PREP

The Personal Responsibility Education Program Evaluation

Enhancing a Home Visiting Program to Address Repeat Adolescent Pregnancy: The Longer-Term Impacts of Steps to Success

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OVERVIEW

Repeat pregnancies during adolescence can further compound the adverse outcomes associated with a teen birth. A small but growing body of evidence suggests that interventions for adolescent mothers can promote healthy birth spacing by providing a combination of individualized support services and improved access to effective contraception. To build on the promising research in this area, the Administration for Children and Families (ACF) within the U.S. Department of Health and Human Services funded Mathematica Policy Research to conduct a rigorous evaluation of Steps to Success, a two-year home visiting program for pregnant and parenting adolescents provided by Healthy Families San Angelo (HFSA) in San Angelo, Texas. Using federal funding from the Personal Responsibility Education Program (PREP) Competitive Grant program, HFSA developed Steps to Success by enhancing a traditional home visiting program. While the traditional home visiting program focused on child development and parenting, the enhanced program included additional program components designed to (1) promote healthy birth spacing, with an emphasis on increasing the use of long-acting reversible contraceptives (LARCs); (2) encourage father involvement; and (3) support mothers' education and career aspirations. The study is part of a broader national evaluation of PREP that Mathematica is conducting for ACF (Wood et al. 2015).

The study team used a random assignment design to test the efficacy of Steps to Success compared to the traditional home visiting program. HFSA staff recruited pregnant and recently postpartum adolescent mothers, ages 14 to 20, over a three-year period. Mothers were randomly assigned to a program group that received the Steps to Success home visiting program or a control group that received the traditional home visiting program that focused on parenting and child development. Mothers in both research groups completed a baseline survey upon enrolling in the study and follow-up surveys one and two years later. Data from the two-year follow-up survey are the focus of this report.

Steps to Success's central goal was to reduce the rate of repeat pregnancy among adolescent mothers. Based on data from the two-year follow-up, conducted around the time program services were slated to end, our analysis found similar rates of repeat pregnancy among mothers in the Steps to Success and traditional home visiting groups. However, there is some evidence that Steps to Success improved other outcomes related to healthy birth spacing. In particular, the evidence suggests that mothers in the Steps to Success group were more likely to use LARC methods than were mothers in the traditional home visiting group. This difference was driven by changes in the behavior of younger adolescent mothers (ages 14 to 18 at program enrollment). The Steps to Success enhancements to the traditional home visiting model also decreased the incidence of unprotected sex among younger adolescent mothers. There was no evidence that the Steps to Success enhancements improved father involvement, mothers' education and career aspirations, or mothers' parenting behavior, relative to the traditional home visiting program.

This report is the last in a series on the implementation and impacts of Steps to Success. It presents evidence on the program's longer-term impacts relative to HFSA's traditional home visiting program. The report also provides information on program costs and describes the study's methods. Earlier reports presented evidence on the program's shorter-term impacts (Rotz and Wood 2018) and described the program's design and implementation (Kisker et al. 2016).

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INTRODUCTION

Despite declines in adolescent pregnancy over the past three decades, many young women still become mothers before they turn 20 years old (Martin et al. 2018). Compared to women who first have children in their 20s, teen mothers are more likely to have poor obstetric and neonatal outcomes, drop out of school, and live in poverty (Hoffman 2008). Their children also tend to fair worse in terms of health, education, and other aspects of well-being (Hoffman and Maynard 2008). Moreover, teen pregnancy has implications for society as a whole. For example, in 2015 alone, U.S. taxpayers faced costs related to teen pregnancy of close to $2 billion (Power to Decide 2018).

Repeat pregnancies during adolescence can further compound the adverse outcomes associated with a teen birth. Adolescent mothers who become pregnant within 18 months of giving birth are at substantially greater risk of having a stillbirth or preterm birth than mothers who delay subsequent childbearing (Conde-Agudelo et al. 2006). Young mothers who have multiple children as teens are also less likely to stay in or complete high school, to work, or to maintain economic self-sufficiency (Klerman 2004). In addition, their children are less likely to exhibit school readiness when they begin school (Klerman 2004) and are more likely to become teenage parents themselves (Liu et al. 2018). Repeat pregnancy is common among adolescent mothers; about one in six teenage births is a repeat birth (Martin et al. 2018).

A small but growing body of evidence suggests that interventions for adolescent mothers can promote healthy birth spacing by providing a combination of individualized support services and improved access to effective contraception (Norton et al. 2017). For example, research has shown that the long-standing Nurse Family Partnership program reduces rates of subsequent pregnancies and births at 24 months postpartum for young, first-time mothers (Olds et al. 2002). More recently, a randomized controlled trial of the Teen Options to Prevent Pregnancy program for low-income adolescent mothers found that the program reduced rates of repeat pregnancy through a combination of one-on-one motivational interviewing sessions and facilitated access to contraceptive services (Rotz et al. 2016).

To build on the promising research in this area, the Administration for Children and Families within the U.S. Department of Health and Human Services funded Mathematica Policy Research to conduct a rigorous evaluation of Steps to Success, a two-year home visiting program for pregnant and parenting adolescents provided by Healthy Families San Angelo (HFSA) in San Angelo, Texas. Using federal funding from the Personal Responsibility Education Program (PREP) Competitive Grant program, HFSA developed Steps to Success by adapting a more traditional home visiting program to address the needs of parenting adolescents. HFSA's traditional home visiting program is based on the Healthy Families America home visiting model, which focuses on parenting skills and child development and has shown success in improving these outcomes (Caldera et al. 2007; Duggan et al. 2004; Harding et al. 2007; LeCroy and Krysik 2011). The program offers home visits for up to two years. HFSA enhanced the traditional approach with additional program components designed to promote healthy birth spacing—with a focus on increasing the use of long-acting reversible contraceptives (LARCs)—encourage father involvement, and support mothers' education and career aspirations.

Mathematica worked with HFSA to implement a random assignment study of Steps to Success, measuring the impacts of the program relative to the agency's traditional home visiting program.

This report is the last in a series on the implementation and impacts of Steps to Success. It presents evidence on the program's longer-term impacts after two years relative to HFSA's traditional home visiting program focused on parenting and child development. The report also provides information on program costs and documents the study's methods. An earlier report presented evidence on the program's shorter-term impacts (Rotz and Wood 2018). That report found that, after one year of the two-year programs, Steps to Success mothers were more likely than mothers enrolled in the traditional home visiting program to report using a LARC method. There was also some evidence that the program reduced the prevalence of unprotected sex around the time of the one-year follow-up survey. But mothers in the two research groups reported similar rates of repeat pregnancy in the year after study enrollment. There was also no evidence that the Steps to Success enhancements improved father involvement, mothers' education and career aspirations, or mothers' parenting behavior relative to the traditional home visiting program.

This report builds on the earlier research by examining whether earlier impacts persisted or new impacts emerged after study participants had the opportunity to complete the two-year programs. The analysis further focuses on the central question of whether the Steps to Success enhancements to the traditional home visiting program reduced rates of repeat pregnancy.

HFSA's two home visiting programs for adolescent mothers

HFSA, a nonprofit organization founded in 1992, promotes healthy child development and family functioning through home visits to families in need. HFSA designed its services to help expectant and new parents care for their babies and prevent child abuse and neglect. This study contrasts two home visiting programs provided by HFSA: a traditional home visiting program and the enhanced Steps to Success program. These programs differed in both content and format, as summarized in Table 1.

Table 1. Comparison of HFSA's two home visiting programs

	Steps to Success	Traditional home visiting
Content of home visits		
Parenting, child health and safety, child development	✓	✓
Healthy birth spacing, contraception, development of a reproductive life plan	✓	
Father involvement and co-parenting	✓	
Education, career planning, other adult preparation subjects	✓	
Format of home visits		
Two years of services, delivered in weekly visits that transition over time to biweekly and then monthly visits	✓	✓
Extended period of weekly home visits	✓	
Active engagement of fathers during visits	✓	

Home visitors from both programs provided new parents with information on child development and worked to improve mothers' parenting skills (Kisker et al. 2016). At each visit, home visitors assessed a baby's progress and discussed mother-baby interactions, how to

stimulate the baby's development and growth, and the importance of keeping doctor's appointments and maintaining immunizations. The Steps to Success curriculum supplemented this content on parenting and child development with additional content in three areas: (1) healthy birth spacing; (2) father involvement; and (3) mothers' education and career planning.

Steps to Success home visitors sought to support young mothers in choosing healthy birth spacing (Kisker et al. 2016). First, home visitors worked to develop a comfortable relationship with mothers to facilitate more honest discussion of reproductive health topics. Once they established rapport, home visitors focused on asking detailed questions to encourage young mothers and their partners to think critically about their contraceptive choices, identify barriers to effective contraceptive use, determine their contraceptive goals, and make informed choices about their reproductive health. Home visitors provided participants with information on different forms of contraception and worked to dispel any misconceptions mothers might have about the methods. They then guided mothers in creating a contraceptive plan to achieve their goals.

In their discussions with families, Steps to Success home visitors placed a particular emphasis on LARCs as reliable, long-term birth control methods. In addition, they counseled families on health insurance coverage of birth control and the importance of being mindful of the expiration of Medicaid benefits that many of the participating mothers faced eight weeks after giving birth (Kisker et al. 2016). Steps to Success home visitors explained to participants that they could use Medicaid to obtain a LARC method shortly after giving birth, which would then protect them against pregnancy long after they stopped receiving Medicaid benefits. More generally, Steps to Success home visitors encouraged mothers to keep medical appointments and took mothers to appointments if necessary to help them obtain contraception.

To encourage father involvement, Steps to Success home visitors were trained to actively engage fathers during home visits; this effort included those fathers who were no longer in romantic relationships with their babies' mothers. Home visitors encouraged fathers to be involved in all parenting decisions, including those related to birth control (for fathers still in romantic relationships with the mothers of their children). In addition, Steps to Success incorporated elements of the *Maps for Dads* curriculum, which covers the father's role in child development, father-child relationships, and effective co-parenting.

To promote mothers' education and career planning, the Steps to Success curriculum emphasized developing skills in goal setting and decision making. Steps to Success home visitors worked to integrate the message that participants should continue to plan for and pursue their education and career goals while parenting their babies, as doing so would help make them better parents. Steps to Success home visitors also worked with participating families to emphasize the link between family planning and career planning and how another pregnancy in the near term might affect their ability to achieve their career goals.

HFSA's traditional home visiting program focused only on parenting and child development topics and did not cover healthy birth spacing or the other topics covered by Steps to Success. Home visitors in the traditional program focused on the mothers during visits and did not actively work to engage fathers.

Families in both programs received home visits for up to two years, with the frequency of visits dropping over this period from weekly to biweekly to monthly. However, Steps to Success offered weekly visits with families for a longer period than the traditional program. HFSA planned for Steps to Success families to receive weekly visits for about three to six months; families receiving the traditional home visiting program typically received weekly visits for one month or less. These additional visits with families in their early months in the program enabled the Steps to Success home visitors to cover a wider array of topics while continuing to provide detailed information on parenting and child development.

Evaluation design

HFSA staff recruited adolescent mothers, ages 14 to 20, on a rolling basis for the evaluation. To be eligible for the study, mothers could be at any point in their pregnancy or up to three months postpartum. Eligibility did not depend on whether the mother had previously had any other children. The recruitment effort occurred in San Angelo, Texas, and surrounding communities from May 2013 to May 2016. Initially, HFSA recruited participants solely through two local hospitals. The effort later expanded to include three local high schools, the Pregnancy Help Center (a local nonprofit), Esperanza clinics (a local health care provider), and the offices of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

The recruitment process involved both obtaining informed consent and conducting a baseline survey. For mothers who were at least 18 years old, an intake worker first obtained signed consent for participation in the study and then asked the sample member to complete a self-administered paper-and-pencil baseline survey. For those who were younger than 18, an intake worker first obtained consent from the mother's parent or legal guardian before asking the sample member to complete the baseline survey.

