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Prescription Contraceptive Sales Following the Affordable Care Act

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Abstract
Objectives We examine trends in prescription contraceptive sales following the Affordable Care Act's (ACA) zero-copayment contraceptive coverage mandate in areas more likely to be affected by the provision relative to areas less likely to be affected. *Methods* Before the ACA, several states had their own contraceptive insurance coverage mandates. Using a national prescription claims database combined with wholesaler institutional sales activity from January 2008 through June 2014, we compare sales of the intrauterine device (IUD), implant, injectable, pill, ring, and patch in states that had a state-level insurance coverage mandate before the ACA to states that did not. *Results* Overall, our results imply the ACA increased sales of prescription contraceptives, with stronger effects for some methods than others. Specifically, we find the ACA increased sales of injectable contraceptives, but had no significant impact on sales of the IUD, implant, pill, or patch in states without a state-level mandate before the ACA relative to states that had a state-level mandate. We also find suggestive evidence of a reduction in sales of the ring. *Conclusions for Practice* Demand responses to changes in out-of-pocket expenses for contraception vary across methods. Eliminating copays could promote the use of contraceptives, but is not the only approach to increasing contraceptive utilization.

Keywords Prescription contraceptives · Affordable Care Act · LARC methods

Significance

What is already known on this subject?

The Affordable Care Act's zero-copayment contraceptive coverage mandate reduced out-of-pocket expenditures by privately insured contraceptive users, but research studying the effects of the policy on utilization yields mixed results.

What this study adds?

Using proprietary pharmaceutical claims data, wholesaler institutional sales activity, and quasi-experimental methods, we compare sales of prescription contraception in areas that were more likely to be affected by the policy to areas less likely to be influenced by the policy. We find the ACA's contraception mandate increased sales of the injectable, but had no significant effect on the IUD, implant, pill, or patch relative to a comparison group.

Introduction

A majority of women of childbearing age in the United States use some contraceptive method (Daniels et al. 2014). Contraceptive methods vary in price, and long-term contraceptive use can incur substantial initial costs, even for insured women. Although long-acting reversible contraceptive (LARC) methods—including intra-uterine devices (IUDs) and sub-dermal implants—are more cost effective in the long run than oral contraceptives (Foster et al. 2009; Trussell 2012), they have higher up-front costs. For example, before the Affordable Care Act (ACA), the mean out-of-pocket (OOP) expenses for initiating an IUD and implant were $262 and $320, respectively (Becker and Polsky 2015), more than ten times greater than the mean OOP for

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initiating non-LARC methods such as the pill, patch, or ring (Dusetzina et al. 2013).

Beginning in August 2012, the ACA required most private health insurance plans to cover all U.S. Food and Drug Administration (FDA)-approved contraceptive methods and counseling, without a copay for the client and without the costs applying to deductibles. This ACA requirement has been the center of a heated policy debate. A Supreme Court ruling originally exempted closely held for-profit corporations with religious objections to contraceptive coverage from complying. One year later, closely held for-profit companies and religiously-affiliated nonprofits with religious morals against contraceptives were allowed an accommodation in which contraceptive coverage would be offered but the employer was not obligated to pay for it.

The ACA's contraception coverage mandate reduced out-of-pocket expenditures for privately insured women who use contraceptives, with variation in price drops across contraceptive methods (Bearak et al. 2016; Becker and Polsky 2015; Law et al. 2015; Pace et al. 2016b). From 2012 to 2013, the average OOP expenses for the intrauterine device (IUD), sub-dermal implant, and injectable contraception decreased by about 70%, compared to a 38% reduction for the pill (Becker and Polsky 2015). On average, IUD users saved $248, and oral contraceptive users saved $255 per year (Becker and Polsky 2015). The policy is also associated with larger reductions in OOP expenses for generic brands and increased continuity and adherence to oral contraceptives (Pace et al. 2016a).

Whether the ACA's cost-sharing reductions affected utilization is less clear. The answer to this question depends on how sensitive privately insured women are to changes in OOP costs for birth control. Two studies utilize claims data to answer this question and find conflicting results. Carlin et al. (2016) use longitudinal claims data from a regional health plan operating in the upper Midwest to compare women covered by employers that complied early with the ACA contraceptive mandate provision to employers that had not complied as of September 2014. They find the ACA increased overall prescription contraceptive use, driven by increases in LARC methods. Pace et al. (2016b) implement an interrupted time series approach using the Truven Health MarketScan Commercial Claims and Encounters database and find no change in LARC uptake following the ACA.

