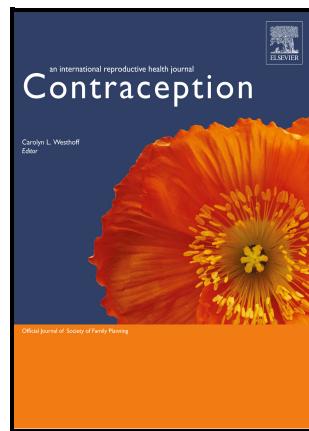


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The Demand for Male Contraception: estimating the potential market for users of novel male contraceptive methods using United States National Survey of Family Growth data

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ABSTRACT

Objective: To estimate the potential market for novel male contraceptives (NMCs) using United States National Survey of Family Growth (NSFG) data, 2015-2017.

Methods: We described the market for NMCs via secondary analysis of the 2015-2017 NSFG's weighted male respondent data, utilizing surrogate markers for contraceptive switching (NSFG) and contraceptive discontinuation data from the Contraceptive CHOICE project. Potential NMC users included men relying on: [1] no methods or less effective methods but who reported that they would be "very upset" if they got someone pregnant, [2] permanent methods but who reported that they might still want more children, [3] a female partner's method that she might discontinue in the next year, [4] a male method even when his partner uses her own contraceptive.

Results: Of 3,340 respondents—representing 55,890,830 sexually active, reproductive-age men—23.2% used no contraception at last intercourse, 15.8% condoms, 5.1% withdrawal, and 5.1% vasectomy. Among respondents relying solely on condoms, withdrawal, or no method, 19.7%, 3.8%, and 4.4% would be "very upset" if they got someone pregnant. For permanent contraceptive users, 17.3%-20.5% wanted another child. For men reliant on their partner's long-acting reversible or combined hormonal contraceptive, 12-17% and 45-51% of partners might discontinue their method. These data conservatively suggest that 13% or more than 7 million men would potentially use NMCs, rising to 15.5 million with less restrictive contraceptive switching criteria.

Conclusion: Adjusting for pregnancy attitudes and likelihood of contraceptive switching, a substantial portion (between 7–15.5 million) of reproductive age men in the US are potential NMC users.

Implications: The population of potential novel male contraceptive users extends beyond just users of condoms, withdrawal and vasectomy and should include couples practicing dual-partner contraception and female partners using contraceptive methods that they may become dissatisfied with and discontinue.

Keywords: male contraception, condoms, vasectomy, withdrawal, acceptability

1. Introduction

In the early 2000s, multinational pharmaceutical companies (e.g., Wyeth, Schering, Organon, Merck) abandoned their male contraceptive research and development programs, citing high costs of research and development, the sufficient variety and supply of low-cost female contraceptive methods on the market, and the liability attributed to adverse events occurring from the regular use of therapeutics by healthy individuals. Specific to novel male contraceptives, concerns are consistently raised by the public about men's willingness to use novel methods and their female partner's willingness to trust them [1], despite substantial research refuting such skepticism [2]. However, an unmet need for contraceptives remains, as a substantial proportion of female users will not tolerate or may be unable to safely use the most effective methods of female contraception[3]. Incremental improvements in condom design and vasectomy procedures are insufficient as condoms remain underutilized [4], and vasectomies remain inaccessible to men in low-resource settings [5]. Novel methods of male contraception could fill this gap and systematic reviews of both clinical trial and population survey data on men's willingness to use novel male contraceptives directly contradict notions that men might not be interested in participating in contraception and family planning. The proportion of male participants in clinical trials reporting willingness to use a male contraceptive ranged from 34% to 82% and the proportion from surveys about hypothetical methods ranged from 14% to 83% [2]. Specific to the United States (US), a population survey conducted in 2002 of 1500 men reported willingness among 49.3% of respondents [6]; two decades later, an online survey of 2066 men from the US and Canada reported willingness among 75% of respondents [7]. Surveys of female clients at family planning clinics similarly demonstrate willingness to trust their male partners to use male contraceptives in 40-78% of respondents [8]. In a recent survey of male partners in attendance at their female partner's abortion, approximately three-quarters of respondents indicated that preventing an unintended pregnancy was a shared responsibility, acknowledged the importance of going through contraceptive counseling with their female partner, and endorsed willingness to use novel male contraceptives [9]. As men's roles and responsibilities in society shift towards the gender equitable support of women, men may become more interested in using a contraceptive of their own [10].

