Short-term impacts of Pulse, a Teen Pregnancy Prevention App

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Introduction

Despite years of nationwide declines in teen childbearing, Black and Latinx young women in the United States still experience disproportionately high rates of teen pregnancy.[1] Historically, family planning efforts and teen pregnancy prevention (TPP) programming have not fully met the needs of Black and Latinx young women. For example, women of color often have different attitudes toward birth control than their white counterparts, due to historical racial prejudice in the healthcare system.[2] Additionally, women of color may not always feel represented in the narratives surrounding sexual and reproductive health.[3] Incorporating these topics into programming and tailoring program content to resonate with Black and Latinx populations are needed to increase access to culturally appropriate reproductive health care for women of color.[4,5]

Administering programming online can also increase access to reproductive health information for Black and Latinx women. For example, TPP programs are often administered in school- or community-based settings where older Black and Latinx teens are not served (either because they have graduated or dropped out of schooling). Administering programming online can bridge this gap and reach populations often left out of more traditional in-person approaches.[6,7]

Healthy Teen Network designed Pulse, an app-based teen pregnancy prevention program, to address the sexual and reproductive health needs of Black and Latinx young women ages 18 to 20. During the development of Pulse, Healthy Teen Network met with Black and Latinx youth advisors to get feedback on the content and design of the app. Youth from both populations identified common themes related to accessing health services, use of birth control, and attitudes and beliefs about birth control. Pulse designers prioritized these themes and used them to inform the app content and multimedia.

From 2016 to 2019, Child Trends conducted a randomized control trial to evaluate the impact of Pulse on two measures of unprotected sex (sex without any birth control method, and sex without a hormonal or long-acting reversible contraceptive method), as well as the program's impacts on knowledge, attitudes, self-efficacy, and intentions. The impact results from the six-week short-term follow-up survey were recently published in the Journal of Adolescent Health (JAH).[8] This research brief summarizes the impact findings from the JAH article.

What is Pulse?

Pulse is a web-based mobile health app for Black and Latinx young adult women. The app has six interactive sections that provide culturally and age-appropriate information on sexual and reproductive health topics, including birth control, healthy relationships, sexual health and physiology, pregnancy, and utilization of clinical services.

Pulse allows users to identify the right birth control method for their needs, find reproductive health services in their area, learn about their bodies and much more, with the ultimate goal of preventing unplanned pregnancies. Each section contains activities that engage users with the content, such as a clinic locator, appointment reminders, animations, and videos with medical professionals.
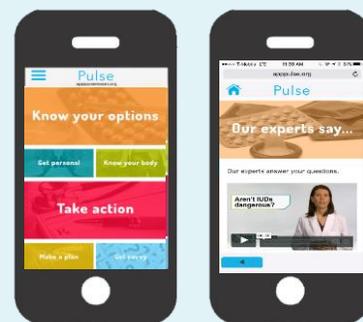
Key Findings

At the conclusion of the six-week Pulse intervention, participants reported their behaviors, knowledge, attitudes, self-efficacy, and intentions through an online survey. Compared to control group participants, Pulse participants:

- Were less likely to report having sex recently without using a hormonal or long-acting contraceptive method

- Had more accurate knowledge about contraceptives

- Were more confident that they would be able to use birth control during every sexual intercourse in the future

Background

We recruited 1,304 participants into the study through targeted ads on Instagram and Facebook. Young women who self-identified as Black and/or Latinx women were prioritized[i] since the app was designed for them. To enroll in the study, participants had to meet the following requirements:

- Self-identify as female

- Ages 18 to 20

- Speak English

- Not currently pregnant or trying to become pregnant

- Have daily access to a smartphone

- Currently live in the United States or a U.S. territory

Both the program and the evaluation were fully technology-based, meaning that all recruitment, enrollment, program content, and pre- and post-survey participation took place online, primarily on smartphones. We did not have one-on-one contact with participants unless the participant reached out for assistance. Participants were enrolled between November 2016 and January 2018. They were randomized to either the Pulse intervention app or a control app on general health topics and began their program immediately after being randomized. During the six-week intervention period, participants had unlimited access to their app and received text messages with app-related content. To encourage participants to use the app, we developed targeted text message reminders.

