to new stages of their children's development, described the learning process as underway, consistent with stage 2 of BAM. Support from their mothers, mothers-in-law and partners was important for moving from stage 2 to stage 3: incorporation of their new role into their conceptualization of self. This progression through the stages of becoming a mother is in line with BAM theory and suggests that participants were developing a maternal identity and moving towards a sense of competence and confidence in their parenting. However, descriptions deviated somewhat in the 3rd stage: incorporation of the new role into conceptualizations of self and future expectations. Participants described plans for the future that often subsumed their own hopes under their hopes for their children. This suggests that in this context, women take on a more one-dimensional role as mother rather than incorporating the role of mother into their existing roles and future dreams. This could be due to the limited opportunities for girls and women outside of motherhood in these communities.(24) It may also be due to cultural expectations around gender. Under the more traditional expectations for ideal female behavior, women are expected to sacrifice their goals to tend to the household and care for their husband and children.(29) Pursuing an education or a career may create role conflict.

Having many children seemed to decrease satisfaction in the parenting role. Mothers felt more strain on their finances and their time. Having many children also seemed to limit future aspirations. Young mothers, because of their earlier initiation of childbearing, tend to have more children over their lifetime.

Parenting Quality

The combination of economic disadvantage, low levels of education, and the social importance of motherhood likely impacts parenting experiences and the quality of parenting in divergent ways. Low socioeconomic status has been linked with poor maternal and child outcomes,(46) but social support is associated with increased confidence in parenting.(47) In our sample, parenting quality and the stimulating quality of the home environment (assessed using the HOME scale) were similar across the different ages of childbirth initiation, with women who began childbearing in adolescence performing only slightly worse than women who began childbearing in early adulthood. However, adolescent mothers' descriptions of their parenting did not reflect this trend. Instead they often portrayed a sense of confidence and competence in parenting. The expressions of confidence and competence in parenting among adolescent

mothers, however, also suggests that when the community is accepting and supportive of mothers' efforts regardless of age, young mothers are capable of fulfilling the maternal role. Motherhood is often seen as the ultimate goal for Latina women, especially among women living in poverty who see few other opportunities for "belonging" in society,(23, 29) and the social status conferred by motherhood may increase women's confidence. Research consistently identifies social support as critical to achieving competence and confidence as a mother.(47-50) In this context, supportive community norms and social support likely provide an important buffer to the challenges accompanying early childbearing.(28)

This study is subject to a number of limitations. The quantitative sample included very few women who were under 19 years of age at the time of interview (6% of the sample), limiting our ability to generalize to the larger population of current adolescent mothers. Additionally, 12 communities originally selected for inclusion in the study (6% of the total communities selected) did not provide baseline data. The qualitative sample included only one woman who began childbearing before the age of 16, which we described as "early adolescent" childbearing. This age of initiation may trigger a different social response and is characterized by a different stage of emotional and cognitive development, resulting in a unique experience that we were unable to explore. Finally, mothers were asked to recall their experiences as new parents. For a few, this experience occurred more than 20 years ago, while for others it was very recent. This may distort the experience reported by older women in the sample. Finally, mothers may have felt hesitant to share parenting challenges for fear of what the researcher would think or do in response. We sought to create a nonthreatening environment by having a trained field director with extensive experience collecting data in similar environments introduce the researcher to participants, creating ample time for questions before beginning the interviews, and conducting the interviews in a conversational and friendly tone. Many participants shared very personal experiences, leading us to believe we were successful in creating the target environment.

Implications for Programs and Policies

The information from this study brings to light a few opportunities for programs or policies that could support adolescent mothers and their children in these and similar communities. Education was frequently mentioned as a means to success for the participants' children, but few women felt a strong desire or ability to finish their own education because of responsibilities in their homes, the lack of infrastructure for adult education or continuing education beyond primary school, or for financial reasons. The provision of child care could free up time for women interested in returning to school. Some partners were adamant about women staying at home for the benefit of their children. Sensitization efforts and time may soften this challenge, but many women would be hard pressed to go against the wishes of their partners to pursue an education or a career. Additionally, many towns did not have secondary schools, and those that did would be full of students much younger than these women. Therefore, adult schools could be a more acceptable model. Interventions aimed at supporting education and career development demonstrate potential for increasing the number of teens pursuing further education.(51) Unfortunately, evidence from low- and middle-income countries on the effectiveness of adult education programs for adolescent mothers is scarce. Additionally, even if these barriers to education were removed, mothers may continue to feel their own time for pursuing an education has passed. For many of the women that were interviewed, their focus had

shifted from their own dreams to achieving success for their children. This points to a need for programs and policies that prevent school dropout.

Having more children than desired was a source of stress for many mothers. Even two children that were born close in time caused strain. Many younger women described only wanting one or two children so they could invest in the children's wellbeing. Previous research demonstrates that with fewer children, mothers are able to invest more deeply in the children they have (52, 53) suggesting efforts to support women in controlling their fertility could be beneficial. Older women whose first birth was in adolescence described having more children than they wanted. We did not ask specifically about use of or attitudes toward contraception, so more specific intervention efforts must rely on others' work.

By understanding the context of adolescent childbearing as well as perceptions of the experience of motherhood from adolescent mothers, this study provides the foundations for identifying how to support young women as they become mothers and continue in this role.

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Figure 1. Flow Chart of Selection, Enrollment and Identification of Quantitative Sample

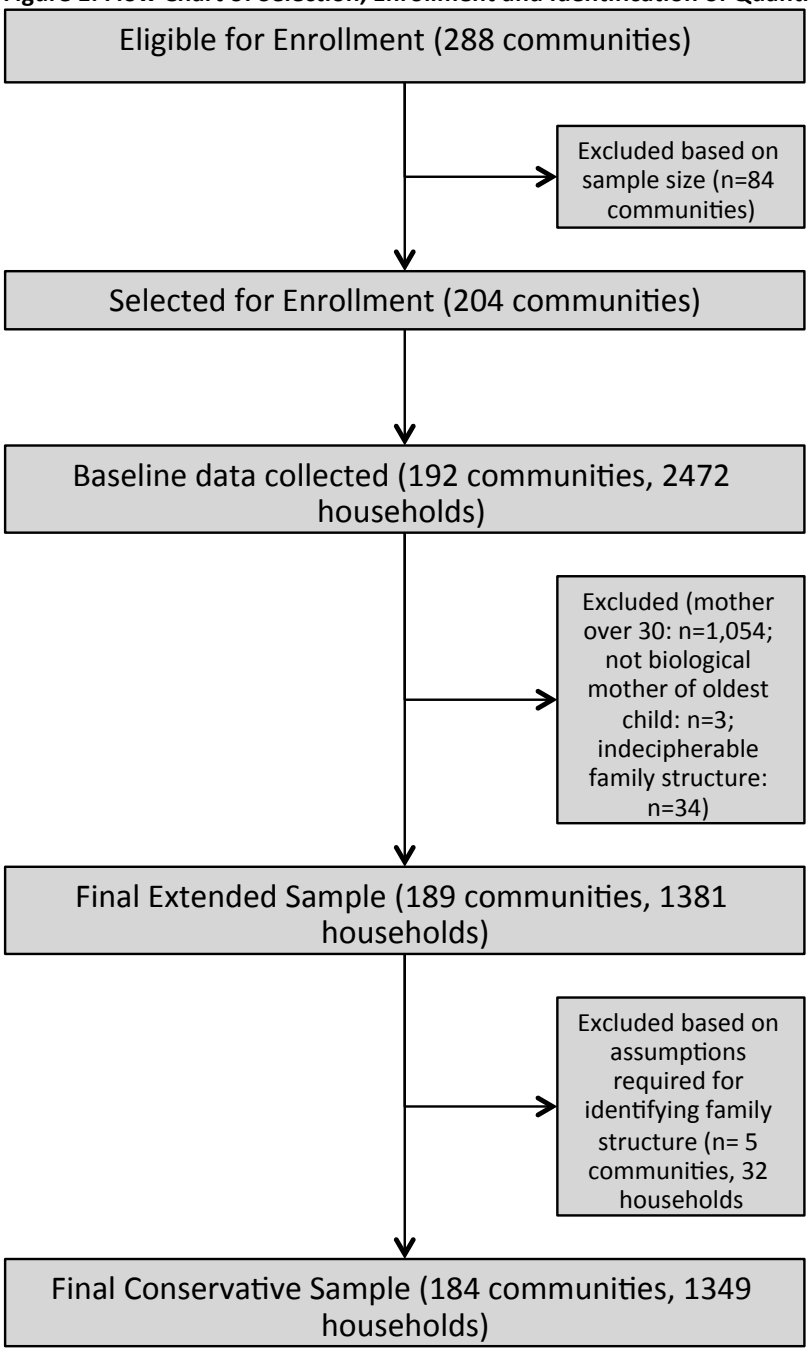

Table 1. Distribution of Mothers by Their Age at First Birth and Age at Interview (N=1381)

	Age at Interview							
Age at First Birth	**≤19 years**		**20-25 years**		**26-30 years**		**Total**	
	n	Percent	n	Percent	n	Percent	n	Percent
Early Adolescence (≤16)	61	68.5	204	34.8	134	19	399	28.9
Late Adolescence (17-19)	28	31.5	277	47.2	305	43.3	610	44.2
Early Adulthood (20-30)	-	-	106	18.1	266	37.7	372	26.9
Total	89	100	587	100	705	100	1381	100

Table 2. Socioeconomic Factors and Maternal Characteristics by Mother's Age at First Birth (N=1,381)

Age at Interview	**Age ≤19**			**Age 20-25**			**Age 26-30**		
Age at First Birth	**≤16**	**17-19**	**≥20**	**≤16**	**17-19**	**≥20**	**≤16**	**17-19**	**≥20**
Maternal Characteristics									
	% (n)	% (n)		% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Completed junior high (grade 9)	26.2 (16)	50.0 (14)	--	11.3 (23)	19.0 (52)	26.4 (28)	4.5 (6)	10.8 (33)	15.2 (40)
	17-19 vs. ≤16 at first birth: p-value<0.001; ≥20 vs. ≤16 at first birth: p-value<0.001								
Completed primary (grade 6)	85.2 (52)	89.3 (25)	--	83.3 (170)	82.5 (226)	87.7 (93)	68.7 (92)	80.3 (245)	84 (221)
	17-19 vs. ≤16 at first birth: p-value=0.077; ≥20 vs. ≤16 at first birth: p-value=0.002								
Depressive symptoms (% ≥16)	15.5 (9)	11.1 (3)	--	14.2 (29)	14.1 (39)	17.9 (19)	26.9 (36)	16.1 (49)	10.6 (28)
	17-19 vs. ≤16 at first birth: p-value=0.071; ≥20 vs. ≤16 at first birth: p-value=0.009								
Household Characteristics									
	% (n)	% (n)		% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Upper half (above median) of wealth	43.3 (26)	50.0 (14)	--	45.6 (93)	43.7 (121)	50.9 (54)	42.5 (57)	51.5 (157)	57.9 (154)
	17-19 vs. ≤16 at first birth: p-value=0.343; ≥20 vs. ≤16 at first birth: p-value=0.007								
Father present	80.3 (49)	82.1 (23)	--	95.6 (195)	90.6 (250)	83 (88)	99.3 (133)	94.7 (288)	93.6 (248)
	17-19 vs. ≤16 at first birth: p-value=0.010; ≥20 vs. ≤16 at first birth: p-value<0.001								
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total children at time of interview	1.6 (0.8)	1.04 (0.2)	--	3.5 (1.1)	2.8 (0.9)	1.7 (0.8)	5.31 (1.4)	4.1 (1.2)	2.9 (1.1)
	17-19 vs. ≤16 at first birth: p-value<0.001; ≥20 vs. ≤16 at first birth: p-value<0.001								
Household crowding (people/rooms)	2.7 (1.7)	2.4 (1.3)	--	3.1 (1.6)	2.8 (1.4)	2.2 (1.2)	3.8 (1.9)	3.3 (1.8)	2.7 (1.4)
	17-19 vs. ≤16 at first birth: p-value<0.001; ≥20 vs. ≤16 at first birth: p-value<0.001								

Sample size varies because of missing values on different variables.
Abbreviations: SD=Standard Deviation
P-values are for comparisons between women who began childbearing at ages 17-19 vs. ≤16 and women who began childbearing at age ≥20 vs. ≤16 and are adjusted for mother's age at interview.

