PPA
Evaluation of Adolescent
Pregnancy Prevention Approaches

OAH Evaluation Report

Impact Report from the Evaluation of Adolescent Pregnancy Prevention Approaches

Teen Options to Prevent Pregnancy

December 2015

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

OFFICE OF ADOLESCENT HEALTH

Purpose statement: This study reports interim findings from a large-scale demonstration project and evaluation of Teen Options to Prevent Pregnancy, an 18-month clinic-based intervention designed specifically for pregnant and parenting adolescents. The study reports interim impacts of the program on adolescent sexual risk behaviors and other short-term outcomes measured six months after participants enrolled in the study. A future report will examine the program's longer-term impacts on repeat pregnancy and sexual risk behaviors at the end of the program.

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I. INTRODUCTION

Although teen pregnancy and birth rates in the United States have declined significantly since 1990, one in six adolescent women still give birth before the age of 20, and about one in four adolescent mothers go on to have a second child as a teenager (Martinez et al. 2011; Centers for Disease Control and Prevention 2013). Compared to older mothers, teen mothers are more likely to have adverse obstetric and neonatal outcomes, receive welfare, and have children with developmental and behavioral difficulties (Hoffman 2008). A rapid repeat pregnancy during adolescence compounds the risk of poorer outcomes for the mother and the child. Teen mothers who experience rapid repeat pregnancies (within 18 months of the prior birth) are at significantly greater risk of having a stillbirth or preterm birth than mothers who delay subsequent childbearing (Conde-Agudelo et al. 2006). They are also less likely to stay in or complete high school, work, or maintain economic self-sufficiency, and to have children who exhibit school readiness when older (Klerman 2004).

Adolescent mothers have the highest risk of a closely spaced repeat pregnancy (Copen et al. 2015). More than one in three recently pregnant teens experience a repeat pregnancy within two years of a previous birth or abortion (Baldwin et al. 2013). The majority of these pregnancies are reported as unintended, and about half end in births (Mosher et al. 2012). Although most teenagers at risk of unintended pregnancy report using a contraceptive method (roughly 80 percent), they rarely select the most effective methods. Adolescents most commonly use methods with relatively high typical use failure rates, such as condoms, withdrawal, and birth control pills. Less than 5 percent of women ages 15 to 19 who are currently using a modern contraceptive method use a long-acting reversible contraceptive (LARC) method—either an intrauterine device (IUD) or the contraceptive implant—which have the highest continuation rates and lowest pregnancy rates among reversible birth control methods (American College of Obstetricians and Gynecologists [ACOG] 2012). Reported barriers to LARC use by adolescents include a lack of familiarity with or misperceptions about the methods, high upfront financial costs of insertion, and lack of access to health care providers (Fleming et al. 2010; Spies et al. 2010)

This report presents interim findings from a demonstration project and evaluation of the Teen Options to Prevent Pregnancy (*T.O.P.P.*) program, an 18-month clinic-based intervention that aims to reduce rapid repeat adolescent pregnancies. The *T.O.P.P.* program was developed by OhioHealth, a large, faith-based health system in Columbus, Ohio, to address high repeat teen birth rates and low family planning rates among teens in the Columbus area (Centers for Disease Control and Prevention 2013; Ohio Department of Health 2007, 2012). The program features three components: (1) telephone-based care coordination, (2) facilitated access to contraceptive services, and (3) a risk assessment and referrals by a social worker. Findings from an implementation study of the *T.O.P.P.* program were presented in an earlier report (Meckstroth and Berger 2014). The present report adds to these findings by describing the program's impacts on adolescent sexual risk behaviors and other short-term outcomes measured six months after participants enrolled in the study. A future report will examine the program's longer-term impacts on repeat teen pregnancy at the end of the 18-month program.

The evaluation has involved a unique collaboration and partnership among several organizations. The demonstration and evaluation was originally designed by the OhioHealth

Research and Innovation Institute and Nationwide Children's Hospital, in collaboration with the OhioHealth Community Partnerships Department, which houses the *T.O.P.P.* program. In fall 2010, OhioHealth received competitive federal grant funding for the evaluation through the Personal Responsibility Education Innovation Strategies grant program within the Family and Youth Services Bureau within the Administration for Children and Families (ACF) of the U.S. Department of Health and Human Services (HHS). In winter 2011, the *T.O.P.P.* evaluation was selected as one of seven sites to participate in the Evaluation of Adolescent Pregnancy Prevention Approaches (PPA), a major federal effort to expand available evidence on effective ways to prevent and reduce pregnancy and related sexual risk behaviors among teens in the United States. The PPA study is conducted by Mathematica Policy Research and its partners, Child Trends and Twin Peaks Partners, LLC, under contract with the Office of Adolescent Health (OAH) within HHS. Participation in the PPA study provided the *T.O.P.P.* evaluation additional resources to support data collection and analysis. In addition, researchers from the PPA evaluation team have collaborated with the OhioHealth Research and Innovation Institute and Nationwide Children's Hospital to refine the evaluation design, support data collection, and plan the analysis.

The report is divided into five chapters. In the remainder of this chapter, we provide a more detailed description of the *T.O.P.P.* program and how it compares to other existing programs for expectant or parenting adolescents. Chapters II and III describe the study design, data, and analytic methods. Chapter IV presents findings from the interim impact analysis, and Chapter V summarizes and discusses the implications of the results.

A. Existing programs for expectant or parenting adolescents

Many health and social service programs aim to address the unique needs of expectant or parenting adolescents. These programs are delivered in a variety of settings, ranging from health clinics or community-based settings to the homes of individual program participants. Some programs focus on delaying repeat teen pregnancies and increasing the use of effective methods of birth control. Others address these issues more indirectly by providing health education, case management, family or peer support, life skills, or employment trainings (alone or in combination).

Adolescents and young adults are a common focus of home visiting programs such as the longstanding Nurse Family Partnership (NFP) program. In the NFP program, trained registered nurses provide one-on-one home visits to first-time, low-income mothers over an extended period from early in the woman's pregnancy and until her child turns 2 years old. The program focuses on a highly diverse array of outcomes, ranging from child health and development to family economic self-sufficiency. NFP has shown favorable effects in reducing rates of subsequent pregnancies and births at 24 months postpartum (Olds et al. 2002). Because of the high intensity and relatively long duration of the program, NFP nurses typically have caseloads of no more than 25 families. Studies have estimated that the annual program costs range from $4,228 to $13,692 per family depending on the program setting and population served (Burwick et al. 2014). Other common home visiting programs such as Healthy Families America and Early Head Start-Home Visiting operate using slightly different program models, but all share a common goal of providing a broad array of program supports intended to influence a diverse range of maternal and child outcomes.

Not all expectant or parenting adolescents may need the full range of services that home visiting programs offer. As a result, other programs that aim to reduce initial or repeat pregnancies among adolescents or young adults have used a more targeted, less comprehensive approach. For example, Peterson et al. (2007) tested the effectiveness of a brief, two-session counseling program designed to reduce unintended pregnancies and sexually transmitted infections (STIs) among adolescent and adult women ages 16 to 44. The study found that the intervention improved contraceptive use among women at risk of unintended pregnancy in the short term (at 2 months), but had no significant effects after 12 months. Similarly, Kirby et al. (2010) found that a clinic-based intervention involving follow-up telephone calls to female adolescent clinic patients (an average of 2.7 calls per patient) had no significant effects on rates of birth control use or pregnancy. In contrast, a study by Barnet et al. (2007) testing the effectiveness of a community-based computer-assisted motivational intervention (CAMI) found that two or more CAMI sessions, alone or within a more intensive home-based intervention, were associated with a reduced risk of rapid subsequent births to adolescent mothers.

Yet other programs have sought to reduce pregnancy risk by addressing practical or logistical barriers to effective contraceptive use. For example, Simmons et al. (2013) tested the effectiveness of a telephone-based care coordination program on uptake of LARC methods among postpartum women who planned to use LARC. The program offered facilitated access to insurance coverage, appointment scheduling, and transportation and child care assistance. However, the study found no differences in LARC adoption between the treatment and control groups. In contrast, the St. Louis-based Contraceptive CHOICE project has received considerable attention recently for its positive results in increasing rates of LARC use and reducing adolescent pregnancy rates relative to national averages (Secura et al. 2014). The CHOICE project provided eligible women with free birth control, standardized contraceptive counseling, and expeditious access to these services. The program was targeted specifically to women who were "not using a contraceptive method or were willing to switch to a new, reversible contraceptive method" (Secura et al. 2014; p. 1317). Researchers do not yet know how well this type of program would perform among members of a more general population.

B. The T.O.P.P. program

The *T.O.P.P.* program was developed as a unique new program focused specifically on pregnant and parenting adolescents that combines and modifies key elements from existing program approaches. Similar to many home visiting programs, the *T.O.P.P.* program is delivered individually to program participants over 18 months by trained nurse educators. However, unlike most home visiting programs, *T.O.P.P.* is delivered primarily by telephone and focuses more narrowly on promoting healthy birth spacing and use of effective contraception, including highly effective LARC methods. These features of the *T.O.P.P.* program enable nurses to serve much larger caseloads than the nurses in traditional home visiting programs. *T.O.P.P.* also aims to reduce possible barriers to contraceptive use, through motivational interviewing techniques (described below) and the provision of transportation assistance and other logistical supports designed to improve access to clinic-based contraceptive services, a combination of services that few programs that aim to reduce repeat pregnancy have used. Finally, *T.O.P.P.* does not base program eligibility on participants' current use of or attitudes toward specific contraceptive methods, in contrast with some other pregnancy prevention programs, such as the Contraceptive CHOICE project

The *T.O.P.P.* program model is grounded in the Behavioral Model of Health Service Use, which posits that a person's use of health services is a function of his or her predisposition to use services (influenced by attitudes and beliefs), factors that enable or impede use (such as access to a source of care), and perceived need for care (Andersen 1995). Applied to the *T.O.P.P.* program context, the model suggests that a young woman's contraceptive behavior will change through changes in her knowledge and attitudes related to pregnancy prevention and birth control, increased access to contraceptive services, and heightened perceived need for birth control (Babitsch et al. 2012; Andersen 1995). The *T.O.P.P.* program is designed to address each of these factors through its three main program components: (1) telephone-based care coordination, (2) facilitated access to contraceptive services, and (3) referrals to social support services. These services are delivered by nurse educators and a program social worker to program participants over 18 months.

1. Telephone-based care coordination

The telephone-based care coordination component of *T.O.P.P.* involves one-on-one telephone motivational interviewing sessions with a trained nurse educator. Motivational interviewing is an individualized, client-centered, collaborative communication and counseling style designed to promote behavior change. It focuses on a person's goals and motivation to change, and emphasizes self-efficacy and the relationship between current behaviors and future goals (Barnet et al. 2007; Hettema et al. 2005). For *T.O.P.P.*, nurse educators use motivational interviewing to elicit information about past experiences with and beliefs about contraception and pregnancy; encourage participants to examine their own knowledge base about contraception; provide individualized education about contraceptive methods based on participants' preferences and interests; and help guide participants toward birth control methods that can be used effectively and consistently. Motivational interviewing has been shown to be a promising approach to reducing risky behaviors among adolescents, including substance use and unhealthy dieting behavior (Rollnick and Miller 2002; Ingersoll et al. 2005; Rendall-Mkosi 2012). For *T.O.P.P.*, nurse educators deliver telephone motivational interviewing sessions with a recommended frequency of approximately once per month throughout the 18-month intervention, with greater call frequency during the initial months of the program and periods in which participants are actively seeking and adopting new forms of birth control.

All *T.O.P.P.* nurse educators receive a set of tools to guide and support their interactions with program participants. Most notably, a *Nurse Educator Flow Sheet* provides a semistructured protocol that guides initial and ongoing conversations between nurse educators and participants, and provides key discussion points, conversation starters, and prompts for birth control reminders. However, this protocol is intended only as a guide; by design, each motivational interviewing session is individualized and unscripted. Other tools available to nurse educators include a *Worksheet for Change*, which facilitates goal-setting and action-planning processes, and a *Self-Evaluation Ruler*, which helps participants explore their feelings toward birth control and pregnancy. Another key tool used to support effective motivational interviewing is *T.O.P.P.*'s *Fidelity Toolkit.* After each contact with a program participant, nurse educators document in a program database whether activities, topics, and conditions outlined in the *Fidelity Toolkit* were covered during the interaction. The *Fidelity Toolkit* also provides important input for ongoing quality assurance monitoring, as discussed below.

T.O.P.P.'s use of motivational interviewing is distinctive in several ways. For one, although motivational interviewing is typically implemented in person, most interactions between *T.O.P.P.* nurse educators and program participants occur by phone. This emphasis on phone rather than in-person communication is designed to facilitate more frequent and repeated interactions with adolescent mothers, who tend to be relatively transient, have difficulty scheduling and keeping in-person appointments, and may not have reliable or convenient transportation. Unlike other programs that employ motivational interviewing to try to improve reproductive health outcomes, *T.O.P.P.* uses high-intensity quality control procedures to maximize treatment fidelity. Before the start of the program, the nurse educators and social worker completed a two-day workshop in motivational interviewing. In addition, *T.O.P.P.* employed a certified Motivational Interviewing Network Trainer, who reviewed a portion of audio-recorded interactions with *T.O.P.P.* participants as the basis for providing ongoing training and technical assistance to the nurse educators. Not all motivational interviewing programs provide this same high level of initial training and ongoing support (Barnet et al. 2007; Peterson et al. 2007; Rendall-Mkosi et al. 2012).

2. Facilitated access to contraceptive services

The *T.O.P.P.* program model acknowledges that knowledge and motivation barriers are not the only obstacles to uptake and consistent use of contraceptives among adolescent mothers, who also often face logistical obstacles to obtaining birth control. One way *T.O.P.P.* seeks to reduce logistical barriers is by providing a van service. This service provides transportation to and from clinic appointments for participants who either do not have their own transportation or have difficulty using public transportation. Furthermore, participants can bring their infants to these contraceptive appointments, if they are unable to or choose not to arrange for child care. These appointments occurred at the participant's facility of choice and were not restricted to OhioHealth facilities. The nurse educators accompanied participants to appointments via the van service, in most cases driving the van themselves.

T.O.P.P. also provides direct access to contraceptive services through a program clinic. The *T.O.P.P.* clinic was originally designed as a mobile clinic that could be stationed in different parts of the program service areas. However, due to insufficient attendance, the mobile clinic was discontinued after a few months and replaced by a stationary clinic in the *T.O.P.P.* offices. In the *T.O.P.P.* clinic, a part-time obstetrician/gynecologist is available to provide contraceptive services to participants who are not already affiliated with another physician or who are struggling to receive timely or effective contraceptive care from their existing provider. Program participants needing transportation to and from the *T.O.P.P.* clinic could use the program's van service.