Methodology

Data collection

All study participants took a baseline survey prior to randomization and were invited to complete a short-term follow-up survey six weeks later. To encourage participants to complete the survey, we sent reminder Multimedia Messaging Service (MMS) messages and, if needed, called participants to follow up. Eighty-five

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[i] Black and Latinx young women were prioritized through targeted social media ad recruitment as well as recruitment caps that limited the number of women who were non-Latinx and non-Black to 20 percent of the sample.

percent of the Pulse intervention group and 87 percent of the control group completed the post-test survey, so the rate of differential attrition was acceptable.[9]

Outcomes

The primary behavioral outcomes are two measures of unprotected sexual intercourse:
- Sexual intercourse without using any method of contraception
- Sexual intercourse without using a hormonal contraceptive (birth control pills, the shot, the patch, and the ring) or long-acting reversible contraceptive (LARC) method (IUDs and implants)

These outcomes were measured for the full sample, including women who reported never having had vaginal sex. We focused on hormonal and LARC methods rather than all forms of modern contraceptives because Pulse focuses on increasing use of highly effective contraceptive methods.

The secondary outcome measures include:
- Average percent correct of questions regarding contraceptive knowledge
- Attitudes toward birth control and accessing sexual and reproductive health services
- Birth control and sexual and reproductive health self-efficacy
- Intentions related to using birth control and visiting a health care provider for sexual or reproductive health services

Analysis

The study design is a randomized control trial with individual-level random assignment. Baseline equivalence was established between intervention and control groups. Linear probability models were used to assess the impact of Pulse on each outcome for the 1,124 participants who completed the short-term follow-up survey.[10] All analyses controlled for 1) the baseline measure of each outcome, 2) whether participants reported ever having had vaginal sex prior to baseline, 3) age at baseline, 4) and race/Latinx ethnicity. All analyses were completed using Stata 13.1.[11]

In addition to the main impact findings presented here, we investigated the sensitivity of our results to alternative coding of the outcome measures to adjust for data discrepancies. See **Appendix A** for details on each of the sensitivity checks conducted. We also conducted interaction analyses, using the linear probability models described above, with data from the 421 Latinx and 430 Black participants who completed the six-week follow-up survey (n = 851) to assess differences in impacts between Black and Latinx participants. However, none of these interactions were significant, indicating there were no differing treatment impacts for Black and Latinx participants.

For additional detail on the study background, design, methods, and limitations, see our recent journal publication here.

Participant characteristics

Among the analytic sample of 1,124 participants who completed the six-week follow-up survey, there were no significant differences between the Pulse intervention and control groups for any measure at baseline. The average age of the sample was 18.8 years, and most of the sample identified as Latinx or Black (76 percent). The sample had high educational attainment, with more than 70 percent having completed some college, technical school, or more. Approximately 69 percent of the sample ever had vaginal sex, 56 percent had sex in the past three months, and 9 percent had ever been pregnant. Participants had high rates of unprotected sex at baseline. One in four participants reported having sex in the past three months without using any contraceptive method, and 28 percent reported having sex in the past three months without using a hormonal or LARC method.

- Average age was 18.8 years.
- 76% were non-Latina black or Latina.
- 73% had some college education.

Had sex in last 3 mos. without hormonal/LARC birth control — 28%

Had sex in last 3 mos. — 56%

Ever had sex — 69%

Had sex in last 3 mos. without a contraceptive method — 25%

Ever been pregnant — 9%

Results

At the end of the intervention period, we found impacts on sex without a hormonal or long-acting method, contraceptive knowledge, and birth control self-efficacy. We did not find impacts on sex without any method of contraception, attitudes toward birth control, sexual and reproductive health self-efficacy, intentions to use birth control, or intentions to visit a health care provider for sexual or reproductive health services.

Sex without a hormonal or long-acting method

At follow-up, Pulse participants were less likely to report that they had sex without a hormonal or long-acting reversible contraceptive method in the past six weeks (22%) than control participants (30%). We did not find significant differences between the intervention and control groups on the second primary outcome, sex without any method in the past six weeks (not shown). **Figure 1** below shows participant responses to the survey question "In the past 6 weeks (about a month and a half), have you had vaginal intercourse without using any of these methods of birth control? Birth control pills; The shot (for example, Depo Provera); The patch (for example, Ortho Evra); The ring (for example, NuvaRing); IUD (for example, Mirena, Skyla, or Paragard); Implant (for example, Implanon or Nexplanon)."

Accurate knowledge about contraceptives

At follow-up, Pulse participants had more accurate knowledge of contraceptives (52%) than control participants (45%). **Figure 1** below shows the average percentage of correct answers, for each group, across

four true/false questions about contraceptives: 1) A condom is more effective at preventing pregnancy than the IUD (intrauterine device); 2) The implant is more effective at preventing pregnancy than the birth control pill; 3) A woman can use an IUD even if she has never had a child; and 4) Long-acting methods like the implant or IUD cannot be removed early, even if a woman changes her mind about wanting to get pregnant.