Table 3. Parenting Behaviors and the Home Environment[a] by Maternal Age at First Birth (N=1,144)

Age at Interview	**Age ≤19**			**Age 20-25**			**Age 26-30**		
Age at First Birth	**≤16**	**17-19**	**≥20**	**≤16**	**17-19**	**≥20**	**≤16**	**17-19**	**≥20**
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
HOME Total (45 items)	25.4 (6.0)	27.2 (4.04)	--	24.8 (6.6)	25.3 (6.3)	26.2 (5.9)	24.0 (6.1)	24.8 (6.05)	25.5 (6.0)
	17-19 vs. ≤16 at first birth: p-value=0.084; ≥20 vs. ≤16 at first birth: p-value=0.003								
Maternal Responsivity (11 items)	7.2 (2.6)	8.1 (2.2)	--	7.1 (2.8)	7.6 (2.6)	7.8 (2.6)	7.0 (2.9)	7.5 (2.7)	7.6 (2.6)
	17-19 vs. ≤16 at first birth: p-value=0.007; ≥20 vs. ≤16 at first birth: p-value=0.003								
Acceptance of Child (8 items)	6.1 (1.2)	5.9 (0.6)	--	5.7 (1.6)	5.6 (1.6)	5.9 (1.5)	5.8 (1.6)	5.8 (1.7)	5.7 (1.5)
	17-19 vs. ≤16 at first birth: p-value=0.445 ≥20 vs. ≤16 at first birth: p-value=0.393								
Organization of the Environment (6 items)	4.2 (1.2)	4.3 (1.03)	--	4.02 (1.2)	4.03 (1.3)	4.0 (1.2)	3.8 (1.2)	4.0 (1.3)	4.1 (1.2)
	17-19 vs. ≤16 at first birth: p-value=0.386; ≥20 vs. ≤16 at first birth: p-value=0.285								
Learning Materials (9 items)	2.6 (2.0)	3.1 (2.1)	--	2.4 (2.3)	2.6 (2.2)	2.6 (2.1)	2.02 (1.9)	2.3 (2.01)	2.5 (2.03)
	17-19 vs. ≤16 at first birth: p-value=0.146; ≥20 vs. ≤16 at first birth: p-value=0.043								
Parental Involvement (6 items)	2.8 (1.4)	3.0 (1.5)	--				2.8 (1.6)	2.8 (1.5)	2.9 (1.5)
	17-19 vs. ≤16 at first birth: p -Value=0.651; ≥20 vs. ≤16 at first birth: p -Value=0.085								
Variety in Experience (5 items)	2.6 (1.03)	2.8 (0.52)	--	2.6 (0.8)	2.6 (1.0)	2.6 (1.1)	2.6 (1.04)	2.5 (1.0)	2.6 (1.0)
	17-19 vs. ≤16 at first birth: p-value=0.703; ≥20 vs. ≤16 at first birth: p-value=0.560								

[a] Measured using the Home Observation for Measurement of the Environment. Data are presented as average sums of responses.
Sample size varies because of missing values on different variables.
Abbreviations: SD=Standard Deviation; HOME=Home Observation for Measurement of the Environment.
P-Values are for comparisons between women who began childbearing at ages 17-19 vs. <19 and women who began childbearing at ages ≥20 vs. <19 and are adjusted for mother's age at interview.

Table 4. Characteristics of Study Population Interviewed for Qualitative Data

	N	Mean Age at First Birth (min, max)	Mean Age at Interview (min, max)	Mean Number of Children at Interview (min, max)
Young Adolescent Mothers *women who began childbearing in adolescence and were in their teens or early 20s at the time of the interview*	16	17.1 (16,19)	19.5 (17, 22)	1.4 (1, 3)
Former Adolescent Mothers *women who began childbearing during adolescence but had aged into adulthood*	7	17.4 (15, 19)	33.1 (26, 42)	5.3 (3, 8)
Never Adolescent Mothers *women who did not begin childbearing until age 20 to 30*	7	23.3 (20, 28)	29.7 (25, 34)	2.3 (1, 6)

Chapter 3. Supporting Adolescent and Former Adolescent Mothers and Their Children: A Cluster-Randomized Controlled Trial of a Parenting Education Program in Rural Mexico

Introduction

Adolescent childbearing is frequently accompanied by poverty, low levels of maternal education, and maternal depression,(1-4) and these challenges often persist as the mothers age into adulthood.(5, 6) The challenges associated with adolescent childbearing contribute to lower levels of cognitive stimulation for the children of adolescent parents and/or parenting difficulties, and play an important role in children's cognitive development.(7-9) The important implications of these challenges can be seen in the developmental deficits recorded among children of adolescent mothers compared to children born to older mothers.(10, 11) Because these patterns of lower maternal educational attainment, less supportive parenting and child learning difficulties may persist as adolescent mothers and their children age,(12) it is important to consider the needs of former as well as current adolescent mothers and their children.

Mexico has one of the greatest total numbers of adolescent pregnancies (677,000 in 2009) (13) because of its large population size and high teenage fertility rate (63.5 per 1000 in 2014).(14) Recent evidence from Mexico's National Survey of Health and Nutrition indicated that while overall fertility rates declined since 2006, adolescent fertility rates have actually increased.(15) Consistent with global patterns, adolescent pregnancy in Mexico is associated with low educational attainment, low socioeconomic status and household crowding.(16-18)

Parenting programs have shown positive effects on child cognitive and social-emotional development as well as improvements in parenting knowledge and behaviors that contribute to child development.(19-22) These effects are also evident among adolescent parents, though the evidence is not as robust as among samples without age restrictions. A systematic review of individual and group-based adolescent parenting support programs showed access to a parenting program was associated with improved parent and child responsiveness as well as parent-child interactions.(23) The review only included eight studies, however, due to strict inclusion criteria and an overall scarcity of evaluations of adolescent parenting programs. The included programs were diverse in intervention design and the outcomes they measured, which limited the ability to draw concrete conclusions about any one intervention format or specific finding. The authors concluded that while parenting programs seemed to benefit adolescents and their children, a stronger evidence base for adolescent parenting programs is needed. Additionally, this review only included studies in which the participants were aged 20 or younger; how results may generalize to former adolescent parents is unknown.

Evidence on the impact of parenting support programs on adolescent and former adolescent mothers and their children in Latin America is even scarcer. One randomized effectiveness study showed that a home-visiting program for adolescents implemented in low-income neighborhoods in Santiago, Chile had a positive impact on maternal and child outcomes.(24) Health educators visited low-income, unmarried, first time adolescent mothers approximately monthly, beginning in their third trimester and continuing through the child's first year of age. When compared with receiving standard prenatal and well-baby care, participants receiving the additional home-visiting program demonstrated short-term benefits (defined as approximately one year) to maternal mental health (including depressive and somatic symptoms, anxiety, and social isolation) and receptive and expressive language development among the children. These effects were no longer detectable when the children reached age 48 months,

however.(25) The authors speculated that the effects faded over time because the social condition of the mothers remained the same despite the intervention, and mothers and their children reverted to pre-intervention patterns after the intervention ceased. They also posited that the loss to follow-up in the interim (33.6%) could have contributed to the diminished effects.

Although many studies have reviewed the effectiveness of programs to prevent adolescent pregnancy,(26-28) there has been relatively little attention given to adolescent mothers and their children after birth. Additionally, most of the limited evidence on the effectiveness of parenting programs among adolescent mothers comes from high-income countries,(23) where less than 5% of adolescent childbirths occur.(29) The consequences of adolescent childbearing can vary widely across social contexts.(30) As a result, findings from evaluations in high-income countries may not be generalizable to contexts that are drastically different in their attitude towards and treatment of young parents. Finally, most studies use the mother's age at the time of the study as the metric for defining adolescent motherhood rather than age at first birth, thereby omitting a large portion of this high-risk population.

In Mexico, the conditional cash transfer program, *Prospera* invests in education and health in an effort to break the cycle of poverty through human capital development. *Educación Inicial* is a parent support intervention overlaid on *Prospera* that aims to improve child development outcomes through early stimulation and parent education. *Educación Inicial* works with pregnant couples, parents (mostly mothers) and children in their first 5 years. The program targets rural and resource poor areas of Mexico with limited availability of preschool programs. An evaluation of the impact of *Educación Inicial* on child cognitive development showed positive effects, especially for children with low developmental scores at baseline.(31)

Our objective was to assess whether access to *Educación Inicial* had differential impacts on parenting behaviors and child cognitive development depending on mother's age at the birth of her first child. We also estimated the effect of access to *Educación Inicial* on parenting behaviors and child cognitive development within subgroups defined by mother's age at first birth. We hypothesized that the parenting program would have larger benefits among the population of women that began childbearing in adolescence. We predicted these families would have the potential for greater gains because of their socioeconomic standing.

Methods

Trial Design

This study used a cluster-randomized, controlled, effectiveness design with equal allocation to two treatment arms and one control arm, and randomization at the community level. The original sample included 2,472 children from 204 rural communities in three states: Chiapas, Puebla and Oaxaca (see (31) for details of the full study). *Prospera*, Mexico's conditional cash transfer program, was available in all selected communities. Communities in the first treatment arm (EI only) received access to *Educación Inicial*. In the second treatment arm (EI+promotion), communities received access to *Educación Inicial*, and the parenting program received additional administrative support and promotion from *Prospera*, the conditional cash transfer program. Communities in the control arm did not receive *Educación Inical* but could receive it after completion of the study. Assessors collected baseline data in 2008, prior to program implementation. Follow-up data were collected in 2012. Survey instruments included data on basic household demographics, the household environment, parenting practices, and child health

and development. Assessors visited households in pairs of two to collect data from participants; one assessor was trained in the collection of anthropometric data and the other in child development questionnaires. Assessors were blinded to study arm, but allocation could not be concealed from participants as the intervention was a group-based program. This study was approved by the Institutional Review Boards at the University of California, Berkeley and the Instituto Nacional de Salúd Pública [National Institute of Public Health] (INSP) in Cuernavaca Mexico (Protocol ID: 2010-05-1528).

Study Population

To be eligible for enrollment in the study, communities were required to have had a high proportion (>70%) of families enrolled in *Prospera*, no prior implementation of *Educación Inicial* in the previous five years, fewer than 2500 residents, and at least 15 families with children between the ages of 0 and 2 years old. Researchers at INSP identified 288 communities that met these criteria from a complete list of communities provided by Mexico's Instituto Nacional de Estadística y Geografía [National Institute of Statistics and Geography] (INEGI) (**Figure 1**). Using a stratified sampling strategy, researchers randomly selected 204 of these communities – 102 indigenous communities (>80% of the community spoke an indigenous language) and 102 non-indigenous communities. Researchers then randomized these communities to the three study arms within strata of indigenous using the SURVEYSELECT procedure in SAS. In each strata of indigenous, 35 communities were allocated to each treatment arm and 32 communities to the control arm. All low-income families (defined by enrollment in *Prospera*) with children 0 to 18 months of age were invited to participate in the study.

A total of 2,472 households were surveyed at baseline. Of the total sample, 2,467 of the respondents were the mothers (rather than grandmothers, fathers or other relations) of the children enrolled in the study. Adolescent mothers were identified by subtracting the age of their oldest child living in the household from the mothers' age. Because mother's age at first birth was determined based on children living in the household, we limited our sample to mothers age 30 and under. Capping the age at 30 made it less likely that a mother's children were old enough to have moved out prior to program initiation. There were a total of 1,418 mothers age 30 or under at the time of enrollment. We excluded 34 of the households because we were unable to identify which children living in the household belonged to the mother. Another three households were excluded because the mothers' oldest children were adopted. In an additional 32 households, the mothers' children could only be identified with assumptions (e.g. all age-eligible children in the household were born to the only woman in the household even if there were men who could have been the father living in the home). We kept these 32 households in the final sample in order to avoid systematically excluding households with more residents and more complex familial relationships. The sample at baseline included 1,381 mother-child dyads from 189 communities.

In 2012, 653 and 809 households, respectively, were not included in the analyses because of missing outcome data on the parenting behavior and child development outcomes. In some cases, missing outcome data led to the exclusion of entire communities. In the final analysis, there were 728 households from 109 communities in the analysis of parenting behaviors, and 572 households from 88 communities in the analysis of child development.

Intervention Description

Mexico launched the conditional cash transfer program *Prospera* (formerly *Oportunidades* and initially *Progresa)* in 1997 with the aim of incentivizing investments in human capital development (e.g. school attendance, health clinic visits, etc.) by providing cash to the female head of household in exchange for complying with the program requirements. *Prospera,* operated by the Secretaría de Desarollo Social [Secretary of Social Development] (SEDESOL), was ongoing at the time this study was initiated, and all enrolled communities had a high level of participation in the cash transfer program. It was hypothesized that *Prospera's* impact on health and development could be bolstered by coupling the program with a parenting education program.

Educación Inicial is a parent support intervention overlaid on *Prospera*. Operated by the Secretaría de Educación [Secretary of Education], *Educación Inicial* was implemented in resource poor rural communities across Mexico. The program works with pregnant couples and parents of young children (<5 years) to increase parenting knowledge and skills. In interested communities, community members identify a *promotora*. The *promotora* participates in an intensive two week training session each year and receives feedback and guidance from his or her local supervisor during frequent visits. *Promotoras* lead weekly sessions with parents who are pregnant or have children 0 to 4 years old, engaging participants in topics such as care during pregnancy, nutrition, hygiene, and activities that promote cognitive stimulation and social-emotional development. The program is described in depth in (31).

Primary Outcomes

The primary outcomes included measures of parenting behaviors and direct assessments of child development. Parenting practices were measured using the Family Care Indicators (FCI).(32) The FCI is based on the Home Observation for Measurement of the Environment (HOME) (33) and assesses child care practices and the presence of important caregiving resources in the home (i.e. books and source and variety of toys). A count of parent activities, the number of types and sources of toys, and whether or not there were books or magazines in the household (0,1) formed the total FCI score. This validated scale has been used successfully in numerous low- and middle-income (LAMI) countries as part of the United Nations International Children's Emergency Fund (UNICEF) Multiple Indicator Cluster Surveys (MICS).(34) Child cognitive development was measured using the McCarthy Scales of Children's Abilities.(35) The McCarthy Scales were adapted for use in Mexico by researchers at the Instituto Nacional de Perinatología [National Institute of Perinatology] in Mexico City and have been used successfully in Mexico in a previous study.(36) Because there are not international standards to which to compare, we normalized the McCarthy scores to the study population within 2-month age groupings. We then transformed the z-score so that it had a mean of 100 and a standard deviation of 15. Previous studies using developmental outcome measures in low- and middle-income countries have used similar approaches (e.g.(37)).