Mothers who applied to the program had an equal chance of being placed into the program group that received the Steps to Success home visiting program or the control group that received the more traditional home visiting program. The evaluation team conducted random assignment separately for two groups of mothers: (1) those who were currently pregnant and (2) those who had recently given birth. This process ensured that the proportion of mothers who entered the study before the birth of their babies was the same in the two study groups. At the end of the three-year enrollment period, 594 young mothers had agreed to participate in the study and been randomly assigned: 298 to Steps to Success and 296 to the traditional home visiting program.

To measure the impact of Steps to Success relative to traditional home visiting, the evaluation team administered three surveys to women in both study groups: (1) a baseline survey administered when mothers first enrolled in the study, before random assignment; (2) a one-year follow-up survey, administered in the middle of the home visiting programs, about 12 months after enrollment; and (3) a two-year follow-up survey, administered at the conclusion of the home visiting programs, about 24 months after enrollment. The evaluation team designed the baseline survey as a self-administered paper-and-pencil questionnaire, which included a broad range of measures of family background, sociodemographic, and personal characteristics as well as measures of sexual risk behavior before a woman's current or recent pregnancy. The evaluation team conducted the first and second follow-up surveys by telephone. In total, 498

study participants completed the one-year follow-up survey for a total response rate of 84 percent, and 483 participants completed the two-year follow-up for a total response rate of 81 percent. Response rates were similar for the Steps to Success and traditional home visiting groups (80 and 82 percent for the two-year follow-up, respectively). This report relies primarily on the baseline survey and the two-year follow-up survey. However, we also refer to results from the Steps to Success interim impact report, which focused on data from the one-year follow-up survey.

The analysis also draws on program data documenting the frequency and content of the services delivered to program participants in both study groups. HFSA home visitors recorded this information after each home visit. Understanding the extent to which the programs differed as intended is important for interpreting program impacts. We therefore used these data to examine the extent to which Steps to Success actually differed from the traditional home visiting program with respect to the content and frequency of home visits. We analyzed measures of program implementation using data from the entire study sample, including both mothers who responded to the two-year follow-up survey and those who did not respond. Results are similar if we restrict the sample to survey respondents.

This report examines the longer-term effects of the two-year Steps to Success program about 24 months after families began receiving program services and around the time when individuals would have concluded service receipt. Because the analysis examines the effect of Steps to Success relative to HFSA's traditional home visiting program, we focus on impacts in areas emphasized by Steps to Success but not the traditional program—specifically, healthy birth spacing, father involvement, and mothers' education and career aspirations. We also examine measures in a fourth area, mothers' parenting behavior. Both Steps to Success and the traditional home visiting program cover parenting topics. However, the additional topics covered during Steps to Success home visits might have led home visitors to spend less time on parenting and child development, potentially making the program less effective in improving mothers' parenting behavior. Alternatively, the additional topics might have enhanced Steps to Success's effects on parenting. Measuring impacts on parenting behavior enables us to examine whether the Steps to Success enhancements made the program more or less effective in this important area.

Before conducting the analysis, the study team selected 11 primary outcomes to examine for the impact study (Table 2). The team designated one of these 11 primary outcomes—whether a mother has had a repeat pregnancy—as the study's sole confirmatory measure. This measure serves as the main test of Steps to Success's effectiveness in achieving its central goal. Based on HFSA's enrollment targets and the assumption that 25 percent of the traditional home visiting group would experience a repeat pregnancy (Centers for Disease Control and Prevention 2013), the study team initially anticipated being able to detect a reduction in repeat pregnancy of about 8 percentage points (Wood et al. 2015). In other words, if the Steps to Success enhancements to the traditional home visiting program reduced repeat pregnancy by 8 percentage points or more, the team would likely be able to conclude that the effect was too large to be due to chance. Despite recruiting almost all eligible adolescent mothers in the San Angelo area, study enrollment fell somewhat below the initial numeric target. Based on actual sample sizes, we would anticipate being able to detect a slightly larger impact on repeat pregnancy of about 9 percentage points. This impact is roughly half the size of the recently-estimated impact on repeat

pregnancy of the Teen Options to Prevent Pregnancy program, an intervention similar to Steps to Success designed to reduce repeat pregnancy among adolescent mothers in Columbus, Ohio (Rotz et al. 2016).

Table 2. Primary outcome measures

Outcome	Measure
Healthy birth spacing	
Any repeat pregnancy[a]	Binary variable: equals 1 if a woman reports any pregnancy since the birth of the HFSA child and 0 if a woman reports not having become pregnant since the birth of the HFSA child.
Currently using a LARC method	Binary variable: equals 1 if a woman reports currently using an IUD or contraceptive implant and 0 if a woman reports not currently using these methods.
Recently had unprotected sex	Binary variable: equals 1 if a woman reports having had sexual intercourse without using any effective method of contraception in the three months before the survey and 0 if a woman reports not having done so. Effective methods include condoms, birth control pills, the shot, the patch, the ring, IUDs, and contraceptive implants.
Desire to avoid a repeat pregnancy in the next year	Single-item scale variable indicating how a mother would feel if she became pregnant again in the next year. The variable ranges from 1 (very happy) to 5 (very upset), with higher values indicating more negative feelings about becoming pregnant. Women with a repeat pregnancy since the baseline survey are excluded from the analysis of this outcome because they were not asked the survey question required to construct the measure.
Knowledge of contraception and pregnancy prevention	Count variable: sum of indicators for correct responses to two survey questions. The variable ranges from 0 to 2, with higher values indicating greater knowledge. The knowledge questions were “If condoms are used correctly and consistently, how much can they decrease the risk of pregnancy?” and “If birth control pills are used correctly and consistently, how much can they decrease the risk of pregnancy?” For both items, respondents were asked to choose between the following options: not at all, a little, a lot, completely, and don’t know.
Father involvement	
Quality of co-parenting relationship	Multiple-item continuous scale variable: average of mother’s responses to seven survey items. The variable ranges from 1 to 5, with higher values indicating a stronger co-parenting relationship (seven items, $\alpha = 0.96$). Each question asked respondents to report their level of agreement with a statement such as “I feel good about child’s father’s judgment about what is right for child” or “No matter what might happen between child’s father and me, when I think of child’s future, it includes child’s father.”
Father’s engagement with child	Multiple-item continuous scale variable: average of a mother’s responses to eight survey items about her HFSA child’s father; variable ranges from 0 to 5, with higher values indicating more frequent interaction with child (eight items, $\alpha = 0.98$). Each question asked the respondent to report the frequency with which the HFSA child’s father participated in activities such as singing songs with the child or helping the child to get dressed.
Father regularly spends time with child	Binary variable: equals 1 if a mother reports that the father of her HFSA child spent one or more hours per day with his child every day, almost every day, or a few times per week in the past month and 0 if a mother reports that the father of her HFSA child spent one or more hours per day with his child a few times, once or twice, or never in the past month.

Outcome	Measure
Mothers' education and career aspirations	
Currently enrolled in school	Binary variable: equals 1 if a mother reports being currently enrolled in school and 0 if a mother reports not being currently enrolled in school.
Mother's career goals	Multiple-item continuous scale variable: average of a mother's responses to six survey items. The variable ranges from 1 to 4, with higher values indicating stronger career aspirations (six items, α = 0.82). Each question asked respondents to report their level of agreement with a statement such as "I have specific goals for my future career" and "Going to college is important for getting a good job."
Mothers' parenting behavior	
Mother's engagement with child	Multiple-item continuous scale variable: average of a mother's responses to five survey items. The variable ranges from 0 to 5, with higher values indicating more frequent interaction with child (five items, α = 0.90). Each question asked respondents to report the frequency with which they participated in activities such as singing songs with the child or reading to or looking at books with the child.

[a] Confirmatory outcome when measured using data from the two-year follow-up survey.

IUD = intrauterine device; LARC = long-acting reversible contraceptive.

The study team also examined impacts on a set of secondary outcomes in exploratory analyses presented in the technical appendix of the report. Details on the analytic approach are also included in that appendix.

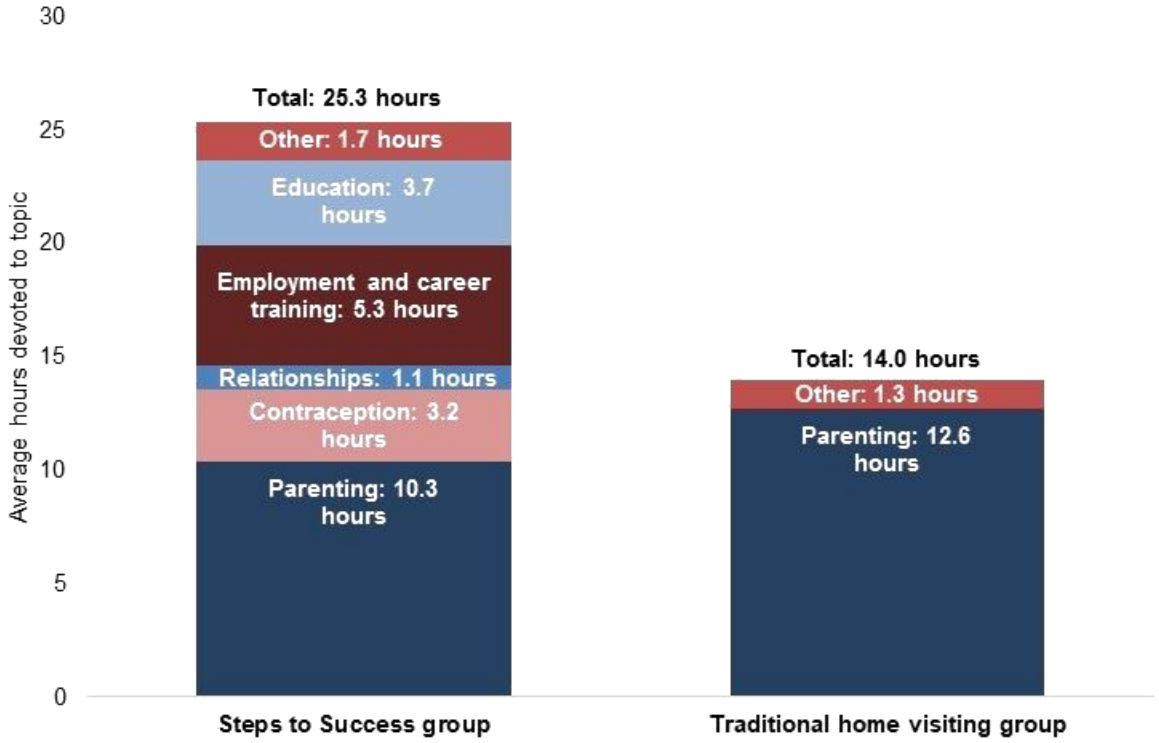
Program implementation and cost

HFSA's staffing plans were designed to facilitate the implementation of both Steps to Success and the traditional home visiting program with fidelity. In particular, the organization maintained separate teams of home visitors for the two programs to reduce the risk that control group families received Steps to Success services. For both programs, some home visitors were staff members who already worked at the organization; HFSA hired others after the evaluation started. HFSA leaders felt strongly that the two programs required home visitors with different strengths and therefore did not assign home visitors randomly to the two programs. In particular, HFSA leaders wanted Steps to Success staff to be comfortable discussing sexuality, contraception, and reproductive health and actively sought these characteristics in staff selections and new hires. If a manager did not think a staff member could readily discuss these topics, or if staff members themselves indicated they were uncomfortable doing so, the manager did not select that candidate for Steps to Success.

Because staff members were not assigned randomly to the two programs, there were some differences in the characteristics of the two sets of home visitors, two of which were particularly notable. First, the organization hired several new home visitors to meet the needs of the evaluation and assigned these staff members to work on Steps to Success. As a result, Steps to Success home visitors had shorter tenures with HFSA, on average, than the traditional home visiting staff. Second, Steps to Success home visitors were more educated, with 63 percent holding a bachelor's degree, compared with 25 percent of the home visitors providing the traditional program (Kisker et al. 2016). Thus, any impacts of Steps to Success might be due in part or in whole to characteristics of the staff rather than the program design itself.