To increase awareness of available contraceptive methods and services, the *T.O.P.P.* nurse educators typically aim to conduct at least one individual, in-person visit with program participants at the participants' homes, or, in some cases, in community settings. For these in-person visits, the nurse educators brought a "contraceptive bag" with them as a tool to help educate participants about different contraceptive options. The bag contains informational flyers and pamphlets (for example, on birth control choices and STIs) as well as a range of birth control devices for participants to see and touch, including NuvaRing (birth control ring), Nexplanon (birth control implant), and intrauterine devices (IUDs). During their van and in-person

interactions with program participants, nurse educators also employ motivational interviewing techniques to further educate participants about the value of preventing rapid repeat pregnancies and to address any misconceptions or concerns inhibiting effective or consistent contraceptive use.

3. Access to a social worker

The *T.O.P.P.* program also gives participants access to a program social worker who, based on an initial psychosocial assessment of program participants and subsequent identification of service needs by the nurse educators, can refer participants to appropriate support services. The initial risk assessment and ongoing referral services attempt to address a range of other barriers to adoption of and adherence to an effective birth control regimen, such as maternal depression, domestic violence, poverty, and homelessness.

C. Research questions

This report examines the interim impacts of *T.O.P.P.*, measured after program participants had received the first 6 months of the full 18-month program. Given the relatively short program duration being evaluated, we limit our analysis to the shorter-term mediating outcomes and interim goals specified in the program logic model (Figure I.1). A future report will examine the impact of the program on longer-term outcomes, most notably the incidence of repeat pregnancy, measured at the end of the full 18-month program.

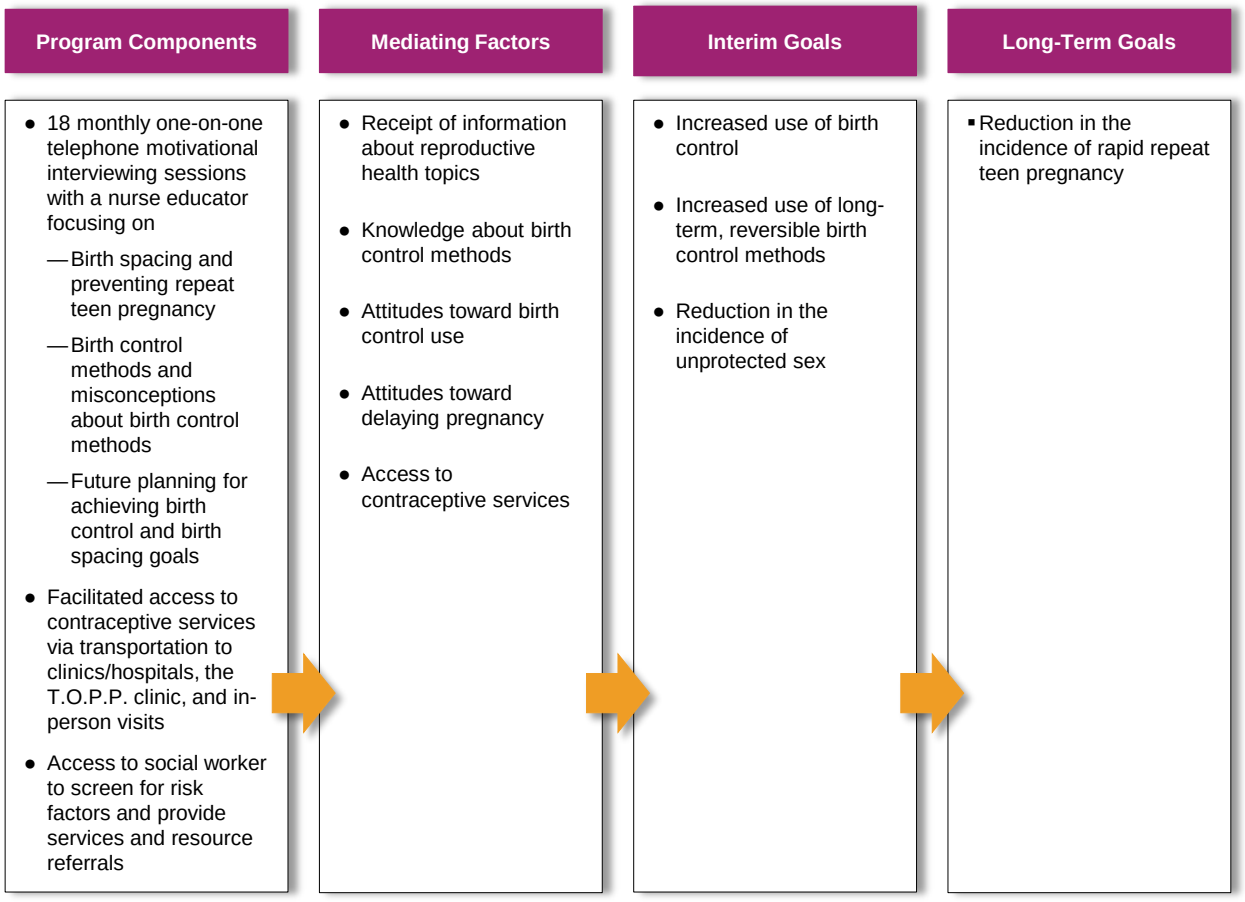
This interim report focuses first on the effectiveness of *T.O.P.P.* in increasing rates of birth control use and reducing the incidence of unprotected sex among pregnant and parenting adolescents. In assessing program impacts on these outcomes, we focus specifically on the program's success in increasing use of highly effective LARC methods. The specific research questions addressed are as follows:

1. Are *T.O.P.P.* participants more likely to have used an effective birth control method in the past three months, and to have used a LARC method in particular?
2. Is *T.O.P.P.* successful in reducing rates of unprotected sex within the past three months?

We also assess the impacts of *T.O.P.P.* on three sexual risk behaviors not directly targeted by the program—namely, overall sexual activity rates, condom use, and number of sexual partners. We examine these outcomes to determine whether the program's emphasis on promoting the use of highly effective contraceptive methods, such as LARC, has any unintended spillover effects to other types of sexual risk behaviors. The specific research question addressed is as follows:

1. Does participation in *T.O.P.P.* have an impact on sexual risk behavior outcomes not directly targeted by the program, including rates of sexual activity and condom use, and number of sexual partners?

Figure I.1. **T.O.P.P.** program logic model



Finally, to explore the potential pathways or mechanisms through which the program may influence rates of birth control use or sexual risk behaviors, we also examine impacts on a range of potential intermediate or "mediating" factors, such as increased exposure to information on sexual and reproductive health topics or changes in knowledge and attitudes. We explore program impacts on these potential mediating outcomes through the following research questions:

1. Is *T.O.P.P.* effective in increasing exposure to information on relationships, birth control methods, refusal skills, and STI prevention, and receipt of this information from a health provider?
2. Does *T.O.P.P.* increase knowledge about the effectiveness of contraceptive methods in preventing pregnancy and STIs?
3. Does *T.O.P.P.* change attitudes toward birth control, including ease of access to and use of birth control methods and perceived need for birth control?
4. Does *T.O.P.P.* make adolescent mothers more likely to report an intention to avoid pregnancy?
5. Does *T.O.P.P.* increase the receipt of birth control from a doctor or nurse?

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II. STUDY DESIGN

This study was designed as a randomized controlled trial involving low-income adolescent women recruited through OhioHealth hospitals and clinics. Among eligible women who agreed to participant in the study, about half were randomly assigned to a treatment group that was offered the *T.O.P.P.* program and half were assigned to a control group that was not offered the program. Both treatment and control group participants had access to existing, standard-of-care reproductive health services available through the OhioHealth system and other providers in the area. Furthermore, after enrollment in the study, all participants from both groups received educational handouts on birth control, STIs, and birth spacing. We calculated interim program impacts of the *T.O.P.P.* program by comparing outcomes for the treatment and control groups about six months after study enrollment.

In this chapter, we begin by describing the enrollment and retention of study participants. We then discuss the baseline characteristics of the study sample. We end by providing a summary description of the treatment and control conditions. Chapter III describes the data, measures, and analytic methods used to estimate impacts of the *T.O.P.P.* program.

A. Sample enrollment and retention

The study population was composed exclusively of low-income expectant or newly parenting adolescent women in the Columbus, Ohio, area. Low-income adolescents were selected because they were expected to benefit from the *T.O.P.P.* transportation assistance to a greater extent than higher-income adolescents. Participants were recruited from seven OhioHealth women's clinics and the postpartum units of five OhioHealth hospitals. These facilities serve seven central Ohio counties: Fairfield, Franklin, Delaware, Licking, Madison, Pickaway, and Union. All of the participating clinics and hospitals are located in Franklin County, except one hospital that is located in Delaware County. To be eligible for the study, women had to be ages 10 to 19, at least 28 weeks pregnant or less than 9 weeks postpartum, and enrolled in Medicaid. Due to the telephone-based nature of the intervention, women also had to have regular telephone service and to speak English.

Sample enrollment began in October 2011 and continued on a rolling basis for 27 months, or until January 2014. To identify eligible women, program staff conducted regular queries in OhioHealth's electronic scheduling system, producing lists of potentially eligible women and their next appointments, including prenatal and postnatal appointments at the clinics and postpartum appointments in the maternity wards of hospitals. After potentially eligible patients were identified, an OhioHealth standard-of-care provider approached them during their next scheduled clinic appointment or in the postpartum unit of the hospital and told them about the opportunity to learn about the study. Some of these women agreed to learn more about the study, and *T.O.P.P.* program and/or local evaluation staff followed up with them to provide more detailed information about the study, the potential opportunity to participate in the *T.O.P.P.* program, and consent procedures. For most women, this follow-up occurred while they were still at the OhioHealth clinic or hospital. To participate in the study, all adolescents were required to provide written assent or consent and complete a paper-and-pencil baseline survey questionnaire (described in Chapter III). Participants under age 18 had to provide consent from a parent or legal guardian. The study procedures and consent forms were approved by the institutional

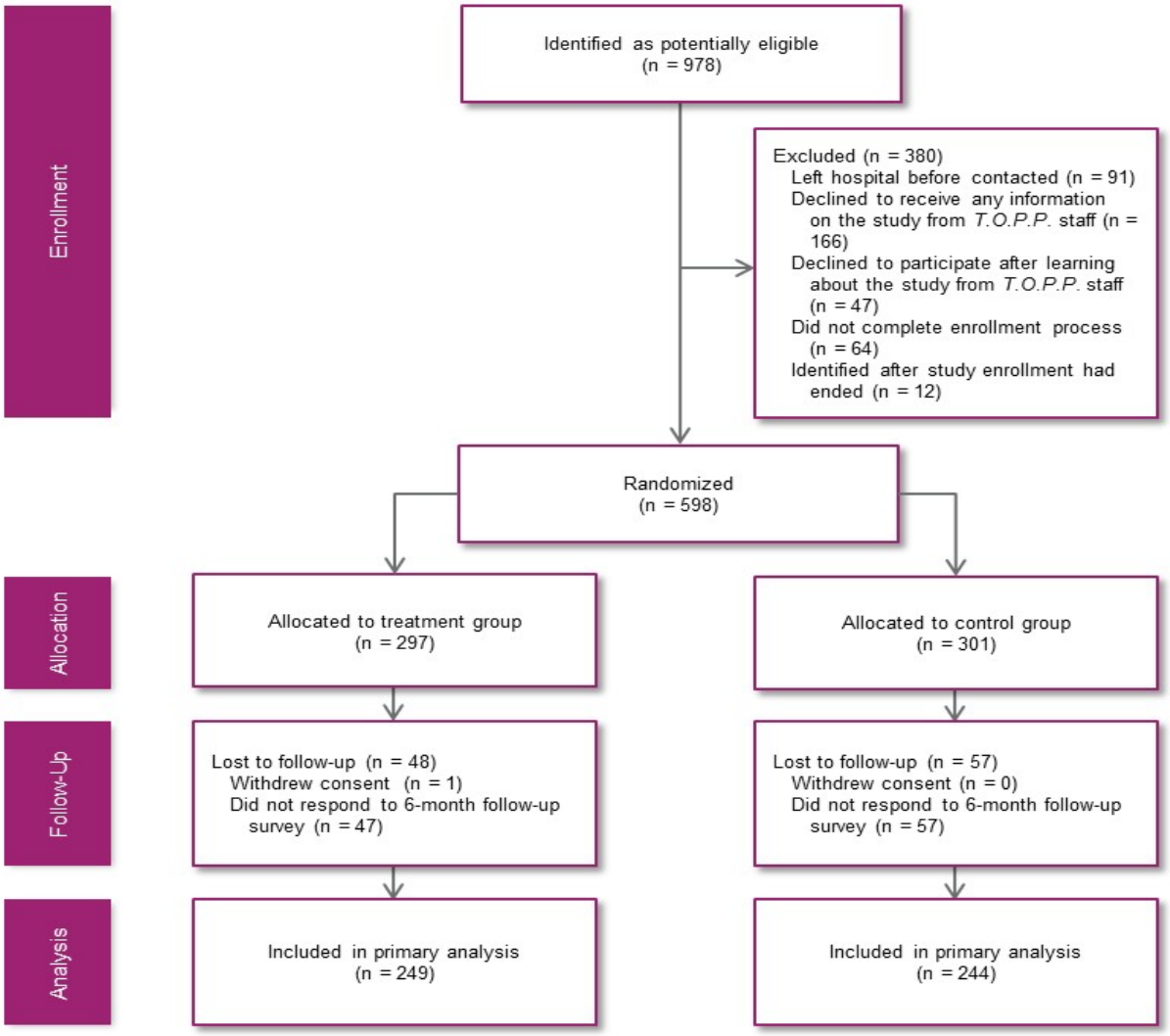
review boards of OhioHealth, Nationwide Children's Hospital, and the Ohio Department of Health.

Sample enrollment and random assignment were managed through a secure web-based system. OhioHealth staff entered participants into the system on a rolling basis as they were recruited into the study. After participants were registered as having provided consent and having completed the baseline survey questionnaire, the system randomly assigned them to either the treatment group or the control group. We programmed the system to conduct random assignment using a permuted block design, a method that helps ensure an even balance of participants between the treatment and control groups throughout the study period (Matts and Lachin 1988; Schulz and Grimes 2002). For this study, we specified a variable block size of up to six characters and a one-to-one allocation of participants between the treatment and control groups. We also stratified the random assignment by recruitment location and age group (under age 18 versus age 18 or 19) to avoid the possibility of a chance imbalance in these characteristics between the treatment and control groups. Shortly after random assignment, an OhioHealth nurse educator was assigned to each treatment group participant and began delivering the intervention on an individual basis. The nurse educator assignments were determined based on existing caseloads and were designed to spread participants relatively evenly among the nurses.

The sample enrollment process yielded a total sample of 598 study participants (Figure II.1). This study sample was obtained from a larger sample of 978 women, who were identified as potentially eligible for the study through the OhioHealth electronic scheduling system. Of these potentially eligible women, 380 (39 percent) were excluded from the study, with the most common reasons being lack of interest (n = 166) or leaving the hospital or clinic before receiving information on the study (n = 91). Because of these exclusions, the study sample is not intended to be a random or representative sample of all women who were potentially eligible. Of the 598 young women who agreed to participate in the study, roughly half were randomly assigned to the treatment group (297 participants) and the other half were randomly assigned to the control group (301 participants).