Covariates

Our main models included variables indicating the state of residence (Puebla, Chiapas or Oaxaca) as well as whether or not the community in which the family lived was majority indigenous (>80% of population spoke an indigenous language). These variables reflected the

fact that communities were clustered within states and accounted for the stratified randomization process. Sensitivity analyses included additional covariates in an attempt to account for loss-to-follow-up and residual confounding after randomization. These variables included the number of household residents, the number of children in the household, the number of children belonging to the mother, household crowding (number of rooms in the home divided by the total number of residents), household wealth, maternal education, child age in months, and child birth order. To create the household wealth measure, we conducted a principal components analysis using 20 household assets (e.g. computers, books, cars and refrigerators).(38) We rotated the factor loads using the varimax rotation and logged the first principal component to account for skewness. Maternal education encompassed four categories: 1) completed kindergarten or less, 2) highest course completed was primary school, 3) highest course completed was secondary school, and 4) completed high school or a higher degree program.

In order to assess balance in our outcomes across our treatment arms before program implementation, we used baseline measurements of parenting behaviors and child cognitive development. The tools used to measure these constructs (the Home Observation for Measurement of the Environment (HOME) (33) and the Ages and Stages Questionnaire (ASQ) (39)) were different from but analogous to the tools used to measure the same constructs at follow-up (the FCI and the McCarthy Scales). The HOME measures opportunities for stimulation and support of the child in his or her environment. It includes seven subscales, which together comprise the HOME total score. The ASQ measures child cognitive development. Three subscales were applied which measured communication, gross motor and personal-social skills. The ASQ was transformed into an age-adjusted z-score within two-month age groups using the study population as its own reference, and scores were centered on 0 with a standard deviation of 1.

Effect Modifier

We examined interaction by mother's age at the birth of her first child. We chose mother's age at first birth rather than age at the birth of the target child or age during the study because many of the challenges associated with adolescent motherhood, such as poverty and low educational attainment, persist even as adolescent mothers grow into adults.(5, 6) Mother's age at the birth of her first child was split into three categories: early adolescence (≤16 years), late adolescence (17-19 years) and adulthood (20-30 years). Childbearing before the age of 16 is associated with a greater risk of poor birth outcomes (e.g. prematurity and low birth weight),(40) and by this age, students are old enough that they could have completed secondary school. To distinguish late adolescence and adulthood, we used the World Health Organization definition of teenage pregnancy with 19 as the upper limit.(29)

Statistical Analysis

We began by assessing the balance of a range of covariates across treatment arms at baseline. Due to sample attrition, we also compared households with complete follow-up to households lost-to-follow-up between 2008 and 2012. We then reassessed the balance of baseline data across the treatment arms among the sample of households with complete follow-up information to assess whether attrition was differential by treatment arm.

Our parameters of interest were the mean differences in the effect of assignment to each treatment arm (EI only and EI+promotion) compared to the control arm on our two outcomes (parenting behavior and child development), comparing program effects across families in which the mother began childbearing during early adolescence, late adolescence or adulthood. We conducted intent-to-treat analyses including indicator variables for treatment assignment interacted with indicator variables for mother's age at the birth of her first child as well as indicators for state and community indigenous status, reflecting the design of the study. Because families within a community were likely more similar to each other than to families in other communities, we used cluster-robust standard errors to account for clustering within the data. The following represents our main linear regression model:

$$Y_{ijkl} = \alpha + \beta_1 T_{1_j} + \beta_2 T_{2j} + \beta_3 A_{1i} + \beta_4 A_{2i} + \beta_5 T_{1_j} * A_{1i} + \beta_6 T_{1_j} * A_{2i} + \beta_7 T_{2j} * A_{1i} + \beta_8 T_{2j} * A_{2i} + \beta_9 I_k + \beta_{10} S_{1l} + \beta_{11} S_{2l} + \varepsilon_{ijkl}$$

Where Y_{ijkl} is the mean outcome for individual *i* in community *j* in indigenous community strata *k* and state *l*. T_1 and T_2 are indicators for treatment arm (T_0 is the control group and serves as the baseline). A_1 and A_2 are indicator variables for mother's age at first birth (early adolescence, late adolescence), and adult serves as baseline. The variables I_k and S_l are indicator variables for indigenous community strata and state of residence. These were included in all models because they reflect the design of the study. Finally, ε_{ijkl} is an error term.

The betas on the interaction terms determine differences in program effect across mother's age at first birth. For example, β_5 is the difference in the effect of T_1 versus T_0 comparing mothers who began childbearing in early adolescence (A_1) to mothers who began childbearing in adulthood (A_0). To determine the effect of the program within subgroups defined by mother's age at first birth we added the corresponding betas. For example, the parameter $\beta_1 + \beta_5$ is the mean difference in Y_{ijkl} comparing households in the EI only treatment arm to households in the control arm among mothers that began childbearing in early adolescence. A p-value of 0.05 was used to establish statistical significance for all comparisons.

We conducted sensitivity analyses to evaluate the robustness of our findings to misspecification of the sample population as well as potential bias due to differential attrition and residual confounding after randomization. We also explored whether differences in mother's age at the time of the study and child's birth order across categories of mother's age at first birth influenced our results. In order to identify a woman as a current or former adolescent mother, we subtracted the age of her oldest child in the household from her age. However, it was sometimes difficult to identify the women's oldest children due to complicated household structures. Most mother-child dyads were clearly identifiable, but some required additional assumptions for identification. The main analyses were run including all identified mother-child dyads in order to ensure that more complicated household structures were not systematically excluded from the analysis. We reran the main analysis among the mother-child dyads that were identified without assumptions in order to check that estimates remained constant.

We used inverse probability weighting (IPW) to address attrition. We selected variables that were associated with attrition and either outcome, and used these to predict the probability of attrition for each household. These variables included the number of household residents, the number of children in the household, the number of children belonging to the mother, child birth

order, household crowding, household wealth, and maternal education.[17] We then reran our main models with each household weighted by the inverse of its probability of attrition. Assuming the model for attrition is correct and attrition is independent of the outcome given the covariates, weighting creates a pseudo-population that mirrors the population at baseline, thereby restoring randomization. We used stabilized weights to reduce variability in our estimates.(41) The weighted models also included any covariates that remained unbalanced across the treatment arms and were associated with our outcomes in order to increase the precision of our estimates and assess the robustness of our findings to differences in the distribution of baseline variables that could lead to confounding. The wealth asset index was the only measured covariate that met these criteria. To assess the impact of positivity violations on our results, we repeated the weighted analysis excluding variables in which treatment did not vary within all levels of the covariate (state of residence and household crowding) and after categorizing the remaining variables so that treatment varied within each category (number of household residents, the number of children in the household, the number of children belonging to the mother, and maternal education). These models continued to use the wealth index as a continuous variable in the calculation of the weights and also included wealth as a covariate in the regression models.

In order to ensure that we had isolated the impact of mother's age of first birth from the impact of mother's age during the study, we reran our unadjusted model among mothers that were age 20 or older at enrollment into the study. This allowed mother's age of first birth to continue to vary, but restricted the ages at which the mothers and their children were assessed to 20-30 years.

Women who began childbearing earlier in life had more opportunity to have more children over their lifetime. Therefore, our final sensitivity analysis explored the extent to which differences among families in which the mothers began childbearing at different ages were due to the birth order of the participating children. To address this, we reran our unadjusted models including child birth order as a covariate.

Results

At baseline, the distribution of mother, child and household characteristics were well balanced across the treatment arms leading to confidence in the randomization based on observed covariates. The significant loss-to-follow-up between the two rounds resulted in a final sample that was slightly less remote and had a higher average socioeconomic characterization (e.g. more mothers completed primary school and more households were in the top median of wealth) than the original sample (**Table 1**).

We compared baseline covariates across treatment arms among the sample included in the follow-up to assess whether attrition was differential by treatment arm (**Table 2**). Only one of the differences reached statistical significance; mothers in the EI+promotion arm were 0.63 (95% CI=0.029, 1.227) years older than mothers in the control arm on average when they began childbearing. We also compared baseline covariates across categories of mother's age at first birth (**Supplemental Table 1**). Women who began childbearing at different ages differed in many ways. For example, on average, women who began childbearing before the age of 17 had

[17] Although the HOME scores appeared somewhat unbalanced between households that were lost and those that were followed, we did not use them to predict attrition because this would have resulted in a further reduction in sample size (additional loss of 132 households).

lower levels of socioeconomic position (e.g. less secondary school completion and lower household wealth), had more children and lived in more crowded households than mothers who began childbearing after age 20.

On average, women in the final sample began childbearing at age 18.3 and were aged 25.4 at the time of enrollment in the study. The mean number of children was 3.1 and the mean household size was 5.7. Education levels were low, with only 17.9% of women having completed secondary school (grade 9) or higher. The children selected for cognitive assessment were 8.9 months of age at the time of enrollment and were the third child on average.

Differences in Effect of *Educación Inicial* on Child Development and Parenting Behaviors by Mother's Age at First Birth

When comparing differences in associations with assignment to the EI+promotion versus control arm on the McCarthy Scales, children born to never adolescent mothers showed the greatest gains (**Table 3** and **Figure 2**). Children of mothers who began childbearing in early adolescence showed far fewer gains associated with assignment to the EI+promotion arm than children of mothers who began childbearing in adulthood on the Verbal (difference in magnitude of associations=-8.19; 95% CI=-15.50, -0.88) and the Memory Scales (difference in magnitude of associations=-7.22; 95% CI=-14.31, -0.14). The children of never adolescent mothers in the EI+promotion group scored significantly better than the children of never adolescent mothers in the control group (difference on General Cognitive Index=6.68; 95% CI=0.56, 12.80; difference on Verbal Scale=6.05; 95% CI=0.12, 11.99; difference on Memory Scale=6.03; 95% CI=0.31, 11.76), but among the children of early adolescent mothers, the differences in scores comparing children in the EI+promotion and control arms were statistically indistinguishable from zero.

Differences in parenting behaviors and child development associated with assignment to the EI only arm compared to the control arm did not vary significantly by the timing of the birth of the mother's first child, with one exception. Assignment to the EI only group was associated with greater benefits to parenting behaviors among late adolescent mothers than among never adolescent mothers (difference in magnitude of associations on FCI=1.62; 95% CI=0.13, 3.12). Among late adolescent mothers, the association was nonsignificant but positive while among the never adolescent mothers, the association was nonsignificant but negative.

Early adolescent mothers and their children in the EI only group performed significantly worse than early adolescent mothers and their children in the control group on the FCI (difference=-1.20; 95% CI=-2.34, -0.07) as well as the General Cognitive Index (difference=-5.48; 95% CI=-10.96, -0.005) and the Verbal (difference=-4.52; 95% CI=-8.40, -0.63) and Memory Scales (difference=-4.33; 95% CI=-8.51, -0.14) of the McCarthy. However, the differences in these associations comparing early adolescent mothers to never adolescent mothers were not statistically significant.

Robustness Checks

After repeating these analyses using only those households in which the children of the target mother were clearly identifiable, the results remained very similar across the McCarthy Scales and the Family Care Indicators (**Table 3)**. However, slight changes in the magnitude of the associations resulted in four associations crossing the p-value<0.05 threshold: 1) the interaction effect on the Memory Scale comparing the magnitude of the association of

assignment to EI+promotion vs. control among the children of early and never adolescent mothers became nonsignificant, 2) among early adolescent mothers, the difference in FCI scores comparing mothers in the EI only and control groups became nonsignificant, 3) among early adolescent mothers and their children, the difference in scores comparing those in the EI only and control arms on the Quantitative Scale became significant, and 4) among never adolescent mothers and their children, the difference in scores on the Verbal Scale comparing children in the EI+promotion arm to the control arm became nonsignificant.

The weighted model provided very similar results to the unadjusted model. The biggest difference was that the differences in McCarthy Scores comparing children of early adolescent mothers in the EI only and control groups became nonsignificant with the exception of the Verbal Scale (difference=-4.22, 95% CI=-8.02, -0.42). Additionally, in the weighted model the difference in the magnitude of the associations on the Memory Scale between the EI+promotion and control arms comparing early adolescent mothers to never adolescent mothers became nonsignificant.

Only one of the interactions and one within group comparison were robust to positivity violations. The association with assignment to the EI only versus control arm was significantly greater among late adolescent mothers compared to never adolescent mothers on the Total FCI. Within early adolescent mothers, being in the EI only arm compared to the control arm continued to be associated with lower Verbal scores.

We sought to isolate the association between age at first birth and our outcomes from the effect of the mother's age at enrollment. We limited the analysis to mothers who were aged 20 to 30 at enrollment into the study. This allowed us to look at whether effects varied by mother's age at first birth controlling for mother's age at enrollment. The results matched the results of the weighted analysis, with late adolescent mothers in the EI only group performing better than never adolescent mothers in the same group on the FCI (difference in magnitude of associations=1.70, 95% CI=0.21, 3.20) and the children of early adolescent mothers in the EI+promotion arm performing significantly worse than the children of never adolescent mothers in the same arm on the Verbal Scale of the McCarthy (difference in magnitude of associations=-8.50, 95% CI=-16.32, -0.69). Among children of early adolescent mothers in the EI only group compared to children in the control, the only within group difference that reached statistical significance was on the Verbal Scale (difference=-5.15, 95% CI=-9.66, -0.63). Additionally, the differences in McCarthy Scores comparing children in the EI+promotion and control groups among children born to never adolescent mothers were significant on the General Cognitive Index (difference=6.72, 95% CI=0.59, 12.85) and the Verbal (difference=6.09, 95% CI=0.14, 12.03) and Memory Scales (difference=6.12, 95% CI=0.39, 11.85).