Both groups of HFSA staff generally adhered to initial implementation plans and maintained a strong contrast in the services they delivered to the two study groups. In particular, Steps to Success home visitors discussed a wider variety of topics with families than did home visitors for HFSA's traditional program (Figure 1). Steps to Success visits covered contraception, education, employment and career training, and co-parenting and other relationships—topics that were not covered during visits provided to the traditional home visiting group. In addition, Steps to Success's goal of actively engaging fathers led to increased participation by fathers in home visits; fathers participated in 39 percent of Steps to Success home visits, compared with 4 percent of visits in the traditional program (not shown).

Figure 1. Exposure to key program topics



Source: HFSA administrative data for two-year after study enrollment.

Notes: N = 298 for the Steps to Success group and N = 296 for the traditional home visiting group. Estimates are regression-adjusted predicted values. Topic-specific estimates do not necessarily add to the total due to rounding. See the technical appendix for details on the estimation procedure.

All differences, except that for time discussing other topics, are statistically significant at the .01 level, two-tailed test.

To cover the additional program topics, home visitors delivering Steps to Success visited families more frequently. As of two years after program enrollment, Steps to Success families received an average of about 32 home visits each, compared with about 20 visits for families enrolled in the traditional home visiting program. In total, Steps to Success families spent 25.3 hours, on average, receiving program services in the two years following random assignment, compared with an average of 14.0 hours for families in the traditional home visiting group (Figure 1). However, because of the time devoted to other topics, Steps to Success home visitors

spent less time discussing parenting and related topics than did home visitors in the traditional program: an average of 10.3 hours per Steps to Success family compared with 12.6 hours per family in the traditional home visiting program. The study team conducted statistical tests to determine whether the differences between the Steps to Success and traditional home visiting groups in these implementation measures are statistically significant. This analysis showed all such differences are significant, except for the amount of time spent discussing "other" topics.

According to home visitors, HFSA leaders, evaluation site visitors, and the participants themselves, mothers in both study groups valued the information they received and appreciated the support provided by their home visitors (Kisker et al. 2016). More generally, focus group respondents reported that they appreciated having the chance to talk to the home visitors. During home visit observations, mothers (and fathers, in the Steps to Success group) actively engaged in the visit activities.

On the basis of cost information collected from HFSA, the study team estimated that the per-participant costs of Steps to Success and HFSA's traditional program were $7,689 and $5,140, respectively (see the technical appendix and Appendix Table A.1 for further details on these estimates and the methods used to construct them). The estimated costs for both Steps to Success and the traditional home visiting program are within the range of publicly available cost estimates for other home visiting programs (see Burwick et al. 2014). The $2,500 per-participant difference in costs between the two programs was driven by Steps to Success families receiving more visits than families in the traditional home visiting group. After adjusting for differences in the average number of visits, the costs of the programs were similar—$233 per visit for Steps to Success and $257 per visit for the traditional home visiting program.

Characteristics of mothers in the study

The characteristics of the young mothers who enrolled in the study reflect the characteristics of the broader San Angelo community that HFSA serves (Kisker et al. 2016). Across both study groups, 67 percent of participants were Hispanic, and 93 percent reported that English was the primary language they spoke at home (Table 3). The young mothers ranged in age from 14 to 20 at study enrollment, with about two-thirds age 18 or older. At the time of study enrollment, about 40 percent lived with their biological mothers and about one-quarter lived with their biological fathers; less than one in five lived with both biological parents. The vast majority (86 percent) had either already earned a high school diploma or GED or were still in school to pursue their diploma. More than three-quarters of mothers reported that they were in a romantic relationship with the baby's father at the time they enrolled in the study. Just over half were living with the baby's father at enrollment, and 14 percent were married to the baby's father. The study enrolled mothers during pregnancy and immediately after birth; 4 in 10 were recruited before their babies were born.

Study participants reported little recent exposure to contraceptive education at the time of study enrollment, suggesting the Steps to Success content on contraception filled an important gap (Table 3). Less than one in five respondents reported having attended classes on abstinence, methods of birth control, or relationship skills in the past year. However, about half reported receiving information on birth control methods from a health care provider during the same period.

Table 3. Characteristics of participants at study enrollment

Characteristic	Measure (percent)
Demographics	
Age	
14 or 15	8
16	10
17	15
18	19
19	23
20	25
Race/ethnicity	
White, non-Hispanic	28
African American, non-Hispanic	3
Hispanic	67
Other	2
Main language spoken at home	
English	93
Spanish	7
Education	
Obtained high school diploma or GED certificate	53
Either currently enrolled in school or have a high school diploma or GED certificate	86
Family relationships	
Lives with biological mother and biological father	17
Lives with biological mother but not biological father	26
Lives with biological father but not biological mother	6
Biological parents are married	30
Relationship with baby's father	
Currently married to baby's father	14
Currently living with baby's father	54
Currently in a romantic relationship with baby's father	78
Exposure to information	
Attended classes or sessions in the prior year on:	
Methods of birth control	12
Abstinence	7
Relationships, dating, or marriage	7
Received information on methods of birth control in the prior year from a doctor, nurse, or clinic	53
Pregnancy history and sexual risk behaviors	
Pregnant at study enrollment	40
Has only been pregnant once	80
Had child prior to HFSA child	17
Age at first intercourse	
13 or younger	9
14	17
15	25
16	24
17	19
18 or older	6
Ever told by a doctor or nurse that she had an STI	14
Sample size	**594**

Source: HFSA baseline surveys.

GED = general educational development; STI = sexually transmitted infection.

As seen in other similar studies of adolescent mothers (for example, Rotz et al. 2016, Covington et al. 2017), most of the study participants reported having had an early sexual initiation and multiple sexual partners (Table 3). The median age at first intercourse among sample members was 15, compared with a median of 17 in the general population (Finer and Philbin 2013), and for 20 percent of sample members, the pregnancy that made them eligible for the study was not their first. On average, participants reported having had 3.4 sexual partners in their lifetimes (not shown). In addition, about one in seven participants had been diagnosed with a sexually transmitted infection (STI).

Impacts

Steps to Success includes enhancements to HFSA's traditional home visiting model in three key areas: (1) healthy birth spacing; (2) father involvement; and (3) mothers' education and career aspirations. This section examines the effects of Steps to Success in these three areas relative to the traditional home visiting program offered to mothers in the control group. Both Steps to Success and the traditional program instructed mothers on parenting and child development, but Steps to Success devoted somewhat less time to this topic than did the traditional program (an average difference of about two hours). Therefore, this section also examines impacts in a fourth area, mothers' parenting behavior. The technical appendix presents additional analyses of program impacts on secondary outcomes and impacts for key subgroups of mothers.

Overall, the impact analysis indicates that mothers in the Steps to Success and traditional home visiting groups had similar rates of repeat pregnancy in the two years following random assignment. However, Steps to Success appears to have had other effects related to healthy birth spacing, particularly for younger mothers. In contrast, there is little evidence that the Steps to Success enhancements improved outcomes in the other domains we examined.

Steps to Success's impact on LARC use at the one-year follow-up appears to have persisted after two years. There were no detectable impacts on repeat pregnancy or other healthy birth spacing outcomes at the two-year point for all study mothers.

As described in the earlier impact report (Rotz and Wood 2018), at the time of the one-year follow-up survey, Steps to Success had increased the rate of LARC use among mothers in the program. At that point, 54 percent of Steps to Success mothers reported using a LARC, compared with 42 percent of mothers in the traditional home visiting program, a statistically significant 12-percentage-point difference.[1]

The impact on LARC use appears to have persisted at the two-year follow-up but may have diminished somewhat. After two years, 53 percent of Steps to Success mothers reported that they were currently using a LARC method, compared with 44 percent of traditional home visiting

[1] Throughout this report, a difference is classified as "statistically significant" if, in the event that there was no actual effect of the Steps to Success enhancements to the traditional home visiting program, the chance of estimating an effect of that size is less than 5 percent (a *p*-value of 0.05 or less). The team also denotes effects as "statistically significant at the 0.10 level" if, in the event that there was no actual effect of the Steps to Success enhancements to the traditional home visiting program, the chance of estimating an effect of that size is less than 10 percent (a *p*-value of 0.10 or less).

mothers (Table 4). The 9-percentage-point difference is statistically significant at the 0.10 level. Exploratory subgroup analysis reveals that the impact on LARC use was concentrated among the younger mothers served by the program. Among those mothers who were younger than 19 years old at study enrollment, Steps to Success had a statistically significant 17-percentage-point impact on LARC use at the time of the two-year follow-up (Appendix Table A.6). In contrast, the program had no significant impact on LARC use among mothers who entered Steps to Success when they were 19 or 20 years old.

At the first follow-up, there was also some evidence that Steps to Success reduced the likelihood that mothers had recently engaged in unprotected sex. At that point, 18 percent of Steps to Success mothers reported having had unprotected sex in the previous three months, compared with 25 percent of mothers in the traditional home visiting group (Rotz and Wood 2018). This 7-percentage-point difference was statistically significant at the 0.10 level. At the two-year follow-up, the difference between the study groups on this outcome was smaller—24 percent for mothers in the Steps to Success group, compared with 29 percent of those in the traditional home visiting group—and no longer statistically significant (Table 4). Exploratory subgroup analysis reveals that, although there was no impact for the full sample on recent unprotected sex, there was an impact for younger mothers. Among mothers who entered the program when they were 14 to 18 years old, Steps to Success reduced the likelihood of unprotected sex around the time of the two-year follow-up by 11 percentage points (Appendix Table A.6), a statistically significant impact. For older adolescent mothers, Steps to Success did not affect this outcome differently than HFSA's traditional home visiting program.

Table 4. Impacts of Steps to Success on healthy birth spacing

Outcome	Steps to Success mothers	Traditional home visiting mothers	Impact	Effect size
Confirmatory outcome				
Any repeat pregnancy (%)	25	28	-3	-0.06
Other primary outcomes				
Currently using a LARC method (%)	53	44	9+	0.18
Recently had unprotected sex (%)	24	29	-5	-0.10
Desire to avoid repeat pregnancy in the next year (range: 1 to 5)[a]	1.9	1.8	0.10	0.09
Knowledge of contraception and pregnancy prevention (range: 0 to 2)	1.1	1.1	-0.02	-0.02
Sample size	**239**	**244**		

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

Notes: Estimates are regression-adjusted predicted values. See the technical appendix for details on the estimation procedure.

[a] Measure does not include the 59 Steps to Success mothers and 67 traditional home visiting mothers who responded to the survey and reported a repeat pregnancy.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

LARC = long-acting reversible contraceptive.

Despite the effects on LARC use and unprotected sex, Steps to Success had no discernible effect relative to the traditional home visiting program on repeat pregnancy in the two years following mothers' enrollment in the study. At the two-year point, 25 percent of Steps to Success mothers had experienced a repeat pregnancy, compared with 28 percent of mothers in the traditional home visiting group, a difference that is not statistically significant (Table 4). Focusing on mothers under age 19 at study enrollment, the difference between groups increases, but is still not statistically significant. Within this subgroup, 18 percent of Steps to Success mothers experienced a repeat pregnancy, compared with 26 percent of mothers in the traditional home visiting group, an 8-percentage-point difference, which does not meet the 0.10 threshold for statistical significance (with a *p*-value of 0.13).

Other measures of healthy birth spacing were similar for the two study groups. Consistent with the one-year follow-up results, mothers in the Steps to Success and traditional home visiting groups who had not had a repeat pregnancy reported similar views of pregnancy two years after random assignment. Both study groups had average values close to 2 on a 1-to-5 scale measuring the desirability of avoiding a repeat pregnancy (Table 4). This value corresponds to the mother indicating that she would be "a little happy" if she got pregnant in the coming year. Mothers in the Steps to Success and traditional home visiting groups also had similar levels of knowledge about contraception and pregnancy prevention. When asked two questions on the follow-up survey about the effectiveness of condoms and birth control pills in preventing pregnancy, mothers from both groups answered just over one of the two questions right, on average (Table 4).

Compared to traditional home visiting, Steps to Success did not improve outcomes related to father involvement.