The retention rate for the study was high (Figure II.1). This report focuses on data from the first follow-up survey, which was administered to study participants beginning six months after study enrollment. Of the 297 women randomly assigned to the treatment group, 249 completed the six-month follow-up survey, for a response rate of 84 percent. Of the 301 women assigned to the control group, 244 completed the survey, for a response rate of 81 percent. We will report retention rates for longer-term follow-up surveys in a future report. See Appendix A for a nonresponse analysis examining the characteristics of participants who did not complete the six-month survey.

Figure II.1. Overview of sample enrollment and retention



B. Baseline sample characteristics

We examined several characteristics of the treatment and control groups at baseline to characterize our sample of interest and ensure that random assignment resulted in comparable study groups. Differences between the treatment and comparison groups were small and were not statistically significant.

The socio-demographic characteristics of the study sample were consistent with those of the population targeted by the *T.O.P.P.* program (Table II.1). At the time of the baseline survey, the mean age of participants at baseline was 18 years. Less than half of all study participants had received a high school diploma or equivalency credential. More than 90 percent of participants were receiving some kind of public assistance at baseline, primarily through the Supplemental Nutrition Assistance Program (SNAP) or the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The racial characteristics of the population reflect those of the area *T.O.P.P.* serves; the majority of sample members were non-Hispanic whites and non-Hispanic blacks.

Consistent with program eligibility criteria, roughly one-quarter of participants were pregnant at the time of study enrollment; the remainder had given birth just prior to enrollment. Many participants had been pregnant more than once: the mean number of pregnancies at baseline was roughly 1.4. Most participants reported having a relationship with their baby's father at the time of the baseline survey; almost half reported being in a dating relationship and an additional 20 percent reported being either engaged or married to their baby's father. About half of the participants lived with at least one biological parent.

Table II.1. Baseline socio-demographic characteristics

Variable	Treatment group mean	Control group mean	Difference	*p*-value
Age at random assignment (years)	18.4	18.3	0.1	0.37
Highest level of education completed (%)				
No high school	4.5	6.7	-2.2	0.24
Some high school	51.0	51.0	0.0	0.78
High school graduate or GED	36.0	35.6	0.5	0.91
Any postsecondary education	6.5	6.3	0.2	0.96
Other	2.0	0.4	1.6	0.10
Economic situation				
Household received SNAP or WIC in past 30 days	91.4	90.3	1.1	0.65
Household received TANF in past 30 days	23.9	26.9	-3.0	0.48
Household received other assistance in past 30 days	23.0	24.5	-1.5	0.76
Race/ethnicity (%)				
White, non-Hispanic	44.0	49.8	-5.8	0.26
Black, non-Hispanic	38.7	35.1	3.5	0.52
Hispanic	7.0	6.3	0.7	0.71
Other race/ethnicity or multiracial	10.3	8.8	1.5	0.61
Pregnant at time of baseline survey	27.2	22.2	4.9	0.12
Number of times pregnant (including most recent)	1.5	1.4	0.1	0.58
Current relationship with baby's father				
Married or engaged	24.8	19.8	5.0	0.22
Dating (seriously or casually)	48.0	45.1	2.8	0.56
Other (no contact, have contact but not romantically involved, or other relationship specified)	27.2	35.0	-7.8	0.09
Family structure				
Lives with both biological parents	11.7	11.5	0.2	0.95
Lives with one biological parent	37.4	45.5	-8.1	0.10
Lives with neither biological parent	51.4	43.9	7.6	0.14
Sample size[a]	**249**	**244**		

Source: Baseline survey administered to study participants before the start of the program.

Notes: Reported means are from regressions that control for random assignment strata. *P*-values are adjusted for clustering of standard errors at the randomization block level. See Appendix B for a description of the measures.

[a] Reported sample size is the number of participants who completed the six-month follow-up survey and are included in the analysis.

GED = General Educational Development certification; SNAP = Supplemental Nutrition Assistance Program; TANF = Temporary Assistance for Needy Families; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Participants reported mixed levels of exposure to information on reproductive health topics at the time of study enrollment (Table II.2). More than 80 percent of participants said they had

received at least some information in the past 12 months on birth control methods, sources of birth control, and STIs. More than two-thirds said they had also received information on talking to a partner about sex or birth control and how to say no to sex. Fewer had received more general information on relationships (roughly 65 percent) or abstinence (roughly 50 percent).

Table II.2. Baseline exposure to reproductive health information

Variable	Treatment group mean	Control group mean	Difference	*p*-value
In past 12 months, received information on (%)				
Relationships	65.3	64.6	0.7	0.98
Methods of birth control	87.2	84.1	3.1	0.28
Where to get birth control	85.9	82.7	3.2	0.28
Abstinence	46.5	52.1	-5.7	0.33
Sexually transmitted infections	81.2	82.1	-0.9	0.75
Talking to a partner about sex or birth control	74.4	71.2	3.1	0.64
How to say no to sex	73.3	72.4	0.9	0.98
Sample size[a]	**249**	**244**		

Source: Baseline survey administered to study participants before the start of the program.

Notes: Reported means are from regressions that control for random assignment strata. *P*-values are adjusted for clustering of standard errors at the randomization block level. See Chapter III for a description of the measures.

[a] Reported sample size is the number of participants who completed the six-month follow-up survey and are included in the analysis; it does not account for item nonresponse for any measures included in the table.

Use of effective contraceptive methods was relatively low among study participants during the three months before their most recent pregnancy at the time of the baseline survey. Although almost all study participants reported some lifetime experience with an effective method of birth control, only roughly one percent of participants reported using a LARC method and 30 percent reported using a hormonal method or IUD in the three months before becoming pregnant (Table II.3). Less than 70 percent reported using an effective birth control method, with condoms being the most commonly used method. More than two-thirds of participants reported having unprotected sex in the three months before becoming pregnant, and nearly 90 percent reported having had sex without a condom. Participants also reported having several sexual partners in their lifetime; the average for participants in the treatment group was 5.1 lifetime partners and the average for women in the control group was 4.7 partners.

C. Treatment and control conditions

Treatment condition. Participants assigned to the treatment group were offered the 18-month *T.O.P.P.* program. As described in Chapter I, the program is delivered by trained nurse educators, who provide and coordinate contraceptive education, care, and other support services using telephone-based care coordination and follow-up. Follow-up services include home or in-person visits, a van service to transport participants to and from appointments with contraceptive providers, and referrals to a social worker, as needed. During all contacts with participants, the nurse educators use motivational interviewing (described in Chapter I) as a style of communication to educate clients about family planning and the value of preventing rapid repeat pregnancies. Detailed information on the selection and training of nurse educators is provided in our accompanying implementation study of the *T.O.P.P.* program (Meckstroth and Berger 2014).

Table II.3. Baseline sexual behaviors

Variable	Treatment group mean	Control group mean	Difference	*p*-value
In three months prior to becoming pregnant (%):				
Used a LARC method	1.4	0.5	0.9	0.29
Used a hormonal method of birth control or IUD[a]	30.6	29.5	1.1	0.92
Used an effective method of birth control[b]	62.9	69.4	-6.5	0.10
Had unprotected sexual intercourse[c]	74.1	70.8	3.3	0.49
Had sexual intercourse without a condom	90.0	85.6	0.4	0.17
Lifetime number of sexual partners	5.07	4.70	0.37	0.42
Sample size[d]	**249**	**244**		

Source: Baseline surveys administered to study participants before the start of the program.

Notes: Reported means are from regressions that control for random assignment strata. *P*-values are adjusted for clustering of standard errors at the randomization block level. See Chapter III for a description of the measures.

[a] Includes the following methods: birth control pills, shot, patch, ring, IUD, and implant.

[b] Includes the following methods: male condoms, female condoms, birth control pills, shot, patch, ring, IUD, implant, and vasectomy.

[c] Defined as having sexual intercourse without using an effective birth control method.

[d] Reported sample size is the number of participants who completed the six-month follow-up survey and are included in the analysis; it does not account for item nonresponse for any measures included in the table.

At the start of the program, each participant was assigned to a specific nurse educator, who conducted the motivational interviewing calls and provided the related telephone-based care coordination services. In addition, a *T.O.P.P.* social worker attempted to administer domestic violence and postpartum depression screeners to each program participant to help identify particular needs and challenges. Over the course of the program, the nurse educators referred *T.O.P.P.* participants, as needed, to the social worker for further clinical assessment and/or referral assistance to access a mental health provider or other community resources.

Our accompanying implementation study of *T.O.P.P.*, which focused on the initial stages of program implementation, suggests that the program was well implemented (Meckstroth and Berger 2014). As noted in Chapter I, the *T.O.P.P.* program model recommends that nurse educators deliver telephone motivational interviewing sessions once per month on average throughout the 18-month intervention, with greater call frequency during the initial months of the program and periods in which participants are actively seeking and adopting new forms of birth control. The implementation study's participation analysis of the first 112 program participants showed that the average participant received eight service contacts during her first six months in the program. On average, five of these contacts were motivational interviewing calls. Depending on individual participants' needs, the remaining three contacts typically comprised the initial assessment and screening from the *T.O.P.P.* social worker along with a service referral, a van ride, and/or an in-person visit. Most of the 112 participants included in the study had discussed and resolved transportation issues with a nurse educator, and about one-fifth had received a van ride through the program during their first six months. Due to scheduling difficulties, only about half of *T.O.P.P.* participants included in the study had received an in-person visit from a *T.O.P.P.* nurse educator during the first six months of the program.

For participants included in the preliminary participation analysis, the overall intensity of the *T.O.P.P.* intervention (including all motivational interviewing calls and other contacts and services) amounted to an average of two hours and 40 minutes during the first six months (or 26 minutes per month, on average). Consistent with the program model, the preliminary participation data also suggest that the first six months is the most intensive period, as staff make initial contacts with participants and assist them in selecting and adhering to a birth control plan. Among the small sample of participants enrolled at least 9 months (82 participants), the average client had received a total of 10.4 contacts (1.2 per month); and among participants enrolled at least 12 months (45 clients), the average client had received 12.7 contacts (1.1 per month). Future analyses of participation for the full 18-month *T.O.P.P.* service period will provide a more complete understanding of participants' experiences in *T.O.P.P.*

Control condition. Participants assigned to the control condition were not offered the *T.O.P.P.* program, but they retained access to any existing standard-of-care services offered through the OhioHealth system and other providers. In the Columbus area, existing pregnancy and reproductive health services include those provided though health care organizations (such as Nationwide Children's Hospital, Planned Parenthood, Columbus Neighborhood Health Centers, and Columbus Public Health Women's Health Center), home visiting programs (such as NFP), and other community-based organizations.

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III. DATA, MEASURES, AND ANALYSIS

This analysis is based on data from two rounds of surveys completed by study participants in the treatment and control groups. As discussed in Chapter II, participants were required to complete a paper-and-pencil baseline survey questionnaire upon study enrollment. The survey was administered by program staff from OhioHealth and collected a broad range of information on participants' demographic and personal characteristics, family relationships, attitudes, sexual risk behaviors, and pregnancy histories. Each participant received a $10 gift card for completing the survey. A first follow-up survey was administered roughly six months later by trained data collection staff from Mathematica and/or Nationwide Children's Hospital (who were not involved in the delivery of any components of the *T.O.P.P.* program). These trained data collection staff did not know which participants were assigned to the treatment and control groups. Staff administered 89 percent of the completed six-month follow-up surveys by telephone. For hard-to-reach cases, the data collectors administered the survey in person, using a hard copy of the questionnaire; these made up 11 percent of the completed six-month follow-up surveys.

For each participant, the data collectors began efforts to administer the first follow up survey exactly six months after the initial random assignment date. However, after accounting for the time required to locate the participants and schedule the surveys, the average timing of survey completion was just over seven months (220 days) after random assignment, with no statistically significant difference in survey timing between the treatment and control groups. Each participant received a $10 gift card for completing the follow-up survey.

In the remainder of this chapter, we first describe the outcome measures constructed from the six-month follow-up survey. We then discuss the analytic methods used to assess the impacts of the *T.O.P.P.* program on participant outcomes. For more detailed information on the measures, see Appendix B.

A. Outcome measures

Drawing on data from the six-month follow-up survey, we constructed eight groups of outcome measures, each corresponding to one of the study's research questions: (1) contraceptive use, (2) unprotected sex, (3) sexual risk behaviors not directly targeted by the program, (4) exposure to information on sexual and reproductive health topics, (5) knowledge of the effectiveness of contraceptive methods in preventing pregnancy and STIs, (6) attitudes toward birth control access and use, (7) intentions to avoid pregnancy, and (8) access to contraceptive services. These measures are summarized in Table III.1 and described in greater detail below.

1. Contraceptive use

The survey asked participants a series of questions about their use of specific birth control methods over the past three months. The list of methods was designed to be as comprehensive as possible, covering more traditional methods such as fertility awareness to more modern methods such as the contraceptive implant and IUDs (see Appendix B for a complete list). For methods such as contraceptive shots, vaginal rings, IUDs, and the contraceptive implant, the survey listed

specific brand names in addition to a generic name. For example, the survey listed Depo-Provera as a specific brand name for contraceptive shots. To measure the impacts of the *T.O.P.P.*

Table III.1. Outcome measures

Measure	Definition
Contraceptive use	
Use of a LARC method	Binary variable: equals 1 if participant reported using a LARC method (IUD or implant) in the past 3 months; equals 0 if she did not use a LARC method.
Use of a hormonal method or IUD	Binary variable: equals 1 if participant reported using one of the following methods in the past 3 months: birth control pills, shot, patch, ring, IUD, or implant; equals 0 if she did not use any of these methods.
Use of any effective birth control method	Binary variable: equals 1 if participant reported using a condom (male or female), hormonal method, IUD, or male vasectomy in the past 3 months; equals 0 if she did not use any of these methods.
Unprotected sex	
Incidence of unprotected sex	Binary variable: equals 1 if participant had sexual intercourse without using an effective birth control method in the past 3 months; equals 0 if she did not have intercourse or always used an effective birth control method during intercourse.
Sexual risk behaviors not directly targeted by the program	
Rate of sexual activity	Binary variable: equals 1 if participant reported having sexual intercourse in the past 3 months; equals zero if she did not have intercourse.
Had sexual intercourse without a condom	Binary variable: equals 1 if participant reported having sexual intercourse without a condom in the past 3 months, equals zero if she did not have intercourse or always used a condom.
Number of partners	Continuous variable: Number of reported sexual partners in the past 3 months.
Exposure to information on sexual and reproductive health topics	
Receipt of information in the past 12 months	Series of seven binary variables: equals 1 if participant reported receiving information on specified topics; equals 0 if she did not receive information.
Received information from a nurse or doctor at a facility	Binary variable: equals 1 if participant received information from a doctor or nurse at a health facility; equals 0 if she did not receive information from this source.
Received information from a health provider during a home visit	Binary variable: equals 1 if participant received information from a health provider during a home visit; equals 0 if she did not receive information from this source.
Knowledge	
Knowledge of efficacy of condoms in preventing pregnancy	Binary variable: equals 1 if respondent answered knowledge question correctly; 0 if response was incorrect.
Knowledge of efficacy of birth control in preventing pregnancy	Binary variable: equals 1 if respondent answered knowledge question correctly; 0 if response was incorrect.
Knowledge of efficacy of condoms in preventing STIs	Binary variable: equals 1 if respondent answered knowledge question correctly; 0 if response was incorrect.
Knowledge of efficacy of birth control pills in preventing STIs	Binary variable: equals 1 if respondent answered knowledge question correctly; 0 if response was incorrect.
Attitudes toward birth control access and use	
Perceived access to condoms	Based on a single survey question: variable ranges from 1 to 5 with higher values indicating greater perceived access.
Perceived access to birth control other than condoms	Based on single survey question: variable ranges from 1 to 5 with higher values indicating greater perceived access.
Perceived trustworthiness of birth control providers	Based on a single survey question: variable ranges from 1 to 5 with higher values indicating greater perceived trustworthiness.

