Association between Increased Emergency Contraception Availability and Risky Sexual Practices

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Objective. We studied whether increased emergency contraception availability for women over age 18 was associated with a higher probability of risky sexual practices.

Data. A total of 34,030 individual/year observations on 3,786 women aged 18 and older were extracted from the National Longitudinal Survey of Youth, 1997 from October 1999 through November 2009.

Study Design. We modeled three binary outcome variables: any sexual activity; sexual activity with more than one partner; and any sex without a condom for women with multiple partners for women in states with state-level policy changes (prior to the 2006 FDA ruling) and for women in states subject to only the national policy change both jointly and separately.

Findings. We found different results when estimating the state and federal changes separately. The national change was associated with a reduction in the probability of sexual activity, a reduction in the likelihood of reporting multiple partnerships, and there was no relationship between the national policy change and unprotected sexual activity. There was no relationship between the probability of sexual activity or multiple partnerships for women in states with their own policy changes, but we did find that women in these states were more likely to report unprotected sex.

Key Words. Health economics, health policy, politics, reproductive health policy, state health policies

The Food and Drug Administration (FDA) approved *Plan B*, an emergency contraceptive pill (EC), for behind-the-counter (BTC) sale to individuals 18 years and older on August 24, 2006, reversing a position it had taken in 2004 (FDA 2012); G.A.O. 2005). Prior to this federal ruling, eight states passed legislation allowing EC to be sold BTC.¹ The controversy over offering *Plan B* BTC continued through the end of 2011, when the Obama administration declined to extend BTC status for *Plan B* to younger women (Harris 2011; Wood, Drazen, and Greene 2011). Much of the controversy revolves around

the degree to which BTC access to EC will have unintended consequences for risky sexual behaviors. By reducing the risk of pregnancy, EC lowers the expected cost of unprotected sex; when the expected cost of anything falls, one expects the amount of that thing to increase. Thus, some opponents of making *Plan B* available without a prescription are concerned that increasing access may increase sexual activity (especially among youth), decrease condom use (which may lead to increases in sexually transmitted infections [STIs]), or decrease other, more effective, types of contraceptive use, as EC is less effective than other FDA-approved contraceptives (Wearn and Gill 1999; Grimes 2002; Hatcher, Trussell, and Nelson 2007). However, it is also possible that increased access to EC may actually limit women's ability to obtain protected sex (if their partners desire unprotected sex and know pregnancy risk can be controlled *ex post*) and thus lead some women to control STI risk through abstinence or monogamy. These two countervailing forces imply that whether EC access reduces or increases risky sexual behaviors on net is an empirical question.

In this article, we explore the relationship between increased EC availability and the probability of risky sexual practices for women over age 18. We do this by conducting a retrospective analysis of female respondents to the National Longitudinal Survey of Youth, 1997 (NLSY97) using observations from October 1999–November 2009 (34,030 individual/year observations on 3,786 women). Between 1998 and 2006, eight states increased the availability of EC by allowing it to be sold BTC² and then in August of 2006, the FDA ruled that EC would be available BTC in all states to women over age 18. We estimate fixed effects (linear probability) longitudinal regressions at the individual level to model the impact of EC access changes on (1) the probability of any sexual activity; (2) the probability of multiple sexual partners; and (3) the probability of any sex without a condom conditional on having multiple sexual partners.

Our results suggest that BTC availability of EC was associated with a reduction in the likelihood of sexual activity and of multiple sexual partners for women subject to the national policy change and was associated with an increased probability of unprotected sex (and consequently the risk of STIs) for those women subject to the state-level policy changes. Finally, we discuss

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what these results suggest about inducing moral hazard, changes to the relative power women have in negotiating safe sex practices with their partners, and ways that FDA and state policies might be adjusted to account for this.

LITERATURE ON EC EFFECTIVENESS

Most research on EC's effect on women's sexual behaviors has focused on advance provision of EC to groups of women enrolled in research trials. Generally, these studies have not found evidence that providing advance supplies of EC results in lower rates of more effective contraception, increases in unprotected sex, increases in STIs, or increases in pregnancy rates (Glasier and Baird 1998; Jackson et al. 2003; Gold et al. 2004; Lo et al. 2004; Raine et al. 2005; Raymond et al. 2006; Polis et al. 2007; Ekstrand et al. 2008; Trussell and Raymond 2011). However, one study of a young, high-risk clinic population found that the advance provision group was more likely to use less effective contraception than the control group (Trussell and Raymond 2011; Wood, Drazen, and Greene 2011). In addition, reanalysis of data from one randomized controlled trial found that women in the advance provision group were more likely to report unprotected sexual activity resulting in pregnancy than women in the control group (Wearn and Gill 1999; Trussell and Raymond 2011). Women receiving advance EC provision also were more likely to report using EC because they did not want to use condoms or another form of birth control (Weaver, Raymond, and Baecher 2009; Trussell and Raymond 2011). It is important to note that the research on advance EC provision has been conducted on relatively small samples of women in trials settings; little evidence exists on the effects of advance EC provision in the community at large. This study addresses this gap in the literature by studying the relationship between increased access to EC using a nationally representative, longitudinal dataset.