Finally, the model including an indicator variable for child birth order mirrored the results from the unadjusted model with two exceptions. The interaction effect comparing the associations between the EI only and control groups on the FCI among late adolescent mothers and never adolescent mothers became nonsignificant. The effect of assignment to the EI+promotion group compared to the control group on the Verbal Scale among never adolescent mothers became nonsignificant.

Discussion

The results of this secondary analysis of a cluster-randomized controlled trial in rural Mexico showed that the children of mothers who began childbearing in early adolescence

benefitted significantly less from randomization to weekly parenting support in a community setting than the children of mothers who began childbearing after their teenage years. When assigned to the parenting program, the children of mothers who began childbearing after the age of 19 showed greater gains in child development than children in the control group, whereas the children of mothers who began childbearing in their teenage years showed no gains associated with assignment to the parenting program. The improvement in scores among the children of never adolescent mothers was only apparent when the parenting program was supported by *Prospera*, the conditional cash transfer program. In fact, when the program was not supported by *Prospera*, our results suggested that being in the parenting program was associated with worse parenting behaviors and reduced child development among mothers who began childbearing in early adolescence and their children.

The strengths of this study include randomized assignment to treatment and prospective measurement of outcome data using validated measures. The significant loss-to-follow-up, however, limits the generalizability of our results. This study could also benefit from more complete data on participation rates in EI as well as perceptions of whether EI was mandatory or not for receipt of the conditional cash provided by *Prospera*.

Our results indicating the program was ineffective among the earliest child-bearers are unexpected given previous research supporting the effectiveness of parenting education programs. However, many previous studies were smaller in scale or used a home-visiting rather than group-based approach.(42-45) For example, the parenting program in Chile involved home-visits during which a trained health educator provided one-on-one education focused on the adolescent's needs. This program, unlike EI, was also designed specifically for adolescent parents, and used a much more individualized approach.(25) Few evaluations of group-based programs for adolescent parents operate at scale in a manner similar to EI. In a systematic review of parenting education programs for adolescent parents, the number of enrolled participants in each reported study ranged from 20 to 164.(23) The large scale, group-based design of *Educación Inicial* may result in message attenuation as the program attempts to reach a broad population.

A previous evaluation of *Educación Inicial* that included participants of all ages showed that the EI only arm had no effect while the EI+promotion arm was associated with improvements in child development compared to the control arm. The differences in cognitive development scores comparing children in the EI+promotion arm to children in the control arm were within the range of those observed here: 0.25 SD on the General Cognitive Index.(31) Disaggregated by mother's age at first birth, it appears adolescent mothers and their children, and particularly the woman who began childbearing at the youngest ages and their children, did not benefit from the program, while the children of women who began childbearing later in life were able to take greater advantage of the program's lessons. This remained true after restricting the sample to women aged 20-30 at the time of the program and after including child birth order as a covariate. The previous evaluation provided evidence that the program was less effective among families with low wealth or in which the mother had no education. In this study, the women who began childbearing at younger ages tended to have lower levels of education and wealth compared to women who began childbearing later in life. Women who face multiple sources of disadvantage may be less able to benefit from parenting programs.(46)

Mothers who begin childbearing in early adolescence may occupy a more marginalized position in society. Women who marry at very early ages often marry men who are much older, impacting their autonomy and decision-making power within the household (47, 48) and putting

them at risk of experiencing more controlling behaviors from their partners.(49) They also often have very low levels of education;(47, 48) in Mexico, lower levels of education have been associated with more traditional beliefs around gender equality.(50) In our sample of mothers in rural Mexico, women who began childbearing before the age of 17 had the lowest levels of education and wealth, the most depressive symptoms and the most household crowding. These women may be less able to leave the home to participate in the parenting classes, more subject to their families' and partners' opinions on childrearing, or they may have more difficulty understanding class material, making it challenging to implement *Educación Inicial* lessons in the home. These women may also rely more on their own parents or parents-in-law, who may not be attending *Educación Inicial*, to largely take over child-rearing responsibilities.

Given the scarcity of research on parenting interventions in low- and middle-income countries among adolescent parents, former adolescent parents and their children, and the high concentration of adolescent childbearing in LAMI countries, future research should evaluate the effectiveness of large-scale group-based parenting interventions in this population. It would also be beneficial to compare interventions explicitly designed for adolescent and former adolescent parents to interventions that include adolescent and former adolescent parents as part of a broader target population. Our study results suggested that parenting interventions similar to EI do not meet the specific needs of women who begin childbearing in adolescence. They additionally highlight the importance of using rigorous promotion and enrollment strategies during implementation.

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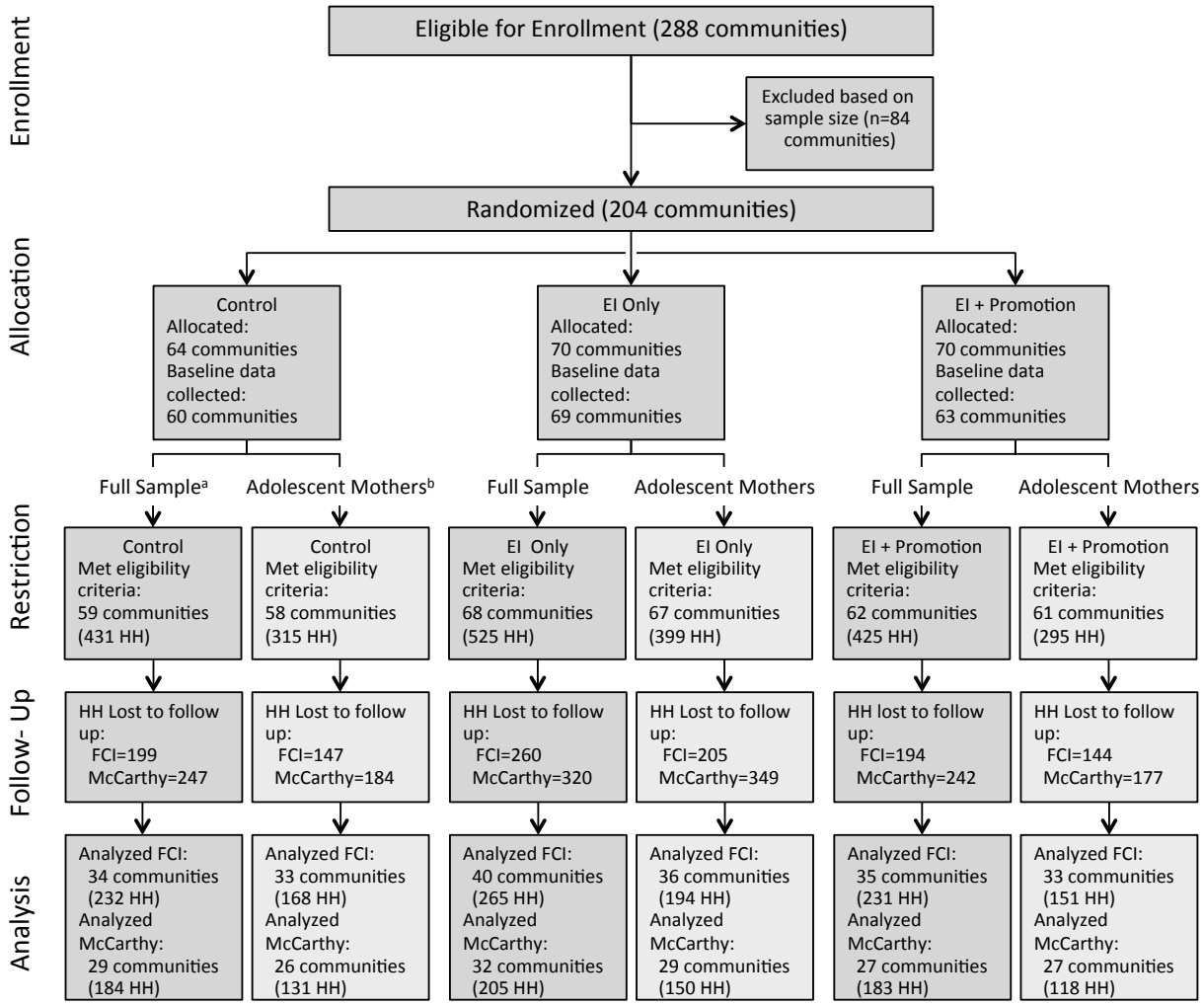
Figure 1: Flowchart of Participants in the Study of *Educación Inicial*



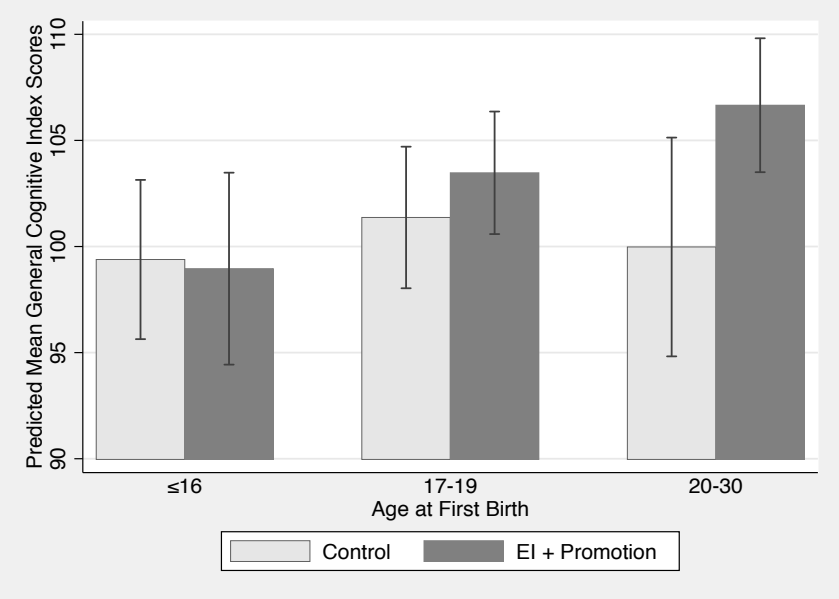
[a] Mothers who were age 30 or under at enrollment. Excludes households in which children of mother were not identifiable.

[b] Mothers who began childbearing in adolescence and were age 30 or under at enrollment. Excludes households in which children of mother were not identifiable.

HH=households

FCI=Family Care Indicators

Figure 2: Mean General Cognitive Index Scores by Treatment Arm and Mother's Age at First Birth



Model includes indicators for state of residence and indigenous community status and accounts for clustering at the village level using robust standard errors.
Bars are 95% confidence intervals.

Table 1: Comparison of Baseline Characteristics Between Households in the Final Sample and Households Lost-to-Follow-Up (N=1,381)

	Households in Final Sample		Households Lost-to-Follow-Up			
	N	mean/%	N	mean/%	Difference in mean/%	95% Confidence Interval
Child Characteristics						
% of target children girls	728	48.6	653	47.5	-1.1	(-0.058, 0.035)
Mean age of target children (months)	728	8.9	653	8.6	-0.3	(-0.919, 0.350)
Mean birth order of target children	725	3.1	652	3.4	0.3	(0.071, 0.505)
Mother Characteristics						
Mean age of mothers at first birth	728	18.3	653	18.0	-0.4	(-0.680, -0.011)
Mean age of mothers at interview	728	25.4	653	25.4	-0.01	(-0.457, 0.445)
Mean number of children	728	3.1	653	3.4	0.3	(0.070, 0.501)
% of mothers completed primary education	723	84.5	652	78.7	-5.8	(-0.112, -0.005)
% of mothers completed secondary education	728	17.9	653	12.6	-5.3	(-0.108, 0.002)
% of mothers speak or understand an indigenous language	728	56.6	653	64.6	8.0	(-0.046, 0.207)
% of mothers living with partner	728	92.0	653	93.0	1.0	(-0.029, 0.047)
Household Characteristics						
% of households in top median of wealth	728	55.9	653	41.2	-14.7	(-0.231, -0.063)
% of households in an indigenous community	728	53.7	653	59.9	6.2	(-0.075, 0.198)
Mean number of residents per household	728	5.8	653	6.0	0.3	(0.032, 0.505)
Mean number of children per household	728	3.4	653	3.7	0.2	(0.030, 0.447)
Mean number of adults per household	727	2.3	652	2.3	0.0	(-0.132, 0.138)
Crowding (people/rooms)	728	2.8	653	3.1	0.3	(0.096, 0.566)
Parenting Behaviors[a]						
HOME Total (45 items)	596	25.9	548	24.3	-1.6	(-2.632, -0.519)
Parental Responsivity (11 items)	596	7.8	547	7.1	-0.6	(-1.037, -0.226)
Acceptance of Child	596	6.0	548	5.5	-0.5	(-0.750, -0.185)

(8 items)						
Organization of the Environment (6 items)	596	4.0	548	4.02	-0.01	(-0.213, 0.204)
Learning Materials (9 items)	595	2.6	548	2.23	-0.4	(-0.730, -0.057)
Parental Involvement (6 items)	596	2.9	548	2.84	-0.08	(-0.328, 0.163)
Variety in Experience (5 items)	596	2.6	546	2.58	0.01	(-0.136, 0.146)
Child Development Indicators[b]						
ASQ Global	558	-0.03	499	-0.001	0.03	(-0.127, 0.179)
Communication	558	-0.04	498	-0.07	-0.03	(-0.175, 0.123)
Perceptual	558	-0.02	499	0.02	0.04	(-0.099, 0.186)
Motor	558	-0.01	500	0.03	0.04	(-0.098, 0.176)