Measure	Definition
Perceived ease of using birth control	Average of two survey questions: variable ranges from 1 to 5 with higher values indicating greater perceived ease of use.
Perceived need for condoms	Based on a single survey question: variable ranges from 1 to 5 with higher values indicating greater perceived need.
Perceived need for birth control other than condoms	Average of two survey questions: variable ranges from 1 to 5 with higher values indicating greater perceived need.
Intentions	
Intention to avoid pregnancy in the next year	Binary variable: equals 1 if participant reported "trying to avoid getting pregnant" in the next year; equals 0 otherwise.
Access to contraceptive services	
Received birth control from a doctor or nurse	Binary variable: equals 1 if participant reported receiving birth control from a doctor or nurse in the past 3 months; equals zero otherwise.

program on rates of contraceptive use, we used responses to these individual survey questions to construct three different composite measures:

- **Any use of a LARC method**. To measure the impact of the program on LARC use, we created a binary (yes/no) indicator for whether the participant reported ever using an IUD or contraceptive implant in the past three months.
- **Any use of a hormonal method or IUD (non-barrier method)**. To measure the impacts of the program on non-barrier methods of contraceptive use, we created a binary (yes/no) indicator for whether the participant reported ever using at least one of the following methods of contraception in the past three months: birth control pills, contraceptive shots, hormonal patches, vaginal rings, IUDs, or the contraceptive implant. This outcome differs from our measure of LARC use by also accounting for use of birth control pills, contraceptive shots, vaginal rings, and hormonal patches.
- **Any use of an effective birth control method**. To broadly assess the program's impacts on a very general measure of contraceptive use, we created a binary (yes/no) indicator for whether the participant reported ever using at least one of the following methods of contraception in the past three months: male condom, female condom, birth control pills, contraceptive shots, hormonal patches, vaginal rings, IUDs, the contraceptive implant, or vasectomy. This outcome differs from our measure of non-barrier methods of contraceptive use by also accounting for use of male condoms, female condoms, and male vasectomy.

2. Unprotected sex

The survey asked participants whether they had sexual intercourse in the past 3 months without using any effective contraceptive method during at least one encounter with a sexual partner. The question was limited to vaginal intercourse, not oral or anal intercourse. The survey defined effective contraceptive method as comprising condoms, birth control pills, the shot, the patch, the ring, an IUD, or the contraceptive implant. Based on responses to this question, we created a binary (yes/no) indicator for whether the participant reported having unprotected sex. Participants who reported abstaining from sexual intercourse in the past three months were retained in the analysis by coding them as "protected" and combining them with respondents who reported always using an effective contraceptive method.

3. Sexual risk outcomes not directly targeted by the program

To examine whether the program's emphasis on promoting the use of highly effective contraceptive methods, such as LARC, had any unintended spillover effects to other types of sexual risk behaviors not directly targeted by the program, we constructed three different outcomes:

- **Had sexual intercourse.** The survey asked participants whether they had had sexual intercourse in the past three months. The question was limited to vaginal intercourse, not oral or anal intercourse. Based on responses to this question, we created a binary (yes/no) indicator for whether a participant reported having had sexual intercourse.
- **Had sexual intercourse without using a condom.** The survey asked participants whether they had had vaginal intercourse without using a condom at least once in the past three months. The question was limited to vaginal intercourse, not oral or anal intercourse. Based on responses to this question, we created a binary (yes/no) indicator for whether the participant reported having had sexual intercourse without a condom in the past three months. Participants who reported abstaining from sexual intercourse in the past three months were retained in the analysis by coding them as "protected" and combining them with respondents who reported always using a condom when they had sexual intercourse.
- **Number of sexual partners.** For respondents who reported being sexually active, the survey asked them to report the number of different sexual partners they had in the past three months. The question was limited to vaginal intercourse, not oral or anal intercourse. Based on responses to this question, we created a continuous variable for the number of recent sexual partners. Respondents who reported abstaining from sexual intercourse in the past three months were retained in the analysis by coding them as having zero sexual partners.

4. Exposure to information on sexual and reproductive health

To assess participants' exposure to information on sexual and reproductive health topics, the survey asked participants whether they had received any information in the past six months on topics such as relationships, birth control methods, where to get birth control, abstinence from sex, STIs, how to talk to a partner about sex or birth control, and how to say no to sex (see Appendix B for a complete list). We used responses to this question to create a series of seven binary (yes/no) indicators for whether participants had received information on each topic. The T.O.P.P. program specifically focused on some of these topics. T.O.P.P. focused less on other topics, such as STIs and relationships, but may have discussed them while covering other items.

The survey also asked respondents where they had received such information on sexual and reproductive health topics. We used responses to this question to examine whether *T.O.P.P.* increased access to information about sexual and reproductive health topics from different sources. In particular, we constructed two separate binary (yes/no) measures to indicate whether a participant had received information from (1) a nurse or doctor in a health facility or (2) a health provider during a home visit.

5. Knowledge

The survey asked participants a series of questions about their knowledge of the effectiveness of different contraceptive methods in preventing pregnancy and STIs. The questions focused on condoms and birth control pills—two of the most commonly used methods of birth control reported by participants upon enrolling in the study. The survey did not include knowledge questions about other birth control methods, such as LARC, that the *T.O.P.P.* nurse educators may have discussed with participants in the treatment group as part of the program.

Based on participants' responses to the available questions, we created four separate knowledge measures. All of the measures are binary (yes/no) indicators for whether the respondent answered a single knowledge question correctly:

- **Knowledge of the efficacy of condoms in preventing pregnancy.** For this measure, the survey asked participants the following question: "If condoms are used correctly and consistently, how much can they decrease the risk of pregnancy?" The five response categories were: "not at all," "a little," "a lot," "completely," and "don't know." We constructed a binary indicator to distinguish participants who answered "a lot" (the correct answer) from those who provided one of the other (incorrect) answers.
- **Knowledge of the efficacy of birth control pills in preventing pregnancy.** For this measure, the survey asked participants the following question: "If birth control pills are used correctly and consistently, how much can they decrease the risk of pregnancy?" The five response categories were: "not at all," "a little," "a lot," "completely," and "don't know." We constructed a binary indicator to distinguish participants who answered "a lot" (the correct answer) from those who provided one of the other (incorrect) answers.
- **Knowledge of the efficacy of condoms in preventing STIs.** For this measure, the survey asked participants the following two questions: (1) "If condoms are used correctly and consistently, how much can they decrease the risk of getting HIV, the virus that causes AIDS?" and (2) "If condoms are used correctly and consistently, how much can they decrease the risk of getting gonorrhea?" For each question, the five response categories were "not at all," "a little," "a lot," "completely," and "don't know." We constructed a binary indicator to distinguish participants who answered "a lot" to both questions (the correct answers) from participants who provided any other combination of (incorrect) answers.
- **Knowledge of the efficacy of birth control pills in preventing STIs.** For this measure, the survey asked participants the following two questions: (1) "If birth control pills are used correctly and consistently, how much can they decrease the risk of getting HIV, the virus that causes AIDS?" and (2) "If birth control pills are used correctly and consistently, how much can they decrease the risk of getting gonorrhea?" For each question, the five response categories were "not at all," "a little," "a lot," "completely," and "don't know." We constructed a binary indicator to distinguish participants who answered "not at all" to both questions (the correct answers) from participants who provided any other combination of (incorrect) answers.

6. Attitudes toward birth control access and use

The survey asked participants a series of questions about their attitudes toward birth control access and use. Some of the questions focused specifically on participants' attitudes toward condoms. Others referred to more general "birth control" methods other than condoms. The survey did not measure participants' attitudes toward other specific contraceptive methods, such as LARCs. The questions also varied in substantive focus: some sought to assess participants' general support for condoms or birth control methods, whereas others sought to assess perceived logistical barriers such as ease of access or levels of trust in health care providers.

To account for the differences among these questions, we constructed a set of six measures of attitudes toward birth control access and use. For four of the six measures, we constructed the outcome based on responses to a single survey question. For two measures, we combined responses to two closely related questions. The six resulting outcome measures are as follows:

- **Perceived ease of access to condoms**. The survey asked participants whether they agreed or disagreed with the statement: "Condoms are pretty easy to get." The five response categories ranged from "strongly disagree" to "strongly agree." To construct a measure of perceived ease of access to condoms, we assigned each response category a value from 1 to 5, with higher values indicating greater perceived access.
- **Perceived ease of access to birth control.** The survey asked participants whether they agreed or disagreed with the statement: "Birth control is pretty easy to get." The five response categories ranged from "strongly disagree" to "strongly agree." To construct a measure of perceived ease of access to birth control, we assigned each response category a value from 1 to 5, with higher values indicating greater perceived access.
- **Perceived trust in birth control providers.** The survey asked participants whether they agreed or disagreed with the statement: "Women can trust what doctors and nurses say about birth control." The five response categories ranged from "strongly disagree" to "strongly agree." To construct a measure of perceived trust in birth control providers, we assigned each response category a value from 1 to 5, with higher values indicating greater perceived trust.
- **Perceived ease of using birth control.** The survey asked participants whether they agreed or disagreed with the following two statements: (1) "Birth control has too many side effects" and (2) "Birth control is a hassle to use." For each statement, the five response categories ranged from "strongly agree" to "strongly disagree." To construct a measure of perceived ease of using birth control, we assigned each response category a value from 1 to 5 and then averaged responses across the two items. The resulting measure ranges from 1 to 5, with higher values indicating greater perceived ease of using birth control.
- **Perceived need for condoms.** The survey asked participants whether they agreed or disagreed with the statement: "Condoms are important to make sex safer." The five response categories ranged from "strongly disagree" to "strongly agree." To construct a measure of perceived need for condoms, we assigned each response category a value from 1 to 5, with higher values indicating greater perceived need.
- **Perceived need for birth control.** The survey asked participants whether they agreed or disagreed with the following two statements: (1) "Birth control is important to make sex

safe" and (2) "Birth control should always be used if a person your age has sexual intercourse." For each statement, the five response categories ranged from "strongly disagree" to "strongly agree." To construct a measure of perceived need for birth control, we assigned each response category a value from 1 to 5 and then averaged responses across the two items. The resulting measure ranges from 1 to 5, with higher values indicating greater perceived need.

7. Intentions

The survey asked participants the following question about their short-term pregnancy intentions: "Over the next year, will you be 'trying to get pregnant again', 'neither trying to get pregnant nor trying to avoid getting pregnant', 'trying to avoid getting pregnant', or 'you don't know'?" Based on responses to this question, we created a binary (yes/no) indicator for participants who reported they will be "trying to avoid getting pregnant again." Participants who were already pregnant again at the time of the six-month follow-up survey were coded as not trying to avoid a pregnancy.

8. Access to contraceptive services

The survey asked participants how many times they had received birth control from a doctor or nurse in the past six months, either in a medical facility or during a home visit. Based on responses to this question, we created an binary (yes/no) indicator of access to contraceptive services that takes on a value of one if the participant reported receiving birth control from a medical provider in the past six months, and zero otherwise.

B. Analytic approach

We used a multivariate regression framework to analyze the impact of *T.O.P.P.* on each outcome. A regression framework is appropriate for this study because it allows us to account for the stratification and permuted block design used for random assignment (discussed in Chapter II). It also allows us to improve the precision of our impact estimates by statistically adjusting for any baseline covariates that are strongly correlated with our outcome measures. This approach of adjusting for baseline covariates can help achieve precision gains in the impact estimates by reducing the amount of residual variation in the outcome measures.

We estimated a separate regression model for each outcome. For binary outcome measures (for example, use of a LARC in the past three months), we estimated impacts with logistic regression models. When reporting results from these models, we calculated mean marginal effects to express the impact estimates as percentage-point differences between outcomes for the treatment and control groups. For all other outcomes, we estimated ordinary least-squares (OLS) regression models. In the regression models for all outcomes, we adjusted the standard errors of the impact estimates to account for the permuted block random assignment design (Matts and Lachin 1988). Appendix C explores the robustness of our results to alternative specifications of the regression models.

Each regression model included the following covariates: a binary indicator for treatment status, a binary indicator variables for each of the strata created for random assignment, two key demographic variables that are highly correlated with our key outcomes of interest (age and

race), a baseline measure of the outcome (if available), and additional baseline covariates empirically selected through a data-driven forward selection procedure developed previously in the literature (Social and Character Development Research Consortium 2010). This forward selection procedure involves gradually adding covariates to the model in order from most to least predictive of the outcome (as defined by the *t*-statistic on each covariate's regression coefficient). The procedure stops when no variable meets a minimum defined threshold of predictiveness. For this procedure, we considered as candidate covariates any baseline variable for which the observed difference between the treatment and control groups had a *p*-value of 0.20 or less based on a two-sided t-test. The same covariates were used for each regression model. Appendix B provides a complete list of the covariates considered for this covariate selection procedure. Appendix C explores the robustness of our results when excluding this procedure. For all baseline covariates, we used dummy variable adjustment to avoid losing any cases on account of missing baseline data (Puma et al. 2009).

We adjusted the statistical significance tests (*p*-values) from our regression models to account for multiple hypothesis testing. As discussed earlier in this chapter, our analysis uses multiple outcomes to answer some of the key research questions. For example, we constructed three separate measures of contraceptive use, four measures of knowledge, and six measures of attitudes. Unless we account for this multiplicity, it could increase the chances of making a false discovery and lead to spurious claims about the program's effectiveness. Researchers often declare a finding "statistically significant" if the probability of falsely rejecting the null hypothesis of no impact is less than 5 percent. However, when conducting separate tests arising from multiple outcomes, the probability of falsely rejecting the null hypothesis in *at least one* of them can be much higher than 5 percent. To correct for this increased probability, we apply a multiple hypothesis testing procedure outlined by Hothorn et al. (2008) and Schochet (2009). This procedure involves adjusting the reported *p*-value for each test to account for other tests conducted within the same "family" of related measures. Similar to other common methods of adjusting for multiple hypothesis testing, this procedure yields a 5 percent false positive rate across outcomes within the same family. However, the procedure is less conservative than other common adjustment methods, such as the well-known Bonferroni correction, because it also accounts for any correlation in test statistics among outcomes within the same family.