In addition to clinical trials examining advance access to EC, other studies have evaluated the relationship between allowing EC to be sold without a prescription and women's reproductive behaviors. Pharmacy access to EC in France did not increase transitions into sexual activity, decrease age of sexual initiation, or increase risk for unintended pregnancy for young women (Moreau, Bajos, and Trussell 2006; Trussell and Raymond 2011). Unintended pregnancy and STI rates were the same for women (aged 15–24 years old) in four family planning clinics in California who were given either advance EC provision, pharmacy access, or prescription access (Trussell and Raymond 2011; Wood, Drazen, and Greene 2011). The first national study of the

impact of BTC access to EC (from the United Kingdom) found that making EC available without a prescription did not significantly change women's contraceptive behaviors (Marston, Meltzer, and Majeed 2005; Trussell and Raymond 2011). A more recent study found that pharmacy provision of EC in England was associated with significant increases in STI diagnoses for teens (Girma and Paton 2011). To our knowledge, only two population-level studies have assessed the effect of increased access to EC in the United States. Durrance (2012) used county-level changes in pharmaceutical EC access in Washington State to examine changes in abortion rates, birth rates, and STI rates. Pharmacy access in these counties led to an increase in gonorrhea rates, but was not associated with changes in abortion rates or birth rates (Durrance 2012). Using the data from the Youth Risk Behavior Surveillance System (YRBS), Atkins and Bradford (2013) studied the effect of increased access to EC in New England on youth sexual behaviors and found that switching EC to nonprescription status had no systematic effect on the probability of sexual activity or the probability of hormonal birth control use but that it significantly reduced the probability that public school students used condoms (Atkins and Bradford 2013).

The current analysis expands the literature on increased pharmacy access to EC in the following ways: (1) to our knowledge, this is the first study to assess increased access to EC BTC using a nationally representative dataset in the United States; (2) we study the effects of both the various state-level and national policy changes that increased access to EC; and (3) although other studies have found a relationship between increased pharmacy access to EC and STIs, this is the first study to examine how BTC access might be related to the behaviors that could lead to increased STI risk.

DATA

For this study, we used data from the NLSY97, a nationally representative longitudinal survey of youth. As we have repeated observations for the same women for the duration of the survey, this enabled us to utilize individual fixed effects in our models. We obtained access to the NLSY state-level geocode sample and were able to identify respondents by state of residence in each wave of the data so we could correctly measure BTC status for *Plan B* as there were both state and national policy changes.³ We measured state-level BTC access as a 1 if the observation was from a state after BTC access was implemented, and we measured national-level BTC access as a 1 if the obser-

vation was from a state subject only to the FDA change that occurred August of 2006. NLSY97 respondents were contacted approximately annually in waves from 1997 through 2009. The survey collected detailed information on dating, marriage, fertility, sexual activity, and information for a rich set of control variables.

We restricted our analysis to data from August 1999 to 2009. As *Plan B* was approved for prescription distribution in July 1999 (FDA 2011) and Wave 3 of the NLSY97 begins in October 1999, *Plan B* is available for all time periods in our sample. Also, all but one of the state-level policy changes occurred during this period (the exception being Washington State, which implemented the policy in February 1998).

BASIC CONCEPTUAL MODEL

We argue that women can mitigate STI risk from sexual activity in three broad ways: abstinence, sexual activity in a bilaterally monogamous relationship, or consistent use of condoms. Opponents of expanding EC access worry that access may increase exposure to STIs because of moral hazard from the lower opportunity (pregnancy) cost of risky sexual behaviors: if women who normally use condoms for contraception know they can easily access emergency contraception to protect against pregnancy, they may be less likely to use condoms. However, there are potential theoretical reasons to expect that some risky activities might fall when EC is switched to BTC status if men bargain for unprotected sex and women bargain for protected sex; in that case, easier access to EC may weaken women's bargaining position and induce them to opt into fewer sexual encounters.⁴ Which effect dominates is an empirical question.⁵

We also expect that single and married/cohabitating women will experience these expected cost and bargaining effects differently, so we estimated separate models for each of these subgroups. For example, most romantically cohabitating women are likely sexually active, so the effect of increased EC access on whether there is any sexual activity should be concentrated among single women. We might expect the other two behaviors we modeled (sex with multiple partners and sex without a condom for women with multiple partners) to be concentrated among single women as well; however, again, this is an empirical question.