[a] Parenting behaviors measured using the Home Observation for Measurement of the Environment. Scores are presented as average sums of responses.
[b] Child development measured using the Ages and Stages Questionnaire. Scores are age-standardized with a mean of 0 and standard deviation of 1.
Samples sizes vary due to missing values.
Abbreviations: HOME=Home Observation for Measurement of the Environment; ASQ=Ages and Stages Questionnaire

Table 2: Comparison of Baseline Characteristics Across the Three Treatment Arms at Follow-Up in 2012 (N=728)

	Control		EI Only		EI Only vs. Control		EI+Promotion		EI+Promotion vs. Control	
	N	mean/%	N	mean/%	Diff.	95% CI	N	mean/%	Diff.	95% CI
Child Characteristics										
% of target children girls	232	51.3	265	44.9	0.1	(-0.017, 0.145)	231	50.2	0.01	(-0.068, 0.090)
Mean age of target children	232	8.3	265	9.1	0.8	(-0.379, 1.964)	231	9.2	0.9	(-0.182, 2.030)
Mean birth order of target children	232	3.2	264	3.2	0.02	(-0.300, 0.349)	230	2.95	-0.3	(-0.615, 0.114)
Mother Characteristics										
Mean age of mothers at first birth	232	18.1	265	18.1	0.01	(-0.533, 0.555)	231	18.7	0.63	(0.029, 1.227)
Mean age of mothers at interview	232	25.2	265	25.3	0.2	(-0.617, 0.928)	231	25.64	0.50	(-0.344, 1.336)
Mean number of children	232	3.2	265	3.3	0.04	(-0.280, 0.365)	231	2.95	-0.3	(-0.614, 0.114)
% of mothers completed primary education	231	85.3	263	87.5	0.02	(-0.039, 0.082)	229	80.3	-0.1	(-0.136, 0.037)
% of mothers completed secondary education	232	20.7	265	15.5	-0.1	(-0.158, 0.053)	231	17.7	-0.03	(-0.143, 0.084)
% of mothers speak or understand an indigenous language	232	58.6	265	59.2	0.01	(-0.219, 0.231)	231	51.5	-0.1	(-0.307, 0.165)
% of mothers living with partner	232	90.5	265	93.2	0.03	(-0.047, 0.101)	231	92.2	0.02	(-0.059, 0.093)
Household Characteristics										
% of households in top median of wealth	232	57.8	265	49.1	-0.1	(-0.233, 0.059)	231	61.9	0.04	(-0.101, 0.183)
% of households in an indigenous community	232	57.8	265	55.8	-0.02	(-0.260, 0.222)	231	47.2	-0.1	(-0.353, 0.142)
Mean number of residents per household	232	5.9	265	5.8	-0.1	(-0.560, 0.336)	231	5.6	-0.2	(-0.688, 0.202)
Mean number of children per household	232	3.5	265	3.5	-0.04	(-0.357, 0.282)	231	3.3	-0.2	(-0.593, 0.130)
Mean number of adults per household	231	2.4	265	2.3	-0.1	(-0.322, 0.141)	231	2.4	-0.01	(-0.213, 0.195)
Crowding (people/rooms)	232	2.8	265	2.9	0.1	(-0.236, 0.364)	231	2.8	-0.1	(-0.290, 0.173)
Parenting Behaviors[a]										
HOME Total (45 items)	180	25.9	220	25.4	-0.5	(-2.349, 1.328)	196	26.5	0.7	(-1.276, 2.624)
Parental Responsivity	180	7.8	220	7.4	-0.4	(-1.059, 0.251)	196	8.02	0.2	(-0.489, 0.843)

(11 items)										
Acceptance of Child (8 items)	180	6.1	220	5.9	-0.1	(-0.407, 0.130)	196	6.02	-0.03	(-0.311, 0.242)
Organization of the Environment (6 items)	180	4.0	220	4.0	-0.05	(-0.471, 0.364)	196	4.1	0.04	(-0.400, 0.477)
Learning Materials (9 items)	180	2.5	220	2.7	0.2	(-0.511, 0.804)	195	2.7	0.1	(-0.560, 0.826)
Parental Involvement (6 items)	180	2.9	220	2.8	-0.1	(-0.506, 0.300)	196	3.1	0.2	(-0.266, 0.650)
Variety in Experience (5 items)	180	2.5	220	2.6	0.02	(-0.240, 0.290)	196	2.7	0.14	(-0.121, 0.393)
Child Development Indicators[b]										
ASQ Global	168	0.01	206	-0.1	-0.1	(-0.393, 0.104)	184	0.1	0.1	(-0.196, 0.321)
Communication	168	-0.1	206	-0.03	0.1	(-0.162, 0.300)	184	0.0002	0.1	(-0.171, 0.378)
Perceptual	168	0.04	206	-0.2	-0.2	(-0.439, 0.068)	184	0.1	0.03	(-0.203, 0.269)
Motor	168	0.1	206	-0.1	-0.2	(-0.386, 0.030)	184	0.1	0.02	(-0.190, 0.234)

[a] Parenting behaviors measured using the Home Observation for Measurement of the Environment. Scores are presented as average sums of responses.
[b] Child development measured using the Ages and Stages Questionnaire. Scores are age-standardized with a mean of 0 and standard deviation of 1.
Samples sizes vary due to missing values.
Abbreviations: Dif.=Differen; HOME=Home Observation for Measurement of the Environment; ASQ=Ages and Stages Questionnaire

Table 3: Intent-to-Treat Analysis: Effects of Randomization to *Educacion Inicial* on Child Development Scores[1] and Parenting Behaviors[2] by Mother's Age at Birth of First Child

	Never	Early	Early Vs. Never Adolescent Mothers		Late	Late vs. Never Adolescent Mothers	
	Effect Size	Effect Size	Diff.	95% CI	Effect Size	Diff.	95% CI
T1 vs. T0							
McCarthy Scales							
General Cognitive Index	-2.15	-5.48[*,a,e]	-3.33	(-10.97, 4.31)	-1.98	0.17	(-6.92, 7.26)
Verbal Score	-1.80	-4.52[*,a,b,c,d,e]	-2.72	(-9.48, 4.04)	-1.53	0.27	(-6.12, 6.65)
Perceptual Score	-1.76	-4.45	-2.69	(-11.45, 6.07)	-1.70	0.07	(-7.12, 7.25)
Quantitative Score	-1.78	-5.42[#]	-3.65	(-11.68, 4.39)	-2.08	-0.30	(-8.06, 7.47)
Memory Score	-1.37	-4.33[*,a,e]	-2.96	(-9.31, 3.39)	-2.49	-1.12	(-7.75, 5.50)
Family Care Indicators							
Total FCI (max score=17)	-1.33	-1.20[*,b,d,e]	0.13	(-1.48, 1.73)	0.30	1.62[*,a,b,c,d]	(0.13, 3.12)
T2 vs. T0							
McCarthy Scales							
General Cognitive Index	6.68[*,a,b,d,e]	-0.43	-7.11	(-15.23, 1.01)	2.10	-4.58	(-11.50, 2.35)
Verbal Scale	6.05[*,b,d]	-2.13	-8.19[*,a,b,d,e]	(-15.50, -0.88)	3.21	-2.84	(-9.44, 3.76)
Perceptual Scale	5.41[b]	2.38	-3.03	(-11.72, 5.65)	0.45	-4.95	(-12.16, 2.26)
Quantitative Scale	5.50	-1.43	-6.93	(-15.51, 1.65)	1.35	-4.15	(-11.15, 2.84)
Memory Scale	6.03[*a,b,d,e]	-1.19	-7.22[*,e]	(-14.31, -0.14)	-0.003	-6.04	(-12.93, 0.86)
Family Care Indicators							
Total FCI (max score=17)	-0.15	-0.16	-0.01	(-1.59, 1.57)	0.27	0.42	(-1.14, 1.98)

[1] Parenting behaviors measured using the Family Care Indicators. (N=728)
[2] Child development measured using the McCarthy Scales of Children's Abilities. Scores are age-standardized with a mean of 100 and standard deviation of 15. (N=572)
* Difference significant at p-value<0.05.
[#] Significant only when the sample is restricted to households in which the mother-child dyads were clearly identifiable.
[a] Robust to misspecification of the sample population.
[b] Robust to inclusion of weights and covariates to address attrition and residual confounding after randomization.
[c] Robust to inclusion of weights and covariates but excluding those covariates that introduced positivity violations.
[d] Robust to restriction of the sample to women age 20-30 at enrollment to address potential confounding by mother's age at enrollment.
[e] Robust to inclusion of child birth order as a covariate.
Models for data presented in table include indicators for state of residence and indigenous community status and account for clustering at the village level using robust standard errors.

Supplemental Table 1: Comparison of Baseline Characteristics Across the Three Categories of Mother's Age at First Birth (N=728)

Age at First Birth	≤16		17-19		20-30	
	N	mean/%	N	mean/%	N	mean/%
Child Characteristics						
% of target children girls	202	51.5	311	49.5	215	44.7
Mean age of target children	202	8.4	311	9.1	215	9.1
Mean birth order of target children	202	3.6	309	3.3	215	2.5
Mother Characteristics						
Mean age of mothers at first birth	202	15.1	311	17.9	215	21.8
Mean age of mothers at interview	202	23.5	311	25.6	215	26.8
Mean number of children	202	3.6	311	3.3	215	2.5
% of mothers completed primary education	202	80.7	309	86.1	212	85.8
% of mothers completed secondary education	202	13.4	311	17.7	215	22.3
% of mothers speak or understand an indigenous language	202	61.4	311	56.9	215	51.6
% of mothers living with partner	202	93.6	311	92.9	215	89.3
Household Characteristics						
% of households in top median of wealth	202	51.0	311	54.7	215	62.3
% of households in an indigenous community	202	58.4	311	54.0	215	48.8
Mean number of residents per household	202	6.2	311	5.8	215	5.3

Mean number of children per household	202	4.02	311	3.5	215	2.8
Mean number of adults per household	202	2.2	310	2.3	215	2.5
Crowding (people/rooms)	202	3.2	311	2.8	215	2.5
Parenting Behaviors[a]						
HOME Total (45 items)	161	25.3	250	25.9	185	26.4
Parental Responsivity (11 items)	161	7.4	250	7.9	185	7.8
Acceptance of Child (8 items)	161	6.01	250	5.9	185	6.1
Organization of the Environment (6 items)	161	3.9	250	4.04	185	4.1
Learning Materials (9 items)	161	2.6	250	2.7	184	2.7
Parental Involvement (6 items)	161	2.9	250	2.8	185	3.1
Variety in Experience (5 items)	161	2.6	250	2.6	185	2.6
Child Development Indicators[b]						
ASQ Global	153	-0.1	236	0.01	169	-0.03
Communication	153	-0.1	236	-0.02	169	-0.02
Perceptual	153	-0.05	236	-0.02	169	0.003
Motor	153	-0.1	236	0.1	169	-0.04

[a] Parenting behaviors measured using the Home Observation for Measurement of the Environment. Scores are presented as average sums of responses.
[b] Child development measured using the Ages and Stages Questionnaire. Scores are age-standardized with a mean of 0 and standard deviation of 1.
Samples sizes vary due to missing values.
Abbreviations: HOME=Home Observation for Measurement of the Environment; ASQ=Ages and Stages Questionnaire

Chapter 4. Center-Based Care and Parenting Stress among Young Mothers

Introduction

Adolescent mothers face the dual demands of adapting to parenthood and meeting the challenges of their developmental stage as adolescents.(1) These simultaneous demands can put significant strain on adolescent parents, who exhibit higher levels of parenting stress than adult parents.(2, 3) For young mothers, this stress could arise from multiple sources including social exclusion if childbearing occurred earlier than accepted family or societal standards;(4, 5) economic hardship resulting from prior family disadvantage,(6) reductions in education and earnings potential stemming from adolescent childbearing,(7) and increased independence as they form their own families;(4) changing relationships with family and friends; and the challenges rising directly from the demands of parenting.(8) Stress has been linked with less stimulating parenting,(3, 9) child maltreatment,(10-12) lower psychological wellbeing and relationship quality,(13-15) and the use of alcohol or illicit substances.(16) Identifying interventions that reduce parenting stress is critical because of the negative impact that parenting stress can have on the mother and child. This study explores whether using daycare or preschool services for children 0 to 6 years of age (referred to broadly as center-base care) is associated with reductions in parenting stress among a nationally representative sample of adolescent mothers in Chile.

Parenting Stress

Parenting stress arises when parents perceive that the activities and demands of parenting exceed their resources.(17) Parenting stress theories tend to emphasize either stress arising from daily hassles relating to parenting or from the relationships between parents and their children.(17) Daily hassles include the everyday problems that occur in families with young children (e.g. sleeping problems, trouble feeding, crying). These minor stressors in daily life have been shown to impact family functioning, in some cases even more than major life stressors.(18) The majority of research has focused on stress arising from the parent-child relationship. These theories place emphasis on stress resulting from characteristics of the parent (e.g. anxiety, depression, substance abuse), the child (e.g. child behavior and temperament) and their relationship.(19) Young mothers may experience greater parenting stress as many of the characteristics associated with parenting stress occur more frequently in this population (e.g. depression (20, 21) and drug or alcohol abuse (22)). Additionally, young mothers have been described as emotionally overwhelmed by the demands of parenting (8) and possessing inaccurate knowledge of the timing of children's development,(23) which could result in increased stress and frustration. According to Richard Abidin's model of parenting stress, social support, material resources, parenting skills and coping strategies can buffer the effects of parenting stress on parenting behavior.(24) External sources of child care could provide the support adolescents need to meet the activities and demands of parenting.