We made this adjustment separately for each of the eight groups of outcome measures described earlier in this chapter (and presented in Table III.1). That is, we adjusted the *p*-values accounting for multiple outcomes within each of the eight groups of measures, but not for multiple outcomes measured across the different groups. We followed this approach because each group of outcomes aligns with a different research question. We base our substantive conclusions for each question only on the corresponding group of outcome measures. The number of outcomes measured in other groups has no bearing on our substantive conclusions for each question and therefore does not warrant an additional adjustment for multiple hypothesis testing.

IV. RESULTS

The *T.O.P.P.* program had favorable impacts on two of the primary, short-term outcomes targeted by the program: (1) use of LARC methods and (2) incidence of unprotected sex. Participants assigned to the treatment group were significantly more likely to report use of a LARC method and less likely to report having sex without using an effective contraceptive method. We find no evidence that the program's focus on reducing barriers to LARC had any unintended spillover effects to sexual risk behaviors not directly targeted by the program. In particular, participants assigned to the treatment group were no more likely than those in the control group to report having sexual intercourse or having sex without a condom in the past three months. Participants in both groups also reported having similar numbers of sexual partners.

Our exploration of potential pathways or mechanisms showed mixed results, but was generally consistent with the program's emphasis on improving access to LARC methods in particular and contraceptive services more generally. Participants assigned to the treatment group were significantly more likely to report exposure to information on key sexual and reproductive health topics, such as methods of birth control and where to get birth control. They were also more likely to report having received birth control from a doctor or nurse. In contrast, we found no evidence that the program affected other potential intermediate or mediating factors, particularly the measures of knowledge, attitudes, and intentions. We provide more detail on these findings in the remainder of the chapter.

A. Program impacts on sexual risk behaviors

The *T.O.P.P.* program had a statistically significant impact on LARC use (Table IV.1). Among participants in the treatment group, 38.3 percent reported using a LARC method in the past three months, compared to 21.4 percent of participants in the control group. Despite this large effect, we found no significant evidence of program impacts on more broadly defined measures of contraceptive use. In particular, there were no statistically significant differences between the treatment and control groups in use of a hormonal method or IUD (75.3 percent versus 67.8 percent, respectively) or a broadly defined measure of any effective contraceptive method (84.4 percent versus 80.7 percent, respectively). These findings suggest that the *T.O.P.P.* program led participants to use highly effective LARC methods over other contraceptive methods, rather than to increase overall rates of contraceptive use.

The *T.O.P.P.* program also had a large and statistically significant impact on the incidence of unprotected sex (Table IV.1). Among participants in the treatment group, 14.4 percent reported having sex without using an effective birth control method in the past three months, compared to a rate of 24.8 percent among participants in the control group. This finding is consistent with increased use of LARC methods, which require almost no user action after insertion to ensure continual protection against pregnancy risk.

Table IV.1. Impacts on sexual risk behaviors targeted by T.O.P.P.

Measure	Treatment group	Control group	Difference	*p*-value
Percentage of respondents reporting use of the following birth control methods in the past 3 months:				
LARC method	38.3	21.4	16.9**	<0.01
Any hormonal method or IUD[a]	75.3	67.8	7.5	0.18
Any effective method of birth control[b]	84.4	80.7	3.6	0.87
Had unprotected sex in the past 3 months[c]	14.4	24.8	-10.4**	<0.01

Source: Surveys administered to study participants by evaluation team.

Note: For each outcome, the numbers in the columns labeled "Treatment group" and "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. Sample sizes accounting for item nonresponse range from 487 to 493 depending on the measure. See Chapter III for a detailed description of each measure and the analytic methods.

[a] Includes the following methods: birth control pills, shot, patch, ring, IUD, and implant.

[b] Includes the following methods: male condoms, female condoms, birth control pills, shot, patch, ring, IUD, implant, and vasectomy.

[c] Defined as having sexual intercourse without using an effective birth control method in the past three months.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

We found no evidence that the program's promotion of highly effective contraceptive methods, such as LARC methods, had any unintended spillover effects to sexual risk behaviors not directly targeted by the program. In particular, we found no evidence of statistically significant differences between the treatment and control groups in the prevalence of sexual activity, the prevalence of condom use, or the number of sexual partners in the past three months (Table IV.2). Most study participants were sexually active at the time of the six-month follow-up survey (82.5 percent of participants in the treatment group and 84.7 percent of participants in the control group). In addition, about half of the participants in each group reported having sexual intercourse without a condom in the past three months (49.9 percent for the treatment group and 52.2 percent for the control group). The difference between groups was small (2.2 percentage points) and not statistically significant. The average number of sexual partners in the past three months was close to one for both groups (0.93 for the treatment group and 1.02 for the control group).

Table IV.2. Impacts on sexual risk behaviors not directly targeted by T.O.P.P.

Measure	Treatment group	Control group	Difference	*p*-value
Percentage of respondents who reported the following in the past 3 months:				
Had sexual intercourse	82.5	84.7	-2.2	1.00
Had sexual intercourse without a condom	49.9	52.2	-2.3	1.00
Number of sexual partners in the past 3 months	0.93	1.02	-0.10	0.76

Source: Surveys administered to study participants by the evaluation team.

Note: For each outcome, the numbers in the columns labeled "Treatment group" and "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. Sample sizes accounting for item nonresponse range from 487 to 493 depending on the measure. See Chapter III for a detailed description of each measure and the analytic methods.

B. Potential pathways or mechanisms for program impacts

Our exploration of potential pathways or mechanisms suggests that the program influenced rates of LARC use and unprotected sex primarily by increasing exposure to key types of sexual and reproductive health information and by improving access to contraceptive services. By contrast, we found no evidence that the program impacted other potential intermediate or mediating factors such as knowledge, attitudes, and intentions.

1. Exposure to information on sexual and reproductive health topics

The *T.O.P.P.* program had statistically significant impacts on participants' exposure to information on three specific sexual and reproductive health topics: (1) methods of birth control, (2) where to get birth control, and (3) abstinence (Table IV.3). Among participants in the treatment group, 89.2 percent reported receiving information on methods of birth control in the past six months, compared to 76.8 percent of participants in the control group. The program had a similar impact on receipt of information on where to get birth control (88.9 percent for the treatment group and 75.0 percent for the control group). Among participants in the treatment group, 52.1 percent reported receiving information on abstinence in the past six months, compared to 36.3 percent in the control group.

The program did not have statistically significant impacts on participants' exposure to four other sexual and reproductive health topics: (1) relationships, (2) STIs, (3) talking to a partner about sex or birth control, and (4) how to say no to sex. This lack of statistically significant impacts is not surprising because the program places relatively less emphasis on these four topics. For example, although program participants may receive some information on STIs when discussing different contraceptive methods, STI prevention is not an explicit goal of the *T.O.P.P.* program.

Table IV.3. Impacts on exposure to information on reproductive health topics

Measure	Treatment group	Control group	Difference	*p*-value
Percentage of respondents who reported receiving information on the following topics:[a]				
Relationships	42.2	34.5	7.7	0.59
Methods of birth control	89.2	76.8	12.3**	<0.01
Where to get birth control	88.9	75.0	13.9**	<0.01
Abstinence	52.1	36.3	15.8**	<0.01
Sexually transmitted infections	77.8	68.9	9.0	0.18
Talking to a partner about sex or birth control	74.8	71.9	2.8	1.00
How to say no to sex	77.1	71.8	5.3	1.00
Percentage of respondents who reported receiving information from each of the following sources:[a]				
Nurse or doctor during a facility visit	85.8	81.7	4.1	0.51
Health provider during a home visit	68.2	37.5	30.7**	<0.01

Source: Surveys administered to study participants by the evaluation team.

Note: For each outcome, the numbers in the columns labeled "Treatment group" and "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. Sample sizes accounting for item nonresponse range from 488 to 493 depending on the measure. See Chapter III for a detailed description of each measure and analytic methods.

[a] Questions refer to information received in the six months prior to survey administration.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

The program did not affect the chances of receiving reproductive health information from a practitioner at a health care facility but did affect the chances of receiving such information during a home visit (Table IV.3). The vast majority of participants in both study groups reported receiving information on reproductive health topics from a nurse, doctor, or other professional in a health facility (85.8 percent for the treatment group and 81.7 percent for the control group). The reported difference between groups is small (4.1 percentage points) and not statistically significant. In contrast, participants in the treatment group were almost twice as likely as control group participants to report having received information from a doctor or nurse during a home visit (68.2 percent for the treatment group and 37.5 percent for the control group). This large reported difference (30.7 percent points) is statistically significant and is likely attributable to the home visiting component of the *T.O.P.P.* program.

2. Knowledge about birth control methods

Despite evidence of program impacts on exposure to key types of sexual and reproductive health information, we found no evidence that *T.O.P.P.* affected participants' knowledge of the effectiveness of condoms and birth control pills in preventing pregnancy and STIs (Table IV.4). In both study groups, levels of knowledge of these topics were relatively low at the time of the six-month follow-up survey. Only about half the participants in both the treatment and control groups responded correctly to questions about the efficacy of condoms and birth control pills in preventing pregnancy. Levels of knowledge about STI prevention were also low, with roughly 30 percent of participants in both study groups responding correctly to a question about the

efficacy of condoms in preventing STIs, and 65 percent responding correctly to a question about the efficacy of birth control pills in preventing STIs. None of the treatment-control group differences in these outcomes are statistically significant. As discussed in Chapter III, the survey did not measure knowledge of contraceptive methods other than condoms and birth control pills. Therefore, we cannot draw conclusions about whether the program impacts knowledge of LARC methods in particular or contraceptive methods more broadly.

Table IV.4. Impacts on knowledge about birth control methods

Measure	Treatment group	Control group	Difference	*p*-value
Percentage of respondents who reported correct knowledge of:				
Effectiveness of condoms in preventing pregnancy	52.7	53.9	-1.2	1.00
Effectiveness of birth control pills in preventing pregnancy	48.6	52.0	-3.4	1.00
Effectiveness of condoms in preventing STIs	28.6	29.7	-1.2	1.00
Effectiveness of the birth control pills in preventing STIs	65.3	64.6	0.7	1.00

Source: Surveys administered to participants by the evaluation team.

Note: For each outcome, the numbers in the columns labeled "Treatment group" and "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. Sample sizes accounting for item nonresponse range from 488 to 491 depending on the measure. See Chapter III for a detailed description of each measure and the analytic methods.

3. Attitudes and intentions

The *T.O.P.P.* program did not have statistically significant impacts on participants' attitudes toward birth control or intentions to avoid pregnancy (Table IV.5). For each of the six attitude measures examined, the reported differences between the treatment and control groups are small and not statistically significant. As discussed in Chapter III, two of these outcomes measured attitudes toward condoms specifically, whereas the other outcomes measured attitudes about more general "birth control" methods other than condoms. The survey did not measure participants' attitudes toward LARC or specific contraceptive methods other than condoms. For the measure of intentions, a majority of participants in both study groups reported that they intended to avoid pregnancy in the next 12 months (70.6 percent of participants in the treatment group and 64.2 percent of participants in the control group). Although the difference between groups is not trivial in size, it is not statistically significant.

Table IV.5. Impacts on attitudes and intentions

Measure	Treatment group	Control group	Difference	*p*-value
Perceived ease of access to condoms (single item, range: 1–5)	4.44	4.50	-0.05	1.00
Perceived ease of access to birth control other than condoms (single item, range: 1–5)	4.28	4.34	-0.06	1.00
Perceived trust in birth control providers (single item, range: 1–5)	4.08	4.01	0.07	1.00
Perceived ease of using birth control (single item, range: 1–5)	3.47	3.48	-0.01	1.00
Perceived need for condoms (average of two items, range: 1–5)	3.58	3.58	0.01	1.00
Perceived need for birth control other than condoms (single item, range: 1–5)	4.32	4.29	0.03	1.00
Percentage of respondents indicating an intention to avoid pregnancy in the next 12 months	70.6	64.2	6.4	0.18

Source: Surveys administered to study participants by the evaluation team.

Note: For each outcome, the numbers in the columns labeled "Treatment group" and "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. Sample sizes accounting for item nonresponse range from 485 to 492 depending on the measure. See Chapter III for a detailed description of each measure and the analytic methods.

4. Access to contraceptive services

The *T.O.P.P.* program had a statistically significant impact on receipt of birth control from a health care provider. Among treatment group participants, 76.5 percent reported receiving birth control from a doctor or nurse in the past six months, compared with 66.2 percent of the control group (Table IV.6). The reported difference of 10.3 percent points is statistically significant. The finding of a statistically significant impact on this outcome is consistent with *T.O.P.P.*'s emphasis on increasing access to medical providers offering contraceptive services. It may also relate to the finding that *T.O.P.P.* increases LARC adoption, since the initial uptake of LARC methods requires a clinical appointment.

Table IV.6. Impacts on access to birth control

Measure	Treatment group	Control group	Difference	*p*-value
Percentage of respondents who reported receiving birth control from a doctor or nurse in past six months	76.5	66.2	10.3**	<0.01

Source: Surveys administered to study participants by the evaluation team.

Note: For each outcome, the numbers in the columns labeled "Treatment group" and "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. The *p*-value is adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. Sample size accounting for item nonresponse is 489. See Chapter III for a detailed description of the outcome measure and the analytic methods.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

V. DISCUSSION AND CONCLUSION

This report presents interim impacts of the *Teen Options to Prevent Pregnancy* (*T.O.P.P.*) program, an innovative 18-month clinic-based program that aims to reduce rapid repeat pregnancies among low-income adolescent mothers. Prior research indicates that adolescent mothers are at high risk of experiencing a rapid subsequent pregnancy, the vast majority of which are reported to be unintentional (Mosher et al. 2012). Although many adolescent mothers begin using contraception after delivery, their rates of discontinuation are high and most do not use highly effective LARC methods, which are associated with decreased rates of repeat teen pregnancy (ACOG 2012). The *T.O.P.P.* program employs a unique combination of telephone-based care coordination, motivational interviewing, and logistical support services to address barriers to contraceptive use and consistency, particularly LARC use, among adolescent mothers.

Drawing on data from a rigorous random assignment evaluation involving a large sample of nearly 600 low-income adolescent mothers from the Columbus, Ohio, area, our findings show that the *T.O.P.P.* program was highly successful in increasing participants' use of LARC methods and reducing the incidence of unprotected sexual intercourse after the first six months of the program. In addition, we found no evidence that the program's focus on reducing barriers to highly effective contraceptive methods, such as LARC, had any unintended spillover effects on other sexual risk behaviors that the program did not target. In particular, participants assigned to the treatment group were no more likely than those in the control group to report having had sexual intercourse or having had sex without a condom in the past three months. Participants in both groups also reported having had similar numbers of sexual partners.