In considering the conceptual model, it is important to first establish that women knew about EC if we expect to see a relationship between

access to EC and women's behaviors. Based on evidence from the National Survey of Family Growth (NSFG), use of EC has increased from the 2002 to 2006–2010 surveys. More specifically, among sexually active women ages 15–44, 11 percent reported use of EC in the 2006–2010 surveys compared to 4.2 percent in 2002. Women ages 20–24 were the most likely to have used EC (23 percent). Use also varied by relationship status with single women being the most common users (19 percent), cohabitating women were the second most common users (14 percent), and married women were the least likely to report EC use (5.7 percent). Roughly half (45 percent) reported they used EC because of method failure and about half (49 percent) reported use after unprotected sex (Daniels et al. 2013). The NSFG focuses on EC use, which should provide a lower bound of awareness of EC. The Oregon Pregnancy Risk Assessment Monitoring System (PRAMS) surveys recent mothers about their awareness of EC before pregnancy. In 2004, 80.1 percent of respondents reported knowing about EC. This percentage grew to 83.9 percent in 2005 and to 86.6 percent in 2006, dropped a small amount to 85.1 percent in 2007, and jumped up to 87.5 percent in 2008. The Oregon PRAMS data illustrate that the vast majority of recent mothers in Oregon are aware of EC and that awareness has been increasing overall since 2004. Importantly, women in Oregon were subject to only the national policy change. California allowed EC to be sold without a prescription beginning 1/1/2002. In a study of California women ages 15–44 in 2003 using the California Health Interview Survey (CHIS), Baldwin et al. (2008) found that, on average, about 76 percent of respondents were aware of EC. Young women ages 18–24 years were the most likely to have heard of EC (80.48 percent) (Baldwin et al. 2008).

Although the previous discussion addresses awareness of EC broadly, it does not directly address awareness of the policy change. A *Google Insight* search shows Google searches for “Plan B over the counter” from January 2004 to April 2014. Recall that the FDA policy change occurred in August of 2006. There is a sharp spike in this search from July to August 2006, and the searches peak in October 2006. This provides evidence that general awareness of the increased availability of Plan B due to the FDA change increased around the time of the decision.

Based on data from a national survey, the NSFG, a survey in a state subject to the national change, the Oregon PRAMS, and a survey from a state with its own policy change, the CHIS, in addition to a sharp increase in Google searches for “Plan B over the counter” after the federal policy change, we

argue that women were sufficiently aware of EC and the increase in access to allow us to test a relationship between increased access to EC and women's reproductive decision making.

EMPIRICAL MODELING

We modeled three binary outcome variables: whether a respondent reported any sexual activity; whether a respondent reported sexual activity with more than one partner; and whether a respondent with multiple sexual partners reported any sex without a condom. We used the following questions from the NLSY97 for our outcome variables. First, the survey asks respondents, "Have you had sexual intercourse since the last interview on [date of last interview], that is, made love, had sex, or gone all the way with a person of the opposite sex?" We used this question to measure any sexual activity. For the NLSY97, the date of last interview is generally the previous year. For multiple partners, we used the following question: "How many PARTNERS have you had sexual intercourse with since the last interview on [date of last interview]?" This question was asked of respondents who reported ever being sexually active. Finally, to measure unprotected sex, or sex without a condom, we used the following question from the survey: "Thinking about ALL THE TIMES that you have had sexual intercourse since the last interview, how many of those times did you or your sexual partner or partners use a condom?" This question was asked of respondents who reported sexual activity since their last interview and reported sexual frequency since the last interview.

We estimated our models three times: once for the full sample of women; once for the subsample of married or cohabitating women; and once for the subsample of single women. Overall, 84.7 percent of respondents reported sexual activity since the date of last interview, with rates of 94.8 percent for married or cohabitating and 78.7 percent for single women. Given the extremely high rate of any sexual activity among cohabitating and married women, we will model the sexual activity choice only for single women. Approximately, 38.6 percent of the sexually active respondents reported multiple sexual partners, and 47.8 percent of the responses with multiple sexual partners reported at least one unprotected sexual encounter, which we define as sex without a condom. Finally, the distribution of women in state policy change states and federal policy change states both before and after the respective switch to BTC status for *Plan B* are relatively similar to one another; there are fewer married women before the state policy changes since the state

policies occurred a bit earlier in calendar time when the cohort of women were somewhat younger (see Tables 1–3).