Birth control self-efficacy

At follow-up, Pulse participants were more likely to agree (67%) that they are confident they would be able to use birth control every time they have sexual intercourse (as opposed to "disagree" or "neither agree nor disagree") compared to control participants (62%). **Figure 1** below shows participant responses to the survey question "I am confident that I can use birth control every time I have sex."

Figure 1. Short-term impacts on sexual behaviors, knowledge, and self-efficacy
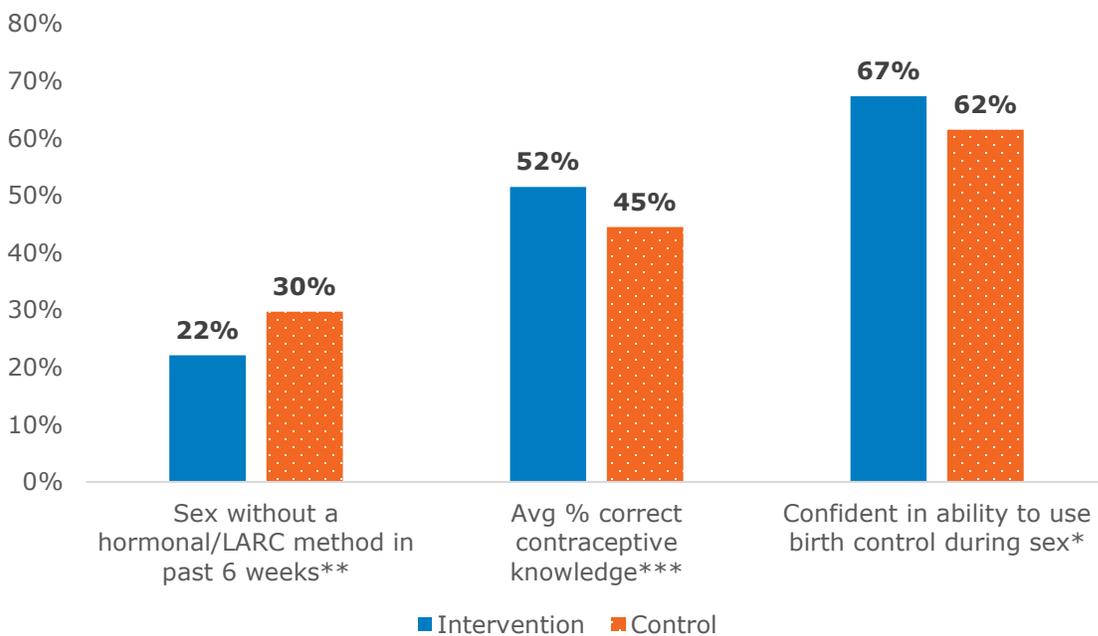
Source: Source: Manlove, J., Cook, E., Whitfield, B., Johnson, M., Martinez-Garcia, G., & Garrido, M. (2019). Short-Term Impacts of Pulse: An App-Based Teen Pregnancy Prevention Program for Black and Latinx Women. *Journal of Adolescent Health*.
Note: *p < 0.05, **p < 0.01, ***p < 0.001; (N=1,124)

Conclusions

This study presents short-term impacts from an app-based teen pregnancy prevention program designed primarily for Black and Latinx young women. It is one of the first randomized control trials to assess impacts of an app-based teen pregnancy prevention intervention with online recruitment and data collection. The study reached a large sample of primarily Black and Latinx young women ages 18-20, who are less likely than younger teens to be served by existing pregnancy prevention efforts.

The results show that culturally appropriate, app-based approaches to teen pregnancy prevention programming designed for Black and Latinx young women can have short-term impacts on behavioral outcomes and outcomes associated with unplanned pregnancy, including knowledge about and self-efficacy in using contraception. Our findings suggest that mobile-based approaches can be accessible, convenient, and scalable and can offer a promising approach to sex education. Forthcoming analyses using longer-term data will assess whether the short-term impacts on unprotected sex are sustained through a longer period and test program impacts on pregnancy.

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Appendix A. Sensitivity Checks

One limitation of our study is that our analyses rely on self-reports of potentially sensitive information, such as whether a participant has had unprotected sex. Responses to these questions may be influenced by social desirability bias. However, tech-based approaches have been shown to yield more truthful answers than in-person data collection techniques,[12] so we are optimistic that participants' reports are by and large accurate.