On November 1, 2022, a National Institutes of Health-sponsored, multinational, Phase 2b clinical trial of a self-administered hormonal male contraceptive transdermal gel completed recruiting nearly 500 couples for its year-long evaluation of contraceptive efficacy [11]. That same year, four men in Australia received injections of a nonpermanent hydrogel into the vas deferens for contraception and are undergoing surveillance for safety and semen analysis for 3 years [12], and the first non-hormonal male contraceptive pill began in-human dose-finding studies [13]. Such developments in male contraceptive research and development suggest that a marketable male contraceptive is on the horizon, thereby warranting a reassessment of the market for male contraception.

Population scientists used US National Survey of Family Growth (NSFG) data from 2006-2010 to project a potential US market for male contraceptives of approximately 10 million men [14]. However, these rough projections limited candidates for male contraception to unmarried fathers, married condom users, and vasectomy users, not recognizing that men whose female partners are using contraception might use male contraception in addition or instead. Previous studies note the impact of female contraceptive user experiences on men's contraceptive attitudes [15] and how men can influence their female partner's decisions about female hormonal contraceptive use or even discontinuation [16,17]. In addition, some men may see contraceptive risk as risk that should be shared by the couple [18]. Further, the estimate simplistically assumed that 50% of eligible candidates would potentially use male contraceptives, however more precise estimates of contraceptive use should consider individuals' motivation to avoid pregnancy [19]. For these reasons, we provide an updated, more precise estimate of potential male contraceptive users in the US, considering these factors and using more recent NSFG data from 2015-2017.

2. Materials and Methods

2.1 Survey and sample

The US NSFG collects population-level data on relationships, family planning, contraceptive use, and general reproductive health in the United States. NSFG data are collected via in-person interviews of a nationally representative, independent sample of US men and women aged 15 – 49 years. We restricted our analysis to available male data from 2015 to 2017. Responses to particularly sensitive questions are collected using audio computer-assisted self-interviewing (ACASI). The survey oversamples for non-Hispanic black, Hispanic, and teenage individuals (ages 15-19 years old). All respondents are assigned weights based on national averages of race, ethnicity, and age from the US Census Bureau. A more detailed description of the NSFG's design and methodology for the 2015-2017 data collection cycle is available through the National Center for Health Statistics [20]. As NSFG data are de-identified and publicly accessible, institutional board review was not obtained.

2.1 Measures & Analysis

Previous attempts to estimate the market for male contraception arbitrarily assumed that 50% of unmarried fathers, married condom users, and vasectomy users might be potential

users of NMCs [14] To provide a more precise estimate of which users of currently available male contraceptive methods might use NMCs, we considered the role of pregnancy attitudes as reported in the 2015-2017 NSFG's weighted male respondent data. Specifically, we considered that condom users, withdrawal users, and users of no method of contraception might use NMCs if they reported that they would be "very upset" if they got someone pregnant. We considered that vasectomy users might have otherwise used NMCs if they reported that they might "want a(nother) child sometime. We additionally considered dual partner contraceptive use where we included male partners who were using condoms or withdrawal despite reporting primary reliance on their female partner's contraceptive method in the NSFG.

Previous estimates further fail to consider that the decision to use and switch methods may be dependent on the methods being used by female partners, their satisfaction with those methods, and likelihood of discontinuing them. Our estimate thus includes male respondents relying on a female method and considered that the proportion of potential NMC users might be those likely to discontinue the method within 12 months, based on multi-year, prospective cohort data from the Contraceptive CHOICE project [21], which offered no-cost, reversible contraception and counseling to more than nine thousand women in St. Louis, Missouri, USA. While these discontinuation data reflect an ideal clinical trial setting where individuals had greater access to consultation, prescription, and removal of implants and intrauterine devices, we believe these data may closely reflect current estimates given the passage of the Affordable Care Act and its provisions for cost-free contraception. Thus, for couples relying on a female contraceptive method, we estimated the proportion of men who might use NMCs as the proportion both reporting that they would be very upset if their partner became pregnant and discontinuing their female contraceptive method within 12 months.