Our research builds upon these studies and makes several important contributions. First, like both of these previous studies, we use pharmaceutical prescription claims data. We combine these data with wholesaler prescription sales activity to hospitals and clinics to capture the full market of prescription contraceptive sales. Unlike Carlin et al. (2016), however, who study a sample of upper Midwestern women, our study is nationally representative. Second, rather than comparing overall trends in contraceptive measures over time as in Pace et al. (2016b)—which could be affected by factors other than the ACA, such as general popularity and comfort level with a particular method—we compare contraceptive sales in a group of states more likely to be affected by the policy to a group of states less likely to be affected by the ACA. This difference-in-differences approach is similar to the approach taken by Carlin et al. (2016), in which a plausibly causal relationship between the ACA's provision and contraceptive utilization can be obtained.

Using proprietary pharmaceutical sales data and quasi-experimental methods, we estimate the effect of the ACA's contraceptive coverage mandate on sales of prescription contraception. We compare the sales of several types of contraceptive methods, providing one of the first glimpses into how the ACA has impacted contraceptive choices.

Methods

Pre-ACA State-Level Mandates

Before the ACA's contraceptive mandate went into effect, 27 states required insurers that covered prescription drugs to provide coverage for the full range of FDA-approved contraceptive drugs and devices (hereafter referred to as "mandate states"). Self-employed insurers are generally exempt from the state-level laws, leaving roughly one-third of the U.S. population potentially covered by the state-level mandates (Mulligan 2015).

Research shows women in mandate states had greater access to contraceptives than women in non-mandate states. Specifically, health insurance plans in mandate states were more likely to include contraception coverage (Sonfield et al. 2004), and insured women in mandate states were significantly more likely to use contraception (Atkins and Bradford 2014; Magnusson et al. 2012). Despite not having a zero copayment requirement—as the ACA's mandate does—these state-level mandates increased contraceptive use (Mulligan 2015), increased consumption of women's preventive health services (Raissian and Lopoo 2015), reduced unintended births (Dills and Grecu 2017; Johnston and Adams 2017), and reduced the abortion rate (Mulligan 2015), compared to women in control groups who were not affected by these policies. Together, this line of research implies that the ACA's federal contraceptive mandate would have a larger impact on women in states without a state-level contraceptive coverage requirement before the ACA than women in the remaining states.

If a state required insurers that covered prescription drugs to also cover the full range of FDA-approved contraceptive drugs and devices, we consider it a mandate state. Online Appendix Table 1 lists states with a pre-ACA state-level mandate and their years of implementation.

Data

Symphony Health Solutions' Pharmaceutical Audit Suite (PHAST) is a database that combines point-of-sale, all-payer pharmaceutical claims data from U.S. retail and mail order pharmacy prescriptions with wholesaler and manufacturer sales activity into non-retail institutions such as hospitals, clinics, long-term care facilities, home health facilities, and others. Since consumers obtain contraceptives in different rates across venues, using only one aspect of this database would omit a substantial portion of the marketplace for contraceptives. For example, the pill is largely distributed through pharmacies, but the implant and IUD are largely brought to patients through hospitals and clinics. Using only the prescription database would omit the majority of implant and IUD transactions, whereas using only the non-retail institution database would omit most purchases of non-LARC methods. Together these two segments present a total view of the prescription contraception marketplace, reflecting all venues from which women obtain prescription contraceptives.

The database contains approximately 82% of all U.S. retail prescriptions, 60% of all U.S. mail order prescriptions, and 98% of prescriptions from non-retail institutions. The aggregated data available to us have been projected (using proprietary weights) to be nationally representative. The sample coverage did not change throughout this study period. Table 1 shows the distribution of contraceptive type by retail/mail order and non-retail institutions. As expected, most transactions for the pill, ring, and patch are through retail and mail order pharmacies. The majority of LARC methods plus the injectable are obtained through non-retail institutions such as hospitals or clinics.

The dependent variable in this study is the number of units of a contraceptive method sold in a state per 1000 females of reproductive age (15–44), measured quarterly.

