

How increasing the use of effective contraception could reduce unintended pregnancy and public health care costs

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Acknowledgments

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How increasing the use of effective contraception could reduce unintended pregnancy and public health care costs

Child Trends researchers were commissioned by the Planned Parenthood Action Fund to estimate, with the microsimulation model FamilyScape, nationwide pregnancy outcomes if all women not seeking pregnancy used the same mix of effective contraceptive methods as women who had participated in a recent evaluation study conducted by researchers from the University of California, San Francisco (UCSF).

Overview

Nearly half of all pregnancies in the United States each year are unintended; that is, they are unwanted or occurred sooner than desired (Finer and Zolna, 2016). Unintended pregnancy can have negative consequences for the health and well-being of women and children, which in turn is associated with a myriad of public costs. Leading scholars have shown that increasing the use of highly effective birth control methods—including long-acting reversible contraception (LARC) methods such as the IUD and implant, and hormonal methods such as injectables, the pill, patch or ring—could reduce unintended pregnancy and improve health outcomes for women and children (Sawhill, Karpilow et al., 2014; American College of Obstetricians and Gynecologists, 2015; Karpilow and Thomas, 2017). But how much impact would such an increase have?

Child Trends estimated nationwide pregnancy outcomes if all women not seeking pregnancy used the same type of effective contraceptive methods as women who had participated in a recent evaluation study conducted by researchers from the University of California, San Francisco (UCSF). In that study, a subset of Planned Parenthood health centers implemented a clinic-based intervention designed to increase awareness of the full range of contraceptive methods available and improve uptake of more effective contraceptive methods. The intervention did not alter the cost of contraception but instead focused on improving counseling and access to all methods—including IUDs and implants. According to the evaluation, published in *The Lancet*, a peer-reviewed medical journal, in 2015, the intervention increased the percentage of women that chose more effective methods of contraception. LARC method use was higher in the treatment clinics as compared to the clinics that did not receive the intervention, and 4 times higher than use in the general population. The percentage of women that chose hormonal methods at these clinics was high as well, with 40 percent more women selecting these methods at the treatment clinics as compared to the general population (Harper, Rocca et al., 2015).

Child Trends used results from the UCSF study to run a simulation using FamilyScape 3.0, a microsimulation model designed to reproduce fertility-related behaviors and outcomes among U.S. women of child-bearing age. FamilyScape provides policymakers and practitioners with estimates of the potential effect of various policies and practices to reduce unintended pregnancies and improve maternal and child health. The model can be used to simulate the effect of changes in contraceptive use because, in the baseline scenario, it simulates these behaviors realistically and matches actual pregnancy, birth, and abortion rates. FamilyScape was developed by The Brookings Institution and expanded and updated to FamilyScape 3.0 by researchers at Child Trends, Brookings, and Georgetown University.

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Below, we report findings from FamilyScape 3.0 that address the following question: what if all women had the same levels of highly effective contraceptive use as the women in the Planned Parenthood clinics? Specifically, we assessed the effects of increasing effective contraceptive method use on unintended pregnancies, unintended births, and abortions in the United States. We then measured how these changes in unintended births could affect maternal health, birth outcomes, and associated public health care cost savings.

Key Findings and Implications

The results of this simulation are promising and suggest that if the mix of contraceptives used by U.S. women ages 15 to 39 (not seeking pregnancy) matched that found in the study sample of Planned Parenthood clinics after an intervention that provided access to the full range of contraceptive methods and contraceptive counseling, there would be substantially fewer unintended pregnancies, unintended births, and abortions. Fewer unintended births would translate to fewer births with poor maternal health and birth outcomes—leading to cost savings for the public health care system. Specifically:

- The simulation reduced unintended pregnancies by 64 percent, unintended births by 63 percent, and abortions by 67 percent.
- These reductions in unintended pregnancies would translate to decreases in the number of negative birth outcomes—such as premature or low birthweight births—and decreases in negative maternal health outcomes, such as hypertension and gestational diabetes.
- Simulation findings indicate that substantial reductions in unintended pregnancy would translate to \$12 billion dollars in public health care cost savings annually, reducing the public costs of unintended pregnancy by half.
- Even implementing the contraceptive mix from Planned Parenthood clinics that did not receive an intervention (the control group), according to this simulation, would lead to dramatic declines in unintended pregnancies.

These findings highlight the potential benefits of linking women who want to avoid pregnancy with high-quality reproductive health care services and the full range of contraceptive methods. Better reproductive health care services could decrease the number of women using no method of birth control or relying only on less effective methods, such as a condom or withdrawal.

Background

In 2011, 45 percent of all pregnancies were unintended (Finer and Zolna, 2016). Births resulting from unintended pregnancies are associated with adverse maternal and child health outcomes, such as negative pregnancy-related behaviors (e.g., smoking, delayed prenatal care) (Dott, Rasmussen et al., 2010; Kost and Lindberg, 2015) and low birth weight (Kost and Lindberg, 2015). Additionally, because women who have unintended pregnancies tend to be more economically disadvantaged, the cost of medical care for unintended pregnancies and subsequent births disproportionately falls on public payers such as Medicaid (Sonfield and Kost, 2015). For these reasons, the U.S. Department of Health and Human Services' Healthy People 2020 campaign has a goal of reducing unintended pregnancy by 10 percent by 2020 (Healthy People 2020, 2016).