The main impact findings presented in this study were based on careful analytic decisions; however, when constructing our primary behavioral measures, we found that 55 of the 1,124 participants (5%) responded inconsistently on the six-week follow-up survey to our three behavioral outcome measures (*sexual intercourse without any contraceptive method*, *sexual intercourse without a hormonal/LARC method*, and *sexual intercourse without a condom*). For example, a participant may have responded that she had not had sex in the past six weeks without using a hormonal/LARC method (i.e., if she had sex, she always used a hormonal/LARC method). Yet, when asked about sex without any method, that same participant responded that she had sex in the last six weeks without using any method (i.e., if she had sex, she did so at least once without using a contraceptive method). Based on additional cognitive testing with a subsequent cohort of intervention participants, we found that participants experienced three main challenges when responding to these survey questions: 1) misinterpretation of negatively worded survey questions, 2) cognitive burden after reading lengthy/detailed questions, and 3) perception of being judged (social desirability bias).[ii]

For our original analyses described in this brief and the JAH article, we used a participant's responses to all questions and did not recode inconsistent responses. We decided to use all responses, even when they reflected inconsistencies, because we could not assess which response was most "accurate." However, because of the importance of these behavioral outcomes to our analysis, we also tested the sensitivity of our results to these coding decisions by creating alternative versions of each outcome that adjust for the data discrepancies (at baseline and follow-up). For these sensitivity checks, we also incorporated responses to one additional measure of unprotected sex that was not a part of the evaluation design or analysis: *sexual intercourse without a condom*. No imputation of missing data was done for any of these analyses. We conducted four sensitivity checks using the measures below. There is some overlap in the analyses conducted for each sensitivity check; however, the combination of analyses for each sensitivity check is unique and meaningfully different.

[ii] The study team conducted in-depth cognitive interviews with participants to better understand why participants responded inconsistently to the measures of unprotected sex. We learned that participants experienced three main challenges when responding to these survey questions: 1) misinterpretation of negatively worded survey questions, 2) cognitive burden after reading lengthy/detailed questions, and 3) perception of being judged. Participants had difficulty comprehending the negatively worded questions and also experienced survey fatigue after reading the dense survey questions. Additionally, some participants' responses were impacted by social desirability bias. Participants reported that they felt uncomfortable answering the survey questions truthfully given the binary "yes" and "no" options. They said that if someone forgot to use birth control one time or was unsure whether they had used birth control, they might still answer as if they had used it every time.

Measures

Outcome	Item phrasing	Item response choices
Sex without any method (primary outcome)	In the past 6 weeks (about a month and a half), have you had vaginal intercourse without using any method of birth control, including condoms?	Yes, No, or Don't Know
Sex without a hormonal/LARC method (primary outcome)	In the past 6 weeks (about a month and a half), have you had vaginal intercourse without using any of these methods of birth control? Birth control pills, the shot, the patch, the ring, IUD, implant	Yes, No, or Don't Know
Sex without a condom (not included in the evaluation)	In the past 6 weeks (about a month and a half), have you had vaginal intercourse without using a condom?	Yes, No, or Don't Know

Sensitivity checks

Sensitivity check #1: **Recode participants' response to the *sex without any method* question so they align with their response to the *sex without a hormonal/LARC method* and the *sex without a condom* questions.** For the first sensitivity check, we chose to take the two unprotected sex measures related to specific contraceptive methods (*sex without a condom* and *sex without a hormonal/LARC method*) at face value and recode the overall unprotected measure (*sex without any method*) to align with the participant's response on the individual measures. Recoding decisions are shown below. For this sensitivity check, we found a significant difference between the intervention and control participants for *sex without any method*, which was not significant in our original analyses. See the **Results** section below for additional detail.

Sex without a condom	Sex without a hormonal/LARC method	Recoding of sex without any method
No	Yes	Yes → No
Yes	No	Yes → No
No	No	Yes → No

Sensitivity check #2: **Recode participants' response to the** *sex without a hormonal/LARC method* **question so they align with their response to the** *sex without any method* **question.** For the second sensitivity check, we chose to take the overall unprotected sex measure (*sex without any method*) at face value and recode the individual *sex without a hormonal/LARC method* measure to align with *sex without any method*. Recoding decisions are shown below. For this sensitivity check, we found marginally significant differences between intervention and control participants for *sex without a hormonal/LARC method* after adjusting for multiple-hypothesis testing. See the **Results** section below for additional detail.