Table 1 Distribution of contraceptive sales by retail and non-retail venues

	Retail and mail order pharmacies (%)	Non-retail institutions (hospitals, clinics, etc.) (%)
Pill	84.6	15.4
Ring	76.9	23.1
Patch	78.1	21.9
Implant	10.8	89.2
Injectable	39.2	60.8
IUD	11.0	89.0

Source Symphony Health Solutions; Pharmaceutical Audit Suite (PHAST), January 2008–June 2014. Percents represent the percent of total number of prescriptions in the retail/mail order pharmacy setting versus the non-retail institutional setting in the database

We perform the analysis on each type of contraceptive method separately (IUD, implant, injectable, pill, ring, and patch) to avoid differences in duration of use across method types. For example, a single IUD can last between 3 and 12 years, while a pack of oral contraceptives may only provide contraceptive coverage for one month. Comparing sales within-method considers the context of the length of time the methods are used. This approach also reveals whether the ACA's provision affected contraceptive methods differently. Further, by comparing within-method across the treatment and control states, our analysis accounts for the possibility that both new contraceptive users could enter the market and current users could switch method types. With sales for 50 states, measured quarterly from January 2008 through June 2014, our sample size is 1300 (50 states × 26 quarters).

There are several state-level characteristics that are known to affect contraceptive use. If these characteristics are also correlated with whether a state had a pre-ACA mandate, we want to control for them to adequately isolate the effect of the ACA's mandate on contraceptive use. Since the state's private insurance rate among females would influence the breadth of the mandate's impact, we include a control variable for the state's under age 65 insurance rate, which comes from the Area Health Resource File. We include the state unemployment rate to control for differences in the economy and labor market that affect women's fertility (Currie and Schwandt 2014). During this time period several states adopted parental notification abortion restrictions and expanded access to family planning services through Medicaid, both of which affect contraceptive use (Cintina and Johansen 2015; Kearney and Levine 2009), and is likely correlated with whether a state had a pre-ACA mandate. We include an indicator variable representing whether these policies were in place in each state/year. Parental notification data come from Cintina and Johansen (2015) and Medicaid family planning waiver data come from Wherry (2013), Kearney and Levine (2009), and the Guttmacher Institute.

We also include state fixed effects which control for any time-invariant differences in contraceptive sales (e.g. attitude towards contraceptive use). Quarter-year fixed effects control for the nationwide secular change in prescription contraceptive sales and macroeconomic factors affecting various parts of the country similarly.

Statistical Analysis

To assess the impact of the ACA's contraceptive insurance coverage mandate on sales of contraceptives, we use a quasi-experimental statistical design that allows us to compare changes over time across "treatment" and "comparison" groups to isolate the policy's impact from other effects that are due to national, year to year changes in contraception sales (Dimick and Ryan 2014). Although

the ACA's mandate applies to most private health insurance plans across the country, we expect states *without* a pre-ACA state-level mandate were more greatly affected by the ACA's mandate, and therefore make up our treatment group. States *with* a pre-ACA state-level mandate are the comparison group because they required coverage of contraceptive methods before the ACA and had greater access to contraceptives as a result. In this difference-in-differences (DD) framework, we control for secular trends in contraceptive sales occurring simultaneously with the ACA policy change. Simply observing trends for states without a state-level mandate before and after the ACA, and assuming any differences were a result of the ACA would result in biased estimates. A particular contraceptive method may simply become more or less popular, and a simple before-and-after analysis would attribute changes in popularity to the policy. By comparing trends to a set of states that are less likely to be affected by the ACA policy change, we use the ACA policy change as a natural experiment or exogenous shock to test the effects of the ACA's contraceptive coverage mandate on contraception sales.

The statistical validity of this approach relies on the assumption that trends in contraceptive sales between the treatment and comparison groups would have remained the same in the absence of the ACA. In this way, the changes over time among the comparison group serve as a baseline of what would be expected for the treatment group if there were no policy change. This assumption holds by observing parallel trends in contraceptive sales for the treatment and control groups prior to the ACA policy change. A formal statistical test confirms that the pre-ACA trends in sales of most contraceptive types are not significantly and meaningfully different in treatment states compared to comparison states (see Online Appendix Table 2), implying mandate states are a good comparison group for non-mandate states.

The independent variable of interest in a DD analysis is the interaction of a treatment group indicator variable and a post-policy dummy variable. The treatment variable equals one if the state did not have a contraceptive insurance coverage requirement before the ACA and the post-policy variable equals one if the time period is after the ACA's zero copayment mandate went into effect (August 2012, or the third quarter of 2012). The coefficient on the interaction represents the differential effect of the ACA's contraceptive mandate on treatment states relative to comparison states.