When asked about the fathers of their babies, mothers in the Steps to Success and traditional home visiting groups had similarly positive views of the quality of their co-parenting relationships. Both groups had an average score of 3.8 on the 5-point co-parenting quality scale (Table 5). In addition, two years after study enrollment, mothers in the two study groups reported similarly on the degree to which the fathers of their children participated in child care and play activities. On the 0-to-5 scale of a father's engagement with his child, Steps to Success fathers had an average score of 2.4, based on mothers' reports, compared with 2.6 for traditional home visiting fathers, a difference that is not statistically significant. These values are consistent with fathers engaging with their children in each of the eight activities included in the scale either a few times per week or a few times per month. These results match those from the one-year follow-up survey (Rotz and Wood 2018).

Although Steps to Success aimed to increase father involvement, there is some evidence that Steps to Success fathers were less likely to spend time with their children at the time of the two-year follow-up survey. According to mothers, 59 percent of Steps to Success fathers and 67 percent of traditional home visiting fathers regularly spent time with their child (Table 5). This 8-percentage-point difference is statistically significant at the 0.10 level. Steps to Success had no impact on the time fathers spent with their children around the time of the first follow-up survey (Rotz and Wood 2018).

Table 5. Impacts of Steps to Success on father involvement, mothers' education and career aspirations, and mothers' parenting behavior

Outcome	Steps to Success families	Traditional home visiting families	Impact	Effect size
Father involvement				
Quality of co-parenting relationship (range: 1 to 5)	3.8	3.8	0	0
Father's engagement with child (range: 0 to 5)	2.4	2.6	-0.21	-0.12
Father regularly spends time with child (%)	59	67	-8+	-0.16
Mothers' education and career aspirations				
Currently enrolled in school (%)	28	24	4	0.09
Mother's career goals (range: 1 to 4)	3.4	3.4	0.04	0.09
Mothers' parenting behavior				
Mother's engagement with child (range: 0 to 5)	4.2	4.1	0.04	0.04
Sample size	**239**	**244**		

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

Notes: Estimates are regression-adjusted predicted values. See the technical appendix for details on the estimation procedure.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

Compared to traditional home visiting, Steps to Success did not affect mothers' education or career aspirations.

Outcomes related to education and career aspirations were similar for mothers in the Steps to Success and traditional home visiting groups. At the time of the two-year follow-up survey, 28 percent of Steps to Success mothers and 24 percent of traditional home visiting mothers were enrolled in school, a difference that is not statistically significant (Table 5). In addition, mothers in Steps to Success and the traditional home visiting program scored similarly on the 4-point scale measuring career goals, with an average score of 3.4 for both groups. Similarly, Steps to Success had no impact on these measures at the one-year follow-up (Rotz and Wood 2018).

Mothers in both programs reported similar levels of engagement with their children two years after study enrollment.

At the two-year follow-up, mothers in the Steps to Success and traditional home visiting groups described their engagement with their child similarly. On a scale ranging from 0 to 5, the average index of mothers' self-reported engagement with their children was 4.2 for the Steps to Success group and 4.1 for the traditional home visiting group, a difference that is not statistically significant (Table 5). These average scores are consistent with mothers typically reporting that they engaged with their children almost every day in a variety of play activities, such as singing songs, looking at books, and playing with toys. These results also mirror the findings from the one-year follow-up (Rotz and Wood 2018).

Discussion

In 2017, about one in six births to women ages 15 to 19 in the United States were second or higher-order births (Martin et al. 2018). Having a repeat birth can compound the challenges that

many adolescent mothers face and amplify the adverse outcomes associated with teen parenthood (Klerman 2004, Liu et al. 2018). Both qualitative and quantitative research suggest that empowering teenage mothers to make and carry out contraceptive plans can reduce the risk of repeat adolescent pregnancy (for example, see Conroy et al. 2016 and Rotz et al. 2016).

HFSA developed the Steps to Success home visiting program to support adolescent parents. Steps to Success supplements a more traditional home visiting program—which focused on parenting and child development—with counseling on contraception and adequate birth spacing; instruction on father involvement, co-parenting, and relationship skills; and guidance on education and career planning. For both Steps to Success and the organization's more traditional program, trained professionals visited mothers' homes regularly for up to two years, with the frequency of visits dropping over this period from weekly to monthly. Steps to Success offered weekly visits for a longer period than the traditional program to allow time for home visitors to cover the additional topics. In addition, unlike HFSA's traditional program, Steps to Success placed a high priority on actively engaging fathers in home visits.

Mathematica partnered with HFSA to test the effects of the Steps to Success enhancements on participating families. The study team randomly assigned young mothers who applied for the program to one of two research groups: (1) a program group that was eligible for Steps to Success or (2) a control group eligible for HFSA's traditional home visiting program. As planned, families in the Steps to Success group received information on a wider variety of topics and received substantially more home visits than families in the traditional program group.

Steps to Success's central goal was to reduce the rate of repeat pregnancy among the adolescent mothers the program served. This analysis, based on a two-year follow-up survey administered around the time program services were slated to end, found similar rates of repeat pregnancy among mothers in the Steps to Success and traditional home visiting groups. At the end of the study follow-up, 25 percent of Steps to Success mothers had a repeat pregnancy, compared with 28 percent of mothers in the traditional home visiting program, a difference that is not statistically significant.

Despite the lack of a significant impact on repeat pregnancy, there is some evidence that the Steps to Success enhancements led to improvements related to healthy birth spacing. Specifically, Steps to Success mothers were more likely to be using a LARC method at the end of the study's two-year follow-up period—53 percent versus 44 percent—a difference that is statistically significant at the 0.10 level. The patterns for all study mothers also mask substantial variation in program effects by mother's age. Among mothers age 14 to 18 at program enrollment, Steps to Success was associated with a 17-percentage point increase in LARC use, an 11-percentage point decrease in unprotected sex, and an 8-percentage point decrease in repeat pregnancy. Although only the first two effects are statistically significant, the overall pattern of findings suggests that, compared with HFSA's traditional home visiting program, Steps to Success might improve healthy birth spacing among younger adolescent mothers.

Several factors could explain why the program was more successful with younger mothers. The older adolescent mothers were in their early 20s at the time of the second follow-up survey, while younger adolescent mothers were ages 16 to 20. Many older adolescent mothers were also in stable relationships with their baby's fathers, with about one in five being married at study

enrollment. In addition, many older adolescent mothers might have achieved their educational goals by study enrollment. Around 80 percent had a high school diploma or General Educational Development (GED) certificate and fewer than 2 percent were enrolled in school at the time they entered the study. These characteristics suggest older adolescent mothers might have been less motivated to avoid a repeat pregnancy than younger adolescent mothers, and thus less likely to respond to program messages on healthy birth spacing.

Another important goal of Steps to Success was to increase the level of father involvement. Although Steps to Success was successful in engaging fathers during home visits, it did not appear to more broadly increase father involvement during the study period. In fact, according to mothers' reports, the program might have made fathers somewhat less likely to spend time with their children (Table 5). We find no program effects (either positive or negative) on other measures related to father involvement, including the quality of the co-parenting relationship and the degree to which mothers report fathers engaged with their children in play and caregiving activities. In addition, despite the program's focus on education and career planning, we find no effects of the Steps to Success enhancement on mothers' education and career aspirations.

Both Steps to Success and HFSA's traditional home visiting program included content on parenting and child development. To allow for the coverage of additional program topics, Steps to Success home visitors spent less time on parenting and child development than did home visitors in the traditional program. However, because Steps to Success families received a greater number of home visits and almost all visits involved some mention of parenting topics, mothers in Steps to Success were exposed to parenting topics more often than mothers in the traditional program. Research has demonstrated that more frequent reminders to participate in developmental activities with young children can improve parental engagement, suggesting that more frequent but shorter exposures to these topics might lead to improved outcomes relative to less frequent but longer discussions (Mayer et al. 2015). Nonetheless, mothers in both groups reported similar levels of engagement with their children, as measured by the self-reported frequency of play activities, such as singing to the child or looking at books with the child.

Why might Steps to Success's impacts on repeat pregnancy have been limited? In particular, although the evidence suggests the program increased LARC use by 9 percentage points, other, similar initiatives have had larger effects on LARC use, and have also led to statistically measurable effects on repeat pregnancy (for example, see Rotz et al. 2016).

One important factor might be the rapid increases in use of LARCs before and during the study period (see Daniels and Abma 2018 and Hubacher and Kavanaugh 2018). Among our sample members, 44 percent of mothers in the traditional home visiting group reported using a LARC at the end of the follow-up period. This high rate of LARC use among control group mothers, which likely reflects at least in part the broader national trend toward greater LARC use, might have limited the extent to which the Steps to Success enhancements to the traditional home visiting program increased LARC use.

In addition, although a high proportion of study mothers used LARCs, they also demonstrated high rates of LARC discontinuation. These discontinuation rates likely reduced the link between LARC uptake and pregnancy. Across study groups, only two-thirds of all participants who first used a LARC at some point in the study period were still using this method

in the three months prior to the two-year follow-up survey. In contrast, O'Neil et al. (2013) found that 87 percent of LARC users still used a LARC one-year after initial insertion or placement and 78 percent still used a LARC after two years. This suggests that LARC discontinuation rates for study participants were higher than typical, which likely limited the extent to which the impacts of Steps to Success on LARC use translated into impacts on repeat pregnancy.

Finally, the effects of Steps to Success were concentrated on younger adolescent mothers, those under age 19 when they enrolled. If the entire study sample was comprised of such mothers, it is possible that we would have been able to detect a statistically significant effect on repeat pregnancy. The relatively small sample size for this subgroup limits our ability to draw firm conclusions. In any case, we did find statistically significant effects for this younger group on other measures of healthy birth spacing, specifically LARC use and recent unprotected sex. Therefore, programs considering implementing an approach similar to Steps to Success might want to target program services on younger adolescent mothers.

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Technical Appendix

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This appendix is a technical supplement to the final impact report on the evaluation of Steps to Success, conducted as part of the Personal Responsibility Education Program (PREP) Multi-Component Evaluation. It details the evaluation's design, methods, and findings. The first two sections describe the methods used to recruit, enroll, and randomly assign adolescent mothers. The third section describes the methods used to estimate the costs of the program. The fourth section describes the survey administration procedures and response rates. The fifth and sixth sections of the appendix describe the evaluation's main outcome and implementation measures, respectively. The seventh section describes the methods used to analyze these measures. The final four sections present additional estimates, including impacts estimated in sensitivity analyses, impacts for key subgroups, impacts on secondary outcomes, and differences in secondary implementation measures.

Recruiting and enrolling mothers

HFSA staff recruited pregnant and postpartum adolescent mothers, ages 14 to 20, on a rolling basis for the evaluation. The recruitment took place in San Angelo, Texas, and the surrounding communities from May 2013 to May 2016. HFSA staff set an enrollment target of 20 adolescent mothers per month for 36 months, yielding a total sample size of 720 mothers; the study enrolled 594 young mothers, 83 percent of the target.[2] However, after comparing the number of mothers enrolled in the study to the number of births to mothers younger than 21 in San Angelo's two hospitals, HFSA staff concluded that the recruitment effort captured nearly all eligible mothers within San Angelo and the surrounding area.

Initially, recruitment took place in the postpartum units of two local hospitals. HFSA outreach staff worked to develop relationships with the facilities' staff and stay in close contact with them. On daily visits to the hospitals, HFSA staff consulted nurses before approaching adolescent mothers to begin the process of enrolling them in the study. If a nurse believed that a mother was not ready to meet with a staff member or discuss the program (because she was tired or distressed, for example), the staff member waited until the nurse thought the mother was ready. Over time, HFSA staff increased their hospital visits to twice a day.

Recruitment also expanded to other locations throughout the study period. In particular, when it became clear that recruiting solely from the two hospitals would not yield enough participants to meet the study's enrollment targets, the outreach team expanded recruitment to three local high schools, offices of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the Pregnancy Help Center (a local nonprofit), and Esperanza clinics (a local health care provider).