Research shows that almost all women who have unintended pregnancies use contraceptives inconsistently and/or incorrectly, have long gaps in contraceptive use, or use no method at all (Sonfield, Hasstedt et al., 2014). Therefore, increasing the use of any contraception among

women using no method, and increasing the use of highly effective methods (e.g., hormonal methods, IUD, or implant) among women using less effective methods of contraception (e.g., condoms or withdrawal) will likely reduce unintended pregnancy.

As recently documented through a randomized controlled trial (Harper, Rocca et al., 2015), 20 Planned Parenthood clinics across the United States conducted an intervention to improve counseling and access to the full range of contraceptive methods. As part of this intervention, providers received training on the insertion of IUDs and implants, on how to counsel patients on method effectiveness, and on ethics and cultural competency, as well as technical assistance to address payment and stocking barriers. Following this intervention, the treatment Planned Parenthood clinics had a high percentage of patients reporting use of LARC methods as compared to condoms (Harper, Rocca et al., 2015). These clinics also had high rates of non-LARC hormonal method use among their patients (i.e., injectable, pill, patch, and ring) along with lower rates of no method use. Previous research has found that even seemingly modest declines in no method use can be associated with large declines in unintended pregnancy, as women who use no contraception account for more than half of unintended pregnancies (Thomas and Karpilow, 2016).

In this study, we used simulation techniques to explore, at the population level, what the impact of increasing the use of more effective birth control methods would be on rates of unintended pregnancy, births, and abortions; maternal health and birth outcomes; and associated public health care cost savings. To conduct this simulation, we used the mix of contraceptive methods, and the level of use, achieved at the post-intervention (i.e., “treatment”) Planned Parenthood clinics in the 2015 Harper et al. study.

Data/Methods

We used a unique microsimulation model, FamilyScape 3.0, to estimate the extent to which improvements in contraceptive behaviors can contribute to population-level changes in:

1. pregnancy, birth, and abortion rates;
2. family formation outcomes, such as child poverty; and
3. maternal and newborn health outcomes, such as gestational diabetes, prenatal care, prematurity, and birth weight.

FamilyScape was originally developed by The Brookings Institution and then expanded and updated to FamilyScape 3.0 by researchers at Child Trends, Georgetown University, and The Brookings Institution. The model is designed to reproduce real-world fertility-related behaviors and outcomes among women in the United States. FamilyScape can be used to simulate the potential effect of changes in contraceptive use or sexual activity on a range of outcomes. Baseline contraceptive use distributions are simulated to match national benchmarks, and the model also matches real-world pregnancy, birth, and abortion benchmarks. The model’s default, or baseline, contraceptive distribution matches that of sexually active, non-sterile/non-sterilized women ages 15 to 39 as calculated using the National Survey of Family Growth (NSFG) 2006–2010. As such, the baseline scenario produces pregnancy, birth, and abortion rates that match the real-world rates for 2008.¹ For more details about FamilyScape 3.0, please see the Technical Appendix.

To estimate the effect of women’s increased use of highly effective methods on population-level pregnancy, birth, and abortion rates, we set FamilyScape’s contraceptive distribution

¹ FamilyScape 3.0 was calibrated using the 2006–2010 NSFG. Thus, baseline pregnancy, birth, and abortion rates match those from 2008. We make the assumption that the proportional effect of the modeled increase in LARC and hormonal use would have a similar impact in 2017.

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to match that found among women in the 20 Planned Parenthood clinics receiving the intervention (Harper, Rocca et al., 2015).² We adjusted this contraceptive mix to account for the fact that, unlike the clinic population, the FamilyScape population includes women using male sterilization (vasectomy) and women seeking pregnancy (see Technical Appendix for details on this adjustment).³ The most significant difference between the baseline and simulation models' contraceptive distributions was the percentage of women relying on hormonal and LARC methods instead of condoms as their most effective method (see Table 1). We ran the model once using the baseline (actual) distribution of contraceptive methods among U.S. women, and then again using the distribution of methods found at the 20 Planned Parenthood clinics. We then compared the pregnancy, birth, and abortion rates between the two sets of results.

Table 1. Comparison of actual (baseline) and simulation contraceptive method distributions for women at risk of pregnancy*

	Actual distribution (baseline)	Distribution at Planned Parenthood treatment clinics (simulation)	Percentage point change
Male sterilization	6.7%	6.7%	0.0
LARC (IUD/implant)	5.4%	24.3%	+18.9
Injectable	3.7%	8.8%	+5.1
Pill/patch/ring	35.5%	45.3%	+9.8
Condom	31.9%	1.9%	-30.0
No method**	16.8%	13.6%	-3.2

*Women at risk of pregnancy are aged 15 to 39, sexually active, non-sterile, and non-sterilized.

**6 percent of women in the sample are seeking pregnancy; they are included in the "no method" category

Note - In FamilyScape, the patch and ring are combined with the pill due to small sample size and the fact that efficacy rates for these methods are similar. Additionally, the pill/patch/ring category includes a small percentage of women using "other" methods such as sponge, diaphragm, natural family planning etc. The condom category also includes withdrawal.

If a woman used more than one method, she was assigned the most effective method.

Distribution may add up to more than 100 percent due to rounding.