We weight regressions by the state's annual population of females of reproductive age (15–44), which comes from the National Center for Health Statistics. We use ordinary least squares (OLS) estimation with Stata/SE version 12.1 (StataCorp LP, College Station, TX). Standard errors are heteroskedasticity-robust and clustered at the state level to account for within-state serial correlation. Human participant protection was not required for this study because no human participants were involved.

Results

We first present trends in prescription contraceptive sales by pre-ACA state-level contraceptive mandate status. For ease of visualization, we separate methods into three groups, based on their effectiveness with "typical use," as defined in Trussell et al. (2009). The first group is LARC methods (the IUD and sub-dermal implant) which have a probability of unintended pregnancy in the first year of use of less than 1% (Trussell et al. 2009). The second group is the injectable, with a 3% probability of unintended pregnancy within the first year of typical use (Trussell et al. 2009). The last group consists of the oral contraceptive, the patch, and the vaginal ring, all with an 8% chance of unintended pregnancy (Trussell et al. 2009). Regression results, however, are reported within each individual method to capture potential substitution effects across method type.

Figure 1 displays sales of long-acting reversible contraceptives and demonstrates several noteworthy elements. The vertical line indicates the date the ACA's zero copayment mandate went into effect, August 2012. First, states that had a contraceptive insurance coverage mandate before the ACA's mandate went into effect had higher per capita sales of these methods than non-mandate states. These findings are consistent with previous research that states with state-level contraceptive mandates had higher contraceptive utilization rates (Atkins and Bradford 2014; Magnusson et al. 2012; Mulligan 2015; Raissian and Lopoo 2015). Although the level of IUD and implant sales is consistently higher in mandate states than non-mandate states, this difference in levels is not a problem for the difference-in-differences framework, since the DD approach compares changes over time within the two types of states to isolate the effect of the policy.

Second, overall trends in sales of these methods were gradually increasing during the years leading up to 2013 for both mandate states and non-mandates states. This finding mirrors national trend data from the National Survey of Family Growth (NSFG), which reports IUD and implant use doubled from 2.3% in 2006–2010 to 5.0% in 2011–2013 (Branum and Jones 2015).

Third, this figure does not suggest a break in the trend of LARC sales after the ACA's provision becomes effective in either states with a state-level mandate or states without. This finding implies the ACA had no statistically significant differential effect on these methods in non-mandate states relative to mandate states.

Panel 1 of Fig. 2 displays per capita sales of the pill, ring, and patch. Panel 2 presents trends for the injectable. In

