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The intensive and extensive margins of contraceptive use: comparing the effects of method choice and method initiation

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Abstract

Objectives: The risk of pregnancy is estimated to be 20 times as high among women who use oral contraception, and 90 times as high among condom users, as among women who use certain long-acting contraceptive methods. We explored the population-level implications of this variation in contraceptive efficacy.

Study design: We used the FamilyScape 3.0 microsimulation model to study the effects on the nonmarital pregnancy rate of movements along two different margins of contraceptive behavior: the extensive margin, which captures decisions about whether to initiate use of any method of contraception among noncontraceptors; and the intensive margin, which captures the choice of methods among contraceptors. The model is populated with a nationally representative sample of 50,000 women who are of childbearing age.

Results: The impact on the number of nonmarital pregnancies would not be substantially different if noncontraceptors adopted long-acting methods than if they began using oral contraception. Moreover, the nonmarital pregnancy rate would be reduced by about twice as much if a subset of noncontraceptors began using condoms as if an equal number of pill users took up long-acting methods.

Conclusions: The prevailing emphasis on long-acting contraception is somewhat misplaced. Policymakers and practitioners will have the largest effects on fertility outcomes if they can change the behavior of sexually active women who neglect to use birth control when they are not seeking pregnancy.

Implications: Women's decisions about which methods to use are less impactful than their decisions about whether to use contraception at all. The policies that affect method choice are likely to differ from the policies that address the underlying motivations of noncontraceptors who are not seeking pregnancy.

Keywords: Contraception; LARC; Microsimulation; Nonmarital pregnancy

1. Introduction

Approximately half of all pregnancies in the United States — in excess of three million each year — are unintended [1]. Forty percent of unintended pregnancies are terminated [1], and children whose conceptions were unintended are disproportionately likely to be born at low birth weight [2] and to experience physical and mental health problems later in life [3]. Moreover, mothers who have unintended births are more likely to delay prenatal care [4], to show symptoms of depression [2,4] and to suffer from physical abuse [3].

A recent body of research emphasizes the potential of long-acting reversible contraception, or LARC, to reduce the incidence of unintended pregnancy. This research underscores the fact that the failure rates of long-acting methods such as intrauterine devices (IUDs) and subdermal implants are markedly lower than the failure rates of other forms of reversible contraception [5–8]. For example, the Contraceptive CHOICE Project in St. Louis provided participants with the reversible method of their choosing at no cost for up to 3 years. The risk of pregnancy among women who chose oral contraception, a vaginal ring or a transdermal patch was found to be 20 times as high as among women who chose LARC methods [8]. Other evidence suggests that some IUDs are 90 times as effective as condoms [9]. Peipert and colleagues aptly summarize the growing consensus among researchers and practitioners when they write that "increased

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uptake of LARC methods is essential to decreasing the rate of unintended pregnancy" [10].

The population-level implications of this variation in contraceptive efficacy are largely unknown. For instance, pregnancy rates are much higher in absolute terms among noncontraceptors than among women who use the least effective methods. The difference in absolute pregnancy risk is notably smaller between users of the least and the most effective contraceptive methods. It is therefore unclear whether the impact on the aggregate pregnancy rate would be materially different if a share of noncontraceptors were to adopt LARC methods than if they were to adopt comparatively less effective methods. Nor is it known whether the number of pregnancies would be substantially affected by the uptake of LARC methods among women who are currently using less effective forms of contraception. Thus, policymakers and practitioners lack information that is critical to understanding whether they can expect sizeable returns on investments of their limited resources in programs that increase the use of long-acting methods.

We address this gap in the literature by simulating the impacts of movements along two different margins of contraceptive behavior: the extensive margin, which captures decisions about whether to initiate use of any method of birth control; and the extensive margin, which captures the choice of methods among existing contraceptors. Simulations were performed using the FamilyScape 3.0 microsimulation model, which was developed by researchers at The Brookings Institution, Georgetown University, and Child Trends.

2. Materials and methods

2.1. Simulation model

We offer a brief explication of our model here; additional detail is provided in the appendix and in a separately available technical paper [11]. FamilyScape 3.0 simulates the key antecedents of pregnancy (sexual activity, contraceptive behavior and female fecundity) and its proximate outcomes (pregnancy, childbearing and abortion). The model is populated with a group of 50,000 stylized female agents who are of childbearing age and whose characteristics are nationally representative with respect to marital status, age, race, educational attainment and socioeconomic status. Behaviors and outcomes are simulated at the individual level and are generally allowed to vary across each of these demographic dimensions. FamilyScape is parameterized to produce aggregate distributions of simulated behaviors (for example, coital frequency and contraceptive use) that are comparable to equivalent distributions found in real-world data. The model can be validated by comparing its outputs to real-world benchmarks. Simulated annual rates of pregnancy, birth, and abortion are all within 4% of their benchmarks.

Fig. 1 provides an overview of FamilyScape's simulation structure. The model has a daily periodicity, which is to say that women decide on a daily basis whether to have sex. Each woman is assigned an initial "contraceptive type" that reflects her choice of female- and male-controlled methods. Contraceptive assignment depends both on a woman's demographic attributes and on the intensity of her sexual activity. With respect to female-controlled methods, we simulate use of three different categories of contraception: LARC methods; other female-controlled methods such as the birth control pill, transdermal patch or vaginal ring (PPR); and female sterilization. The LARC category, as defined in this analysis, encompasses IUDs, subdermal implants and injectable methods. In addition to capturing women who use the pill, patch or ring, the PPR category contains the small proportion (1%) of women who use emergency contraception or any nonhormonal, reversible, female-controlled method.

With respect to male-controlled methods, we simulate the use of condoms, withdrawal and male sterilization. Because condoms and withdrawal have roughly similar levels of efficacy [12], we collapse these two methods into a single "condom" category. Some women in the simulation use both female- and male-controlled methods, some use only one method and others do not use contraception. Women are allowed to switch contraceptive types at the beginning of each month. Contraceptive switching behaviors vary not only according to women's demographic characteristics but also according to their prior contraceptive histories and whether they have recently experienced a pregnancy. The parameters related to sexual behavior, initial contraceptive assignment and contraceptive switching were estimated using data from the female respondent file of the 2006–2010 National Survey of Family Growth (NSFG) [13].

A woman's probability of becoming pregnant when she has sex is a function of the efficacy of any contraception that

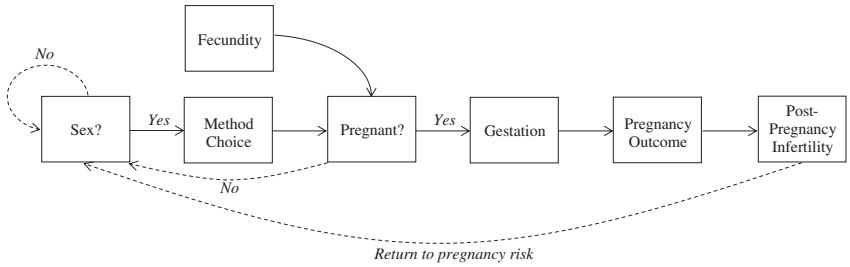

Fig. 1. Overview of the FamilyScape 3.0 simulation model.