Source: NSFG 2006-10 (baseline), Planned Parenthood treatment clinic data (simulation)

Results

Estimated reductions in unintended pregnancy, unintended birth, and abortion rates

The simulation demonstrated large changes in pregnancy outcomes when the distribution of contraceptive use among U.S. women ages 15 to 39 not seeking pregnancy matched that of the study sample at Planned Parenthood clinics:

- The unintended pregnancy rate among women ages 15 to 39 fell from 62.8 per 1,000 women to 22.4 per 1,000 women (a 64-percent decrease);

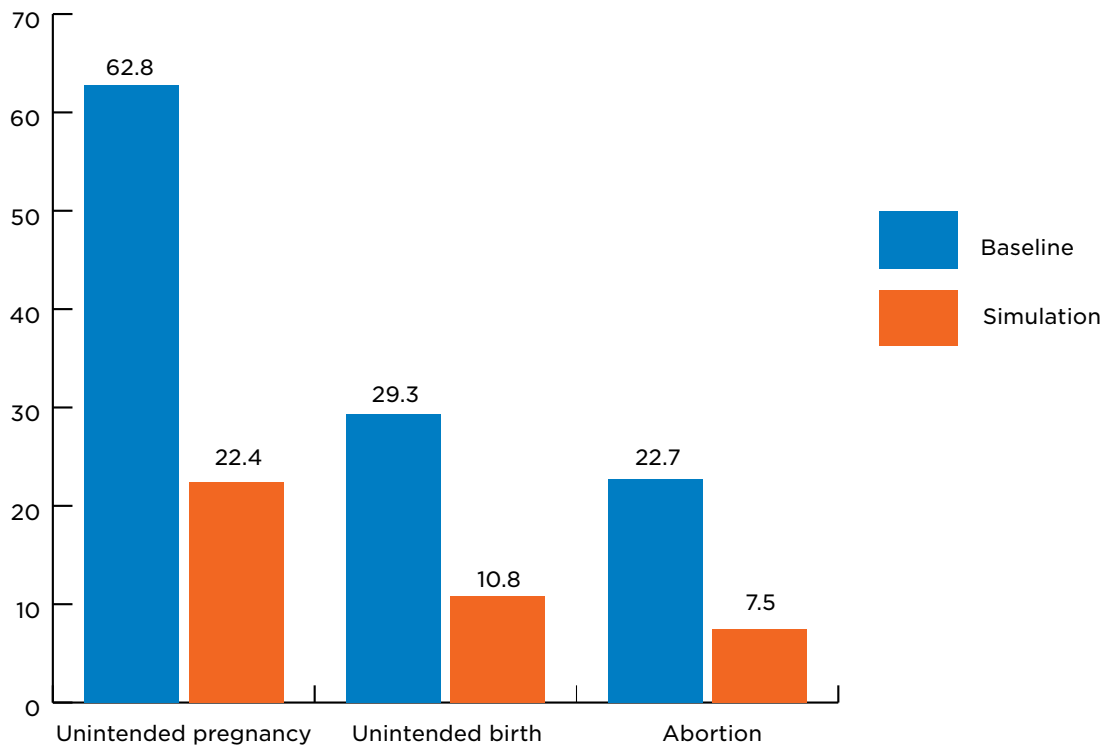
² The published article, Harper et al 2015, does not include the full contraceptive distribution. This was provided to authors by the Planned Parenthood Action Fund via electronic mail.

³ Because pregnancy intentions of married and unmarried women differ, adjustments were made separately by marital status.

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- The unintended birth rate fell from 29.3 unintended births per 1,000 women to 10.8 per 1,000 women (a 63-percent decrease); and
- The abortion rate fell from 22.7 abortions per 1,000 women to 7.5 per 1,000 women (a 67-percent decrease)⁴ (See Figure 1).

Figure 1. Reductions in unintended pregnancy, unintended birth, and abortion resulting from simulated changes in contraceptive use; rates per 1,000 women ages 15 to 39



Source: Results from FamilyScape model runs using the baseline and simulation contraceptive distributions outlined in Table 1

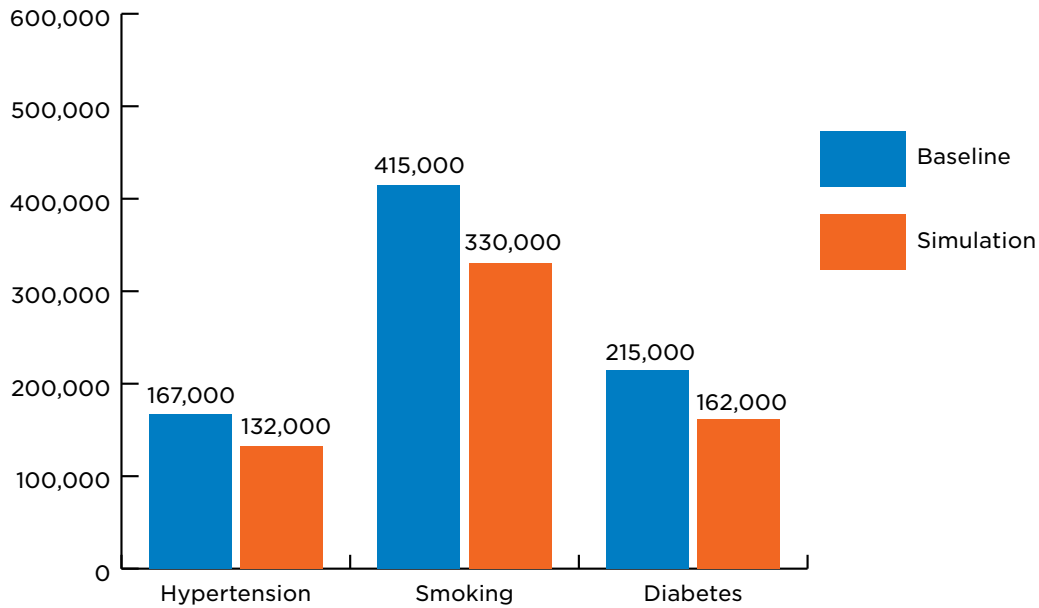
Projected reductions in negative maternal and child health outcomes