We thus considered the potential pool of NMC users to include men relying on: (1) no methods or less effective methods (e.g., condoms, withdrawal) but who reported that they would be "very upset" if they got someone pregnant, (2) permanent methods (e.g., vasectomy, tubal ligation) but who reported that they might still want more children, (3) a female partner's method that she might discontinue in the next year (e.g. pill, patch, IUD), (4) a male method even when his female partner is using her own contraceptive. The above pool offered a more conservative estimate using restrictive criteria.

We additionally offered a more moderate estimate, whereby we included those who would be "upset or very upset" if they got someone pregnant, as well as vasectomy and tubal ligation users who "might want" or who were "unsure" if they might want another child. With respect to female methods, we considered reports of dissatisfaction with their method as criteria that might be linked to willingness to switch to using NMCs.

All analyses were performed using STATA version 13.1 for Windows (STATA Corp. College Station, TX, USA); all percentages presented are weighted according to weights provided by the NSFG via the National Center for Health Statistics.

3. Results

Of 3,340 respondents—representing 55,890,830 reproductive-age men reporting sexual intercourse within the last 12 months—23.2% used no contraception at last intercourse, 15.8% used condoms, 5.1% withdrawal, 5.1% vasectomy, and 50.1% relied on their female partner’s method (Table 1).

We first considered men who reported using no method, being unsure if their partner was using a method, or using less effective male-controlled methods, but who reported that they would be “very upset” if they got someone pregnant. Among respondents who use no method or who were unsure about their partner using a method, 4.3% and 11.1% reported that they would be “very upset” if they got someone pregnant, corresponding to 545,557 and 19,066 individuals, respectively. For condom and withdrawal users, 19.7% and 3.8% reported that they would be “very upset” if they got their partner pregnant, corresponding to 1,746,686 and 107,717 individuals, respectively. For dual method users where the male partner used condoms or withdrawal, 19.7% and 3.8% reported that they would be “very upset” if they got their partner pregnant, corresponding to 1,746,686 and 107,717 individuals, respectively (Table 2).

We considered that users of permanent contraception might prefer to use NMCs if reporting that they wanted to have another child some time, which we noted among 20.5% of men reliant on their female partner’s tubal ligation and 17.3% of men who received a vasectomy, corresponding to 1,210,565 and 491,962 individuals, respectively.

We considered men reliant on their female partner’s long-acting reversible or combined hormonal contraceptive method to be potential NMC users only if their female partners might discontinue their current method (12-17% and 45-51%, respectively) and if they would be “very upset” if they got their partner pregnant (8-16% and 7.7-15.5%, respectively). We thus estimated that 86,889 men relying on female long-acting reversible contraceptives and 424,020 men relying on combined hormonal contraceptives might use NMCs (Table 3).

These data suggest that about 13% of sexually active, reproductive-age men would be potential NMC users, corresponding to more than 7 million men. We acknowledge however, that this estimate is based on conservative assumptions of men only adopting NMCs in extreme cases where they would be “very upset” if they got their partner pregnant. As previous research identified significant associations between men’s willingness to use NMCs and their beliefs about gender equity [7], and noted the positive influence of men’s perceptions of what their female partner would think of them using NMCs [22], the extent of their desire to avoid pregnancy might not need to be as great. Thus, when expanding inclusion criteria for use of NMCs to include men who would be at least “upset” (rather than just “very upset”) about getting their partner pregnant, men relying on permanent contraception who either wanted or were unsure about wanting more children (rather than just wanted alone), and men relying on a female method that their partner expressed

dissatisfaction (rather than discontinued), the estimated number of potential NMC users rises to 15.5 million men.

4. Discussion

Skepticism persists surrounding the market for new male contraceptive methods despite the multitude of surveys indicating that men would be willing to use them. Some of the skepticism may be related to the predominance of female contraceptive methods on the market and already being used by couples for pregnancy prevention, which might leave a substantially smaller proportion of individuals not using any method and wanting to avoid pregnancy. Combined hormonal contraceptive pills are among the most prescribed drugs in the United States, with more than 13 million reproductive-age women using them for pregnancy prevention [23]. However, women commonly express dissatisfaction and will discontinue their contraceptive methods, using approximately 3.4 different contraceptive methods throughout their lifetimes [24]. Such contraceptive switching creates an opportunity for the introduction of novel male contraceptives.