At all locations, the enrollment process involved both informed consent and a baseline survey. Once a mother expressed interest in participating in home visiting services, intake workers followed up within 48 hours to enroll her in the study. For mothers who were at least 18 years old, an intake worker obtained signed consent for participation in the study. For those who

[2] One mother (not included in the study sample of 594 mothers) enrolled in the study but did not complete the baseline survey, and asked to be removed from any further data collection efforts.

were younger than 18, an intake worker first obtained consent from the mother's parent or legal guardian before seeking assent from the mother.

Random assignment

As described in the main text of the report, individuals were randomly assigned on a rolling basis to either (1) a treatment group eligible to receive the enhanced Steps to Success home visiting program or (2) a control group eligible to receive a traditional home visiting program. Mothers who applied to the program had an equal chance of being placed into either study group. In total, 298 women were assigned to the Steps to Success group and 296 to the traditional home visiting group.

The study used a stratified random assignment design. The evaluation team conducted random assignment separately for two groups of mothers throughout most of the study enrollment period: (1) those who were currently pregnant and (2) those who had recently given birth. This stratification process, introduced about two months after enrollment began, ensured that the two study groups had a similar proportion of mothers who entered the study before the birth of their babies. In the first two months of random assignment, during which 40 mothers enrolled in the study, random assignment was not stratified. Our main analysis treats these mothers as if they were randomly assigned in the same manner used to assign those who enrolled later in the study period; however, our results are robust to treating these women as if they made up a third random assignment stratum (see Table A.4).

The study team conducted random assignment by generating a random string of characters (C for control and P for program) for each stratum of study participants. The string was created in a manner that ensured the two study groups had a similar number of participants at any point in the study enrollment process.

One group of mothers was deemed exempt from this random assignment process: those with a sister (or other co-residential adolescent mother) already enrolled in the study. There were 21 such study participants, and all were assigned to the same study group as the sister or co-resident who had enrolled in the study first. Our results are qualitatively similar if these mothers are omitted from the analysis (see Table A.4).

Cost estimates

For the cost analysis, Mathematica coordinated with HFSA staff to collect information on the resources required to deliver each of the two home visiting programs. Because of the enhancements Steps to Success added to HFSA's traditional home visiting program, the team expected that Steps to Success would require more resources to deliver. For the cost analysis, the study team sought to quantify this difference by calculating the cost of both the traditional home visiting program and the enhanced Steps to Success program. The team estimated program costs for both HFSA's traditional home visiting program and the enhanced Steps to Success program using the "ingredients" or resource cost method (Levin and McEwan 2001). They relied primarily on HFSA's accounting records to value the resources. The impact study of Steps to Success started in 2013, so the study team chose to collect cost data during the following year (September 2014 to August 2015), to measure costs during a steady-state period of operations.

For both programs, the study team produced two sets of cost estimates reflecting two different perspectives:

1. **Cost to the implementing agency.** These estimates reflect costs from the perspective of HFSA. As such, they include all of the resources the organization needed to deliver the programs. These estimates might also be useful to ACF or other funding organizations as the basis for determining the likely resource needs of future grantees or other implementing agencies.
2. **Societal cost.** The societal cost estimates start with the cost to the implementing agency, but also include the value of the participants' time. When considering program costs to society, the value of the time that mothers and fathers (that is, study participants) spent participating in the program is included in the program cost, because they could have used this time to engage in some other productive activity such as working or caring for their child. Researchers also use societal costs as the basis for estimates of a program's cost-effectiveness.

As expected, the cost analysis reveals that the enhanced Steps to Success program cost more than HFSA's traditional home visiting program (Table A.1). For Steps to Success, the study team estimated a total annual program cost of $629,173, compared to an estimated total annual cost of $371,509 for HFSA's traditional home visiting program. Estimates of per-participant costs were $7,689 for Steps to Success and $5,140 for the traditional home visiting program—a difference of $2,549 per participant. The difference in cost between the two programs is explained primarily by the difference in the frequency of home visits. During the September 2014–September 2015 period, HFSA staff conducted nearly twice as many home visits with mothers in Steps to Success than they did with mothers in the traditional home visiting program (2,705 versus 1,447 visits). As a result, although Steps to Success had a higher total annual program cost, the average cost of a single home visit was similar for both programs ($233 and $257, respectively).

Table A.1. Program cost estimates

Program	Total annual program cost	Number of home visits conducted during cost period	Average cost of a single home visit	Average number of home visits each mother received*	Average cost per participant
Costs to implementation agencies					
Steps to Success	$629,173	2,705	$233	33	$7,689
Traditional home visiting	$371,509	1,447	$257	20	$5,140
Societal cost					
Steps to Success	$682,652	2,705	$252	33	$8,316
Traditional home visiting	$393,056	1,447	$272	20	$5,440

*Based on the total number of visits to participants randomly assigned by the end of February 2015.

For both Steps to Success and HFSA's traditional home visiting program, there were higher estimates of both annual and per-participant cost from the societal perspective (Table A.1). For the total annual program cost for the cost period, the societal perspective leads to a cost estimate about 8 percent higher for Steps to Success ($682,652 vs. $629,173) and 6 percent higher ($393,056 vs. $371,509) for HFSA's traditional home visiting program. The per-participant cost estimates increase by a comparable percentage, to $8,316 for Steps to Success and $5,440 for the traditional home visiting program—a difference of $2,876 per participant. The reason for the larger increase in costs for Steps to Success is that societal costs account for the value of participant time, and, on average, participants assigned to that program received more home visits. In addition, fathers participated in more Steps to Success home visits than fathers in HFSA's traditional home visiting program did.

Survey administration

This study relied on information from three surveys: (1) a baseline survey, administered before random assignment; (2) a one-year follow-up survey, administered about 12 months after random assignment, and (3) a two-year follow-up survey, administered about 24 months after random assignment. This report uses data from all three surveys, but focuses on the sample of mothers who responded to the two-year follow-up survey.

The evaluation team designed the surveys to capture a broad range of demographic and personal characteristics and outcomes across four topic areas: healthy birth spacing, father involvement, mothers' education and career aspirations, and mothers' parenting behavior. The team drew most of the questions from past evaluations such as the Building Strong Families Evaluation and the Evaluation of Adolescent Pregnancy Prevention Approaches, as well as established surveys such as the National Longitudinal Study of Adolescent Health, the National Survey of Family Growth, and the Youth Risk Behavior Survey.

All enrolled mothers were eligible to complete all of the surveys, regardless of their responses to past study surveys. The baseline survey was a self-administered paper-and-pencil form completed as part of the study's enrollment process. Both the one- and two-year follow-up surveys were conducted by telephone, with in-person follow-up. Study participants received a thank-you gift for responding to follow-up surveys: $20 for the one-year follow-up and $25 for the two-year follow-up.

The survey procedures yielded high survey response rates. All 594 mothers in the study sample completed the baseline survey as part of the enrollment process. In total, 498 mothers completed the one-year follow-up survey, for a response rate of 84 percent, and 483 completed the two-year follow-up, for a response rate of 81 percent. Response rates were similar for the Steps to Success and traditional home visiting groups (82 percent and 80 percent at the two-year follow-up, respectively).

A comparison of the characteristics of respondents and nonrespondents to the two-year follow-up survey indicates few differences (Table A.2). Compared with survey respondents, mothers who did not respond to the two-year follow-up survey were about the same age, had similar racial or ethnic backgrounds, and were about as likely to speak English at home. They had comparable educational attainment at baseline and comparable relationships with the fathers of their babies. Survey respondents and nonrespondents also had analogous sexual risk

Table A.2. Participant characteristics at study enrollment: survey respondents and nonrespondents

Measure (percentage)	Survey respondents	Survey nonrespondents	Difference
Demographics			
Age at random assignment			
14	3	3	0
15	5	5	0
16	10	11	-1
17	16	13	3
18	19	17	2
19	22	27	-5
20	26	24	1
Race/ethnicity			
White, non-Hispanic	28	29	-1
African American, non-Hispanic	2	4	-2
Hispanic	67	66	1
Other	2	1	1
Main language spoken at home			
English	94	91	3
Spanish	6	9	-3
Education			
Obtained high school diploma or GED certificate	52	59	-7
Either currently enrolled in school or have a high school diploma or GED certificate	85	88	-3
Family relationships			
Lives with biological mother and biological father	18	10	8+
Lives with biological mother but not biological father	26	22	4
Lives with biological father but not biological mother	5	8	-3
Biological parents are married	30	30	0
Relationship with baby's father			
Currently married to baby's father	13	17	-4
Currently living with baby's father	54	56	-2
Currently in a romantic relationship with baby's father	80	73	7
Exposure to information			
Attended classes or sessions in the prior year on:			
Methods of birth control	12	10	2
Abstinence	7	4	3
Relationships, dating, or marriage	7	7	1
Received information on methods of birth control in the prior year from a doctor, nurse, or clinic	52	57	-5
Pregnancy history and sexual risk behaviors			
Pregnant at study enrollment	42	34	7
Has only been pregnant once	79	84	-5
HFSA child will not be/is not first child	18	14	4
Age at first intercourse			
13 or younger	9	11	-2
14	17	18	-1
15	26	20	6
16	22	35	-12*
17	20	11	9+
18 or older	6	6	0
Ever told by a doctor or nurse that she had an STI	15	11	3
Sample size	**483**	**111**	

Source: Baseline surveys conducted by Mathematica Policy Research.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

GED = General Educational Development; STI = sexually transmitted infection.

behaviors, pregnancy histories, and exposure to information about key reproductive health topics at the time of the baseline survey.

Of the 36 characteristics examined, survey respondents and nonrespondents only differed on three (two at the 0.10 level and one at the 0.05 level). Survey respondents were less likely than nonrespondents to have initiated sexual activity at age 16 (a statistically significant difference), and more likely to have initiated sexual activity at age 17 (a statistically significant difference at the 0.10 level). Nevertheless, the two groups' average age at sexual initiation was not significantly different. In addition, although respondents and nonrespondents had similar likelihoods of living with either their biological mother or father, there is some evidence that survey respondents were more likely to live with both biological parents, a difference that is statistically significant at the 0.10 level.

The evaluation team also investigated whether there were any differences in the baseline characteristics of the mothers in the Steps to Success and traditional home visiting groups in the sample of two-year follow-up survey respondents used to analyze impacts. Although we would expect these characteristics to be similar due to random assignment, chance might have led the two study groups to differ in some way. In addition, if mothers in the different study groups were more or less likely to respond to the two-year follow-up survey, there could be differences within the analytic sample even if there were none among all randomly assigned mothers.

Within the sample of survey respondents, the average characteristics of the Steps to Success and traditional home visiting groups at baseline were mostly similar (Table A.3). Although more mothers in the traditional home visiting group were 17 years old (19 percent versus 12 percent in the Steps to Success group), the average age in both study groups was 18.1 (not shown). Mothers in the two study groups were also about equally likely to speak English at home, and had similar levels of education, living situations, relationships with their babies' fathers, and exposure to information on key Steps to Success topics at baseline (Table A.3). In addition, baseline measures of past pregnancy, pregnancy at enrollment, and sexual risk behavior were similar across the study groups.

There is one noteworthy difference between the groups: compared with the mothers in the traditional home visiting group, mothers in the Steps to Success group were more likely to be white and non-Hispanic (33 percent versus 23 percent, a statistically significant difference) and less likely to be Hispanic (63 percent versus 71 percent, a statistically significant difference at the 0.10 level). This difference was also apparent in analyses of the full random assignment sample (the Steps to Success group was 32 percent white, non-Hispanic and 64 percent Hispanic; the traditional home visiting group was 24 percent white, non-Hispanic and 71 percent Hispanic), as well as the sample excluding mothers who enrolled in the study after one of their sisters had already done so. Therefore, the difference is due to chance and not to differential attrition or the precise nature of the study design. To adjust for this difference, the evaluation team controlled for race and ethnicity when estimating program impacts, as described in detail below.