As a preliminary analysis, we compared average rates of any sexual activity, multiple sexual partners, and unprotected sex with multiple partners using simple *t*-tests comparing mean rates 1 year before the FDA *Plan B* BTC change (2005) to those 1 year after the FDA change (2007) for the subsample of states subject to the national policy change only. These comparisons found that single women exhibited a drop in the frequency of any sexual activity of –10.5 percent ($p < .01$); married or cohabitating women saw a drop in the rate of multiple sexual partners of –3.5 percent ($p < .05$); and single women experienced an increased rate of unprotected sex conditional on multiple partners, of +14.9 percent ($p < .01$). (See Appendix Table A2 for details.)

Table 1: Variable Means and Standard Deviations

	(1)			
	Mean	Standard Deviation	Minimum	Maximum
Sexually active	0.847	0.360	0	1
Respondent had multiple sex partners	0.386	0.487	0	1
Respondent had any unprotected sexual encounters and multiple partners	0.478	0.500	0	1
Currently married and living together	0.198	0.398	0	1
Cohabitating without marriage	0.173	0.378	0	1
EC available OTC	0.462	0.499	0	1
Preven withdrawn from market	0.00176	0.0420	0	1
Age	22.56	2.934	18	29
Respondent has had pregnancy in past	0.440	0.496	0	1
Respondent reports health good or better	0.605	0.489	0	1
Respondent has health insurance	0.733	0.442	0	1
Household income (in \$10K)	5.293	5.144	0	42.14
Self-assessed as overweight	0.506	0.500	0	1
African American	0.294	0.456	0	1
Hispanic	0.215	0.411	0	1
Other race	0.0338	0.181	0	1
Living in urban setting	0.775	0.417	0	1
Has associate degree	0.0416	0.200	0	1
Has undergraduate degree	0.120	0.325	0	1
Has graduate degree	0.0119	0.108	0	1
County unemployment rate	5.746	2.138	1.400	20.20
Year	2004.8	2.783	1998	2009
Observations	34,030			

Note. All NSLY97 women were over 18 at time of survey round.

Our multivariate analyses modeled the probability that a woman reported any of these behaviors using linear probability models with individual, state, and year fixed effects,⁶ as well as state-specific time trends. Including time and state fixed effects, along with state-specific time trends is a method for dealing with state-level unobservables that is increasingly used in panel and pooled cross-sectional data models; for examples from labor economics, see Dube, Lester, and Reich (2010) and Allegretto, Dube, and Reich (2011). The general specification for this set of regressions was:

$$B_{it} = P_{st}\alpha + X_{it}\beta + \delta_{st} + \mu_i + \sigma_s + \omega_t + \varepsilon_{it}$$

where B_{it} represents the behavior (either sexual activity, multiple partners conditional on being sexually active, or unprotected sex conditional on being sexually active with multiple partners) of the i th respondent at time t , P_{st} represents the policy in state s at time t , X_{it} is a vector of individual and county-level characteristics in time t , δ_{st} are state-specific time trends, μ_i signifies individual fixed effects, σ_s represents the state fixed effects, ω_t represents polynomials of time, and ε_{it} is an i.i.d. error term. (The state fixed effects directly model the clustering of observations at the state level.) We used individual fixed effects regressions to account for the potential bias that could be introduced due to individual-level and time-invariant unobservables. We included state fixed effects to control for bias resulting from time-invariant state unobservables and polynomials of the time trend to account for national time-varying unobservables. State-specific time trends were also included to capture within state variation across time. All models were estimated using the “xtreg” command in Stata 12.

We ran three different specifications for the policy variables: the first estimated the effect of both the state and national policy changes in one model and included an indicator variable for whether the observation was in a state and a period on or after the state-level policy change⁷ or the period on or after the date that the FDA allowed *Plan B* to be sold behind-the-counter (August 2006 and after); the second specification was limited to the states with their own policy changes and included an indicator variable for whether the observation was in a state and a period on or after the state-level policy change; and the third focused on states that were subject to the national policy change using an indicator variable for whether the observation was in a period on or after the date that the FDA allowed *Plan B* to be sold behind-the-counter (August 2006 and after) excluding the states with their own prior policy change. We also included an indicator variable to control for Preven being withdrawn from the

Table 2: Variable Means and Standard Deviations, by Time Period and Policy Type

	<i>In State Policy States</i>				<i>In FDA Only Policy States</i>			
	<i>EC Available OTC = 0</i>		<i>EC Available OTC = 1</i>		<i>EC Available OTC = 0</i>		<i>EC Available OTC = 1</i>	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Sexually active	0.713	0.453	0.852	0.355	0.851	0.356	0.853	0.354
Respondent had multiple sex partners	0.408	0.492	0.376	0.484	0.447	0.497	0.296	0.457
Respondent had any unprotected sexual encounters and multiple partners	0.508	0.501	0.427	0.495	0.453	0.498	0.553	0.497
Currently married and living together	0.0639	0.245	0.214	0.410	0.135	0.341	0.298	0.457
Cohabiting without marriage	0.118	0.323	0.191	0.393	0.148	0.355	0.210	0.407
Currently single	0.818	0.386	0.595	0.491	0.717	0.450	0.492	0.500
Observations	1,111		4,154		17,195		11,570	

Note. All NSLY97 women were over 18 at time of survey round.