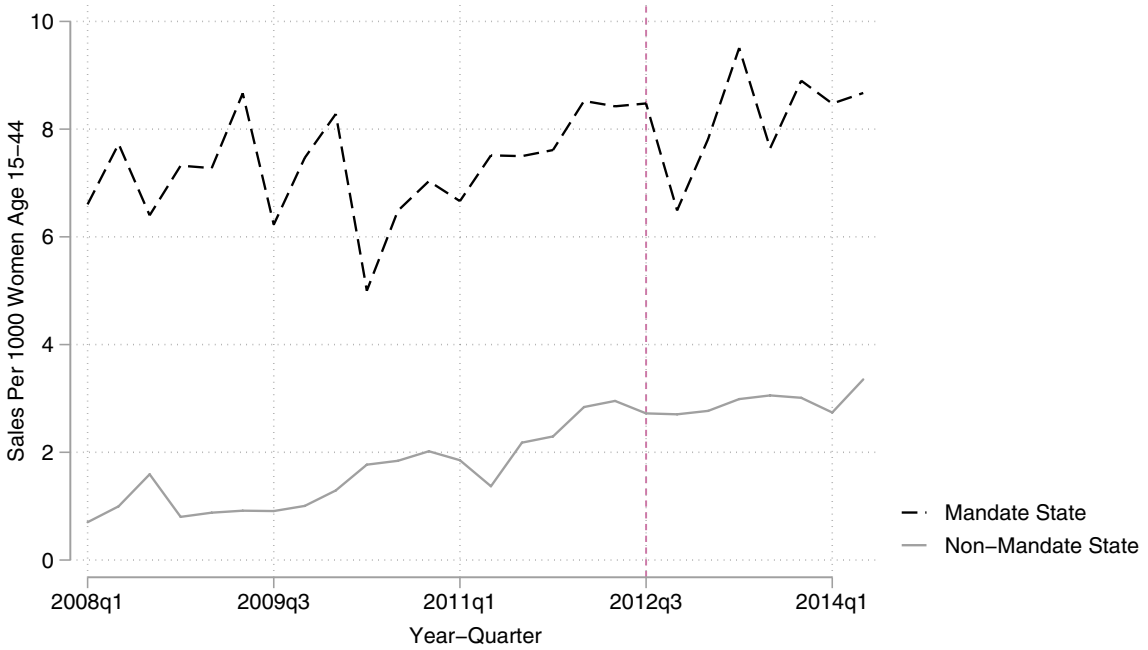

Fig. 1 Sales of LARC methods (IUD and Implant) per capita by pre-ACA state mandate status, January 2008–June 2014. *Source* Symphony Health Solutions' Pharmaceutical Audit Suite (PHAST), January 2008–June 2014

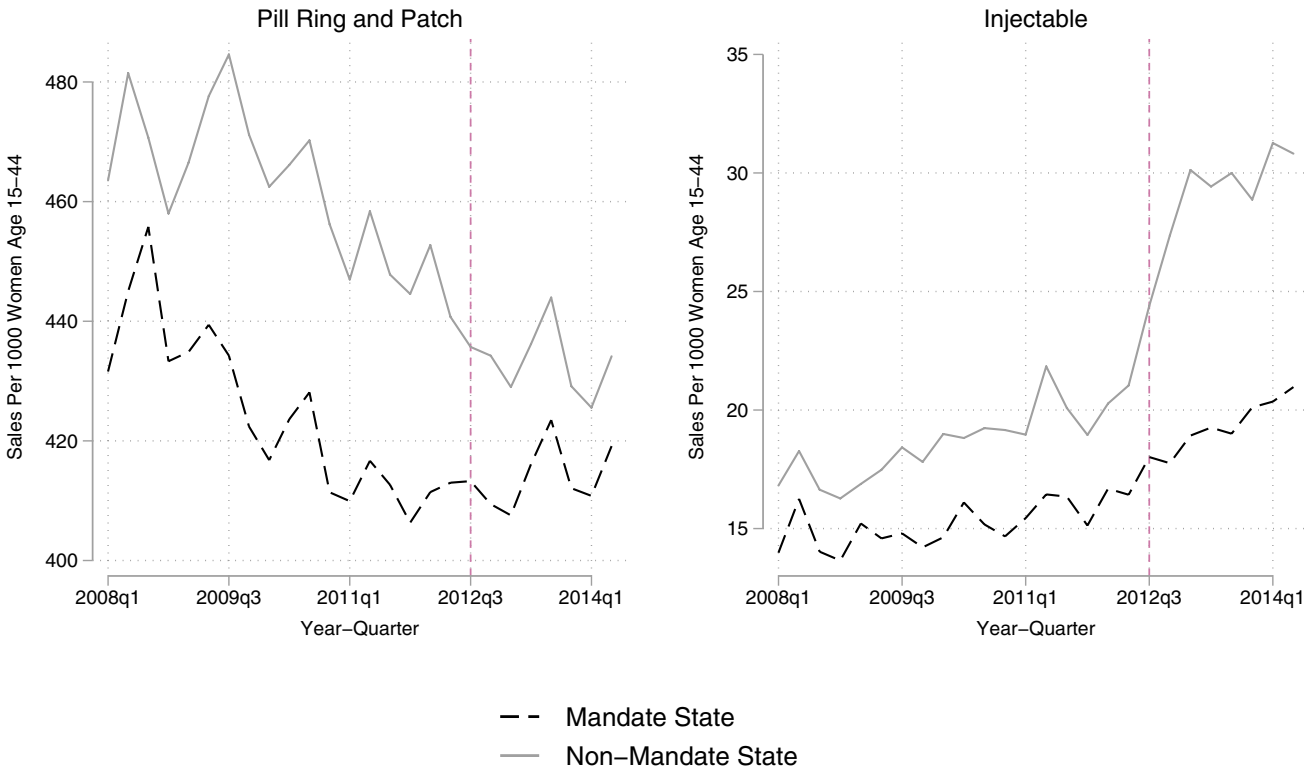

Fig. 2 Sales of non-LARC methods per capita by pre-ACA state mandate status, January 2008–June 2014. *Source* Symphony Health Solutions' Pharmaceutical Audit Suite (PHAST), January 2008–June 2014. Note that these two graphs are scaled differently to clearly show differences in trends

contrast to sales of the IUD and implant, per capita sales of the pill, ring, patch, and injectable are consistently higher in non-mandate states than in mandate states. Since access to contraceptives is greater in mandate states (Atkins and Bradford 2014; Magnusson et al. 2012; Sonfield et al. 2004), this difference may be due to an increased likelihood of using more effective methods that, when not covered by health insurance, are much more expensive.