Table A.3. Baseline characteristics of analytic sample

Measure (percentage)	Steps to Success mothers	Traditional home visiting mothers	Difference
Demographics			
Age at random assignment			
14	3	2	1
15	5	5	0
16	11	9	2
17	12	19	-7*
18	22	16	6+
19	20	24	-4
20	26	25	1
Race/ethnicity			
White, non-Hispanic	33	23	10*
African American, non-Hispanic	3	2	0
Hispanic	63	71	-8+
Other	1	3	-2
Main language spoken at home			
English	95	93	1
Spanish	5	7	-1
Education			
Obtained high school diploma or GED certificate	51	53	-2
Either currently enrolled in school or have a high school diploma or GED certificate	87	84	2
Family relationships			
Lives with biological mother and biological father	18	18	1
Lives with biological mother but not biological father	28	23	5
Lives with biological father but not biological mother	4	5	-1
Biological parents are married	31	29	2
Relationship with baby's father			
Currently married to baby's father	13	13	-1
Currently living with baby's father	51	57	-6
Currently in a romantic relationship with baby's father	78	81	-2
Exposure to information			
Attended classes or sessions in the prior year on:			
Methods of birth control	12	12	0
Abstinence	6	8	-2
Relationships, dating, or marriage	7	8	-1
Received information on methods of birth control in the prior year from a doctor, nurse, or clinic	53	52	2
Pregnancy history and sexual risk behaviors			
Pregnant at study enrollment	41	42	-1
Has only been pregnant once	79	79	0
HFSA child will not be/is not first child	17	19	-1
Age at first intercourse			
13 or younger	8	10	-2
14	17	17	0
15	26	25	1
16	26	19	7+
17	17	23	-6
18 or older	6	6	0
Ever told by a doctor or nurse that she had an STI	14	15	-2
Sample size	**239**	**244**	

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

GED = General Educational Development; STI = sexually transmitted infection.

Outcome measures

In selecting outcome measures, the evaluation team sought to balance two competing demands. To comprehensively assess the program, the team worked to identify a relatively broad range of outcomes that would successfully capture the breadth of topics covered by Steps to Success. However, focusing on such a wide-ranging group of outcomes can increase the chances of identifying a spuriously statistically significant impact (Schochet 2009). The evaluation team deemed program impacts statistically significant if the associated *p*-value of the estimate fell below 5 percent, a common standard. We also note when the *p*-value associated with an impact is between 5 and 10 percent, classifying these impacts as statistically significant at the 0.10 level. A 5 (or 10) percent chance of incorrectly identifying an estimated effect as a true impact is a relatively modest risk for a single test. But the more outcomes that are examined, the more likely it becomes that at least one of the tests will estimate a spuriously statistically significant impact.

To balance these competing demands, the evaluation team identified a set of four topical areas of interest. Because the analysis focuses on the relative effectiveness of Steps to Success and the traditional home visiting curriculum, the team focused the analysis on measures of healthy birth spacing, which is emphasized by Steps to Success but is not part of the curriculum the control group received. In addition, the team examined outcomes related to father involvement and mothers' education and career aspirations, which Steps to Success might have affected, but which were not targeted by the traditional home visiting program. Finally, the evaluation team analyzed measures in a fourth area, mothers' parenting behavior, which both programs address. This last analysis enables the evaluation team to examine whether the Steps to Success enhancements influenced the effectiveness of the home visits in improving mothers' parenting behavior. Within these four topic areas, the evaluation team identified 11 primary outcomes of interest, described in detail next.

1. Healthy birth spacing

We consider five primary outcomes related to healthy birth spacing. These capture measures of repeat pregnancy, current LARC use, recent unprotected sex, desire to avoid repeat pregnancy in the next year, and knowledge of contraception and pregnancy prevention.

Repeat pregnancy. The survey instrument included a question about whether mothers had become pregnant at any time since the birth of the child that made them eligible to participate in the study. Using this question, the evaluation team constructed a binary (yes/no) variable indicating whether a woman had a repeat pregnancy. Repeat pregnancy is the study's sole confirmatory outcome.

Current LARC use. To determine whether Steps to Success was successful in increasing the use of the most effective forms of contraception, the evaluation team constructed a binary (yes/no) indicator for whether a study participant currently used a LARC method. In particular, the survey asked mothers whether they had used each of the following methods of birth control at any point since the last time they completed a study survey (that is, the time of the first follow-up survey for those who had completed it, or the time of the baseline survey for those who had not):

- Condoms

- Birth control pills
- The shot, or the Depo-Provera shot
- The patch, or Ortho Evra
- The ring, or NuvaRing
- An IUD—Mirena, Paragard, or Skyla
- An implant—Implanon or Nexplanon
- Emergency contraception, or Plan B
- Any other type of birth control

Respondents were next asked whether they currently used any of the methods they had indicated using at any time since the baseline or first follow-up survey, as applicable (with the exception of condoms and emergency contraception). Survey items were adapted from the Evaluation of Adolescent Pregnancy Prevention Approaches (Smith et al. 2012).

For the "any other" category, respondents were instructed to write in the method they used. The evaluation team examined all such responses to ensure they should not be categorized as one of the named methods, taking into account any newly available methods (in particular, the Liletta and Kyleena IUDs that were introduced during the study period) and other common names for methods (for example, calling the progestin-only birth control pill the "minipill").

The evaluation team characterized all respondents who indicated that they currently used either an implant or an IUD as currently using a LARC method. The team characterized respondents who indicated they did not currently use these methods, or had not used these methods at any point in time since completing the last study survey, as not currently using a LARC method.

Recent unprotected sex. To determine whether Steps to Success was successful in reducing rates of unprotected sex, the evaluation team constructed a binary (yes/no) indicator for whether the study participant reported having had sex without using any effective contraceptive method in the three months before the survey. We constructed this variable using the following series of three survey questions:

1. In the past 3 months, have you had sexual intercourse?
2. In the past 3 months, how many times have you had sexual intercourse without using a condom?
3. Now I want you to think about your use of the following methods of birth control in the past 3 months: Condoms, birth control pills, the Depo shot, the patch, the ring, an IUD like Mirena, Paragard, or Skyla, or an implant such as Implanon or Nexplanon. In the past 3 months, how many times have you had sexual intercourse without using any of these methods of birth control?

These questions were adapted from the National Longitudinal Study of Youth, 1997 cohort (U.S. Bureau of Labor Statistics n.d.).

The evaluation team characterized a woman as recently having had unprotected sex if she reported having had sex in the three months before the survey without using any of the methods of birth control listed above. The team characterized a woman as not having had recent unprotected sex if she indicated that, in the three months before the survey, she had not had sex, had not had sex without a condom, or had not had sex without using any of the above-listed methods of birth control.

Although respondents generally answered these questions consistently, the evaluation team found a few exceptions. In particular, seven respondents indicated they had not had sex without a condom, but that they *had* had sex once or more without using any method of birth control. The team characterized these respondents as not having had unprotected sex.

Desire to avoid repeat pregnancy in the next year. To assess mothers' attitudes toward a repeat pregnancy in the next year, the survey instrument asked them, "If you got pregnant again in the next year, how would you feel? Would you say very happy, a little happy, neither happy nor upset, a little upset, or very upset?" This survey item was adapted from the National Survey of Family Growth (Centers for Disease Control and Prevention n.d.).

The evaluation team used responses to this question to construct a scale variable indicating a woman's attitudes toward repeat pregnancy. The scale ranges from 1 to 5, with higher values indicating more negative feelings about becoming pregnant.

Respondents who had already become pregnant again since the birth of the child that made them eligible to participate in the study were not asked to respond to this question. Therefore, they are excluded from analyses of this measure. Counting the mothers who did not respond to the two-year follow-up survey, the mothers who did not respond to this particular question, and the mothers who had experienced a repeat pregnancy since they enrolled in the study, this variable was not available for 41 percent of the Steps to Success group (122 mothers) and 43 percent of the traditional home visiting group (126 mothers). Comparing the share of observations missing to the What Works Clearinghouse cautious attrition threshold indicates that missing data are unlikely to lead to biased estimates of the impacts of Steps to Success on a mother's desire to avoid repeat pregnancy (What Works Clearinghouse 2017). Therefore, we analyze this outcome just as we do the other measures examined in the study.

Knowledge of contraception and pregnancy prevention. The survey included two items designed to measure a mother's knowledge of how to prevent pregnancy: "If condoms are used correctly and consistently, how much can they decrease the risk of pregnancy?" and "If birth control pills are used correctly and consistently, how much can they decrease the risk of pregnancy?" For both items, respondents were asked to choose one of the following options: "not at all," "a little," "a lot," "completely," and "don't know." These questions were adapted from those used in the Evaluation of Title V Abstinence Education Programs (Trenholm et al. 2007).

The evaluation team combined the answers to these two items to create a scale score ranging from 0 to 2 and reflecting the number of these items the mother answered correctly. Answers of "don't know" were counted as incorrect responses. If a mother answered only one of the two questions, the skipped question was treated as if the mother responded "don't know." If a mother

skipped both of the questions, the evaluation team excluded her from the analysis of this outcome.

2. Father involvement

We constructed three measures to understand the relative impacts of Steps to Success and the traditional home visiting program on father involvement. These items capture the quality of the parents' co-parenting relationship, fathers' engagement with their children, and whether fathers regularly spend time with their children.

Quality of co-parenting relationship. The evaluation team created a summary measure of the quality of the mother-father co-parenting relationship based on the mother's responses to seven survey items. The first five survey items were items 3, 7, 11, 14, and 18 of the Parenting Alliance Measure (Abidin and Konold 1999).[3] To these, the evaluation team added two items drawn from the survey used for the Building Strong Families Evaluation (Wood et al. 2010):

- [CHILD] needs [CHILD'S FATHER'S NAME] just as much as he needs me.
- No matter what might happen between [CHILD'S FATHER'S NAME] and me, when I think of [CHILD]'s future, it includes [CHILD'S FATHER'S NAME].

For each statement, the survey asked mothers to report their level of agreement using a five-point scale ranging from "strongly disagree" to "strongly agree."

To construct a scale based on mothers' responses to these statements, the evaluation team first assigned each response category a number ranging from 1 to 5, with higher values indicating a stronger co-parenting relationship. For mothers who responded to at least six of the seven statements, the evaluation team calculated a scale score by taking the average value of the mother's responses across the different statements. The team did not calculate scores for mothers who responded to five or fewer statements. The resulting scale ranged from 1 to 5, with higher values indicating a stronger co-parenting relationship. The scale had high internal consistency within the two-year follow-up data (alpha coefficient = 0.96).

Father's engagement with child. The evaluation team created a summary measure of fathers' engagement with their children based on a series of eight survey items. Mothers were asked to assess how many times in the past month the fathers of their children had participated in the following activities:

- Played a game like "peek-a-boo" or "gotcha" with [CHILD]
- Sung songs with [CHILD]
- Read or looked at books with [CHILD]
- Told stories to [CHILD]
- Played with games or toys with [CHILD]

[3] The text of these items is copyrighted. Contact Psychological Assessment Resources, Inc. for details.

- Helped [CHILD] to get dressed
- Changed [CHILD]'s diapers or helped [him/her] use the toilet
- Given [CHILD] a bottle or something to eat

The response options were "more than once a day, "every day or almost every day," "a few times a week," "a few times in the past month," "once or twice in the past month," and "never." The team drew the statements from the Building Strong Families Evaluation (Wood et al. 2010); researchers on that project had adapted the measures from those used by the National Evaluation of Early Head Start (Love et al. 2002).

To construct a scale based on mothers' responses to these statements, the evaluation team first assigned each response category a number ranging from 0 to 5, with higher values indicating that fathers engaged more often. For mothers who responded to at least six of the eight statements, the evaluation team calculated a scale score by taking the average value of the mother's responses across the different statements. Mothers who reported that their child had not seen his or her father in the past month or that their child had died (in response to earlier survey questions) were not asked these questions but were treated as if they responded "never" to each. The team did not otherwise calculate scores for mothers who responded to five or fewer statements. The resulting scale ranged from 0 to 5, with higher values indicating that fathers engaged more often. The scale had high internal consistency within the two-year follow-up data (alpha coefficient = 0.98).