Consistent with the program model, our analysis of potential pathways or mechanisms suggests that the *T.O.P.P.* program influenced rates of LARC use and unprotected sex primarily by increasing exposure to information on birth control methods and sources, and increasing access to contraceptive services. By contrast, we found no evidence that the program impacted other mediating factors, such as knowledge, attitudes, and intentions. However, the survey only measured knowledge of condoms and birth control pills, and attitudes toward condoms and more general "birth control methods." Therefore, we cannot draw conclusions about the program's impacts on knowledge of or attitudes toward LARC methods, or other specific methods of birth control that *T.O.P.P.* nurse educators may have discussed with program participants.

The favorable program impacts on LARC use are particularly notable given the recent emphasis on these methods among health professionals (for example, ACOG 2014) and social policy researchers (for example, Sawhill 2014). In recent years, the St. Louis-based Contraceptive CHOICE project has received considerable attention for its positive results in increasing rates of LARC use and reducing adolescent pregnancy rates relative to national averages (Secura et al. 2014). Of the 1,404 adolescent females who enrolled in CHOICE, 72 percent adopted a LARC when it was provided at no cost through a standardized contraceptive counseling session. Our interim findings for the *T.O.P.P.* program are consistent with those from the CHOICE study in highlighting that facilitating access to contraceptive services is a potentially important mechanism for increasing LARC use among adolescents. The CHOICE project sought to improve access primarily by offering LARCs at no cost to adolescents seeking birth control. Our interim findings for the *T.O.P.P.* program suggest the importance of also considering such barriers as a lack of awareness of these contraceptive methods, lack of reliable

or convenient transportation, and poor access to a regular, convenient health care provider. These additional barriers may be especially important for programs that serve a relatively low-income or high-risk population.

These findings extend prior research by showing the potential to increase LARC use among a high-risk sample of adolescent mothers who were not necessarily looking to change their current contraceptive behaviors. The CHOICE study focused on female adolescents and women who were not currently using a contraceptive method or had expressed a willingness to switch methods. By contrast, the *T.O.P.P.* program did not screen out or exclude study participants based on contraceptive use behaviors or intentions, so the program and the sample reflect a typical clinical environment. Perhaps partly for this reason, overall rates of LARC use at the time of the six-month follow-up were lower for *T.O.P.P.* participants (38.3 percent) than for the adolescents in the CHOICE project (72 percent). However, these findings for the *T.O.P.P.* program measure rates after the first 6 months of a planned 18-month program. A future report will examine whether and how rates of LARC use changed among *T.O.P.P.* participants at the end of the full 18-month program.

The interim findings presented in this report do not answer the ultimate question of whether the program's success in increasing LARC use and reducing unprotected sex after six months of program enrollment will lead to reduced rates of rapid repeat pregnancy among adolescent mothers. Because this report focused on outcomes measured after six months of program enrollment, we limited our analysis to interim goals of the program and shorter-term intermediate or mediating outcomes. A future report will examine the longer-term impacts of the program on repeat pregnancies measured at the end of the full 18-month program. In the future report, we will also examine whether the observed program impacts on LARC use and unprotected sex were sustained for the duration of the program period.

As is typical of evaluations of teen pregnancy prevention programs, the findings presented in this report may not necessarily generalize to populations or settings outside our study sample. By design, the evaluation focused on a specific set of low-income adolescent mothers living in the Columbus, Ohio, area—those who were enrolled in Medicaid and had recently delivered and/or had received prenatal care at an OhioHealth facility at the time of study recruitment. Within this target population, the study was further limited to the subset of women who were successfully contacted before leaving the health care facility and who agreed to participate in the study. This particular sample of adolescent mothers may differ from those in other parts of the country or even from other adolescent mothers in the same area. In addition, the study was conducted within a setting—the OhioHealth hospital system—that was particularly well suited to implement this type of program model. *T.O.P.P.* program staff leveraged and drew heavily on existing OhioHealth personnel, systems, and infrastructure to identify program participants and deliver key program support services. For example, having access to OhioHealth's electronic scheduling system greatly helped program staff identify and recruit program participants. The program also benefited from being able to provide contraceptive services directly to program participants through the *T.O.P.P.* clinic. Other health care providers or organizations seeking to replicate the positive outcomes presented in this report must think carefully about their own local context and the availability of a comparable mix of supports and resources.

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APPENDIX A

NONRESPONSE ANALYSIS

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This appendix examines the characteristics of the study participants lost to follow-up at the time of the six-month follow-up survey. As reported in Chapter II, among the 598 young women who enrolled in the study and were randomly assigned to the treatment and control groups, 493 completed the six-month follow-up survey, for an overall response rate of 82 percent. The remaining 105 participants did not complete the six-month follow-up survey and were therefore excluded from the interim impact analyses presented in this report. To better understand the characteristics of the study participants lost to follow-up, we used data from the baseline survey to compare the samples of follow-up survey respondents (n = 493) and nonrespondents (n = 105).

The characteristics of the survey nonrespondents were generally similar to those of the participants who responded to the survey. The two groups had similar levels of economic disadvantage, had similar racial/ethnic backgrounds, reported similar numbers of prior pregnancies, and had similar types of relationships with the fathers of their most recently delivered children (Table A.1). The two groups were also similar on baseline measures of exposure to information on reproductive health topics (Table A.2) and sexual risk behaviors (Table A.3). Among all the personal characteristics examined, we found only three statistically significant differences; nonrespondents were: (1) five months older than respondents on average, (2) less likely to report their education level in the "other" category, and (3) less likely to report living with both biological parents.

Table A.1. Baseline socio-demographic characteristics

Variable	Respondent mean	Non-respondent mean	Difference	*p*-value
Age at random assignment (years)	18.33	18.74	-0.42**	<0.01
Highest level of education completed (%)				
No high school	5.6	4.8	0.8	0.73
Some high school	51.0	43.8	7.2	0.21
High school graduate or GED	35.8	44.8	-9.0	0.11
Any postsecondary education	6.4	6.7	-0.3	0.90
Other	1.2	0.0	1.2*	0.01
Economic situation (%)				
Household received SNAP or WIC in past 30 days	90.8	91.6	-0.8	0.82
Household received TANF in past 30 days	25.4	26.7	-1.3	0.78
Household received other assistance in past 30 days	23.7	24.1	-0.4	0.94
Race/ethnicity (%)				
White, non-Hispanic	46.9	51.9	-5.0	0.39
Black, non-Hispanic	36.9	32.7	4.2	0.45
Hispanic	6.6	5.8	0.9	0.73
Other race/ethnicity or multiracial	9.5	9.6	-0.1	0.98
Pregnant at time of baseline survey (%)	24.7	20.0	4.7	0.31
Number of times pregnant (including most recent)	1.44	1.46	-0.02	0.84
Current relationship with baby's father (%)				
Married or engaged	22.4	22.6	-0.2	0.97
Dating (seriously or casually)	46.6	51.0	-4.4	0.45
Other (no contact; have contact but not romantically involved; or other relationship specified)	31.1	26.5	4.6	0.37
Family structure (%)				
Lives with both biological parents	11.6	5.7	5.9*	0.02
Lives with exactly one biological parent	41.4	41.0	0.4	0.94
Lives with neither biological parent	47.1	53.3	-6.3	0.22
Sample size[a]	493	105		

Source: Baseline survey administered to study participants before the start of the program.

Notes: Reported means are from regressions that control for random assignment strata. *P*-values are adjusted for clustering of standard errors at the randomization block level. See Appendix B for a description of the measures.

[a] Reported sample size is the number of participants who completed the six-month follow-up survey and are included in the analysis; it does not account for item nonresponse for any measures included in the table.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

GED = General Educational Development certification; SNAP = Supplemental Nutrition Assistance Program; TANF = Temporary Assistance for Needy Families; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Table A.2. Exposure to reproductive health information

Variable	Respondent mean	Non-respondent mean	Difference	*p*-value
In past 12 months, received information on (%):				
Relationships	64.9	63.7	1.2	0.84
Abstinence from sex	49.3	52.4	-3.2	0.57
Methods of birth control	85.7	86.1	-0.5	0.90
Where to get birth control	84.3	86.0	-1.7	0.66
Sexually transmitted infections	81.6	81.2	0.4	0.92
Talking to a partner about sex or birth control	72.8	75.3	-2.4	0.63
How to say no to sex	72.9	79.0	-6.1	0.19
Sample size	493	105		

Source: Baseline survey administered to study participants before the start of the program.

Notes: Reported means are from regressions that control for random assignment strata. *P*-values are adjusted for clustering of standard errors at the randomization block level. See Chapter III for a description of the measures. See Chapter III for a description of the measures.

[a] Reported sample size is the number of participants who completed the six-month follow-up survey and are included in the analysis; it does not account for item nonresponse for any measures included in the table.

Table A.3. Baseline sexual behaviors

Variable	Respondent mean	Non-respondent mean	Difference	*p*-value
In three months prior to becoming pregnant:				
Used a LARC method	0.9	2.2	-1.3	0.44
Used a hormonal method of birth control or IUD[a]	30.1	31.9	-1.8	0.76
Used an effective method of birth control[b]	66.1	60.0	6.1	0.32
Had unprotected sexual intercourse[c]	72.5	72.2	0.2	0.96
Had sexual intercourse without a condom	87.8	89.6	-1.8	0.61
Lifetime number of sexual partners	4.89	5.99	-1.10	0.36
Sample size[d]	493	105		

Source: Baseline surveys administered to study participants before the start of the program.

Notes: Reported means are from regressions that control for random assignment strata. *P*-values are adjusted for clustering of standard errors at the randomization block level. See Appendix B for a description of the measures. See Chapter III for a description of the measures.

[a] Includes the following methods: birth control pills, shot, patch, ring, IUD, and implant.

[b] Includes the following methods: male condoms, female condoms, birth control pills, shot, patch, ring, IUD, implant, and vasectomy.

[c] Defined as having sexual intercourse without using an effective birth control method.

[d] Reported sample size is the number of participants who completed the six-month follow-up survey and are included in the analysis; it does not account for item nonresponse for any measures included in the table.

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APPENDIX B

DATA AND MEASURES

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This appendix provides more detailed information on the survey data collection and measures. We begin by describing the survey design and administration. We then provide a more detailed description of how we constructed some of the key outcome measures. We end by listing the baseline measures considered as candidate covariates for the regression models.

A. Survey design and administration

As discussed in Chapter III, the interim impact estimates presented in this report are based on survey data collected at two time points: a baseline survey administered upon enrollment in the study and a follow-up survey administered about six months later. For the baseline survey, OhioHealth program staff distributed to each participant a self-administered paper-and-pencil interviewing (PAPI) questionnaire. For the follow-up survey, trained data collection staff from Mathematica administered the surveys either by telephone or in person.

The baseline and follow-up surveys followed a similar structure and were designed to capture a broad range of measures of family background and demographic characteristics, views and attitudes, sexual activity, past pregnancies, and future intentions. The surveys were developed by the Evaluation of Adolescent Pregnancy Prevention Approaches research team in coordination with OhioHealth and Nationwide Children's Hospital. They drew on items found in well-established surveys such as the National Longitudinal Study of Adolescent Health, National Longitudinal Survey of Youth, Youth Risk Behavior Survey, and National Survey of Family Growth. In some cases, we had to adapt the questions to fit our PAPI survey mode. We also made minor changes to question wording and response categories to align with our target population of expectant or parenting young women.

As is the case with any self-reported survey, the survey responses may be subject to reporting bias and bias may differ between the treatment and comparison groups. For this study, we were primarily concerned with the questions relating to sexual behavior, intentions to avoid a future pregnancy, contraceptive use, and attitudes about contraceptive use. For these measures, the differential reporting bias may occur in either direction. On the one hand, participants in the treatment group may be less likely to report risky sexual behaviors because they are embarrassed to admit to a behavior the program discourages. Such underreporting could lead to a spurious finding of lower rates of sexual activity or contraceptive use among young women in the treatment group. On the other hand, the program could make young women in the treatment group better informed about sexual risk behaviors and therefore more likely to report their true involvement in these behaviors. Such an effect could lead to a spurious finding of higher rates of sexual activity or contraceptive use among young women in the treatment group.

We took several steps to minimize these risks. To help encourage honest reporting, the six-month follow-up survey was administered by independent field staff trained and employed by the study team, not OhioHealth program staff or anyone else personally connected to the study participants. In addition, the data collectors did not know the respondents' treatment status, to avoid any intentional or unintentional difference in data collection procedures between the treatment and control groups. As a final pre-caution, we had the telephone interviewers use a standardized script to administer the follow-up surveys to ensure both uniformity in the data collection procedures and objectivity in the question wording. The interviewers reminded

participants that their answers would be kept confidential and encouraged them to respond truthfully to the questions.

B. Outcome measures

As discussed in Chapter III, we examined program impacts on eight different groups of outcome measures, each corresponding to one of the study's research questions. In this section, we provide more detailed information on how we constructed the outcomes related to (1) contraceptive use, (2) sexual risk behaviors, and (3) exposure to information on sexual and reproductive health topics.

1. Contraceptive use

We constructed three variables capturing the use of different contraceptive methods. The survey asked participants to report their recent (past three months) use of each of 14 different traditional and modern contraceptive methods. For each method, the survey asked participants whether they had used the method "none of the time," "some of the time," "half of the time," "most of the time," or "all of the time." The survey also included an open-ended response field that allowed participants to provide alternative names or labels for different contraceptive methods. We used responses to these questions to construct the following series of three binary (yes/no) indicator variables: (1) any use of a long-acting reversible contraceptive method (LARC), (2) any use of a hormonal method of contraception or IUD (non-barrier method), and (3) any use of any effective birth control method.

Table B.1 shows the contraceptive methods that each of the three variables included. We also back-coded any relevant responses from the open-ended survey question. For all three measures, we coded a participant as having used the method if she reported that she used it "some of the time," "half of the time," "most of the time," or "all of the time." The resulting variables therefore reflect measures of "any" use, not consistency or duration of use.

Table B.1. Methods included in summary measures of contraceptive use

Type of contraceptive method	Use of a LARC method	Use of a hormonal method or IUD	Use of any effective birth control method
Condoms			X
Birth control pills		X	X
The shot or Depo-Provera		X	X
The patch		X	X
The ring or NuvaRing		X	X
An IUD such as Mirena or Paragard	X	X	X
An implant such as IMPLANON	X	X	X
Male vasectomy			X

2. Sexual risk behaviors

We constructed four separate measures of sexual risk behaviors. To determine whether *T.O.P.P.* was successful in reducing rates of unprotected sex, we constructed a binary (yes/no) indicator for whether the study participant reported having sex in the past three months without

using any effective contraceptive method. To examine whether the program's emphasis on promoting the use of highly effective contraceptive methods, such as LARCs, had any unintended spillover effects to other types of sexual risk behaviors not directly targeted by the program, we also constructed three other measures of sexual risk behaviors: (1) a binary indicator (yes/no) of whether the participant reported having had sexual intercourse in the past three months, (2) a binary indicator (yes/no) of whether the participant reported having had sexual intercourse without a condom in the past three months, and (3) a continuous variable measuring the number of sexual partners in the past three months.