5. While previous estimates of the male contraceptive market characterized users as those who might switch from condoms, withdrawal, or vasectomy, our analysis considers the role of pregnancy aversion in men's likelihood of using NMCs instead, as well as the role of dissatisfaction with and discontinuation of female methods to provide a more comprehensive and precise market estimate. Additionally adjusting for pregnancy attitudes, we estimated that more than 7 million reproductive age men in the United States might use novel male contraceptives, an estimate that rises to more than 15 million men when considering variations in attitudes towards getting someone pregnant. In addition, we note that dual-contraceptive users in this analysis contributed nearly one-third of potential NMC users. With the increasing adoption of dual or even multiple concurrent contraceptive methods among couples over time [25], new male contraceptive methods may have an even greater share of users. While these findings do not ultimately deviate too far from previous estimates of the market for male contraceptives at approximately 11 million men [14], their combination with our findings, as well as US population surveys projecting findings of male contraceptive acceptability among approximately 75% of surveyed men [7,26], offer a reassuring forecast for male contraceptive developers and investors.

Regardless of financial projections on the demand and market for new male contraceptives, the development of new male contraceptives offers a priceless opportunity for men to take on a reproductive responsibility historically and disproportionately shouldered by their female partners. As women increasingly express their dissatisfaction with hormonal contraceptive methods and a desire to regain control of their own bodies [27], they might readily encourage their male partners to consider new male contraceptives. In fact, in population surveys of men, one of the strongest predictors of whether he might use a novel male contraception pill or injection was whether he thought his female partner would want him to use it [28].

While our estimates offer an encouraging outlook on male contraceptive demand, they are based on numerous assumptions about contraceptive use that remain isolated from attitudes towards an actual male contraceptive product on the market. We additionally note the potential for overestimate in using men's attitudes towards getting someone pregnant as a proxy for men's potential use of a novel male contraceptive, as attitudes may not translate into behavior. In fact, our review of NSFG data indicates that even among those expressing that they would be very upset about getting someone pregnant, 8.9% still did not use a method of contraception at their last intercourse. This population might represent individuals who are fatalistic about their ability to prevent pregnancy or individuals awaiting a more acceptable method of contraception. Nevertheless, we also note that our estimate could even underestimate the pool of potential users as research on women's contraceptive behaviors note the use of contraception among 63% of women with low preference to avoid a pregnancy. Women using contraception to meet their male partner's greater desire to avoid a pregnancy may represent an additional pool of male contraceptive users.

The absence of private pharmaceutical investment in male contraceptive development is evidence that male contraception has been judged to be unprofitable [14]. However, our analysis suggests that the market for new male contraceptives may be greater than that of any of the non-oral hormonal female contraceptives that continue to be marketed today. With the increasing visibility of online testimonials featuring women's negative experiences with hormonal contraception and their exacerbation of "hormonophobia" [29], the pool of male contraceptive users may have the potential to even eclipse the current 13 million users of combined oral contraceptives. The value of investments in male contraception warrant re-examination particularly considering a society transitioning towards greater gender equitability and shared contraceptive responsibility [7].

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Competing Interests:

BTN provides consultation for Sebela Pharmaceuticals and Sumitomo Pharmaceuticals, the products of which are not relevant to this research.