Father regularly spends time with child. We used a single survey item to construct a binary (yes/no) variable indicating whether a father regularly spent time with his child. Mothers were asked, "In the past month, how often has [CHILD'S FATHER'S NAME] spent one or more hours a day with [CHILD]? Was it every day or almost every day, a few times a week, a few times in the past month, once or twice in the past month, or never?" The team adapted the survey item from the Building Strong Families Evaluation (Wood et al. 2010). The evaluation team coded responses of "every day or almost every day," and "a few times a week" as indicating that a father regularly spends time with his child. The team coded all other responses as indicating that a father did not regularly spend time with his child.

3. Mothers' education and career aspirations

We consider two primary outcomes related to mothers' education and career aspirations: an indicator for whether a mother was currently enrolled in school, and a scale variable related to her career goals.

Currently enrolled in school. The survey asked respondents to report whether they were currently enrolled in school, instructing mothers to choose "yes" if they were "currently on summer break or taking a short break to have a baby but plan to return to school." We created a binary (yes/no) indicator of whether a mother was enrolled in school based on this single survey item.

Mother's career goals. The evaluation team created a summary measure of a mother's career goals based on responses to a series of six survey items. For each of the following items,

mothers were asked to respond on a four-point scale with options ranging from "strongly disagree" to "strongly agree:"

- I have specific goals for my future career.
- I have a plan for achieving my future career goals.
- Planning for a career is not worth the effort.
- I haven't thought much about my future career.
- If I have a career, I won't be able to enjoy other things in life.
- Going to college is important for getting a good job.

The statements were adapted from the Career Commitment Measure (Carson and Bedeian 1994; Diemer and Blustein 2007), with items added to address adolescent development and educational and career success.

To construct a scale based on mothers' responses to these statements, the evaluation team first assigned each response category a number ranging from 1 to 4, with higher values indicating stronger career aspirations. (Items were reverse coded, as appropriate.) For mothers who responded to at least five of the six statements, the evaluation team calculated a scale score for each mother by taking the average value of the mother's responses across the different statements. The team did not calculate scores for mothers who responded to four or fewer statements. The resulting scale ranged from 1 to 4, with higher values indicating greater orientation toward career success. The scale had high internal consistency within the baseline data (alpha coefficient = 0.82).

4. Mothers' parenting behavior

The evaluation team constructed a single primary outcome to measure mothers' parenting behavior. This measure uses data from a series of five survey items similar to the items used to construct the outcome measuring a father's level of engagement with his child. In particular, mothers were asked to indicate how many times in the past month they had participated in the following activities:

- Played a game like "peek-a-boo" or "gotcha" with [CHILD]
- Sung songs with [CHILD]
- Read or looked at books with [CHILD]
- Told stories to [CHILD]
- Played with games or toys with [CHILD]

The response options were "more than once a day," "every day or almost every day," "a few times a week," "a few times in the past month," "once or twice in the past month," and "never." Expecting that most mothers would be their child's primary caregiver, the evaluation team omitted the survey items related to basic child care (dressing, diapering/toileting, and feeding the child) that were used to measure fathers' engagement.

To construct a scale based on mothers' responses to these statements, the evaluation team first assigned each response category a number ranging from zero to 5, with higher values indicating greater frequency of engagement. For mothers who responded to at least four of the five statements, the evaluation team calculated a scale score by taking the average value of the mother's responses across the different statements. Mothers who reported that they had not seen their child in the past month or that their child had died (in answering earlier survey items) were not asked these questions, but were treated as if they responded "never" to each. The team did not calculate scores for other mothers who responded to four or fewer statements. The resulting scale ranged from 0 to 5, with higher values indicating more active engagement. The scale had high internal consistency within the two-year follow-up data (alpha coefficient = 0.90).

Implementation measures

In addition to the outcome measures described above, the evaluation team constructed nine measures related to the services received by families in the Steps to Success and traditional home visiting groups. To construct these implementation measures, the team used administrative data recorded by home visitors after each visit. Because HFSA served members of both study groups, these data provide a full account of the home visits each mother received as part of this study. All measures were constructed using data from only the first two years after study enrollment to match the time horizon used to construct the outcome measures for the main report.

The evaluation team created two measures of the number of home visits study participants received:

- Total number of home visits
- Number of home visits the HFSA child's father was present for

Both measures are count variables indicating the number of unique home visits recorded by HFSA staff. The team also used information on the duration of each visit to construct a measure of the number of hours each family spent receiving home visits.

The evaluation team also created six continuous measures capturing the extent to which home visiting exposed families to different topics:

- Number of hours spent discussing parenting with home visitor
- Number of hours spent discussing contraception with home visitor
- Number of hours spent discussing relationships or relationship skills with home visitor
- Number of hours spent discussing employment and career training with home visitor
- Number of hours spent discussing education with home visitor
- Number of hours spent discussing other topics with home visitor

The evaluation team used the total visit duration and the number of topics mentioned during a visit to construct these outcomes. For each visit, the team counted the number of topics mentioned by the home visitor and then assumed the home visitor spent the same amount of time discussing each topic. This enabled the evaluation team to estimate the time spent on each of the

topics during a visit. The team then created the measures of interest by summing the quantities across all visits.

Analytic methods

The evaluation team used *RCT-YES*, a statistical software tool developed by Mathematica, to estimate the impacts of Steps to Success in comparison with traditional home visiting (https://www.rct-yes.com/). *RCT-YES* uses estimation methods designed specifically for estimating treatment effects with data from randomized controlled trials, using the design-based methods introduced by Neyman (1923) and expanded upon by Rubin (1974;1977) and Holland (1986). The study team used the estimation methods for what *RCT-YES* describes as Design 2: the non-clustered, blocked design (Schochet 2016). These methods account for the study team randomly assigning mothers to the Steps to Success and traditional home visiting groups within separate blocks defined by whether mothers were pregnant or postpartum at the time of random assignment. Impact estimates are calculated as a regression-based weighted average of the difference in outcomes for mothers in the Steps to Success and traditional home visiting groups.

RCT-YES requires users to input certain technical specifications of the model, such as the approach for covariate adjustment and handling of missing data. The study team used data from the baseline survey to include covariates for mothers' age, race and ethnicity, time since birth (or due date, in the case of miscarriage), and the baseline value of the outcome measure or a close proxy (if available). To the extent that these covariates are correlated with mothers' outcomes, they can improve the precision of the impact estimates by reducing the residual variation in the outcome measures (Orr 1999). The study team also used the *RCT-YES* default assumptions to calculate impacts assuming a finite-population model (SUPER_POP = 0) and including block-by-treatment interactions (BLOCK_FE = 0). For missing outcome data, the study team used the default *RCT-YES* option of case deletion—meaning that the impact estimates for a particular outcome exclude mothers with missing data for that outcome. For missing baseline data, the team used dummy variable adjustment. This involves setting any missing baseline values to constants and including missing value flag variables as additional covariates in the regression model. The team deemed the resulting impact estimates statistically significant if the estimated *p*-value for the coefficient fell below 5 percent based on a two-tailed hypothesis test. The team deemed any coefficients with estimated *p*-values between 5 and 10 percent to be statistically significant at the 0.10 level.

To help interpret the magnitude of the reported estimates, the evaluation team also calculated an effect size associated with each impact estimate. For continuous outcomes, the team calculated the standardized effect size as Hedges' *g*, which equals the impact estimate produced by *RCT-YES* divided by the unadjusted pooled standard deviation of the outcome for mothers in both study groups (Hedges 1981). For binary outcomes, the evaluation team calculated the effect size as the Cox index, which equals the log odds ratio divided by the constant 1.65 (Cox 1970).

Sensitivity analyses

The main impact findings presented in the body of this report are derived from a particular set of analytic decisions. The evaluation team made these decisions in accordance with established research standards and the particular features of the study design. However,

sensitivity analyses can help generate more confidence in the study's findings and alleviate concerns that the findings arose due to specific analytic decisions.

We conducted four tests of the sensitivity of our results to our analytic decisions:

1. Using ordinary least squares (OLS) regression, instead of the *RCT-YES* design-based approach, to estimate impacts
2. Not adjusting estimates for differences in baseline covariates
3. Dividing study participants into three strata instead of two: mothers randomly assigned in the first two months of the study enrollment period (before random assignment was stratified), mothers randomly assigned after this period who were pregnant at assignment, and mothers randomly assigned after this period who were postpartum at assignment
4. Removing any respondents from the sample who had a sister already enrolled in the study at random assignment (These participants were assigned to the same study groups as their sisters to avoid the sharing of program messages between sisters across study groups.)

Comparing the impacts estimated using these alternative methods with those from the evaluation team's primary method reveals the estimates are generally robust (Table A.4). In two cases, different modeling assumptions lead a difference that was significant at the 0.10 level to become statistically significant at the 0.05 level. Also, when covariates are excluded from the model, two other differences, significant at the 0.10 level, emerge; Steps to Success is associated with a decrease in fathers' engagement with their children and an increase in mothers' enrollment in school. However, given the differences in the racial composition of the study groups at baseline, covariate-adjusted estimates are preferable to unadjusted estimates.

Table A.4. Impacts estimated using alternative methods

Outcome	Primary method	OLS	No covariate adjustment	Three strata	Exclude siblings
Healthy birth spacing					
Any repeat pregnancy[a] (%)	-3	-3	-3	-3	-4
Currently using a LARC method (%)	9+	9+	9+	9+	11*
Recently had unprotected sex (%)	-5	-5	-4	-5	-6
Desire to avoid repeat pregnancy in the next year (range: 1 to 5)[b]	0.10	0.10	0.17	0.10	0.08
Knowledge of contraception and pregnancy prevention (range: 0 to 2)	-0.02	-0.03	-0.01	-0.02	0
Father involvement					
Quality of co-parenting relationship (range: 1 to 5)	0	0	-0.11	0	0.02
Father's engagement with child (range: 0 to 5)	-0.21	-0.21	-0.30+	-0.22	-0.19
Father regularly spends time with child (%)	-8+	-7+	-10*	-8+	-7
Mothers' education and career aspirations					
Currently enrolled in school (%)	4	3	8+	4	4
Mother's career goals (range: 1 to 4)	0.04	0.03	0.04	0.04	0.06
Mothers' parenting behavior					
Mother's engagement with child (range: 0 to 5)	0.04	0.04	0.02	0.04	0.05
Sample size	**483**	**483**	**483**	**483**	**429**

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

[a] Confirmatory outcome when measured using data from the two-year follow-up survey.

[b] Measure does not include the 59 Steps to Success mothers and 67 traditional home visiting mothers who responded to the survey and reported a repeat pregnancy.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

LARC = long-acting reversible contraceptive; OLS = ordinary least squares.

Impacts for key subgroups of mothers

As an additional exploratory analysis, the study team examined whether the relative impacts of Steps to Success and traditional home visiting differed for subgroups of mothers defined based on pregnancy status (mothers who were pregnant versus postpartum at study enrollment) and age (mothers ages 19 or 20 versus mothers ages 14 to 18 at study enrollment). The study team conducted these analyses using the optional SUBGROUP input command in the *RCT-YES* statistical software tool (described earlier). These subgroup analyses are exploratory for two reasons. First, the evaluation team determined the required sample size for the evaluation assuming an analysis of the full sample. Because of the smaller sample sizes, the reported impact estimates for subgroups of mothers might not have sufficient precision. Second, estimating impacts for different subgroups of mothers greatly increases the number of outcomes examined. As discussed earlier, the more outcomes examined, the more likely at least one of the tests will find a spurious statistically significant impact (Schochet 2009).