Child Care and Parenting Stress

Support in caring for children may be one way to reduce the number of stressors facing adolescent parents. Maternal employment is correlated with the use of non-maternal sources of

care.(25, 26) In one study, 42% of adolescent mothers (the majority of whom began childbearing between 16 and 18 years of age) in Santiago, Chile were working by the time their children reached 6 years of age.(4) This was quite a bit higher than the national average for urban women at the time (29.6%).(4) Because balancing work and family life can be a source of stress,(27) one potential mechanism of action is that child care support helps young mothers meet the demands of work or school and home. Additionally, employment may enhance home life and reduce stress by increasing role satisfaction or by buffering negative experiences at home.(28, 29) The combination of work and family life may also provide adolescent mothers with additional resources for fulfilling the role of mother such as self-esteem and social skills.(30, 31) In addition to reducing parenting stress via the social and psychological benefits of working, child care may reduce parenting stress by allowing mothers to earn an income. Unemployment has been found to be associated with greater levels of stress among single, African American mothers in the United States.(32) By making it possible for mothers to finish their education or enter the workforce, child care support can help young mothers establish economic independence. A small randomized controlled trial showed that randomization to free daycare services was associated with a higher probability of high school graduation and self-sufficiency in adulthood,(33) whereas lack of child care options has been identified as a barrier to young mothers' continuing their education.(34)

Alternative pathways suggest that child care could be associated with increased, rather than decreased, parenting stress. If mothers who use center-based care also enter the workforce out of economic necessity rather than for self-fulfillment, this may increase parenting stress. Research suggests jobs with low remuneration, unpredictable hours, and few benefits can increase work-related stress and work-family conflict.(35-37) Parents may feel overwhelmed by the multiple demands of work and home, react more quickly to stressful stimuli, and in this way, transfer work-related stress to the home environment.(37) Adolescent mothers with lower levels of education may be more likely to engage in unstable, low-wage work (7) and as a result, may be more likely to experience parenting stress resulting from work demands. Nonstandard work hours have also been linked to child behavioral problems,(38, 39) which could increase parenting stress.(40) One hypothesis is that the correlation between non-day shift work and behavioral problems is a result of preexisting financial difficulties, the physical and mental strain of working the non-day shift as a mother, or a reduction in child supervision.(38)

The National Institute of Child Health and Human Development (NICHD) Study of Early Child Care demonstrated that more time in child care is also associated with increased behavioral problems among preschool aged children.(41-44) The association with problem behaviors was no longer present among children in third grade, though it was associated with more contentious relationships and poorer social skills at this age.(45) More time in child care is associated with less maternal sensitivity and less positive mother-child engagement,(46) which may mediate the association between time in non-maternal child care and behavioral problems.(47) However parenting quality may not entirely account for the observed associations between time in center-based care and child behavioral problems.(42) An NICHD report highlights the need for more research on the mechanisms of action to explain the connection between time in child care and child behavioral problems.(42) Alternative theories suggest that quality of care and peer processes may play an important role.(48)

Child Care Availability in Chile

Since the early 2000s, Chile has greatly expanded access to early childhood development programs.(49) Much of the expansion has been in the creation of new preschools for children 3 years of age and under. A voucher system was designed to increase enrollment among the country's most impoverished. By 2010, enrollment rates had increased substantially among preschool aged children.

The aim of the current study was to examine the extent to which using center-based care was associated with parenting stress among adolescent mothers. Specifically, we explored whether child's center-based care attendance was associated with mother's self-reported parenting stress as it pertains to the role of parenting (i.e. sense of parenting competence, social support, and life constraints) and whether time in child care over the child's life was associated with parenting stress as it pertains to maternal perceptions of the child (i.e. perceptions of child behavior and ability to manage child behavior). The secondary aim of this paper was to assess whether time in center-based care was associated with mother-reported measures of child behavior. We hypothesized that using center-based care would be associated with decreases in mothers' reported parenting stress related to the parenting role, perhaps as a result of greater support in meeting the demands of the parenting role. We hypothesized that time in center-based care would be associated with increases in child-related parenting stress and increases in child behavioral problems, the latter being a likely explanation for the former.

Methods

The Sample

This study used data from a subsample of the second round of the Chilean Encuesta Longitudinal de la Primera Infancia [Chilean Longitudinal Study of Early Infancy] (ELPI), collected in 2012. The ELPI is a nationally representative longitudinal study following children in Chile born between 2006 and 2011 and their families. The study used cluster-randomized sampling, with Chilean municipalities as the primary sampling unit. Children were sampled from among all registered births between the years 2006 and 2009 in the selected municipalities. The original sample included 15,175 children. After some attrition between the first and second rounds (15%), the sample in 2012 included 12,898 children. During the second round of the ELPI, 3,135 children born between the two rounds were added to the sample for a final count of 16,033 children.

This study used data only from households where the target child was born before the mother reached 20 years of age; this age corresponds with the World Health Organization's definition of teenage childbearing (50) and previous studies of adolescent childbearing in Chile.(51, 52) We also limited the analysis to households in which the child was the only child during the 2012 follow-up because the number of children a mother has could influence her decision and/or ability to put her children in child care. In 2010, 1,965 households met these criteria. At follow-up in 2012, 1,404 of these women remained in the study and had not had additional children. An additional 376 adolescent mothers whose children were born between the two waves and met the eligibility criteria were added to the sample at this time, resulting in a total sample of 1,780 mothers and their children. Of these women, 426 and 475 were missing

data on the Parenting Distress and Difficult Child Scales of the Parenting Stress Index, Short Form respectively and 136 were missing values on program participation. Among women with an exposure and outcome measurement, 58 had missing data on at least one covariate. The majority of missing covariate data was due to missing values on mother's participation in school (n=29), and household income (n=24). There was overlap in who had missing data, resulting in 1,190 women with complete data on the Parenting Distress Scale and 1,149 women with complete data on the Difficult Child Scale.

Mothers of the selected children were interviewed in their homes after providing voluntary and informed consent. This research was approved by the Institutional Review Board at the University of Pennsylvania.

Outcomes: Maternal Stress and Child Behavior

Maternal stress was assessed using the Parenting Stress Index, Short Form (PSI-SF).(53) The PSI-SF is a 36 item questionnaire with three subscales: Parental Distress, Parent-Child Dysfunctional Interaction, and Difficult Child. This study focused on the Parental Distress and Difficult Child Scales only, as these were the domains of parenting stress we most expected to be impacted by child care attendance. The Parental Distress Scale measures parenting stress associated with the role of parent; this scale is responsive to parents' sense of competence in their role, constraints on the parents' lives, relationship quality between the parents, social support, and depressive symptoms. The Difficult Child Scale assesses parenting stress resulting from the parents' perceptions of their child; this scale reflects children's behavior and the parents' ability to manage their children's behavior. The two scales include 12 items each and are rated on a Likert scale of 1 (strongly agree) to 5 (strongly disagree). Total scores were used to compare parenting stress levels.

We measured child behavior using the Child Behavior Checklist (CBCL).(54) The Preschool Age Checklist was applied among parents of children 1.5 to 5 years of age and the School-Age Checklist was applied among parents of 6 year olds. Child internalizing and externalizing behaviors were assessed by parent report. Examples of internalizing behaviors include withdrawal and anxiety, whereas examples of externalizing behaviors include aggressive behavior and attention problems. We used the sample as its own comparison group by normalizing the scores within two-month age windows. The resulting z-scores were centered on 0 with a standard deviation of 1. Higher scores reflect more behavioral problems.

Exposure: Participation in Center-Based Care

We explored participation in center-based care in two forms: concurrent attendance and percent of child's life in center-based care. Mothers reported whether or not the target child was enrolled in center-based care at the time of the interview. Children could be enrolled in daycare, early childhood education programs, or the first year of primary school. All three of these classifications include educational components. Children enrolled in any of these programs were considered to be participating in center-based care concurrently with the measurement of parenting stress. Mothers also provided a retrospective history of their child's time in center-based care. We multiplied the total months and weeks in child care by whether or not the child was in care half- or full-time. This was then divided by the child's age in months to determine the percent of the child's life spent in center-based care.

Covariates

Our descriptive analysis included identifying the primary caretakers of the target children, examining motivations for using or not using center-based care, and describing characteristics of center-based care programs. Mothers were asked who cared for the child the majority of the time at difference periods of the child's life (survey questions referring to periods of the children's lives spanned 6 month intervals from age 0 to 2 years and 12 month intervals from age 2 to 6 years). Among families with the child in child care, mothers were asked to retrospectively describe the main reason for sending the child to an educational establishment during each period of the child's life. They were also asked whether access to center-based care facilitated their decision to work, whether or not they lived near an educational establishment, what type of educational establishment they used (e.g. private, public), the child's attendance schedule (half or full-time), and whether the schedule of the educational establishment was compatible with their work schedule during each period of the child's life. In families where the child was not in center-based care, mothers were asked to retrospectively provide up to three reasons for not sending their child to an educational establishment during each period of the child's life. For each of these questions, we used the responses pertaining to the most recent period of the child's life to summarize the responses.

The use of center-base care is not randomly distributed in the population. We attempted to control for confounding by including a range of household, maternal and child variables that we hypothesized influence both the decision or ability to enroll a child in center-based care as well as the level of parental stress the mother may experience. We included two measurements of household socioeconomic status: average monthly household income during the 12 months prior to the interview and an index of household wealth. The wealth index was calculated using principal components analysis.(55) Household assets used to create this index included refrigerators, washing machines, cell phones, internet access, computers, DVD players, microwaves, hot water heaters, video cameras, and cable connections. We used the Varimax rotation and retained the first principal component for inclusion in our models. Maternal education was included as three indicator variables (whether the mother completed secondary school, whether the mother began but did not complete higher education, and whether the mother completed higher education) with completion of primary school or less set as the baseline. We included binary variables indicating whether the mother was working, whether the mother was in school, residence in an urban or rural area, and whether the child's father lived with the mother and child, and indicator variables for the mother's total number of children (1, 2, 3 or more). Child's age was included in months as a continuous variable.

Statistical Analysis

We began by describing caretaking patterns among adolescent mothers using simple descriptive statistics. We explored who spent the most time caring for the child, motivations for sending or not sending a child to center-based care, rates of continuing education or working, and characteristics of the daycare centers and preschools being used. This provided a context for understanding how child care decisions affect parenting stress among adolescent mothers.

We explored two aspects of parenting stress: stress arising from the role of parenting (Parental Distress) and stress arising from the child's behavior and temperament and the

mother's ability to manage the child's behavior (Difficult Child). First, we used a multivariable linear regression model to estimate the difference in parental distress among adolescent mothers with and without children in center-based care at the time their stress levels were measured. We used concurrent enrollment (rather than cumulative enrollment) because we hypothesized that center-based care would have an immediate and transient effect on mothers' ability to pursue their goals outside of parenting as well as on relationship strain caused by demands on the families' time due to child care, work and school responsibilities. Secondly, we used multivariable linear regression models to estimate the association between time in center-based care (measured as a proportion of the child's life) and child behavior (measured using the CBCL) and parent stress related to child behavior (measured using the Difficult Child Scale of the Parenting Stress Index).

Because enrollment in center-based care is nonrandom, our main concern was confounding by factors that predicted both child enrollment status and parenting stress. Our models included the following covariates in an attempt to create exchangeable groups conditional on these covariates: household wealth, household income, urban/rural location, presence of father, maternal education, number of children, maternal employment status, maternal school enrollment status, and child age. We used linearized variance estimation to account for the fact that households within the same geographic location may be more similar to each other than to households in other locations.(56) Our models also included survey weights to account for the sampling design and nonresponse. These weights also allowed for extrapolation to the population of households eligible to participate in this study. A p-value of 0.05 was used to determine whether observed associations were statistically significant.

We conducted a number of sensitivity analyses to assess the robustness of our findings. First we repeated all analyses after removing outliers. Second we repeated the adjusted analyses excluding the employment and school attendance covariates. While employment and school attendance may influence the decision to use center-based care making them potential confounders, they may also mediate the relationship between center-based care and stress if availability of care influences the decision to work or attend school. We used Stata 12 (StataCorp. 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP) to complete these analyses.

Results

Descriptive Statistics

We began by comparing households in the sample to those lost-to-follow-up or with missing covariates to assess the extent of selection bias in our sample. Across a range of demographic variables collected at baseline in 2010 (this excludes the 376 households added to the sample in 2012 from this comparison), in families that were lost-to-follow-up or had missing data, the mothers were less likely to have completed secondary school (p-value=0.002). No other differences reached statistical significance.

Primary Caretakers

Children receive care from a variety of sources, and during any given week, they are likely cared for by more than one source. In this sample, the majority of children were cared for

by their mothers most of the time (51% of children) followed by grandmothers (29%). Twelve percent of mothers reported daycares and preschools provided the majority of care to children. Fathers and nannies were much less likely to be listed as caring for the child the majority of the time (0.8% and 0.6% respectively) (**Figure 1**).

Mothers were most likely to fill the gap in child care when the family was not using center-based care. Seventeen percent of mothers with children in center-based care reported that a center cared for the child the majority of the time. In this group, 45% of mothers reported that they provided care to the child the majority of the time. This is compared to 69% of mothers not using center-based care.