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Table 1: Contraceptive method used at last intercourse and sociodemographic characteristics among sexually active, reproductive age male respondents from the National Survey of Family Growth (2015–2017)

Contraception used at last intercourse in the 12 months prior to survey* (N=3,340) [§]						p
	Condoms, n=627 (15.8%);	Withdrawal n=165 (5.1%)	Vasectomy n=129 (5.1%)	Female method† n=1614 (50.8%)	No method‡ n=805 (23.2%)	Total
Want a(nother) child some time (%)						<0.001
Yes	448 (19.6)	110 (5.2)	21 (1.5)	961 (48.7)	511 (24.9)	2051
No	159 (9.9)	54 (5.1)	108 (10.6)	606 (53.1)	283 (21.3)	1210
Unsure	20 (23.2)	1 (0.3)	0 (0.0)	47 (63.1)	11 (13.4)	79
Upset if they got someone pregnant (%)						<0.001
No opinion or pleased	343 (11.8)	105 (5.1)	129 (7.2)	983 (46.6)	682 (29.3)	2242
Little upset	169 (24.6)	48 (7)	0 (0)	382 (60.7)	78 (7.6)	677

Very upset	115 (27.6)	12 (1.7)	0 (0)	249 (61.7)	45 (8.9)	421
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[§] Sample represents 55,890,830 US reproductive age males, reporting sexual intercourse in last 12 months.

* Respondents categorized as users of male-controlled methods of contraception only if no other method of contraception was used by the respondent. Respondents were categorized as users of a female method if a male-controlled method was used in conjunction with a female method.

† Female methods include pills, patches, vaginal rings, injections, intrauterine devices, implants, spermicide, tubal ligation, or the rhythm/calendar method.

‡ “No method” refers to instances where male respondents reported not using any male or female method, as well as where he did not use any method and did not know if his female partner used a method.

Table 2: Estimating potential novel male contraceptive (NMC) users by contraceptive method used at last intercourse, adjusted by pregnancy attitudes and likelihood of method switching – among men relying on male/female sterilization, male-controlled contraceptive methods, and no method.

Contraceptive method used at last intercourse	Contraceptive eligible men, weighted (N=56,588,371)	Adjustment factors (%)	Most restrictive criteria Potential NMC market size ($\pm 2\%$ error)	Adjustment factors (%)	Moderate estimate Potential NMC market size ($\pm 2\%$ error)
Received permanent contraception					
Female sterilization	5,888,958	20.5% ^a	1,210,565 (1,186,353- 1,234,776)	21.0% ^d	1,236,681 (1,211,947- 1,261,415)
Vasectomy	2,844,865	17.3% ^a	491,962 (482,122- 501,801)	17.3% ^d	491,962 (482,122- 501,801)
No method used					
Female partner did not use method	12,792,735	4.3% ^b	545,557 (534,646- 556,468)	9.72% ^e	1,243,454 (1,218,585- 1,268,323)
Unsure if female partner used method	172,398	11.1% ^b	19,066 (18,685-19,447)	40.3% ^e	69,476 (68,086-70,866)
Single male method used only (Tier 3)					
Condoms	8,856,774	19.7% ^b	1,746,686 (1,711,752- 1,781,620)	47.0% ^e	4,162,684 (4,079,430- 4,245,938)
Withdrawal	2,822,494	3.8% ^b	107,717 (105,563- 109,871)	28.2% ^e	795,943 (780,024- 811,862)
Dual male and female method used					
Condoms	6,934,918	23.3% ^b	1,613,209 (1,580,945- 1,645,473)	55.2% ^e	3,828,075 (3,751,514- 3,904,637)
Withdrawal	4,037,492	25.4% ^b	1,026,242 (1,005,717- 1,046,767)	56.1% ^e	2,265,033 (2,219,732- 2,310,334)

NMC USERS FROM CURRENT MALE CONTRACEPTIVE SWITCHING OR INITIATION	6,761,004 (11.9%)	14,103,308 (24.9%)
TOTAL POTENTIAL NOVEL MALE CONTRACEPTIVE MARKET ($\pm 2\%$)	7,200,402-7,494,296 (12.7-13.2%)	14,983,292-15,594,854 (26.5-27.6%)

* Rounded to 2% from a 1.70% margin of error calculated based upon a sample size of 3,340 respondents extrapolated to represent a population size of 55,890,830 men reporting intercourse with a female partner in the 12 months prior to survey

^a Weighted % of male NSFG respondents reporting they might “want a(nother) child sometime”; ^d might want or are unsure

^b Weighted % of male NSFG respondents reporting they would be “very upset” if they got someone pregnant; ^e “upset” or “very upset”

Table 3: Estimating potential novel male contraceptive (NMC) users by contraceptive method used at last intercourse, adjusted by pregnancy attitudes and likelihood of method switching – among men relying on female-controlled contraceptive methods.