Table 3: Average Rates of Sexual Activity, Multiple Partners, Unconditional and Conditional Unprotected Sex

	(1)	(2)	(3)
	<i>All Females Mean [Number in Subsample]</i>	<i>Married or Cohabiting Sample Mean [Number in Subsample]</i>	<i>Single Sample Mean [Number in Subsample]</i>
Sexually active	0.847	0.948 [N = 12,616]	0.787 [N = 21,414]
Respondent had multiple sex partners	0.386	0.164 [N = 11,965]	0.543 [N = 16,856]
Respondent had any unprotected sexual encounters and multiple partners	0.478	0.622 [N = 1,965]	0.447 [N = 9,153]
Observations	34,030	12,616	21,414

Note. All NSLY97 women were over 18 at time of survey round.

market in May of 2004. Other control variables were as follows: respondent age, pregnancy history, self-reported health status, health insurance status, household income, marital or cohabitating status, self-assessed over-

weight status, race/ethnicity, urbanicity, education, county unemployment rate, state fixed effects, year fixed effects, and state-specific time trends.

RESULTS

The coefficients (which in our linear probability models are the same as the marginal effects) for the *Plan B* BTC switch (using both national and state-level policy changes) on any sexual activity are presented in Table 4. (To limit the number of tables in the paper, we are presenting only the coefficients on the EC policy change in Tables 4–6; the full models are presented in Appendix SA5.) We found that switching *Plan B* to BTC status decreased the likelihood of any sexual activity by -4.1 percent ($p < .01$) for the full sample and -7.6 percent ($p < .01$) for single women. The results for any sexual activity broken out by state and national policy changes are shown in the second and third set of parameters in Table 4. Women in states with policy changes were not more or less likely to report sexual activity; however, women in states sub-

Table 4: ECP Coefficients in Linear Probability Models for Any Sexual Activity

	(1)	(2)
	<i>All Females</i>	<i>Single</i>
All states		
ECP available OTC	$-0.041^{***} (-3.88)$	$-0.075^{***} (-4.51)$
Observations	27,648	16,255
Respondents in state policy states		
ECP available OTC	$0.037 (0.79)$	$0.062 (0.91)$
Observations	4,274	2,578
Respondents in national policy states		
ECP available OTC	$-0.067^{***} (-5.76)$	$-0.12^{***} (-6.19)$
Observations	23,374	13,677
Time polynomials	Yes	Yes
State fixed effects	Yes	Yes
State-specific time trends	Yes	Yes

Note. Estimated for the NLSY97 female population over 18 at time of survey. Also included but not shown are as follows: age, household income, county unemployment rates, and indicators for Preven withdrawal, past pregnancy, good or better health, health insurance, married, cohabitating (single is excluded category) self-assessed overweight status, urban setting, associate degree, 4-year college degree, graduate degree (high school is the excluded category), state fixed effects, state-specific time trends, and time trend polynomials. The full regression results are in the Appendix.

* $p < .10$, ** $p < .05$, *** $p < .01$.

ject to the national policy change were -6.8 percent ($p < .01$) less likely to report any sexual activity in the full sample and -12 percent ($p < .01$) less likely to be sexually active in the single subsample.

The EC policy results for the models predicting the probability of multiple partners, conditional on sexual activity are presented in Table 5. For the models predicting the effect of the national and state policy changes together, we found that, conditional on being sexually active, single women were -4.2 percent ($p < .10$) less likely to report sexual activity with more than one partner. The policy change did not significantly predict this outcome for the full sample or the married/cohabitating subsample. Sexually active women in states with a policy change were neither more nor less likely to report multiple sexual partnerships, while sexually active women in states affected only by the national policy change were -3.3 percent ($p < .10$) or -6.6 percent ($p < .05$) less likely to report multiple partnerships for the full sample and single subsample, respectively.