Sex without any method	Recoding of sex without a hormonal/LARC method
Yes	No → Yes

Sensitivity check #3: **When there is consistency across two of the three unprotected sex measures, recode the third unprotected sex measure to align with the two consistent responses.** For the third sensitivity check, we decided to use a "two out of three" approach: If participants aligned on two of the three unprotected sex measures, then the third measure was recoded to match. We recoded anyone who replied "no" to the *sex without a condom* question (i.e., if they had sex, they always used a condom) and "no" to the *sex without a hormonal/LARC* question (i.e., if they had sex, they always used a hormonal/LARC method) to "no" for the *sex without any method* question (i.e., if they had sex, they always used a condom or hormonal/LARC method). We also recoded anyone who replied "yes" to the *sex without any method* question (i.e., they did not always use a condom or hormonal/LARC method during sex) and "yes" to the *sex without a condom* question (i.e., they did not always use a condom during sex) to "yes" for the *sex without a hormonal/LARC method* question (i.e., they did not always use a hormonal/LARC method during sex). We also conducted the latter recode for the *sex without a condom* question, but because it was not one of our primary outcome measures we did not include it here.

For this sensitivity check, we did not find significant differences for *sex without any method*. However, we did find significant differences between intervention and control participants for *sex without a hormonal/LARC method*. See the **Results** section below for additional detail.

Sex without a condom	Sex without a hormonal/LARC method	Recoding of sex without any method
No	No	Yes → No

Sex without any method	Sex without a condom	Recoding of sex without a hormonal/LARC method
Yes	Yes	No → Yes

Sensitivity check #4: **Recode discrepancies between participants' responses to the** *sex without any method* **and the** *sex without a hormonal/LARC method* **questions to missing.** For the fourth sensitivity check, we recoded any discrepancies between *sex without a hormonal/LARC method* and *sex without any method* to missing. Participants who replied "no" to the *sex without a hormonal/LARC method* question but "yes" to the *sex without any method* question were coded to missing for the *sex without any method* and *sex without a hormonal/LARC method* questions. For this sensitivity check, we found significant differences between

intervention and control participants for both *sex without a hormonal/LARC method* and *sex without any method*. See the **Results** section below for additional detail.

Sex without a hormonal/LARC method	Sex without any method	Recoding of sex without a hormonal/LARC method	Recoding of sex without any method
No	Yes	No → Missing	No → Missing

Results

Overall, the results from the sensitivity checks support our initial findings and indicate that our original analyses may have produced conservative estimates. For one of the three sensitivity checks conducted for the measure of *sex without any method* in the past six weeks (#3), we found non-significant impacts, similar to our original analyses; for the other two sensitivity checks (#1 and #4), we found significant impact effects. This demonstrates that our original impact findings may have been conservative, since some alternate methods of coding to adjust for reporting discrepancies resulted in significant findings.

For two of the three sensitivity checks conducted for the measure of *sex without a hormonal/LARC method* in the past six weeks (#3 and #4), we found comparable or more significant impacts compared to our original analyses; for the other sensitivity check (#2), impact findings were reduced to marginal significance once adjustments were made for multiple hypothesis testing. Adjustments for multiple hypothesis testing are fairly conservative; however, even with these conservative adjustments, findings for *sex without a hormonal/LARC method* remained at least marginally significant for each sensitivity check.

See **Table 1** below for impact effect sizes and p-values for the original analyses compared to each of the four sensitivity checks.

Table 1. Impact results from sensitivity checks

	Sex without any birth control method		Changes made (N)		Sex without a hormonal/LARC method		Changes made (N)	
	Impact	p-value	Intervention	Control	Impact	p-value	Intervention	Control
Original findings	-2.4	0.265	0	0	-7.6	0.001**	0	0
Sensitivity check 1	-5.5	0.006**	29	34	-	-	N/A	N/A
Sensitivity check 2	-	-	N/A	N/A	-4.7	0.042*a	27	28
Sensitivity check 3	-2.8	0.197	3	1	-5.3	0.024*	27	29
Sensitivity check 4	-4.4	0.031*	27	28	-7.3	0.002**	27	28

*p<0.05, **p<0.01, ***p<0.001
a Findings marginally significant after adjusting for multiple hypothesis testing.

Conclusions

These findings lend support to our original analysis while also pointing out interesting differences that can result from discrepancies in self-reported measures. These sensitivity checks demonstrate that Pulse may have had impacts on both primary unprotected sex outcomes, but due to a small percentage of participants who had difficulty understanding the questions, the results may be underestimating the impact. However, one sensitivity check found a reduced, marginal impact on the measure of sex without a hormonal or long-acting method after adjusting for multiple hypothesis testing. These differences in program impacts based on coding of inconsistent data are important to keep in mind for future teen pregnancy prevention programs as they consider which behavioral measures to use in their surveys and how to address inconsistencies across self-reported behavioral measures.

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