Following the ACA's contraceptive mandate, both mandate and non-mandate states exhibit an apparent break in the downward trend of pill, ring, and patch sales, switching to an increase in per capita sales. Whether the trends are more impactful for one set of states, however, requires further examination.

Following the implementation of the ACA's contraceptive mandate, the trend in sales of the injectable for non-mandate states increases much more sharply compared to mandate states. This figure suggests the ACA had a differential effect in states that previously had no contraceptive insurance coverage requirement compared to states that did have a mandate pre-ACA.

Table 2 presents results from the regression analysis. Column (1) reports the mean sales of prescription contraceptives per 1000 women of reproductive age before the ACA's mandate took effect (January 2009–July 2012). Column (2) reports the mean rate of sales after the ACA's mandate (August 2012–June 2014). Column (3) shows the difference within state group before and after the ACA mandate. Column (4) represents the difference in the differences from column (3) (hence the term "difference-in-differences" or "DD"), without controlling for other factors. Column (5) is the preferred parameter of interested, where the DD estimate is adjusted for other state-level covariates and state and quarter-year fixed effects. The relative percent change is the adjusted DD parameter estimate relative to the mean in non-mandate states before the ACA's mandate, which we estimate for all contraceptive methods, even if the change is not statistically significant. Column (7) represents the R^2 value from the adjusted DD regression.

Echoing Fig. 1, column (3) shows overall absolute increases in both mandate and non-mandate states for the IUD, implant, and injectable after the ACA mandate compared to before the ACA mandate. Column (3) also shows overall absolute decreases in both types of states in the pill, ring, and patch following the ACA mandate. These trends alone suggest greater LARC utilization under the ACA. It is unclear, however, whether these trends are due to the ACA versus overall increases in popularity among LARC methods, especially since LARC method use was already increasing in the years leading up to the ACA (Branum and Jones 2015).

The DD parameter estimates in column (5) remove some of the variation in overall trends addressed above by comparing non-mandate states to mandate states. These coefficients provide the estimated differential effect of the ACA's zero copayment contraceptive coverage mandate for states that did not have a state-level mandate before the ACA compared to states that did. The results indicate that relative to mandate states, the ACA's contraceptive provision had no statistically significant effect on sales of the IUD, implant, pill, or patch in non-mandate states. With the exception of the ring and pill, however, the magnitudes of these coefficients imply increases in prescription contraceptive sales in non-mandate states after the ACA.

Panel 3 shows the ACA provision is associated with a differential increase in per capita sales of the injectable in non-mandate states compared to mandate states of 6.6 more prescriptions per 1,000 women of reproductive age. Relative to the baseline mean of 18.67 (row 1, column 1 of Panel 3), these estimates imply increases of about 35% for the injectable (column 6) following the ACA's contraceptive mandate. Panel 5 also suggests a decrease in sales of the ring of 7.2 prescriptions per 1000 women, or about 22%. Together, these results suggest an overall increase in prescription contraceptive sales, particularly in more effective methods.

Sensitivity Analysis

To ensure the robustness of our results, we implement a few checks which are presented in Table 3. The ACA zero copay provision took effect on August 1, 2012. Since new plan years typically begin in January, many health insurance plans were grandfathered until January 2013. Specifically, in 2012, 48% of U.S. employees were enrolled in grandfathered plans. By 2013, 36% were grandfathered (Claxton et al. 2014; Kaiser Family Foundation 2014b). In our main analysis, we use August 2012 as the policy implementation date. Using January 2013 as the implementation date instead of August 2012 produces similar results (Panel 1) and does not change our conclusions. In this table, the DD parameter estimate is analogous to the main results in column (5) of Table 2.

In a second modification, we estimate an OLS regression using the log of per 1,000 capita sales with an August 2012 implementation date (panel 2). We log the outcome to reduce the influence of extreme values. In this case—where estimates are interpreted as percent changes—results are substantively similar, though smaller in magnitude and less precise. The exception is a suggestive increase in IUD sales.