Finally, the results for the models predicting the impact of the EC policy on the probability of unprotected sex (no condom) for women with multiple

Table 5: ECP Coefficients in Linear Probability Models for Multiple Sexual Partners

	(1)	(2)	(3)
	<i>All Females</i>	<i>Married or Cohabiting</i>	<i>Single</i>
All states			
ECP available OTC	$-0.021 (-1.31)$	$0.0055 (0.27)$	$-0.041^* (-1.69)$
Observations	24,250	10,781	13,469
Respondents in state policy states			
ECP available OTC	$0.034 (0.53)$	$-0.024 (-0.26)$	$0.064 (0.67)$
Observations	3,673	1,568	2,105
Respondents in national policy states			
ECP available OTC	$-0.032^* (-1.76)$	$0.0097 (0.43)$	$-0.066^{**} (-2.36)$
Observations	20,577	9,213	11,364
Time polynomials	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
State-specific time trends	Yes	Yes	Yes

Note. Estimated for the NLSY97 female population over 18 at time of survey. Also included but not shown are as follows: age, household income, county unemployment rates, and indicators for Preven withdrawal, past pregnancy, good or better health, health insurance, married, cohabitating (single is excluded category) self-assessed overweight status, urban setting, associates degree, 4-year college degree, graduate degree (high school is the excluded category), state fixed effects, state-specific time trends, and time trend polynomials. The full regression results are in the Appendix.

* $p < .10$, ** $p < .05$, *** $p < .01$.

Table 6: ECP Coefficients in Linear Probability Models for Unprotected Sex and Multiple Partners

	(1)	(2)	(3)
	<i>All Females</i>	<i>Married or Cohabiting</i>	<i>Single</i>
All states			
ECP available OTC	0.057** (2.15)	0.090 (1.11)	0.052* (1.73)
Observations	9,233	1,713	7,520
Respondents in state policy states			
ECP available OTC	0.22** (2.15)	-0.17 (-0.38)	0.27** (2.39)
Observations	1,403	238	1,165
Respondents in national policy states			
ECP available OTC	0.047 (1.54)	0.10 (1.14)	0.047 (1.34)
Observations	7,830	1,475	6,355
Time polynomials	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
State-specific time trends	Yes	Yes	Yes

Note. Estimated for the NLSY97 female population over 18 at time of survey. Also included but not shown are as follows: age, household income, county unemployment rates, and indicators for Pre-ven withdrawal, past pregnancy, good or better health, health insurance, married, cohabiting (single is excluded category) self-assessed overweight status, urban setting, associates degree, 4-year college degree, graduate degree (high school is the excluded category), state fixed effects, state-specific time trends, and time trend polynomials. The full regression results are in the Appendix.

* $p < .10$, ** $p < .05$, *** $p < .01$.

sexual partners are reported in Table 6. In the models predicting the effect of the national and state policy changes together, we found that, conditional on having multiple sexual partners, women in the full sample and single subsample were +5.9 percent ($p < .05$) and +5.2 percent ($p < .10$) more likely to report sex without a condom, respectively. Finally, we found that this effect was concentrated among single women in the states that had state-level policy changes and not evident in the states subject only to the national change. More specifically, sexually active women with multiple partners in states with a policy change were +22 percent ($p < .05$) more likely to report unprotected (no condom) sex; when we break our sample by cohabitating/marital status, we found that the effect appears only among single women, who were +27 percent ($p < .05$) more likely to report sex without a condom. We did not find any relationship between the state-level policy change for the full or married/cohabitating samples nor for any of the models focused on states subject to only the national policy change.⁸

Thus, while we observed statistically significant effects of EC going BTC, we found countervailing influences: switching EC to BTC status had the effect of decreasing sexual activity and multiple partners, but increasing

unprotected sex conditional on multiple partners. These effects taken together contributed toward a slight overall decrease in the *rates* of unprotected sex with multiple partners over the time period we studied, but a substantial increase in the *actual number* of women engaging in risky sex. In terms of raw averages, there were 107 women reporting having multiple partners in 1998; 58.9 percent of them report having unprotected sex. By 2009, 848 women report having multiple sexual partners with 55.9 percent of them reporting unprotected sex. In terms of total exposure in the cohort, 63 women had what we define as risky sex in 1998 and that number rose to 474 by 2009. It would appear that the marginal effect of BTC status for emergency contraception interacts with the general trend toward greater rates of multiple partners as the cohort ages to substantially increase exposure to risky sex.

LIMITATIONS

Although not reported, we did not find systematic evidence that leads of the policies were predictive of behavior in the prepolicy periods (see Appendix SA4). Thus, evidence suggests we have identified the impact of policy on behavior, rather than some other omitted influence. However, there are several factors that we were not able to directly address, which may serve as a limitation to the work.