The simulation also resulted in large reductions in the estimated number of mothers with poor maternal health outcomes and the estimated number of newborns born into poverty and with poor child health outcomes (see Figure 2 and Figure 3). For instance, the estimated number of children born into poverty fell by 259,000 between baseline and simulation (a reduction of 22 percent), and there were 78,000 fewer babies born with low birthweight (a reduction of 23 percent). Additionally, an estimated 85,000 fewer mothers smoked during pregnancy (a reduction of 20 percent). However, it is important to note that all reductions in poor maternal and child health outcomes resulting from the simulation are generally proportional to the percentage reduction in births overall. Although previous research has linked unintended pregnancy to negative maternal and child health outcomes, we did not find significant differences between baseline and simulation in the *rate* at which women and newborns experienced negative maternal and child health outcomes, despite a reduction in unintended pregnancy. This finding is likely due to the specifics of our simulation and limitations of the FamilyScape model, as discussed further in the Limitations section below.

⁴ FamilyScape output overall birth, pregnancy and abortion rates for the baseline and simulation runs. We then translated these rates into rates of unintended pregnancy and unintended birth using the published estimates that 51 percent of pregnancies to women 15-44 in 2008 were unintended (Finer and Zolna, 2016) and 37 percent of births were unintended (Mosher et al, 2012).

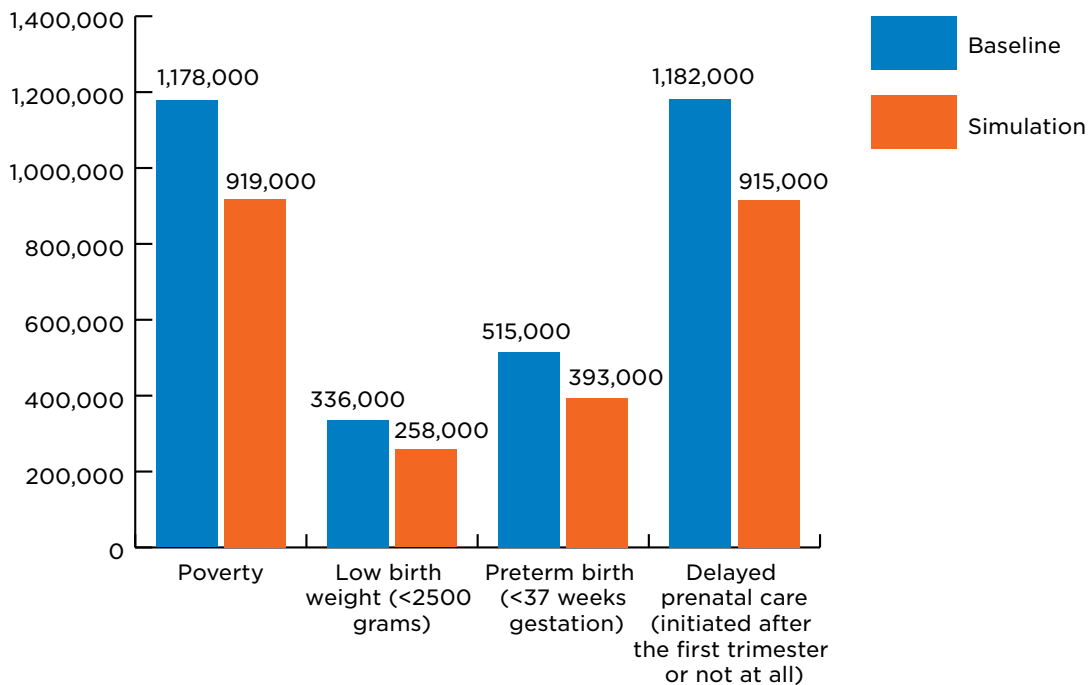
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Figure 2. Estimated number of women aged 15-39 nationwide experiencing negative maternal health outcomes,* baseline and simulation



Source: Results from FamilyScope model runs using the baseline and simulation contraceptive distributions outlined in Table 1
*Health outcomes during pregnancy

Figure 3. Estimated number of newborns nationwide experiencing negative child health outcomes, baseline and simulation



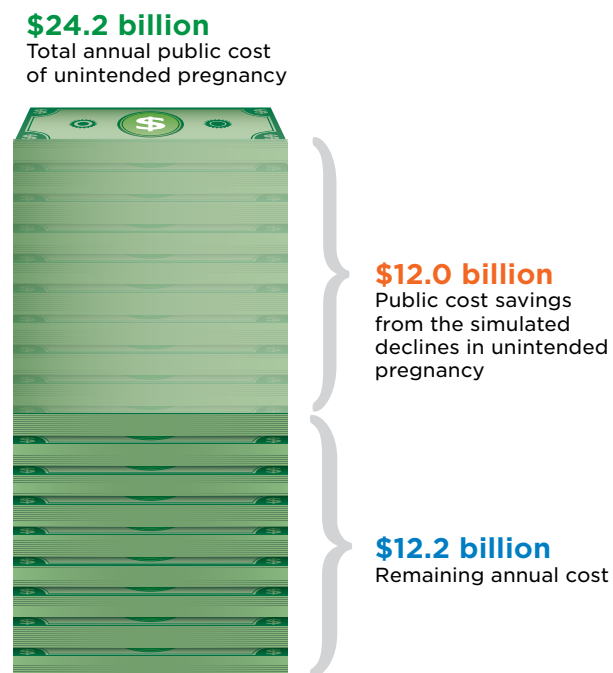
Source: Results from FamilyScope model runs using the baseline and simulation contraceptive distributions outlined in Table 1