Discussion

Economic theory and previous empirical research suggest that decreasing out-of-pocket contraception expenses to consumers would result in increased use (Pauly 1968). The

Table 2 Effect of ACA's contraceptive mandate on contraceptive sales, by method type

	Outcome: sales of prescription contraceptives per 1000 women aged 15–44						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Mean before ACA mandate	Mean after ACA mandate	Difference (column 1–column 2)	Unadjusted DD (row 1–row 2)	Adjusted DD (column 4 + covariates and fixed effects)	Relative percent change	R^2 from adjusted DD models
Panel 1: IUD							
No pre-ACA state mandate	0.791	1.3810	0.590**				
Yes pre-ACA state mandate	6.4900	6.8196	0.330				
DD parameter estimate				0.261	0.457	57.8%	0.949
Panel 2: implant							
No pre-ACA state mandate	0.779	1.5376	0.758***				
Yes pre-ACA state mandate	0.7727	1.4290	0.656***				
DD parameter estimate				0.102	0.144	18.5%	0.642
Panel 3: injectable							
No pre-ACA state mandate	18.669	29.0407	10.371***				
Yes pre-ACA state mandate	15.2096	19.3016	4.092***				
DD parameter estimate				6.279**	6.567**	35.2%	0.732
Panel 4: pill							
No pre-ACA state mandate	420.437	404.0751	−16.362***				
Yes pre-ACA state mandate	390.5908	382.7672	−7.824				
DD parameter estimate				−8.539	−10.220	−2.4%	0.915
Panel 5: ring							
No pre-ACA state mandate	33.462	22.9875	−10.475**				
Yes pre-ACA state mandate	27.3742	24.5890	−2.785***				
DD parameter estimate				−7.689*	−7.215*	−21.6%	0.554
Panel 6: patch							
No pre-ACA state mandate	8.283	6.4242	−1.859***				
Yes pre-ACA state mandate	8.6534	6.6312	−2.022***				
DD parameter estimate				0.164	0.138	1.7%	0.776

Source Symphony Health Solutions' Pharmaceutical Audit Suite (PHAST), January 2008–June 2014. Notes: N = 1300 (50 states × 26 quarters). Before ACA Mandate represents January 2009–July 2012. After the ACA Mandate represents August 2012–June 2014. All regressions are weighted by state's population of females aged 15–44. Robust standard errors clustered at the state-level are in parentheses. The parameter of interest is the adjusted difference-in-differences (DD) estimate (row 3, column 5 in each panel), which represents the differential effect of the ACA's mandate on states with a state-level mandate compared before the ACA to states without a state-level mandate before the ACA. These estimates come from models that include state and quarter-year fixed effects, and the state characteristics described in text. Relative percent change (column 6) reflects the adjusted DD coefficient (row 3, column 5 in each panel) divided by the baseline mean for non-mandate states before the ACA (row 1, column 1 in each panel) to estimate the implied percent change in contraceptive sales. R^2 is only reported for adjusted DD regressions

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

ACA's mandate decreased mean out-of-pocket expenses for IUDs, implants, and the injectable by roughly 70%, 40% for the pill, and less than 5% for the ring and the patch (Becker and Polsky 2015). Compared to states that had their own state-level contraceptive coverage mandate before the ACA, we find states that did not have a pre-ACA state-level mandate experienced greater sales of the injection and fewer sales of the ring. These states did not, however, experience significant increases in sales of LARC methods (IUDs and implants) or the pill.

Table 3 Alternative models

	Outcome: sales of prescription contraceptives per 1000 women age 15–44					
	(1)	(2)	(3)	(4)	(6)	(7)
	IUD	Implant	Injectable	Pill	Ring	Patch
Panel 1: January 2013 implementation date instead of August 2012						
Post ACA*non-mandate state (adjusted DD parameter estimate)	0.042	0.127	6.530**	− 11.444	− 6.093*	0.134
	(1.010)	(0.200)	(3.122)	(6.895)	(3.307)	(0.359)
N	1300	1300	1300	1300	1300	1300
	Outcome: log(sales of prescription contraceptives per 1000 women age 15–44)					
	(1)	(2)	(3)	(4)	(6)	(7)
	IUD	Implant	Injectable	Pill	Ring	Patch
Panel 2: log(sales per 1000 capita) instead of sales per 1000 capita, August 2012 implementation date						
Post ACA*non-mandate state (adjusted DD parameter estimate)	0.529*	− 0.008	0.174**	− 0.020	− 0.174**	− 0.007
	(0.313)	(0.163)	(0.082)	(0.017)	(0.080)	(0.050)
N	1299	1300	1300	1300	1300	1300