Motivations for Care Provision Choices

Mothers that used center-based care reported doing so primarily because they felt it was good for their children rather than out of necessity (**Table 1**). Approximately half of mothers (51%) sent their children to center-based care because they said they had to work and preferred using a daycare or preschool, to socialize their child, or to stimulate their child's learning. Another 33% of mothers reported sending their child to center-based care simply because the school year started. Only 1% said they sent their child because they worked and could not afford a nanny or did not have family that could help.

The majority of mothers not using center-base care said they did not need to because either they (49%) or another family member (19%) cared for the child (**Table 1**). Many mothers (39%) opted not to use center-based care because they said they felt their child was too small or for health reasons, 21% of mothers said they distrusted or disliked center-based care, and 8% said they would have liked to use center-based care but could not either because it was too far or too expensive. Mothers were able to provide up to three responses to this question and could have fallen into multiple categories.

Work and School

Many of the mothers with children in center-based care said they felt that access to this care facilitated their decision to work (66%). In fact, nearly twice as many mothers whose child was in center-based care were working at the time of the interview (45%) compared to mothers whose child was not in center-based care (23%). The proportion of mothers continuing their education however, was similar in both groups (31% and 26% respectively). However, work and school were not the primary motivating factors for sending their child to center-based care, as only 8% said they sent their child in order to look for a job or study and 14% said they enrolled their child because they had to work.

Characteristics of Center-Based Care

Nearly all families with children enrolled in center-based care lived close to a daycare, preschool, or school (N=60, 7% of respondents did not live near a center) (**Table 2**). This question was not asked of families in which the target child was not enrolled in center-based care. The majority of children in center-based care were attending municipal (31%) or subsidized private programs (29%) followed by *Junta Nacional de Jardines Infantiles* [National Kindergarten Board] (JUNJI)] programs (25%). JUNJI is a national early childhood program

aimed at socially vulnerable children under the age of 4. Most children attended center-based care only in the morning or afternoon (60%) rather than all day (40%). The majority of mothers reported that the schedule of the center was compatible with their work schedule or that this question did not apply (88%).

Center-Based Care Use and Parenting Distress

We began by comparing families with the target child in center-based care to families in which the target child was not attending a center across a range of demographic factors (**Table 3**). In families in which the target child was enrolled in center-based care, the children and their mothers were older on average compared to families in which the target child was not enrolled in center-based care. They were also less likely to have the father of the child living in the home. A high proportion of mothers in both categories lived with the grandparents of the child. Household wealth and income did not vary significantly between families with and without the target child in center-based care. Finally, mothers with the target child in center-based care were more likely to have completed secondary school and to be employed.

The mean parenting stress scores for this sample were very similar to the norms defined by Abidin (53) (**Table 4**). Table 4 also shows the distribution of child behavior scores.

In unadjusted analyses, adolescent mothers with children in center-based care scored lower on the Parental Distress Scale compared to adolescent mothers without the target child in center-based care (difference=-1.35; 95% CI=-2.67, -0.02) (**Table 5**). After controlling for a range of factors that could impact the decision to enroll the child in center-based care and parental distress, the magnitude of the association decreased and became non-significant (difference=-0.01; 95% CI=-1.68, 1.65). When this analysis was repeated excluding outliers and again excluding employment and school attendance as covariates, the pattern remained the same.

Time in Center-Based Care, Child Behavior and Child-Related Parenting Stress

There was a positive linear association between the time a child spent in center-based care (measured as a percentage of the child's life) and his or her mother's stress levels as measured by the Difficult Child Scale (beta=6.30; 95% CI=2.012, 10.580) (**Table 6**). Proportion of life in care was also positively associated with child externalizing behaviors (beta=0.61; 95% CI=0.158, 1.059), but not the Total CBCL or internalizing behaviors. These results remained similar after adjustment for potential confounding factors, both with (beta on Difficult Child Scale=6.45; 95% CI=1.980, 10.928; beta on Externalizing Scale=0.59; 95% CI=0.128, 1.050) and without the employment and school attendance covariates. After removing outliers, the results remain largely the same with the exception of the Total CBCL. In both unadjusted and adjusted analyses excluding outliers, longer proportions of life in center-based care were significantly associated with higher scores on the Total CBCL in addition to the difficult child and externalizing behaviors measures.

Discussion

The results from this analysis of cross-sectional data from a nationally representative sample of adolescent mothers in Chile showed enrollment in center-based care was not associated with parenting stress pertaining to the parenting role. However, mothers' child-related

parenting stress increased as children spent a greater proportion of their lives in center-based care. Our findings also showed children in child care for a greater proportion of their lives displayed more externalizing behavioral problems.

Our findings on the association between time in center-based care and child behavior mirror findings from previous studies.(41-44) The finding that time in care is also associated with increases in child-related parenting stress are novel, to the best of our knowledge. It seems plausible that time in center-based care is associated with increased parenting stress via increased child externalizing problems, as previous research suggests child behavior is significantly associated with parenting stress.(57)

We did not find an association between center-based care use and the Parental Distress Scale of the Parenting Stress Index-Short Form. Previous research suggests that center-based care to a large extent just replaces more informal sources of child care rather than filling a gap in child care.(58) For example, one study found that one third of new center-based care users had shifted from more informal sources of care.(59) Our descriptive data showed that 70% of mothers lived with the child's grandmother, and grandmothers were the second major source of child care after mothers. Additionally, previous research on adolescent mothers in Santiago, Chile found the majority of young mothers lived with their parents or other family members (91% in the child's first year of life and 73% by the child's sixth birthday).(4) Together, this suggests child care support from family members is readily available for many young mothers, and center-based care may be a replacement for informal care rather than a needed service. Additionally, many mothers reported sending their children to center-based care not out of necessity, but because they felt it would be good for their child. If center-based care does not provide additional support in meeting the many demands of life and parenting but merely replaces other sources of support, this may explain why we see no association between the use of center-based care and parenting stress associated with the role of parent.

This study benefited from the use of a large and nationally representative sample of Chilean families, numerous control variables, and validated measures of parenting stress and child behavior. However, this study was also subject to a number of limitations. The study relied on cross-sectional data, and as such, we were unable to determine temporal ordering of our exposures and outcomes. It is plausible that parents are more likely to put their children in center-based care when the parents are stressed or when they perceive their children's behavior to be difficult, rather than the reverse pathway explored in this study. Additionally, while we were able to control for many potential confounders, unmeasured confounders may remain, precluding causal interpretations of our findings. The formation of our second exposure variable, percent of child's life in center-based care, did not allow for exploration of the impact of center-based care during specific developmental windows. Additionally, we did not have the mother's exact birthdate. To create the variable indicating whether a woman was an adolescent mother or not at the time of birth, we subtracted the child's age in years from the mother's age in years. Using this method, some women who began childbearing at age 19 may have been misclassified as having had her child at age 20 and excluded from the study. Finally, generalizations of our findings to the broader Chilean population of adolescent mothers are tempered by the fact that we had missing data due to loss-to-follow-up and non-response as well as our choice to limit our study population to mothers with only one child.

Center-based care has been suggested as a means to support young mothers as they return to school.(4) Early childhood education has also been shown to benefit child cognitive development.(60) In the domain of parenting stress, however, our findings suggest center-based

care may increase parenting stress rather than reduce it. This stress seems to be specific to less harmonious mother-child relationships potentially resulting from increased externalizing behaviors among children in center-based care. Future research should explore whether child behavior truly mediates the association between center-based care use and parenting stress as well as the downstream impacts of increased stress resulting from poor child behavior and the durability of this parenting stress. While our results suggest a negative outcome of center-based care, conclusions about the overall utility of center-based care should be made considering the larger body of knowledge on its impacts.

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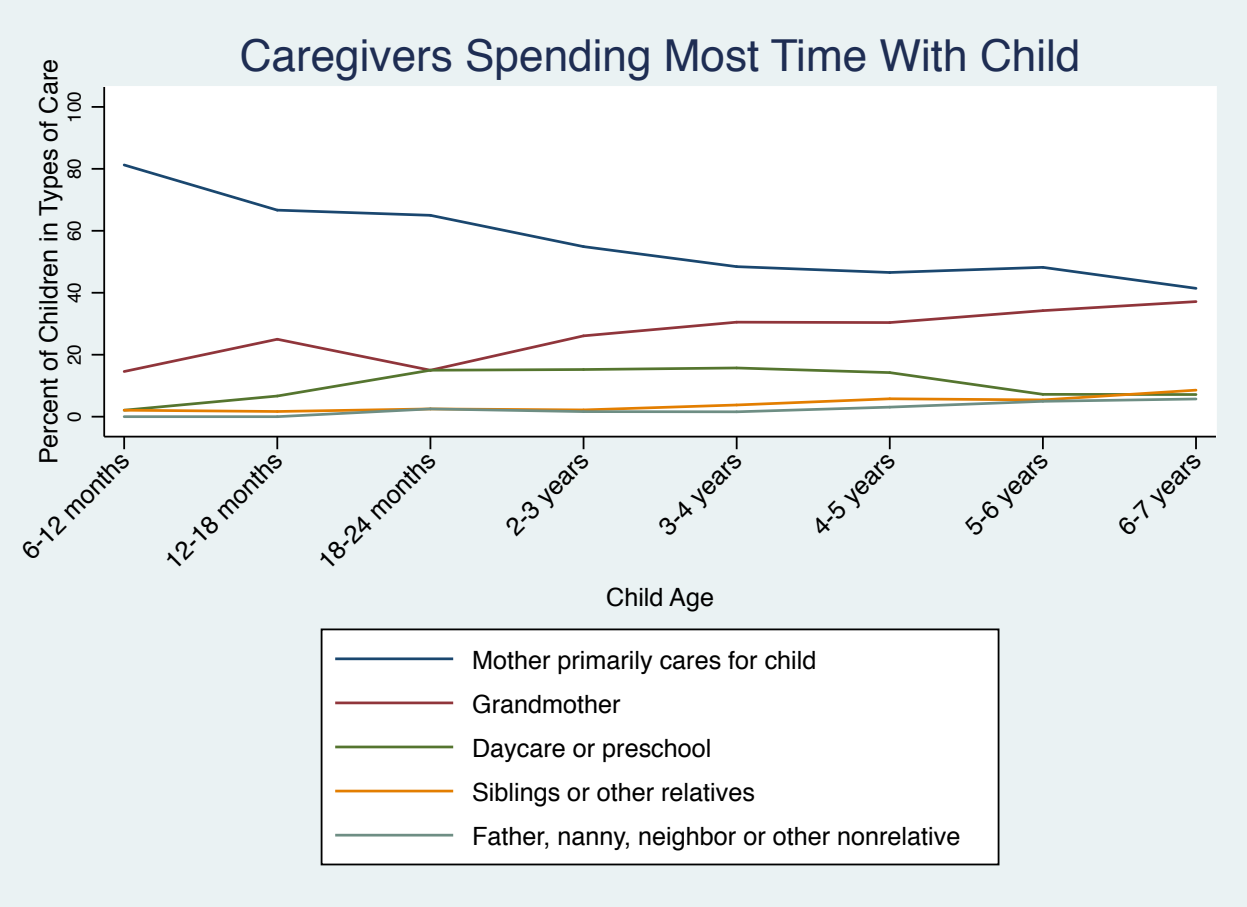
Figure 1. Caregivers Spending Most Time with Child



Responses refer to the most recent period of the child's life and are cross-sectional rather than longitudinal.

Table 1. Motivations for Using or Not Using Center-Based Care

Primary reasons for using center-based care (one response possible)	N	Percent
The school year started	290	33.0
To stimulate his/her learning	233	26.5
Had to work and preferred a nursery or kindergarten	112	12.7
So that the child would socialize with other children	100	11.4
To be able to look for work/study	72	8.2
Other	63	7.2
Had to work and could not pay for someone to care for him/her at home	5	0.6
Had to work and didn't have relatives that would help	5	0.6
Total	880	100
Primary reasons for not using center-based care (up to three responses possible)[a]	**N**	**Percent**
I do not need to use the center. I care for my child	158	49.1
Child very small	112	34.8
I don't trust or I don't like the centers	68	21.1
I do not need to use the center. A relative cares for my child	61	18.9
Other	46	14.3
I prefer not to use a center because kids get sick in centers	30	9.3
I need to send him/her to a center, but it's very far, and transportation is a problem	18	5.6
For the child's health reasons	12	3.7
I need to send him/her to a center, but the inscription and monthly fees are expensive	8	2.5
I do not need to use the center. I prefer to pay a third person (nonrelative) to care for my child	2	0.6
Total	515	--

Answers are translated from survey response options. Some answers with few responses were categorized as "other".

[a] Does not sum to 100% because respondents could choose up to three responses.