We constructed these variables in a step-wise fashion from the following series of four sexual behavior questions included on the survey:

1. Please think about the past 3 months, that is, from [date three months ago] until today. In the past 3 months, have you had sexual intercourse, even once?
2. In the past 3 months, how many different people have you had sexual intercourse with, even once?
3. In the past 3 months, have you had sexual intercourse without you or your partner using a condom?
4. In the past 3 months, have you have sexual intercourse without you or your partner using any of these methods of birth control: condoms; birth control pills; the shot or Depo-Provera; the patch; the ring or NuvaRing; an IUD such as Mirena or Paragard; or implants such as IMPLANON?

Using responses to these questions, we first constructed the indicator variable for whether the participant reported having had sexual intercourse in the past three months. We then constructed the variables for number of partners, sex without a condom, and sex without any effective contraceptive method. If participants reported being abstinent in the past three months, we retained them in the analysis and assigned them a value of zero on all four outcomes.

In constructing these outcomes, we accounted for any observed inconsistent or discrepant responses across different items—for example, participants who reported having had sex in the past three months but also reported that they had had zero sexual partners in that time period. We checked for inconsistencies across the four main survey questions listed above as well as across additional survey questions that asked about the frequency of sexual intercourse, sex without a condom, and unprotected sex. To resolve any inconsistent responses across all the related items in the survey, we developed the following set of rules and procedures:

- **Resolve inconsistencies in responses related to sexual intercourse of any type.** We first examined inconsistencies between responses to questions about having had any sexual intercourse, the frequency of sexual intercourse, and the number of partners. We found 21 cases in which two or more of these variables conflicted. We classified 19 of these responses as indicating that the participant did have sex and the remainder as indicating that she did not have sex.
- **Resolve inconsistencies in responses related to sexual intercourse without a condom.** We examined inconsistencies between questions asking about having any sex without a

condom, the frequency of sex without a condom, and use of condoms. There were 71 cases of conflict across these variables. We recoded 22 of these responses as indicating that the participant had sex without a condom and 47 as indicating that she did not do so. We coded 2 cases as missing, as there was no strong evidence in either direction.

- **Resolve inconsistencies in responses related to sexual intercourse without any birth control method.** We examined inconsistencies between questions asking about any sex without the use of birth control, frequency of sex without birth control, and use of various birth control methods. There were 35 cases of conflict across these survey items. We recoded 18 cases as indicating that the participant had sex without birth control, 15 as indicating that she did not have sex without birth control, and two cases as missing.

Appendix C explores the robustness of our results to these coding decisions for handling inconsistent responses.

3. Exposure to information on sexual and reproductive health

As discussed in Chapter III, we used data from the six-month follow-up survey to construct a series of measures on exposure to information on sexual and reproductive health. We constructed these measures from two questions on the follow-up survey. The first question asked participants whether they had received in the past six months any information on the following topics:

- Relationships, dating, marriage, or family life;
- Abstinence from sex;
- Methods of birth control;
- Where to get birth control;
- Sexually transmitted diseases;
- How to talk to your partner about whether to have sex or whether to use birth control; and
- How to say no to sex.

For each topic, we constructed a binary (yes/no) indicator to measure the percentage of participants who reported receiving information on the topic (yes = 1, no = 0). In addition, for each topic, participants who did not respond to the question were coded as missing.

Participants who reported receiving information on any of the topics were then asked a follow-up question about where and how frequently they had received the information. For the purpose of this report, we focused specifically on receipt of information from the following three sources:

- A doctor or nurse you saw at a hospital, clinic, or trailer;
- A nurse, social worker, or other health care professional who came to your home;
- A nurse, or other provider from the Nurse Family Partnership or Help Me Grow program who came to your home.

For each source, the survey asked study participants to report how frequently they had received information in the past six months: "never," "1–3 times," "4–9 times," or "10 or more times."

We used responses to these questions to construct two separate measures: (1) the percentage of study participants who reported receiving information from a nurse, doctor, or other professional in a health care facility and (2) the percentage of participants who reported receiving information from a nurse, doctor, or other professional at home. Participants who did not respond to the questions but who had received information on any of the above topics were coded as missing. Participants who had not received any information on the above topics were coded as not receiving information from the various sources listed above.

C. Baseline measures considered as candidate covariates

As discussed in Chapter III, to improve the precision of the impact estimates, we used a data-driven forward stepwise selection process to identify baseline covariates that are strongly correlated with our outcome measures. Including such covariates can help improve the precision of the impact estimates by reducing the amount of residual variation in the outcome measures. Table B.2 lists all the candidate covariates we considered for the model. To select from this list, we first identified any variables for which the observed difference between the treatment and control groups had a *p*-value of 0.20 or less. We entered variables that met this criterion into the forward selection procedure, which was conducted separately for each sexual behavior outcome. To identify a common set of covariates to use in all of the final impact models, we compared the covariates selected for each outcome. Variables selected as a covariate for at least 60 percent of the outcomes examined were included in the final impact model, along with the fixed set of core covariates included in all models (age, sex, the baseline outcome measure [if available], and random assignment strata). The results of the selection procedure identified two variables to include in the impact models, in addition to the core covariate set: (1) participants' self-reported use of a modern, highly effective method of birth control in the three months prior to their becoming pregnant and (2) participants' baseline perceptions of their need for birth control.

Table B.2. Measures of baseline sample characteristics

Measure	Definition
Demographic and Personal Characteristics	
Age	Continuous variable for age at randomization. Ranges from 13 to 20.
Education level	Categorical variable with categories for (1) no high school, (2) some high school, (3) high school graduate or GED, (4) any postsecondary education, and (5) other educational attainment.
Race/ethnicity	Categorical variable with categories for (1) Hispanic, (2) non-Hispanic white, (3) non-Hispanic black, and (4) non-Hispanic "other" race.
Main language spoken at home is not English	Binary variable: equals 1 if participant reported primarily speaking a language other than English at home; equals 0 if participant reported speaking primarily English at home.
Importance of religion	Binary variable: equals 1 if participant reported that religion is very important in her life; equals 0 if participant reported religion is somewhat important or not at all important.
Religious attendance	Binary variable: equals 1 if participant reported attending religious services once per week or more often; equals 0 if participant reported attending religious services less than once per week.
Pregnant at baseline	Binary variable: equals 1 if participant was pregnant when the baseline survey was administered; equals 0 if participant was postpartum when the baseline survey was administered.
Number of times pregnant	Count variable for number of times a participant has been pregnant in the past, including the current pregnancy.
Family Structure	
Living situation	Categorical variable with categories for (1) lives with both biological parents, (2) lives with exactly one biological parent, (3) lives with neither biological parent.
Biological parents' marital status	Categorical variable with categories for (1) biological parents are married, (2) biological parents previously married, (3) biological parents never married.
Biological parents cohabitation	Binary variable: equals 1 if biological parents currently live together; equals 0 if biological parents do not currently live together (or one or both biological parents has passed away).
Relationship with baby's father at conception	Categorical variable with categories for (1) married or engaged, (2) dating, and (3) other.
Relationship with baby's father at survey	Categorical variable with categories for (1) married or engaged, (2) dating, and (3) other.
Economic Situation	
Receive SNAP or WIC	Binary variable: equals 1 if anyone in household received transfers from the Supplemental Nutrition Assistance Program (SNAP, otherwise known as food stamps) or Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in the 30 days prior to survey; equals 0 if no one received such assistance.
Receive TANF	Binary variable: equals 1 if anyone in household received transfers from the Temporary Assistance for Needy Families (TANF) program in the 30 days prior to survey; equals 0 if no one received such assistance.
Receive other assistance	Binary variable: equals 1 if anyone in household received Unemployment Insurance or Social Security Disability Income; equals 0 if no one received such assistance.
Receipt of Information on Sexual and Reproductive Health	
Received information on relationships	Binary variable: equals 1 if participant received any information in the past 12 months on relationships, dating, marriage, or family life; equals 0 if participant did not receive this information.
Received information on abstinence from sex	Binary variable: equals 1 if participant received any information in the past 12 months on abstaining from sex; equals 0 if participant did not receive this information.

Measure	Definition
Received information on methods of birth control	Binary variable: equals 1 if participant received any information in the past 12 months on methods of birth control; equals 0 if participant did not receive this information.
Received information on where to get birth control	Binary variable: equals 1 if participant received any information in the past 12 months on where to get birth control; equals 0 if participant did not receive this information.
Received information on STIs	Binary variable: equals 1 if participant received any information in the past 12 months on STIs; equals 0 if participant did not receive this information.
Received information on how to talk to partner about sex	Binary variable: equals 1 if participant received any information in the past 12 months on how to talk to partner about whether to have sex or use birth control; equals 0 if participant did not receive this information.
Received information on how to say no to sex	Binary variable: equals 1 if participant received any information in the past 12 months on how to say no to sex; equals 0 if participant did not receive this information.
Number of issues received information on	Count variable for the number of above topics a participant received information on in the past 12 months; variable ranges from 0 to 7.
Knowledge	
Correct knowledge of efficacy of condoms to prevent pregnancy	Binary variable: equals 1 if participant reported that condoms can prevent pregnancy "a lot;" equals 0 if participant responded to question in any other way.
Correct knowledge of efficacy of condoms to prevent STI transmission	Binary variable: equals 1 if participant reported that condoms can prevent transmission of HIV, Chlamydia, and gonorrhea "a lot;" equals 0 if participant responded to question in any other way.
Correct knowledge of efficacy of birth control pills to prevent pregnancy	Binary variable: equals 1 if participant reported that birth control pills can prevent pregnancy "a lot;" equals 0 if participant responded to question in any other way.
Correct knowledge of efficacy of birth control pills to prevent STI transmission	Binary variable: equals 1 if participant reported that birth control pills can "not at all" prevent transmission of HIV and "not at all" prevent transmission of Chlamydia and gonorrhea; equals 0 if participant responded to these questions in any other way.
Knew benefits of birth spacing at baseline	Binary variable: equals 1 if participant reported awareness of the benefits of birth spacing; equals 0 otherwise.
Attitudes	
Birth control is pretty easy to get	Response to a single survey question; values range from 1 to 5 with higher numbers indicating stronger agreement.
Condoms are pretty easy to get	Response to a single survey question; values range from 1 to 5 with higher numbers indicating stronger agreement.
Women can trust what doctors say about birth control	Response to a single survey question; values range from 1 to 5 with higher numbers indicating stronger agreement.
Perceptions of ease of use of birth control	Average of responses to two survey questions; values range from 1 to 5 with higher numbers indicating stronger agreement.
Perceptions about need for condoms	Response to a single survey question; values range from 1 to 5 with higher numbers indicating stronger agreement.
Perceptions about need for birth control other than condoms	Average of responses to two survey questions; values range from 1 to 5 with higher numbers indicating stronger agreement.
Intentions	
Intention to avoid pregnancy	Binary variable: equals 1 if participant reported she will be trying to avoid becoming pregnant within the next 18 months; equals 0 if participant did not report she will be trying to avoid becoming pregnant within the next 18 months or is unsure.
Intention to avoid unprotected sex	Binary variable: equals 1 if participant reported she will definitely not have sex, definitely not have sex without a condom, or definitely not have sex without some other form of birth control in the next 18 months; equals 0 if none of the above apply but associated survey items were not left blank.

Measure	Definition
Preferred time to next pregnancy	Categorical variable with categories for (1) would like to become pregnant less than 6 months after birth, (2) would like to become pregnant between 6 and 18 months after birth, (3) would like to wait more than 18 months to become pregnant again, (4) do not want to become pregnant again.
Partner's intention for pregnancy	Binary variable: equals 1 if participant reported that her partner will be trying to get her pregnant in the next 18 months; equals 0 if participant has no partner or has a partner who will not be trying to get her pregnant in the next 18 months.
Sexual Risk Behavior	
Had sex in three months prior to finding out pregnant	Binary variable: equals 1 if participant had sexual intercourse in the three months prior to finding out she was pregnant; equals 0 if she did not do so.
Had unprotected sex in three months prior to finding out pregnant	Binary variable: equals 1 if participant had sexual intercourse without using condoms, an IUD, or a hormonal method of birth control in the three months prior to finding out she was pregnant; equals 0 if she did not do so.
Had sex without a condom in three months prior to finding out pregnant	Binary variable: equals 1 if participant had sexual intercourse without using condoms in the three months prior to finding out she was pregnant; equals 0 if she did not do so.
Number of sexual partners	Count variable indicating the total number of sexual partners the participant has ever had.
Contraceptive Use	
Used LARC for birth control in three months prior to finding out pregnant	Binary variable: equals 1 if participant ever used an IUD or implant for birth control in the three months prior to finding out she was pregnant; equals 0 if woman did not use such a method.
Used a hormonal method of birth control or IUD in three months prior to finding out pregnant	Binary variable: equals 1 if participant ever used an IUD or hormonal method for birth control in the three months prior to finding out she was pregnant; equals 0 if woman did not use these methods.
Used any highly effective, modern method of birth control in three months prior to finding out pregnant	Binary variable: equals 1 if participant ever used any highly effective, modern method of birth control in the three months prior to finding out she was pregnant; equals 0 if woman did not use these methods.
Ever used LARC	Binary variable: equals 1 if participant ever used an IUD or implant for birth control; equals 0 if woman never used this method.
Ever used hormonal method of birth control or IUD	Binary variable: equals 1 if participant ever used an IUD or hormonal method for birth control; equals 0 if woman never used these methods.
Ever used highly effective, modern method of birth control	Binary variable: equals 1 if participant ever used any highly effective, modern method of birth control; equals 0 if woman never used these methods.

APPENDIX C

SENSITIVITY ANALYSIS

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The main impact findings presented in Chapter IV of this report are derived from a particular set of analytic decisions, ranging from the data cleaning procedures used to construct the outcome measures to the specification of the regression models. We made these decisions in accordance with established research standards and the particular features of our study design. However, we also investigated the sensitivity of our results to alternative analytic decisions. In this appendix, we present findings from three types of sensitivity tests. First we examine the sensitivity of our results to alternative data cleaning procedures for the measures of sexual risk behavior. We then examine the sensitivity of our results to the specification of the regression models used to estimate program impacts. We end by examining the sensitivity of our results to alternative methods for calculating standard errors and statistical significance tests.

A. Data cleaning procedures

As described in Appendix B, our analysis of the self-reported survey data uncovered some inconsistent or discrepant responses to the questions on sexual risk behaviors. For example, it was possible for a participant to report having not had sex in the past three months but having had two sexual partners over the same period. For the main impact findings presented in this report, we accounted for these discrepancies when creating our outcome measures by considering the preponderance of evidence across all relevant questions in the survey (see Appendix B for a more detailed description). However, we also examined the sensitivity of our results to three alternative methods for cleaning the data:

1. Coding a participant as having engaged in a specific behavior if *any* survey item indicates she did so.
2. Coding a participant as *not* having engaged in a specific behavior if any survey item indicates she did *not* do so.
3. Dropping a participant from the analysis if the survey items show a pattern of inconsistent responses.