First, at least two state-level factors could be important determinants of sexual risk taking: access to abortion services and subsidized family planning services via Medicaid. Over the time period we studied, states generally had relatively constant stances toward abortion; however, according to the Alan Guttmacher Institute (2012), 15 states changed access, all becoming less supportive (2012). Also, since the mid-1990s, states have applied for and received permission from the Centers for Medicare and Medicaid Services (CMS) to expand family planning services provided by Medicaid, either through a waiver or through State Plan Amendment (Kearney and Levine 2009; Kearney and Levine 2012). States either increased access to family planning services or remained the same over the time frame of our study. While we do not measure the effect of these policies directly, the changes increased access to either abortion or family planning (none of the policy changes reduced access) and so they should have been captured by the state-specific time trends. In addition, none of the states in our state policy change group had family planning waiver expansions near the time of the EC policy change (Kearney and Levine 2009).

Second, when EC went BTC, there may have been price changes for some women at some times. The degree to which out-of-pocket price changed for any individual woman depended on whether she had health insurance that covered contraceptive prescriptions, had met her annual deductible, and chose to purchase EC BTC rather than with a prescription. Importantly, we are not modeling use of EC, but rather the impact of *potential* increased access through availability of BTC on sexual risk taking; to cause bias in our within-person models, the take-up of insurance would have to be changing in response to the change in EC access, which seems implausible, so we do not believe this to be a serious limitation.

DISCUSSION

Estimating the policy effects for the state changes and national change separately highlighted some important differences. The results show that increased access to EC from the national policy change was protective in that the change was associated with a decreased probability of sexual activity and multiple partnerships for the full sample and for single women, and there was no relationship between increased access from the FDA policy change and sex without a condom for women with multiple partners. However, the models focused on the state-level policy changes tell a different story. More specifically, there was no evidence of a relationship between the state policy changes and sexual activity or multiple partnerships, but these policy changes were associated with an increased likelihood of sex without a condom for women with multiple partnerships, which imply an increase in STI risks for these women. This suggests that increased access to emergency contraception introduced moral hazard through its reduction in pregnancy risk by discouraging some women in this group from taking preventive actions (condom use) and increased the risk of STIs. These results support findings from studies by Durance (2012) and Girma and Paton (2011) showing that increased access was associated with increases in STIs. It is important to note that although we found evidence of increased STI risk for single women in states with policy changes, the protective effects (decreased sexual activity and multiple partnerships) along with no change in unprotected sex for the national policy change affected much more women. For example, 1,403 women were in the state policy change sample compared to 7,830 in the national policy change sample for the unprotected sex outcome. Thus, although we found evidence of

increased risk for women in the state policy group, the impact extends to a smaller population of women.

Why might increased EC access at the national-level lead to lower rates of any sexual activity and multiple sexual partners and no change for the state-level policies? After all, as Zuppann (2011) argues, greater access to EC should lower the expected cost of sex outside of monogamous relationships and so increase the frequency of these behaviors. However, as we discussed above, it is also the case that women and men when dating are implicitly negotiating what their sexual practices will be. If women are less able to negotiate protected sex, then they may have to choose between unprotected sex, monogamous sex, or no sex; it is plausible that many women may opt for monogamy or “no sex.” Our results for the national policy change are consistent with the “lost negotiating power” effect dominating the “lower expected cost” effect: when EC became more available, more women chose to abstain or enter monogamous relationships. Further, the women in states with policy changes who continued to report multiple sexual partners with easier EC access also show evidence of decreased bargaining power as they were more likely to have unprotected sex.

Although the differing effects of the state and national policies may initially seem counterintuitive, this may in part be an artifact of the longitudinal nature of the data. The state policy changes preceded the national policy change, which, given the fact the women in our sample are aging, might contribute to the differing observed responses. The state EC BTC switches were associated with riskier behaviors by the women in our sample, while the national BTC switches were associated with less risk-taking behavior. This could be because, as they have aged, women in the NLSY97 have learned to make safer decisions in the face of reduced bargaining power. It may well be that the reduction in bargaining power when the women were younger (from the earlier state policies) led to increased risk-taking behaviors, whereas older women responded to lower bargaining power (from the federal change) with risk-reduction strategies.

Given the differing results and number of women treated by the state and national policy changes, it is unclear whether, on net, the shift toward greater access to emergency contraception from reclassifying *Plan B* as a BTC drug was beneficial or harmful in terms of the likelihood of unprotected sex. Some women were less exposed to STI risk after the national BTC switch from reductions in sexual activity and multiple partnerships (because even if they used a condom, STI risk still exists with any sexual activity), and some women were more exposed based on our findings for the state policy changes.

Overall, we see a significant increase in the number of women in the cohort engaging in unprotected sex with multiple partners, though much of that overall trend is associated with rising rates of multiple partnerships as the cohort ages.