Health care cost implications

Prior research indicates that \$17,000 (2015\$) is saved in public medical costs for each publicly-funded unintended birth averted (Sonfield and Kost, 2015).⁵ These costs include Medicaid-financed medical care for the mother, and Medicaid and CHIP-financed medical care for children in the first 5 years of life. Savings per incident are lower for abortions (\$1,440) and fetal losses resulting from unintended pregnancies (\$432) (Sonfield and Kost 2015). It is important to note that the public *savings* estimates in this report are lower than the calculated public *costs* per year based on the assumption that many avoided unintended pregnancies are mistimed (occurring earlier than desired) rather than unwanted and will still occur at a later date and will be publicly funded. Published estimates show that 16 percent of all abortions (Sonfield, Kost et al., 2011) and 68 percent of unintended births are publicly funded (Sonfield and Kost, 2015).⁶

We applied these per-incident savings estimates, along with the percentage publicly funded, to the estimated number of births, abortions, and fetal losses averted between our baseline and simulation results. Based on this, we calculate \$12 billion in public health care cost savings per year. To put this in perspective, researchers estimate that the total public cost of unintended pregnancy is \$24.2 billion annually (Sonfield and Kost, 2015),⁷ meaning that the simulated change in contraceptive use could cut annual public health care costs associated with unintended pregnancy by half.

Figure 4. Estimated public cost savings from the simulated declines in unintended pregnancy as a proportion of the total annual cost, 2015 dollars



Note: Original published estimate for the total cost of unintended pregnancy was \$21 billion in 2010 (Sonfield and Kost, 2015). For this report, we scaled up to 2015 dollars using the medical care component of Consumer Price Index for All Urban Consumers (CPI-U).

⁵ Original estimates were in 2010 dollars; estimates used in this report were inflated to 2015 dollars using the medical care component of the Consumer Price Index for All Urban Consumers (CPI-U).

⁶ We assume that 68 percent of fetal losses from unintended pregnancies are also publicly funded.

⁷ Original published estimate was \$21.0 billion in 2010, scaled to 2015 dollars using the medical care component of the CPI-U.

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Fewer babies and mothers experiencing negative maternal and child health outcomes can also result in reduced health care costs for both private and public payers (see text box on premature births in Appendix A, where we explore the medical costs associated with unintended premature births).

Limitations

There are some important limitations to keep in mind when reading this report. As noted above, we did not find any reductions in the *percentage* of women and newborns experiencing negative maternal and child health outcomes as a result of this simulation. All reductions in the number of women and newborns with adverse maternal and child health outcomes were a result of the overall decline in the number of births in the simulation. We had hypothesized that the simulated results would show a decline in the rates of negative birth outcomes, such as delayed prenatal care and low birth weight, as unintended pregnancy is associated with these outcomes. However, this was not the case. This unexpected finding may be the result of the intervention decreasing unintended pregnancies equally among *all* women, not just among the most disadvantaged women who tend to experience higher rates of unintended pregnancy and negative maternal and child health outcomes. Ultimately, this unexpected finding is likely due to a limitation of the model itself. Although the model includes demographic characteristics associated with unintended pregnancy (e.g., age and marital status), it would be best if FamilyScape could explicitly model women's pregnancy intentions at the outset and use women's pregnancy intentions to then model their contraceptive choices, pregnancy outcomes, and their maternal and child health outcomes should they have a baby. Unfortunately, there are currently no data available that would make it possible to credibly integrate pregnancy intentions into FamilyScape's simulation structure. Despite these limitations, however, FamilyScape remains a powerful tool for estimating the impact of changes in contraceptive use on population-level pregnancy and birth rates and related health outcomes.

Conclusion

Results from our simulation highlight the potential health and financial benefits of a large increase in the use of effective contraception among women in the United States. Changing the contraceptive use of women in the United States to mirror that of the Planned Parenthood clients after an intervention that provided access to the full range of contraceptive methods and contraceptive counseling would mean declines in the number of women who use no method or only condoms, and large increases in LARC and hormonal method use. These changes would lead to a 64 percent reduction in the number of unintended pregnancies, which, in turn, could result in billions of dollars in public health care cost savings. In fact, these savings are approximately half of the total public cost of all unintended pregnancies.

Another key finding from this analysis is the link between increased use of highly effective methods of contraception and reductions in the number of children born with poor outcomes. Reductions in unintended pregnancies and births mean fewer children born into poverty and fewer with negative birth outcomes such as low birthweight.

While such statistics highlight the importance of contraceptive use among women not seeking pregnancy, it is important to remember that our simulation is a “what-if” scenario and may be difficult to achieve in the real world. Planned Parenthood's clients are a select sample of women who have sought out a clinic for reproductive health services. It is not surprising, therefore, that they are far less likely than the general population to rely on condoms alone for birth control, with or without a clinic-level intervention (simulation findings based on the mix of contraceptive methods from the Planned Parenthood clinics that served as controls—that is, did not receive the intervention—are similarly dramatic, see Appendix A).