The results of these analyses showed that our findings are generally robust to alternative data cleaning procedures (Table C.1). For the measure of unprotected sex, the reported impact estimates show reductions in rates of unprotected sex ranging from 5.9 to 10.4 percentage points. Three of the four reported impact estimates are statistically significant at the 5-percent level. For the measures of sexual activity and sex without a condom, the reported impact estimates are uniformly small (less than three percentage points) and do not reach statistical significance.

Table C.1. Sensitivity of impacts to data cleaning procedures

Outcome	Primary method			Alternative method 1			Alternative method 2			Alternative method 3		
	Control group mean	Impact	*p*-value	Control group mean	Impact	*p*-value	Control group mean	Impact	*p*-value	Control group mean	Impact	*p*-value
Percentage of respondents who reported the following in the past 3 months												
Had unprotected sex	24.8	-10.4**	<0.01	26.5	-9.4**	0.01	19.6	-5.9	0.13	21.8	-7.6*	0.04
Had sex	84.7	-2.2	1.00	84.7	-2.2	1.00	80.0	-0.2	1.00	84.0	-2.0	1.00
Had sex without a condom	52.2	-2.3	1.00	60.5	-2.3	1.00	46.1	0.3	1.00	54.1	-2.2	1.00

Source: Surveys administered to study participants by the evaluation team.

Note: For each outcome, the numbers in the columns labeled “Control group” are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. See Chapter III for a more detailed description of the analytic methods.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

B. Alternative specification of regression models

For the main findings presented in Chapter IV of this report, we specified the regression models using logistic regression for binary variables and ordinary least squares regression for continuous variables. To test the sensitivity of our results to an alternative specification, we estimated comparable models using linear probability models for binary variables, Poisson regression for the one count variable (number of sexual partners), and ordinal logit regression for the six attitude measures. In no case did this alternative specification change the direction, general magnitude, or statistical significance of the reported impact estimates (Table C.2).

As an additional test, we also examined the sensitivity of our results to alternative combinations of control variables. For the main findings presented in Chapter IV of this report, our regression models control for a binary indicator for treatment status, binary indicator variables for each of the strata created for random assignment, two key demographic variables that are highly correlated with our key outcomes of interest (age and race), a baseline measure of the outcome (if available), and two additional baseline covariates empirically selected because of their strong predictive power and potential to improve the precision of the impact estimates: (1) participants' self-reported use of a modern, highly effective method of birth control in the three months prior to their becoming pregnant and (2) participants' baseline perceptions of their need for birth control. The last two covariates were selected empirically through a data-driven forward selection procedure (described in Chapter IV). To examine the sensitivity of our results to alternative combinations of control variables, we estimated comparable regression models when (1) controlling only for random assignment strata and (2) controlling only for random assignment strata and the outcome measure at baseline. In no case did the alternative combination of control variables change the direction, general magnitude, or statistical significance of the reported impact estimates (Table C.3)

Table C.2. Sensitivity of impacts to specification of regression model

Outcome	Control group mean	Original model		Alternative model	
		Impact	*p*-value	Impact	*p*-value
Percentage of respondents who reported using the following birth control methods in the past 3 months:					
LARC method	21.4	16.9**	<0.01	16.5**	<0.01
Any hormonal method or IUD	67.8	7.5	0.18	8.0	0.13
Any effective method of birth control	80.7	3.6	0.87	3.8	0.65
Had unprotected sex in past 3 months	24.8	-10.4**	<0.01	-10.8**	<0.01
Percentage of respondents who reported the following in the past 3 months:					
Had sexual intercourse	84.7	-2.2	1.00	-1.9	1.00
Had sexual intercourse without a condom	52.2	-2.3	1.00	-2.7	1.00
Number of sexual partners in past three months	1.02	-0.10	0.76	-0.12	0.64
Percentage of respondents who reported receiving information on the following topics:					
Relationships	34.5	7.7	0.59	7.8	0.58
Abstinence	36.3	15.8**	<0.01	15.7**	<0.01
Birth control methods	76.8	12.3**	<0.01	12.1**	<0.01
Where to get birth control	75.0	13.9**	<0.01	11.3**	<0.01
Sexually transmitted infections	68.9	9.0	0.18	9.0	0.15
Talking to a partner about sex or birth control	71.9	2.8	1.00	2.7	1.00
How to say no to sex	71.8	5.3	1.00	4.4	1.00
Percentage of respondents who reported receiving information from each of the following sources:					
Doctor or nurse during a facility visit	81.7	4.1	0.51	4.0	0.46
Health provider during a home visit	37.5	30.7**	<0.01	30.2**	<0.01
Percentage of respondents who reported correct knowledge of:					
Efficacy of condoms in preventing pregnancy	53.9	-1.2	1.00	-1.4	1.00
Efficacy of the birth control pill in preventing pregnancy	52.0	-3.4	1.00	-2.9	1.00
Efficacy of condoms in preventing STI transmission	29.7	-1.2	1.00	-1.6	1.00
Efficacy of the birth control pill in preventing STI transmission	64.6	0.7	1.00	0.6	1.00
Perceived ease of access to condoms	4.50	-0.05	1.00	-0.10	0.79
Perceived ease of access to birth control	4.34	-0.06	1.00	-0.10	0.38
Perceived trust in birth control providers	4.01	0.07	1.00	0.10	1.00
Perceived ease of using birth control	3.48	-0.01	1.00	0.00	1.00
Perceived need for condoms	3.58	0.01	1.00	0.00	1.00
Perceived need for birth control	4.29	0.03	1.00	0.00	1.00

Outcome	Control group mean	Original model		Alternative model	
		Impact	*p*-value	Impact	*p*-value
Percentage of respondents who intend to avoid pregnancy in the next year	64.2	6.4	0.18	6.2	0.19
Percentage of respondents who reported receiving birth control from a doctor or nurse in past six months	66.2	10.3**	<0.01	10.6**	<0.01

Source: Surveys administered by the evaluation team.

Note: For each outcome, the numbers in the columns labeled "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. See Chapter III for a more detailed description of the analytic methods.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

Table C.3. Sensitivity of impacts to alternative combinations of control variables

Outcome	Control group mean	Original model		Controls for strata and baseline outcome measures only		Controls for strata only	
		Impact	*p*-value	Impact	*p*-value	Impact	*p*-value
Percentage of respondents who reported using the following birth control methods in the past 3 months:							
LARC method	21.4	16.9**	<0.01	14.2**	<0.01	14.2**	<0.01
Any hormonal method or IUD	67.8	7.5	0.18	5.9	0.44	6.1	0.40
Any effective method of birth control	80.7	3.6	0.87	3.4	0.95	3.1	1.00
Had unprotected sex in past 3 months	24.8	-10.4**	<0.01	-10.1**	<0.01	-9.9**	<0.01
Percentage of respondents who reported the following in the past 3 months:							
Had sexual intercourse	84.7	-2.2	1.00	-1.9	1.00	-1.5	1.00
Had sexual intercourse without a condom	52.2	-2.3	1.00	-1.5	1.00	-1.2	1.00
Number of sexual partners in past three months	1.02	-0.10	0.76	-0.12	0.82	-0.12	1.00
Percentage of respondents who reported receiving information on the following topics:							
Relationships	34.5	7.7	0.59	8.0	0.51	8.0	0.53
Abstinence	36.3	15.8**	<0.01	16.8**	<0.01	16.0**	<0.01
Birth control methods	76.8	12.3**	<0.01	11.7**	<0.01	11.8**	<0.01
Where to get birth control	75.0	13.9**	<0.01	11.9**	<0.01	12.1**	<0.01
Sexually transmitted infections	68.9	9.0	0.18	9.0	0.15	9.1	0.15
Talking to a partner about sex or birth control	71.9	2.8	1.00	3.4	1.00	3.7	1.00
How to say no to sex	71.8	5.3	1.00	5.4	1.00	4.7	1.00
Percentage of respondents who reported receiving information from each of the following sources:							
Doctor or nurse during a facility visit	81.7	4.1	0.51	3.4	0.69	3.6	0.62
Health provider during a home visit	37.5	30.7**	<0.01	31.4**	<0.01	31.5**	<0.01
Percentage of respondents who reported correct knowledge of:							
Efficacy of condoms in preventing pregnancy	53.9	-1.2	1.00	-1.0	1.00	-0.7	1.00
Efficacy of the birth control pill in preventing pregnancy	52.0	-3.4	1.00	-2.7	1.00	-3.9	1.00
Efficacy of condoms in preventing STI transmission	29.7	-1.2	1.00	-2.1	1.00	-2.5	1.00
Efficacy of the birth control pill in preventing STI transmission	64.6	0.7	1.00	0.6	1.00	2.4	1.00

Outcome	Control group mean	Original model		Controls for strata and baseline outcome measures only		Controls for strata only	
		Impact	*p*-value	Impact	*p*-value	Impact	*p*-value
Perceived ease of access to condoms	4.50	-0.05	1.00	-0.05	1.00	-0.08	1.00
Perceived ease of access to birth control	4.34	-0.06	1.00	-0.06	1.00	-0.08	1.00
Perceived trust in birth control providers	4.01	0.07	1.00	0.05	1.00	0.02	1.00
Perceived ease of using birth control	3.48	-0.01	1.00	-0.03	1.00	-0.03	1.00
Perceived need for condoms	3.58	0.01	1.00	-0.01	1.00	-0.02	1.00
Perceived need for birth control	4.29	0.03	1.00	0.02	1.00	-0.01	1.00
Percentage of respondents who intend to avoid pregnancy in the next year	64.2	6.4	0.18	5.7	0.34	5.3	0.26
Percentage of respondents who reported receiving birth control from a doctor or nurse in past six months	66.2	10.3**	<0.01	9.5**	<0.01	8.5**	<0.01

Source: Surveys administered by the evaluation team.

Note: For each outcome, the numbers in the columns labeled “Control group” are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain. See Chapter III for a more detailed description of the analytic methods.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

C. Alternative estimates of standard errors and p-values

For the main findings presented in Chapter IV of this report, we adjusted the statistical significant tests (*p*-values) to account for two statistical issues. First, we adjusted the standard errors to account for the blocked random assignment design. As described in Chapter II, instead of randomly assigning each participant as an independent observation, we used permuted block random assignment to keep an even balance between the numbers of participants assigned to the treatment and control groups. To account for this design feature, we allowed for clustering of our standard errors at the randomization block level (Matts and Lachin 1988). Second, we also adjusted our *p*-values to correct for multiple hypothesis testing within domain, using a procedure outlined by Hothorn et al. (2008) and Schochet (2009).

To examine the sensitivity of our results to these adjustments, we estimated comparable regression models under three alternative conditions: (1) no adjustment for clustering, (2) no adjustment for multiple hypothesis testing, and (2) no adjustment for clustering *or* multiple-hypothesis testing. The results of these analyses (Table C.4) showed that the clustering adjustment has relatively little effect on the reported *p*-values and in no case changes the reported statistical significance levels. By contrast, the adjustment for multiple hypothesis testing, with or without clustering, has a relatively larger effect on the reported *p*-values and changes the reported statistical significance levels for two outcomes: (1) the percentage of participants who reported receiving information on STIs and (2) the percentage of participants who reported using an IUD or hormonal methods of birth control. For both outcomes, the reported impact estimates reach statistical significance at the 5-percent level when not adjusting for multiple hypothesis testing.

Table C.4. Impacts of T.O.P.P. using alternative methods to estimate **p**-values

Outcome	Control group mean	Original model		Alternative *p*-values		
		Impact	*p*-value	Ignore clustering	Ignore multiple com-parisons	Ignore both
Percentage of respondents who reported using the following birth control methods in the past 3 months:						
LARC method	21.4	16.9**	<0.01	<0.01	<0.01	<0.01
Any hormonal method or IUD	67.8	7.5	0.18	0.20	0.04	0.05
Any effective method of birth control	80.7	3.6	0.87	0.93	0.45	0.48
Had unprotected sex in past 3 months	24.8	-10.4**	<0.01	<0.01	<0.01	<0.01
Percentage of respondents who reported the following in the past 3 months:						
Had sexual intercourse	84.7	-2.2	1.00	1.00	0.76	0.76
Had sexual intercourse without a condom	52.2	-2.3	1.00	1.00	0.85	0.82
Number of sexual partners in past three months	1.02	-0.10	0.76	0.69	0.39	0.34
Percentage of respondents who reported receiving information on the following topics:						
Relationships	34.5	7.7	0.59	0.54	0.07	0.06
Abstinence	36.3	15.8**	<0.01	<0.01	<0.01	<0.01
Birth control methods	76.8	12.3**	<0.01	<0.01	<0.01	<0.01
Where to get birth control	75.0	13.9**	<0.01	<0.01	<0.01	<0.01
Sexually transmitted infections	68.9	9.0	0.18	0.18	<0.01	<0.01
Talking to a partner about sex or birth control	71.9	2.8	1.00	1.00	0.71	0.71
How to say no to sex	71.8	5.3	1.00	1.00	0.25	0.23
Percentage of respondents who reported receiving information from each of the following sources:						
Doctor or nurse during a facility visit	81.7	4.1	0.51	0.48	0.39	0.36
Health provider during a home visit	37.5	30.7**	<0.01	<0.01	<0.01	<0.01
Percentage of respondents who reported correct knowledge of:						
Efficacy of condoms in preventing pregnancy	53.9	-1.2	1.00	1.00	0.92	0.93
Efficacy of the birth control pill in preventing pregnancy	52.0	-3.4	1.00	1.00	0.66	0.65
Efficacy of condoms in preventing STI transmission	29.7	-1.2	1.00	1.00	0.93	0.92
Efficacy of the birth control pill in preventing STI transmission	64.6	0.7	1.00	1.00	0.95	0.95
Perceived ease of access to condoms	4.50	-0.05	1.00	1.00	0.68	0.65
Perceived ease of access to birth control	4.34	-0.06	1.00	1.00	0.51	0.56
Perceived trust in birth control providers	4.01	0.07	1.00	1.00	0.52	0.59
Perceived ease of using birth control	3.48	-0.01	1.00	1.00	0.97	0.97
Perceived need for condoms	3.58	0.01	1.00	1.00	0.96	0.96
Perceived need for birth control	4.29	0.03	1.00	1.00	0.85	0.83
Percentage of respondents who intend to avoid pregnancy in the near year	64.2	6.4	0.18	0.14	0.18	0.14

Outcome	Control group mean	Original model		Alternative *p*-values		
		Impact	*p*-value	Ignore clustering	Ignore multiple com-parisons	Ignore both
Percentage of respondents who reported receiving birth control from a doctor or nurse in past six months	66.2	10.3**	<0.01	<0.01	<0.01	<0.01

Source: Surveys administered by the study team.

Note: For each outcome, the numbers in the columns labeled "Control group" are regression-adjusted predicted values of outcomes at the six-month follow-up survey. *P*-values are adjusted for clustering of standard errors at the randomization block level and for multiple outcomes measured within a single domain, unless otherwise noted. See Chapter III for a more detailed description of the analytic methods.

*Significantly different from zero at the .05 level, two-tailed test.

**Significantly different from zero at the .01 level, two-tailed test.

Evaluation of Adolescent
Pregnancy Prevention Approaches

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