The differing effects by state and national policy lead suggest that policy makers should carefully consider how younger women will react to the potential loss in bargaining power for protected sex induced by increased access to EC. If younger women are more likely to be negatively affected by a reduction in bargaining power from increased access to EC, policy makers should work to limit this effect. This is particularly important as EC has recently moved to over-the-counter (OTC), which means women of any age now have access. Better education or messaging regarding the lower efficacy of EC compared to traditional forms of birth control and the lack of protection against STIs might be helpful.

With respect to the messages conveyed by the EC package, the front of EC labels explains that EC is not to be used as regular birth control, while the package insert explains that EC is not as effective in preventing pregnancy as regular birth control. Similarly, EC boxes have an STI alert on the back of the packaging explaining that EC does not protect against STIs. Perhaps changing the wording on the front of the box to indicate that EC is *less* effective than other forms of birth control and upgrading the STI alert to the front of the box or placing it in a boxed warning on the back would make these messages more prominent and effective. Of course, even in the absence of evidence of increased risk-taking behavior associated with the state policy changes, increasing awareness of the reduced efficacy of EC in pregnancy prevention and lack of effectiveness for STI prevention should still be pursued.

For example, Raymond with coauthors in 2002 (Raymond, Dalebout, and Camp 2002) and subsequently with other collaborators in 2009 (Raymond et al. 2009) demonstrated that women can understand messages about pregnancy and STI risk on EC labels in an experimental setting. However, we are unaware of any research that demonstrates that the current labels optimize the salience of these messages in practice. Thus, given the placement of the efficacy and STI notices discussed above, it seems likely that gains can still be made with regard to comprehension, particularly for adolescents. Such improvements in salience should advance the public health goal of reducing unintended pregnancy and STI transmission while still maintaining improved access to emergency contraception.

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NOTES

1. These states include California, New Mexico, Maine, Massachusetts, New Hampshire, Washington, Alaska, and Hawaii. Vermont passed state-level access to all women irrespective of age in 2007, after the FDA policy change which applied to women aged 18 and over.
2. During this period, some state legislation allowed EC to be purchased BTC by individuals younger than 18; however, we are interested in the effect of these policy changes on young adult women's sexual behaviors, so we do not discuss this aspect of the legislation.
3. Note that as Washington State had BTC access for EC for the entire time frame of our data, we excluded all observations from that state. Further, Alaska and Hawaii are unusual states compared to the "Lower 48" (indeed, in many parts of Alaska "morning after" access to a pharmacy may not be feasible), and so we also exclude observations from those states.
4. This framework of sexual risk-taking behavior as the outcome of a bargaining process between men and women is discussed by Gertler, Shah, and Bertozzi (2005). The result with respect to EC is a straight-forward extension of that literature.
5. Note that there are other potential policy influences on sexual risk taking, including state-level abortion access, subsidies to contraception (for example, via Medicaid family planning services), or changes to price that might result from changing prescription status for insured women. We discuss the potential of each of these factors to affect our results in Section 7 below.
6. The nonlinear logit estimator with fixed effects had difficulty with convergence—and often remained lodged in regions of nonconcavity of the Hessian (covariance) matrix. Given the well-known sensitivity of logit models to fixed effects (and indeed, the lack of a closed-form solution to the standard probit likelihood function with fixed effects), we opted to use linear probability models with fixed effects for all of our specifications.
7. This applies to the following states, which implemented a behind-the-counter policy for EC prior to the federal ruling: California, New Mexico, Maine, Massachusetts, and New Hampshire. We exclude Washington from our analysis because the policy is enacted for all periods of our data. We also exclude Alaska and Hawaii.
8. Note that one may wonder whether the negative effects of the state policy changes—in terms of increasing the conditional likelihood of unprotected sex—are mitigated once the federal policies come into effect. That is, did the federal policy effect

supersede the state policy effect? To test this, we estimated a version of our models with indicator variables for being exposed to the state policy, being exposed to only the federal policy, and being exposed to the federal policy after a state policy is also in effect. In those models, the state–federal policy interaction effect was generally only significant and negative for the “any sex” model (which is driven by the single women in the sample) and just under the 5 percent level of significance and negative for multiple partners among single women. The interaction was never significant for unprotected sex. So, in terms of the adverse impact of state policies, we find no consistent evidence that the national policy improved matters.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

- Appendix SA1: Author Matrix.
- Appendix SA2: State Policy Changes.
- Appendix SA3: Bivariate *t*-test on Policy Change Effects.
- Appendix SA4: Sensitivity Analyses.
- Appendix SA5: Full Regression Results.