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In our simulation, only 2 percent of women rely on condoms as their primary form of birth control, meaning most women not seeking pregnancy would have to visit a health care provider for hormonal or long-acting birth control. Separate analyses (not shown) of the latest NSFG survey find that approximately half of sexually active women ages 15 to 39 did not receive family planning services in the past year.⁸ This suggests that many women may face barriers to accessing clinics (Dehlendorf, Rodriguez et al., 2010) or barriers to using contraception, such as ambivalence about pregnancy, lack of knowledge about method effectiveness, and concerns about side effects and cost (Kay, Suellentrop et al., 2009; Mosher and Jones, 2010). Increasing access to and use of reproductive health services is an important step towards increasing women's use of effective contraceptive methods and could thereby help women avoid unplanned pregnancy and improve health outcomes for women and children.

⁸ Defined as receiving a prescription for birth control, counseling on birth control, or a check-up related to birth control.

Appendix A: Additional Simulations

The contraceptive distribution for the simulation was drawn from a small number of Planned Parenthood clinics that received an intervention to increase access to the full range of contraceptive methods. Could we apply the contraceptive distribution from other clinics and see the same dramatic changes in pregnancy outcomes? To test this, we ran a simulation using the contraceptive distribution from the Planned Parenthood clinics in the control group of the 2015 Harper et al study. These clinics did not receive the intervention and continued to provide care as usual during the study period. Similar to the treatment clinics, we found that the use of LARC and hormonal methods among control clinic patients was much higher than the overall population, while the use of condoms (as the most effective method) was much lower and the use of no method was lower (see Table A1). In this simulation, the unintended pregnancy rates fell from 62.8 per 1,000 women to 27.7 (a 56-percent drop), the birth rate fell from 29.3 to 13.4 (a 54-percent reduction) and the abortion rate fell from 22.7 to 9.3 (a 59-percent drop; see Table A2). Studying the control clinics demonstrates that increasing women’s use of effective contraception, whether LARC or hormonal methods, could result in meaningful reductions in unintended pregnancy outcomes.

Table A1. Comparison of actual (baseline) and simulation contraceptive method distributions for women at risk of pregnancy*

	Actual distribution (baseline)	Distribution at Planned Parenthood control clinics (simulation)	Percentage point change
Male sterilization	6.7%	6.7%	0.0
LARC (IUD/implant)	5.4%	14.6%	+9.2
Injectable	3.7%	12.1%	+8.4
Pill/patch/ring	35.5%	50.4%	+14.9
Condom	31.9%	3.4%	-28.5
No method**	16.8%	12.8%	-4.0

*Women at risk of pregnancy are ages 15 to 39, sexually active, non-sterile, and non-sterilized.

**6 percent of women in the sample are seeking pregnancy; they are included in the “no method” category.

Note - In FamilyScape, the patch and ring are combined with the pill due to small sample size and the fact that efficacy rates for these methods are similar. Additionally, the pill/patch/ring category includes a small percentage of women using “other” methods such as sponge, diaphragm, natural family planning etc. The condom category also includes withdrawal.

If a woman used more than one method, she was assigned the most effective method.

Source: NSFG 2006-10 (baseline), Planned Parenthood control clinic data (simulation)

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Table A2. Reductions in unintended pregnancy, unintended birth, and abortion resulting from simulated changes in contraceptive use (control clinics); rates per 1,000 women ages 15 to 39

	Actual distribution (baseline)	Control clinics simulation	% reduction
Unintended pregnancy	62.8	27.7	56%
Unintended birth	29.3	13.4	54%
Abortion	22.7	9.3	59%

Source: Results from FamilyScape model runs using the baseline and simulation contraceptive distributions outlined in Table A1.

Medical cost savings from the estimated reduction in premature births

Fewer children born with complications can mean substantial reductions in overall medical costs borne by both private and public payers. To take a different view on the cost implications of our simulation analysis, we quantified the total medical costs averted from the simulated reduction in premature births (< 37 weeks gestation). This is a distinct estimate from our calculation of public cost savings, which focuses only on costs borne by *public* payers and includes prenatal, labor and delivery costs, and medical costs for the first 5 years of life for the *average* unintended birth. Medical costs for this analysis include inpatient and outpatient medical costs during the infant year for a premature birth, such as hospital accommodation costs, physician fees, and ancillary services (pharmacy, radiology, laboratory, respiratory care services, etc). For premature newborns covered under publicly-funded medical insurance, these are a subset of the medical costs in the first 5 years of life as included in our calculation of public health savings. However, this cost calculation also includes premature infants covered by *private payers*. The Institute of Medicine studied the costs of prematurity and estimated that the average total medical costs for a premature baby during the first year of life is \$45,000 (adjusted to 2015 dollars) (Behrman and Butler, 2007).^a We estimate that the simulation reduced premature births by 122,000 (see Figure 3), translating to \$5.5 billion in medical costs averted for both private and public payers.

^a Original estimates were presented in 2005 dollars and inflated to 2015 dollars using the medical care component of the Consumer Price Index for All Urban Consumers (CPI-U).