Table 2. Characteristics of Center-Based Care Used by Sample

Type of program	N	%
Municipal (public)	271	30.8
Subsidized private	259	29.4
JUNJI (public)	216	24.6
Integra (private non-profit)	70	8.0
Unsubsidized private	42	4.8
Publicly funded corporate	13	1.5
Other	9	1.0
Total	880	100
Child's care center schedule	**N**	**%**
Full time	528	60
Morning or afternoon	352	40
Total	880	100

Table 3. Baseline Demographics Comparing Families in which the Target Child was Enrolled in Center-Based Care to Families in which the Target Child was not Enrolled

	Enrolled in Center-Based Care		Not in Center-Based Care		
	N=880		N=322		
Demographics	Mean/%	SD/N	Mean/%	SD/N	95% CI
Mean age of mother at birth of target child	3	1.4	17.6	1.3	(-0.020, 0.371)
Mean age of mother at interview	21.4	1.8	19.2	1.8	(1.866, 2.440)
Mean age of target child (months)	49.6	14.4	25.5	13.5	(22.016, 26.327)
% of target children girls	49.2	407	45.5	145	(-0.107, 0.033)
% of households in urban area	94.0	812	89.8	283	(-0.008, 0.093)
% of mothers living with the father of the child	31.5	299	40.2	129	(-0.149, -0.026)
% of mothers living with child's grandparents	72.0	612	78.6	247	(-0.055, 0.234)
Mean Household wealth (wealth factor)	-0.02	1.0	-0.1	1.0	(-0.055, 0.234)
Mean monthly household income (US dollars)	975.2	737.8	933.3	693.6	(-73.251, 157.054)
% of mothers completed secondary school	91.1	796	82.6	267	(0.035, 0.136)
% of mothers employed	45.3	431	23.0	83	(0.157, 0.291)
% of mothers in school	30.6	234	26.4	81	(-0.028, 0.112)

Abbreviations: SD=Standard Deviation
95% confidence intervals are for the mean or percent difference between those enrolled and those not enrolled in center-based care.

Table 4: Means and Standard Deviations for Parenting Stress and Child Behavior

	Sample Raw Scores		Score Norms
	Mean (SD)	**Range**	**Mean (SD)**
PSI-SF Total	72.5 (20.9)	36 – 164	71.0 (15.4)
Parental Distress	27.8 (8.8)	12 – 56	26.4 (7.2)
Dysfunctional Interaction	18.9 (6.9)	12 – 56	18.7 (4.8)
Difficult Child	26.0 (9.1)	12 – 56	26.0 (6.7)
CBCL Total	0.10 (1.0)	-2.1 – 4.1	--
Externalizing	0.11 (1.0)	-2.0 – 3.7	--
Internalizing	0.06 (1.0)	-1.7 – 4.9	--

Abbreviations: SD=Standard Deviation; PSI-SF=Parent Stress Index, Short Form; CBCL=Child Behavior Checklist
Score norms for the Parenting Stress Index are based on Abidin 1995.(53)
Child Behavior Checklist total, externalizing and internalizing scales are age-standardized within two-month age categories and centered at 0 with a standard deviation of 1.

Table 5. Parental Distress Associated with Having a Child in Center-Based Care

	Currently In Center-based Care N=869	Not in Center-based Care N=321	Difference	95% CI
Parental Distress				
Unadjusted	27.6	28.9	-1.4	(-2.671, -0.024)
Adjusted	27.8	27.9	-0.01	(-1.679, 1.654)

Unadjusted and adjusted models account for clustering by geographic location and use weights to account for the sampling design and nonresponse.
Adjusted model includes the following covariates: household wealth, income, urban/rural location, and presence of father; maternal education, employment status, and school status; and child age.

Table 6. Parenting Stress and Child Behavior Associated with Percent of Life in Center-Based Care

	Beta	95% Confidence Interval
Unadjusted		
Difficult Child	6.3	(2.012,10.580)
Total CBCL	0.3	(-0.083,0.720)
Externalizing	0.6	(0.158,1.059)
Internalizing	0.01	(-0.334,0.363)
Adjusted		
Difficult Child	6.5	(1.980,10.928)
Total CBCL	0.3	(-0.056, 0.746)
Externalizing	0.6	(0.128,1.050)
Internalizing	0.1	(-0.262,0.435)

Abbreviations: CBCL=Child Behavior Checklist
CBCL total, externalizing and internalizing scales are age-standardized within two-month age categories and centered at 0 with a standard deviation of 1.
Unadjusted and adjusted models account for clustering by geographic location and use weights to account for the sampling design and nonresponse.
Adjusted model includes the following covariates: household wealth, income, urban/rural location, and presence of father; maternal education, employment status, and school status; and child age.
Betas represent the change in parenting stress or child behavior associated with each additional percent of a child's life spent in center-based care.

Chapter 5. Conclusions

Adolescent birth rates in Latin America remain stubbornly steady and are expected to be the highest globally by 2020.(1) As this dissertation highlights, however, effective methods of supporting adolescent mothers and their children are not readily apparent, and borrowing solutions from other populations (e.g. Western countries, women who began childbearing after their teenage years) has not led to success as hypothesized.

The second chapter of this dissertation explored the experience of adolescent motherhood in rural, resource poor towns in Southern Mexico. This study found adolescent pregnancy and parenting in this setting was common and socially acceptable, but that women who began childbearing in adolescence were more likely than women who began childbearing at later ages to live in situations of adversity. For example, current and former adolescent mothers had the lowest levels of education and household wealth. These challenges seemed to be somewhat counterbalanced by strong social support systems, most frequently involving the participants' mothers and mothers-in-law, who helped the participants achieve confidence and competence in the parenting role. For these women, motherhood gave them a sense of belonging and importance in the social fabric of their communities.(2, 3) At the same time, traditional cultural expectations around gender and limited economic opportunities in the towns meant there were few alternative opportunities for women to pursue outside of or in addition to motherhood. This study demonstrated the importance of understanding adolescent motherhood in context in order to identify opportunities for supporting young mothers and their children. The cultural norms around adolescent childbearing and social support available to these women differs significantly from the experience of many women in Western societies.(4) These results highlighted the importance of adapting interventions for adolescent mothers in light of their social, economic and cultural contexts.

The third chapter assessed whether the effects of a parenting education program differed depending on mother's age at first birth using data from a cluster-randomized controlled trial in Chiapas, Oaxaca and Puebla, Mexico. We found that randomization to the parenting education program, *Educación Inicial,* was associated with benefits to child cognitive development among women who began childbearing after age 20, but that these benefits were not apparent among the children of women who began childbearing before the age of 17. These results suggest women who begin childbearing in early adolescence require more targeted interventions. Early childbearing may indicate that these women occupied more disadvantaged positions within their households and were unable to participate in the parenting education program or had more difficulty learning or implementing the lessons from the parenting classes. Interventions that are designed specifically for women who begin childbearing in early adolescence may be more effective at improving parenting behaviors and child development in this population.

The final study included in this dissertation explored the association between use of center-based child care and parenting stress. This study also assessed whether center-based care was associated with child behavior, which in turn could influence parenting stress. The findings from this cross-sectional study suggested center-based care was not associated with parenting distress as it relates to the parenting role. Young mothers frequently lived with the child's grandparents, which could explain why there were no differences in parenting distress related to the parenting role depending on child attendance in center-based care. Regardless of center-based care use, mothers may have had the child care support they needed to feel competent in their role as mother and pursue activities outside of motherhood as needed. Time in center-based

care, however, was associated with increased child externalizing problems, and mothers with children in center-based care for longer periods of time reported more parenting stress resulting from perceptions of their ability to manage their children's behavior. Taken together, this study provides evidence that using center-based care is actually associated with increased parenting stress among adolescent mothers rather than decreased stress. These results should be balanced with the positive benefits found to correlate with the use of center-based care, including high school graduation and self-sufficiency in adulthood among adolescent mothers and child cognitive development.(5, 6)

These three studies highlight the importance of understanding the context of adolescent motherhood when implementing interventions to support adolescent mothers and their children as well as the lack of understanding around what works to improve outcomes among adolescent mothers and their children in non-Western settings. Globally, adolescent childbearing is common.(7) Understanding how to support adolescent mothers and their children is critical to reducing disparities in social, economic and health outcomes experienced by this population.

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Appendix A. Interview Guide

"Evaluación de impacto del programa de Educación Inicial no Escolarizada de CONAFE *(PEI-CONAFE) en sinergia con Oportunidades"* - Exploración de la experiencia de crianza de las madres jóvenes.

Guía de la Entrevista

Instrucciones para los investigadores
Preguntas en negrita son las preguntas principales. Intenta completar todas esas preguntas.

- ⇒ Las preguntas marcadas con flecha son para obtener información adicional alrededor de las preguntas principales. Son opcionales, pero es importante obtener tanta información como pueda. Si termina con tiempo, puede regresar a estas para explorar los temas a mayor profundidad.

INTRODUCCIÓN

a. Participaste en el programa EI?
b. Cuántos niños tienes? Cuales son sus nombres? Que edades tienen?
c. Cuáles de sus hijos participaron en EI?

Mientras platicamos, quiero que pienses en los hijos con quienes participaste en EI. Como el programa es para los hijos muy jóvenes, las preguntas se enfocan allí.

PARTE I. *El Embarazo y la maternidad*

Empezamos platicando sobre tu embarazo y tu experiencia como mamá.

1. Puedes decirme que estaba sucediendo en tu vida cuando quedaste embarazada con (nombre del hijo/a).

- ⇒ Asistías a la escuela? ¿En que trabajabas? ¿En ese momento tenias una pareja? ¿Vivías con la pareja? ¿Dónde vivías?
- ⇒ ¿Estabas tratando de quedar embarazada?
- ⇒ ¿Cómo te sentiste acerca de tu embarazo cuando recibiste las noticias? ¿Cómo se transformó tu vida cotidiana?
- ⇒ ¿Cómo se sintió tu familia acerca de tu embarazo?
- ⇒ ¿Cómo se sintió tu pareja acerca de tu embarazo?
    - ¿Cómo se sienten al respecto ahora?

2. Para ti que es ser una buena madre de familia?

- ⇒ ¿Qué piensas que deben hacer las mamas con sus niños para criarlos?

3. ¿Qué tan bien te sientes en tu papel de madre?

- ⇒ Te sientes preparada para ser madre? ¿Porqué si / no?
- ⇒ ¿Crees que podrías y/o deberías ser de otra forma con tus hijos?, ¿Cómo?, ¿Por qué?, ¿Según quién?

Sólo para las madres jóvenes:

- ⇒ ¿Crees que sería diferente tu relación con tu hijo si hubieras sido mayor cuando diste a luz?
    - ¿En cual manera sería diferente?
- ⇒ ¿Ves alguna diferencia entre ser una madre joven en comparación con ser una madre de mayor edad?
    - ¿Cómo es diferente para ti?
    - ¿Cómo eres un poco mas joven, las personas te tratan diferente en comparación con otras madres de mayor edad?
        - ¿Me puedes contar un ejemplo?
    - ¿Quién toma las decisiones de educación, salud o gastos en tu familia?
        - ¿Me puedes contar un ejemplo?
    - ¿Qué tan fácil es para apoyar económicamente a tu familia en comparación con las madres de mayor edad?
        - ¿Me puedes platicar un poco mas sobre esto?

Sólo para las madres mayores:

- ⇒ ¿Crees que sería diferente tu relación con tu hijo si hubieras sido menor cuando diste a luz?
    - ¿En cual manera sería diferente?
- ⇒ ¿Ves alguna diferencia entre ser una madre joven en comparación con ser una madre de mayor edad?
    - ¿Cómo es diferente para ti?
- ⇒ ¿Quién toma las decisiones de educación, salud, o gastos en tu familia?
    - ¿Me puedes contar un ejemplo?
- ⇒ ¿Qué tan fácil es para apoyar económicamente a tu familia?
    - ¿Me puedes platicar un poco mas sobre esto?

PARTE II. *Apoyo para la maternidad*

Ahora tengo algunas preguntas sobre fuentes de apoyo y fuentes de problemas en el tema de la maternidad. También voy a preguntarte sobre tu experiencia con el programa de Educación Inicial PEI-CONAFE.

4. ¿Hay alguien quien te ayuda ser una buena madre? ¿Quién y cómo?

- ⇒ ¿Hay alguien más que te apoye en la atención de tus hijos? ¿Quién? ¿Cómo? ¿Cuándo?
- ⇒ ¿Te gustaría contar con el apoyo de alguien para atender a tus hijos? ¿Quién? ¿Para qué ámbitos? ¿Por qué?
- ⇒ ¿Hay alguien mas que se hace cargo de tu niño cuando tu no puedes cuidarlo? ¿Con qué frecuencia?
- ⇒ ¿Qué mas te ayuda a ser una buena madre? (programas o servicios en la comunidad)

5. ¿Qué situaciones te dificultan ser una buena madre?

- ⇒ ¿Qué te hace difícil ser una buena madre? (el costo, tiempo, distancia de los programas o servicios etc.)

6. ¿Consideras que te ha ayudado a ti o a tu hijo participar en el programa de Educación Inicial (EI) PEI-CONAFE? ¿Me puedes decir un poco mas sobre esto?

- ⇒ Ha cambiado tu forma de criar a tus hijo desde que empezaste a asistir a las sesiones de la EI? ¿De que manera ha cambiado?
- ⇒ Ves algún cambio en tu hijo a partir de las sesiones de EI? ¿Qué cambios ves en tu hijo?
- ⇒ ¿Cómo ha sido tu experiencia con el promotor de salud?
- ⇒ ¿Qué partes de las sesiones te han ayudado más? (los temas, actividades, estar con los otros padres, el promotor de salud)
- ⇒ ¿Qué le gusta tu hijo de los clases de Educación Inicial?
- ⇒ ¿Qué te gustaría que hubiera en los clases de Educación Inicial para ayudarte más en tus esfuerzos como madre? ¿Cambiarías algo de los clases?

PARTE III. *Esperanzas o expectativas*

Ahora, en función de lo que me has platicado, me gustaría preguntarte sobre tus esperanzas o lo que te gustaría lograr para ti y para (nombre del hijo).

7. ¿Qué te gustaría lograr para ti y para (nombre del hijo)?

- ⇒ ¿Por qué?
- ⇒ ¿De qué forma crees que se podría lograr?
- ⇒ ¿En cuánto tiempo crees que se podría lograr?
- ⇒ ¿Tienes confianza de que vas a lograr esto / de que tu hijo va a lograr esto?