To alleviate these concerns, before conducting any impact analyses, the study team established a set of reporting rules intended to reduce the chances of emphasizing a false positive impact from the subgroup analyses. In particular, we established that we would not report the results of these subgroup analyses in the main tables of this report unless we found statistically significant impacts of the Steps to Success enhancements compared with the traditional home visiting program for repeat pregnancy or at least 3 of the 10 other primary outcomes within a subgroup. None of the examined subgroups met this bar; therefore, the tables for these results (Tables A.5 and A.6) remain in this appendix, although we do discuss the most noteworthy of these results briefly in the body of the report. In particular, we highlight that the higher levels of LARC use among Steps to Success mothers relative to mothers in the traditional home visiting program was driven entirely by LARC use among younger mothers. The program increased LARC use by 17 percentage points for mothers ages 14–18 (Appendix Table A.6.), a statistically significant impact. The program also reduced the prevalence of unprotected sex for younger

Table A.5. Subgroup impacts by pregnancy status at study enrollment

Outcome	Full sample	Pregnant at enrollment	Postpartum at enrollment
Healthy birth spacing			
Any repeat pregnancy[a] (%)	-3	-6	-1
Currently using a LARC method (%)	9+	15*	4
Recently had unprotected sex (%)	-5	-7	-3
Desire to avoid repeat pregnancy in the next year[b] (range: 1 to 5)	0.10	-0.10	0.29+
Knowledge of contraception and pregnancy prevention (range: 0 to 2)	-0.02	0.03	-0.05
Father involvement			
Quality of co-parenting relationship (range: 1 to 5)	0	-0.05	0.03
Father's engagement with child (range: 0 to 5)	-0.21	-0.29	-0.16
Father regularly spends time with child (%)	-8+	-10	-6
Mothers' education and career aspirations			
Currently enrolled in school (%)	4	2	5
Mother's career goals (range: 1 to 4)	0.04	0.01	0.07
Mothers' parenting behavior			
Mother's engagement with child (range: 0 to 5)	0.04	-0.09	0.12
Sample size	**483**	**201**	**282**

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

[a] Confirmatory outcome when measured using data from the two-year follow-up survey.

[b] Measure does not include the 59 Steps to Success mothers and 67 traditional home visiting mothers who responded to the survey and reported a repeat pregnancy.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

†††/††/† Difference in impacts between subgroups is statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

LARC = long-acting reversible contraceptive.

mothers by 11 percentage points, a statistically significant impact not detected in the full sample (Appendix Table A.6.).[4]

Table A.6. Subgroup impacts by age at study enrollment

Outcome	Full sample	Age at enrollment	
		19 or 20	14 to 18
Healthy birth spacing			
Any repeat pregnancy[a] (%)	-3	3	-8
Currently using a LARC method (%) †	9+	0	17**
Recently had unprotected sex (%)	-5	2	-11*
Desire to avoid repeat pregnancy in the next year[b] (range: 1 to 5)	0.10	0.17	0.04
Knowledge of contraception and pregnancy prevention (range: 0 to 2)	-0.02	-1.0	0.06
Father involvement			
Quality of co-parenting relationship (range: 1 to 5)	0	-0.11	0.10
Father's engagement with child (range: 0 to 5)	-0.21	-0.22	-0.20
Father regularly spends time with child (%)	-8+	-12*	-4
Mothers' education and career aspirations			
Currently enrolled in school (%)	4	2	6
Mother's career goals (range: 1 to 4)	0.04	0.08	0
Mothers' parenting behavior			
Mother's engagement with child (range: 0 to 5)	0.04	0.08	0
Sample size	**483**	**231**	**252**

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

[a] Confirmatory outcome when measured using data from the two-year follow-up survey.

[b] Measure does not include the 59 Steps to Success mothers and 67 traditional home visiting mothers who responded to the survey and reported a repeat pregnancy.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

†††/††/† Difference in impacts between subgroups is statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

LARC = long-acting reversible contraceptive.

Impacts on secondary outcomes

As another set of exploratory analyses, the study team estimated impacts for several secondary outcomes within each topic area:

- **Healthy birth spacing.** To provide more context for the observed impacts on repeat pregnancy, the evaluation team analyzed these outcomes: whether a mother had a repeat

[4] Although we focus on comparing mothers who were ages 14 to 18 and those ages 19 or 20 at the time of study enrollment, we also examined results for mothers ages 14 to 17. These mothers were significantly more likely to be living with their parents and enrolled in high school at baseline than mothers who were age 18 (not shown), which could have led to differences in the impacts of the Steps to Success enhancements. However, results for mothers ages 14 to 17 and ages 14 to 18 were similar.

birth, how many times she had been pregnant since the birth of the child that led her to enroll in the study, and whether she reported that she would like to wait at least two years before having another child. To develop our understanding of the impacts observed for current LARC use and recent unprotected sex, the team analyzed impacts on LARC use since program entry and current use of a hormonal method or IUD (that is, any effective, female-initiated method of birth control) at the time of the two-year follow-up survey. Finally, to determine whether the emphasis of Steps to Success on LARC methods led to adverse effects on other risky sexual behaviors (see Steiner et al. 2016), the evaluation team examined impacts on whether mothers had sex without a condom in the three months before the two-year follow-up survey and mothers' STI diagnoses.

- **Father involvement.** The evaluation team examined four secondary outcomes related to the mother-father relationship as potential mediating factors for changes in father involvement: (1) whether the mother and father are married, (2) whether the mother and father live together, (3) whether the mother and father are romantically involved, and (4) how much of the baby's life the mother and father had spent living together with the baby. In addition, the team analyzed an outcome measuring fathers' financial contributions to capture a different aspect of paternal support.
- **Mothers' education and career aspirations.** The evaluation team examined other measures of educational achievement and ambitions, including an indicator for whether a mother had obtained her high school diploma or GED certificate; an indicator for whether a mother had either obtained her high school diploma or GED certificate, or was currently enrolled in school; and a four-point scale score capturing the extent to which a mother believes she will eventually graduate from a four-year college.
- **Mothers' parenting behavior.** The evaluation team examined the five individual survey questions used to construct the scale measure of mothers' parenting behavior to get a deeper understanding of the observed impact for the scale as a whole. In addition, the team analyzed an indicator for whether a mother had spanked her child in the past month.

The results of these analyses are in Table A.7. Overall, the results on the secondary outcomes confirm the findings based on the primary outcomes and detailed in the main report. We highlight two key findings apparent from the secondary outcomes. First, many mothers in both the Steps to Success and traditional home visiting groups said they used a LARC at some point in the study period but then discontinued use. In the Steps to Success group, 78 percent of mothers used a LARC method at some point in the study period (Table A.7), but only 53 percent were using this method at the time of the two-year follow-up survey (Table 4). This suggests higher discontinuation rates than are typical for LARCs (O'Neil et al. 2013). Second, although there is some evidence that Steps to Success mothers were more likely than mothers in the traditional home visiting group to use a LARC, the rates of use of any hormonal method or IUD are not significantly different between the study groups. This suggests that the effects of the Steps to Success enhancements on LARC use were driven, at least in part, by the program prompting mothers to switch from hormonal methods of birth control such as the patch, the pill, or the ring to LARCs.

Table A.7. Impacts on secondary outcomes

Outcome	Steps to Success families	Traditional home visiting families	Impact	Effect size
Healthy birth spacing				
Any repeat birth (%)	14	14	0	0.00
Number of repeat pregnancies	0.33	0.33	0	0.01
Used a LARC method since study enrollment (%)	78	66	12**	0.25
Currently using an IUD or hormonal method of birth control (%)	60	56	5	0.09
Want to wait two or more years until next birth[a] (%)	54	50	4	0.09
Recently had sex without a condom (%)	64	61	3	0.06
Diagnosed with an STI since study enrollment (%)	14	17	-3	-0.08
Father involvement				
Baby's parents are married (%)	18	23	-4	-0.11
Baby's parents live together (%)	38	41	-3	-0.06
Baby's parents are romantically involved (%)	53	57	-4	-0.08
Share of time since birth the baby's mother and father have lived together with the baby (%)	0.54	0.54	0.01	0.02
Father provides substantial financial support for raising the baby (%)	58	62	-4	-0.08
Mothers' education and career aspirations				
Obtained high school diploma or GED certificate or currently enrolled in school (%)	83	82	1	0.02
Obtained high school diploma or GED certificate (%)	76	76	0	0.01
Believe will eventually graduate from a four-year college (range: 1 to 4)	2.66	2.68	-0.02	-0.01
Mothers' parenting behavior				
Frequency mother plays games with child (range: 0 to 5)	4.07	3.97	0.10	0.10
Frequency mother sings songs with child (range: 0 to 5)	4.15	4.16	-0.01	-0.01
Frequency mother reads to or looks at books with child (range: 0 to 5)	3.85	3.87	-0.02	-0.01
Frequency mother tells stories to child (range: 0 to 5)	3.73	3.73	0	0
Frequency mother played with games or toys with child (range: 0 to 5)	4.23	4.22	0.01	0.01
Mother spanked child in past month (%)	63	65	-2	-0.05
Sample size	**239**	**244**		

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

Notes: All estimates account for the random-assignment design and differences across study groups in age of mother at random assignment, mother's race and ethnicity, time since birth (or due date, in the case of miscarriage), and the baseline value of the outcome measure or a close proxy (when available).

[a] Set to zero for women who have had a repeat pregnancy since the time of study enrollment.

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively, two-tailed test.

IUD = intrauterine device; LARC = long-acting reversible contraceptive; STI = sexually transmitted infection.

Differences in secondary implementation measures

In addition to the secondary outcome measures, we also analyzed several secondary measures capturing information on the implementation of Steps to Success and the traditional home visiting program. We constructed these measures using survey data indicating respondents' self-reports of how often they received information from home visitors and how often they received information from other sources in the community.

For each of the constructed measures, we drew data from a single survey item: a respondent was asked how many times she received information on a specific topic from a specific source. Response categories included "never," "1 or 2 times," "3 to 5 times," "6 to 9 times," and "10 or more times." We used these data to construct eight additional measures of services the mothers received. For each, we set the constructed variable to 0 if the response was "never," 1.5 if the response was "1 or 2 times," 4 if it was "3 to 5 times," 7.5 if it was "6 to 9 times," and 11 if the response was "10 or more times."

The results of this analysis reveal a strong contrast between the information participants received during Steps to Success and traditional home visits (Table A.8). Compared with the group receiving traditional home visiting, mothers in the Steps to Success group reported receiving about two and a half more visits at which parenting was discussed, more than four more visits when methods of birth control were discussed, and between two and three more visits at which abstinence and relationships, dating, and marriage were discussed. Although these differences are both strong and significant, they are less stark than those suggested by the administrative data. This could be because survey recall error attenuates the reported differences in visits. It could also be due to the particular way we coded categorical survey responses. Nonetheless, these results confirm our general findings from the administrative data.

The survey data reveal few differences between the study groups in information received from health care practitioners on contraception or through classes and group meetings on relationships, dating, or marriage (Table A.8). For these measures, the difference between the two study groups was statistically insignificant.

In contrast, the results show that mothers in the Steps to Success group attended more classes on methods of birth control (a statistically significant difference) and offer some evidence they attended more class on abstinence (a statistically significant difference at the 0.10 level) (Table A.8). At the one-year follow-up, there were no significant differences in mothers' exposure to classes or group meetings on these topics. These results suggest that the Steps to Success enhancements to the traditional home visiting program induced mothers to seek out additional information on pregnancy prevention—or connected mothers to information sources on those topics—in the second year of the program.

Table A.8. Differences in secondary implementation measures

Outcome	Steps to Success families	Traditional home visiting families	Difference
Number of home visits from HFSA staff since study enrollment at which a specific topic was discussed:			
Parenting	9.22	6.64	2.58**
Methods of birth control	6.82	2.63	4.19**
Abstinence	3.91	1.79	2.11**
Relationships, dating, or marriage	6.91	3.93	2.98**
Number of times respondent received information on contraception from a doctor, nurse, or clinic (since study enrollment)	1.51	0.98	0.53
Number of times respondent attended classes or group meetings at which a specific topic was discussed (since study enrollment):			
Methods of birth control	1.50	0.91	0.59*
Abstinence	0.86	0.53	0.33+
Relationships, dating, or marriage	1.31	0.96	0.35
Sample size	**239**	**244**	

Source: Baseline surveys and two-year follow-up surveys conducted by Mathematica Policy Research.

Notes: All estimates account for the random assignment design and differences across study groups in the mother's age at random assignment, mother's race and ethnicity, time since birth (or due date, in the case of miscarriage), and the baseline value of the outcome measure or a close proxy (when available).

**/*/+ Differences are statistically significant at the .01/.05/.10 levels, respectively; two-tailed test.

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