Contraceptive method used at last intercourse	Contraceptive eligible men, weighted (N=56,588,371)	Most restrictive criteria Adjustment factors (%)	Potential NMC market size ($\pm 2\%$ error)	Moderate estimate Adjustment factors (%)	Potential NMC market size ($\pm 2\%$ error)
Single reversible female method used only (Tier 1)					
Intrauterine device (hormonal or copper)	3,690,712	If all LNG: 16.1% ^b x 12% ^c	If 79% LNG uptake: ^t $595,005 \times 0.12 \times 0.79 = 56,407$ (55,279- 57,535)	If all LNG: $36.7\% \times 14\% = 5,135$ x 0.79 = 149,807 (146,811- 152,803)	If 79% LNG uptake: ^t $1,354,491 \times 0.14 = 194,987$ x 0.79 = 149,807 (146,811- 152,803)
		If all copper: 16.1% ^b x 16% ^c	If 21% copper uptake: ^t $595,005 \times 0.16 \times 0.21 = 19,992$ (19,592- 20,392)	If all copper: $36.7\% \times 20\% = 7,340$ x 0.21 = 15,751 (15,589- 15,920)	If 21% copper uptake: ^t $1,354,491 \times 0.20 = 270,898$ x 0.21 = 56,889 (55,751-58,027)
Subcutaneous implant	795,628	8.0% ^b x 17% ^c	$63,824 \times 0.17 = 10,850$ (10,633- 11,067)	28.8% x 21.3% = 48,120 (47,158-49,082)	$229,141 \times 0.21 = 48,120$ (47,158-49,082)
Single reversible female method used only (Tier 2)					
Combined oral contraceptive pill	5,476,755	14.2% ^b x 45% ^c	$778,535 \times 0.45 = 350,341$ (343,334- 357,348)	39.5% ^e x 46% ^f = 1,015,029	$2,163,318 \times 0.46 = 995,126$ (975,223- 1,015,029)

Depot medroxy-progesterone acetate	608,619	15.5% ^b x 43% ^c	94,124 x 0.43 = 40,473 (39664-41,282)	36.9% ^e x 46% ^f	224,580 x 0.46 = 103,307 (101,241- 105,373)
Vaginal ring	764,289	7.7% ^b x 46% ^c	58,549 x 0.46 = 26,933 (26,394- 27,472)	41.1% ^e x 47% ^f	314,123 x 0.47 = 147,638 (144,685- 150,591)
Transdermal patch	126,314	9.7% ^b x 51% ^c	12,300 x 0.51 = 6,273 (6,148-6,398)	9.7% ^e x 56% ^f	12,252 x 0.56 = 6,861 (6,724-6,998)
Single reversible female method used only (Tier 3)					
Rhythm method	240,594	24.7% ^b	59,426 (58,237- 60,615)	53.9% ^e	129,680 (127,086- 132,274)
Spermicide	4,601	0.0% ^b	0	100% ^e	4,601 (4,509-4,693)
Other	419,245	3.7% ^b	15,650 (15,337- 15,963)	10.9% ^e	45,698 (44,784-46,612)
NMC USERS FROM FEMALE CONTRACEPTIVE SWITCHING			586,345 (1.0%)		1,687,727 (3.0%)
TOTAL POTENTIAL NOVEL MALE CONTRACEPTIVE MARKET ($\pm 2\%$)			7,200,402-7,494,296 (12.7-13.2%)		14,983,292-15,594,854 (26.5-27.6%)

* Rounded to 2% from a 1.70% margin of error calculated based upon a sample size of 3,340 respondents extrapolated to represent a population size of 55,890,830 men reporting intercourse with a female partner in the 12 months prior to survey

^b Weighted % of male NSFG respondents reporting they would be “very upset” if they got someone pregnant; ^e “upset” or “very upset”

^c Proportion of women from CHOICE project discontinuing their method after 12 months; ^f reporting dissatisfaction after 12 months

^t Data on proportion of levonorgestrel versus copper IUD users taken from clinical trial data from the CHOICE project