Appendix B: Technical Appendix

FamilyScape 3.0

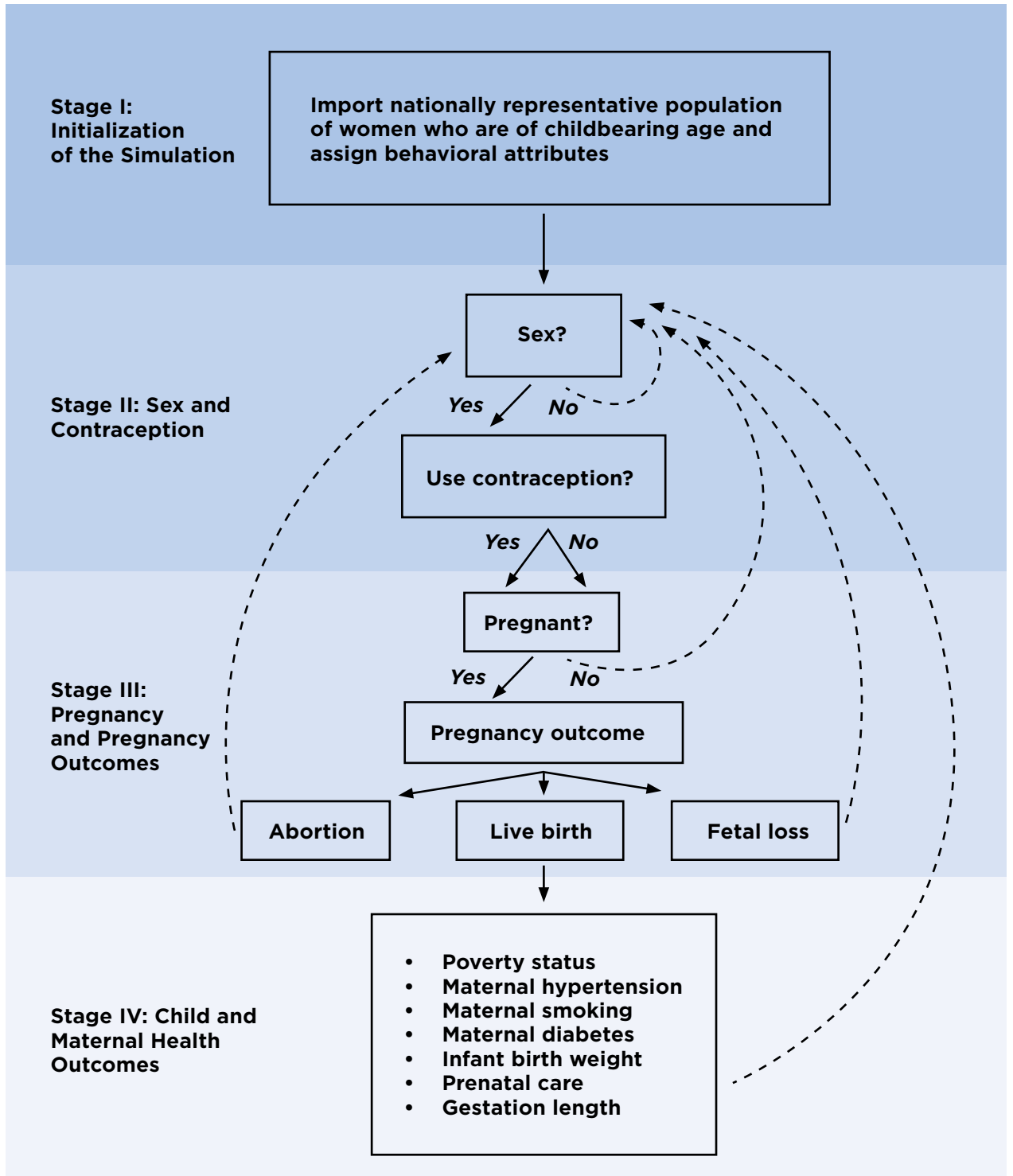
FamilyScape 3.0 was used in our analysis to assess the effect of improved contraceptive use on population-level pregnancy outcomes. FamilyScape 3.0 is a microsimulation model designed to reproduce fertility-related behaviors and outcomes as observed between 2006 and 2010 in the United States. The model has a daily periodicity, which is to say that each increment in analysis time corresponds to a single day. Behaviors and outcomes are simulated at the individual level and are then aggregated to produce population-wide estimates for various outcomes of interest.

The model's simulation population is nationally representative of women who are of childbearing age in terms of marital status, age, race, educational attainment, and socioeconomic status, and simulated behaviors and outcomes are allowed to vary across these demographic dimensions. Each of FamilyScape's inputs (sexual activity, contraceptive behavior, etc.) is simulated so as to ensure that aggregate measures of the resulting behaviors are consistent with real-world benchmarks. We then validate the model by comparing its outputs (rates of pregnancy among women who rely on various types of contraception, the incidence of childbearing among teens and adults, abortion rates within and outside of marriage, etc.) to their equivalent benchmarks. FamilyScape's baseline outputs are in line with the actual rates and distributions for the outcomes of interest, meaning the model can be used to perform simulations in which researchers change the key inputs and model the subsequent effects on the outputs.

The figure below delineates the various stages of the simulation. First, the model is populated (using data from the National Survey of Family Growth) with a nationally representative group of women who are assigned a set of behavioral attributes as a function of their demographic characteristics. Next, sexual activity (or a lack thereof) is simulated, and contraceptive use (or a lack thereof) is modeled among women who have sex. In the next stage, some sexually active women become pregnant as a function of their birth control method choice and underlying fertility. Each pregnancy eventually results in a birth, an abortion, or a fetal loss (often called a "miscarriage") and after the appropriate post-pregnancy infertility period, a woman is again eligible for pregnancy and the cycle begins again. For pregnancies that result in a live birth, the model assigns a poverty status to each newborn child using Census data. Additionally, child and maternal health outcomes are assigned during this final stage using Vital Statistics data. Specifically, maternal hypertension, maternal smoking, maternal diabetes, infant birth weight, prenatal care, and gestation length are determined based on the characteristics of the mother. For more information on FamilyScape 3.0, please see the technical guide, available at: <http://www.brookings.edu/~media/research/files/papers/2015/05/familyscape3/familyscape-thomas-karpilow.pdf>

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Figure B1. Diagram of the FamilyScape 3.0 Microsimulation Model



Contraceptive distribution adjustments

Unlike the Planned Parenthood sample in Harper et al (2015), FamilyScape’s population includes women seeking pregnancy and women relying on male sterilization. We analyzed the NSFG to determine what percentage of non-sterilized sexually active women ages 15 to 39 are seeking pregnancy. We did this separately by marital status as a higher percentage of married women are seeking pregnancy. We then increased the original “no method” use category accordingly and also accounted for women who rely on male sterilization (which did not change between baseline and simulation). In order to get the appropriate distribution for the condom, pill/patch/ring, injectable, and LARC categories in FamilyScape, we took the original distribution and multiplied by 94 percent for unmarried women (100 percent-2.6 percent who rely on male sterilization and 3.79 percent seeking pregnancy) and 77 percent for married women (100 percent -12.8 percent who rely on male sterilization and 9.9 percent seeking pregnancy). As a result, the percentages of married and unmarried women who are not seeking pregnancy and not relying on male sterilization who are using condoms, pill/patch/ring, injectables, LARC, and no method equal those from the Planned Parenthood distribution. We then combined the contraceptive method distributions for married and unmarried women, weighting each category by the percentage of married and unmarried women in our sample.¹ Below we show the original Planned Parenthood distribution, the overall simulation distribution, and the simulation distribution by marital status.

Table B1. Original Planned Parenthood distribution using method mix of study intervention clinics

Contraceptive method	Percentage of women
LARC	27.9%
Injectable	10.1%
Pill/patch/ring	52.4%
Condom	2.2%
No method	7.4%

*May add up to more than 100 percent due to rounding

Table B2. Simulation contraceptive distribution

Contraceptive method	Percentage of all women	Percentage of unmarried	Percentage of married women
Male sterilization	6.7%	2.6%	12.8%
LARC	24.3%	26.1%	21.5%
Injectable	8.8%	9.4%	7.8%
Pill/patch/ring	45.3%	48.7%	40.3%
Condom	1.9%	2.1%	1.7%
No method	13.6%	11.2%	17.3%

*May add up to more than 100 percent due to rounding

¹ We ran FamilyScape separately for married and unmarried women and the simulation results, when combined, were nearly identical to those produced from the single model with the full population. In this report we present the findings from the married and unmarried models combined.

References

- American College of Obstetricians and Gynecologists (2015). "Increasing Access to Contraceptive Implants and Intrauterine Devices to Reduce Unintended Pregnancy. Committee Opinion No. 642." *Obstet Gynecol* 126(e44-8).
- Behrman, R. E. and A. S. Butler (2007). *Preterm Birth: Causes, Consequences, and Prevention*. Washington, D.C., National Academies Press.
- Dehlendorf, C., M. I. Rodriguez, et al. (2010). "Disparities in family planning." *American Journal of Obstetrics and Gynecology* 202(3): 214-220.
- Dott, M., S. Rasmussen, et al. (2010). "Association between pregnancy intention and reproductive-health related behaviors before and after pregnancy recognition, National Birth Defects Prevention Study, 1997-2002." *Maternal and Child Health Journal* 14(3): 373-381.
- Finer, L. B. and M. R. Zolna (2016). "Declines in unintended pregnancy in the United States, 2008-2011." *New England Journal of Medicine* 374(9): 843-852.
- Harper, C. C., C. H. Rocca, et al. (2015). "Reductions in pregnancy rates in the USA with long-acting reversible contraception: a cluster randomised trial." *Lancet* 386(9993): 562-568.
- Healthy People 2020. (2016). "Family planning." Retrieved September 28, 2016, from <http://www.healthypeople.gov/2020/topics-objectives/topic/family-planning>.
- Karpilow QC & Thomas AT. (2017). "Reassessing the importance of long-acting contraception." *American Journal of Obstetrics and Gynecology* 216:148.e1-14.
- Kaye, K., K. Suellentrop, et al. (2009). *The Fog Zone: How misperceptions, magical thinking, and ambivalence put young adults at risk for unplanned pregnancy*. Washington, DC, The National Campaign to Prevent Teen and Unplanned Pregnancy.
- Kost, K. and L. Lindberg (2015). "Pregnancy Intentions, Maternal Behaviors, and Infant Health: Investigating Relationships With New Measures and Propensity Score Analysis." *Demography* 52(83).
- Mosher, W. D. and J. Jones (2010). *Use of contraception in the United States: 1982-2008*. *Vital and Health Statistics*. Hyattsville, MD, National Center for Health Statistics. 29.
- Sawhill, I., Q. Karpilow, et al. (2014). *Improving children's life chances through better family planning*. Washington, DC, Brookings Institution.
- Sonfield, A., K. Hasstedt, et al. (2014). *Moving Forward: Family Planning in the Era of Health Reform*. New York, Guttmacher Institute.
- Sonfield, A. and K. Kost (2015). *Public Costs from Unintended Pregnancies and the Role of Public Insurance Programs in Paying for Pregnancy-Related Care*. National and State Estimates for 2010. New York, Guttmacher Institute.
- Sonfield, A., K. Kost, et al. (2011). "The public costs of births resulting from unintended pregnancies: National and state-level estimates." *Perspectives on Sexual and Reproductive Health* 43(2): 94-102.
- Thomas, A. and Q. Karpilow (2016). "The intensive and extensive margins of contraceptive use: comparing the effects of method choice and method initiation." *Contraception* 94: 160-167.



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