Source Symphony Health Solutions' Pharmaceutical Audit Suite (PHAST), January 2008 - June 2014. *Notes*: N = 1300 (50 states* 26 quarters), except for cases when there are zero sales in the log regressions (1 state-quarter for IUDs). All regressions are weighted by state's population of females aged 15–44. Robust standard errors clustered at the state-level are in parentheses. The parameter of interest is the adjusted difference-in-differences (DD) estimate. These estimates come from models that include state and year fixed effects, and the state characteristics described in text

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Despite lower costs, we find little evidence that sales of LARC methods increase after the ACA. Factors other than costs may prevent women from increasing utilization of LARC methods, such as a misunderstanding about LARC methods (Fleming et al. 2010; Thompson et al. 2016), misperceptions about safety (Gomez and Freihart 2017; Hladky et al. 2011), comfort with devices (Gomez and Freihart 2017; Weisman and Chuang 2014), the multiple physician visits required for insertion (Bergin et al. 2012), physicians' reluctance to embrace new products and their attitudes about IUD usage (Fiebig et al. 2015; Tyler et al. 2012), or a lack of awareness of LARC coverage under the ACA (Chuang et al. 2015). Our results suggest cost is only one part of the contraceptive method decision. Eliminating copays could promote the use of contraceptives, but is not the only approach to increasing contraceptive utilization. Policies or programs that can affect other factors, such as awareness, education, and women-centered approaches, are important as well (Weisman and Chuang 2014).

Our results are likely a conservative estimate of the full effect of the ACA for several reasons. The ACA reduced the cost of contraceptives in both groups of states. Thus, our comparison group includes women who might have been "treated,"—though likely to a lesser extent—which would bias our estimates downward. Additionally, the state-level contraceptive coverage mandates do not apply to plans offered by employers that self-insure. Since a substantial proportion of covered workers were in a plan that was self-insured in 2014 (Kaiser Family Foundation 2014a), and our data include sales for all plan types, the effect of the state-level mandates is attenuated.

Although we cannot conclusively prove the ACA provision caused the changes in contraceptive sales we observe, we have taken several steps to mitigate this concern. First, studying changes over time in the same geographical area and controlling for several state characteristics should reduce the chance that our results are confounded by variations in unobserved consumer characteristics. Second, comparing changes in states with a prior mandate to states without a prior mandate should help account for nationwide changes in contraceptive use.

Our data are contraceptive sales and therefore a proxy for contraceptive utilization. Sales from retail pharmacies to consumers and from pharmaceutical companies to institutions, such as hospitals and clinics, are included in our data. If a clinic anticipates an increase in demand that never comes, our data would still capture these sales. This scenario is only a limitation in our analysis if institutional behavior differs across mandate states and non-mandate states. If institutions in both types of states engage in similar purchasing and stocking behavior, the difference-in-differences approach would control for these effects. If institutions in both types of states engage in different purchasing and stocking behavior, but this behavior does not change over time, our approach would also control for this phenomenon. Further, this scenario seems more theoretical than reality suggests. Stocking LARC methods is a

challenge for providers. Since IUDs and implants cost several hundred dollars, many providers would order as frequently as needed because they cannot afford to keep large quantities in stock (Strasser et al. 2016).

Since payment type is not available for all of our data, we are unable to compare prescriptions paid with private insurance to other payment types. Our dataset also lacks individual identifiers. Therefore, we cannot examine whether the ACA led individuals to substitute from one form of contraceptive prescription to another or if the increase in the sales comes from new users.

Although our study is not without limitations, we are among the first to examine the contraception utilization responses to the ACA's zero copay contraceptive insurance coverage provision. Our findings are more aligned with the findings of Pace et al. (2016b), which may suggest the findings of Carlin et al. (2016)—who use a sample of women from the upper Midwest—are not representative of the national population. Indeed, many upper Midwestern states are non-mandate states, and may have been more strongly affected by the ACA's contraceptive mandate as a result of their pre-ACA state mandate status.

Our findings reveal the importance of policy-induced changes in OOP expenses in decisions regarding contraceptive choices. Increased contraception utilization could have long-term impacts on fertility rates and improve the economic status of women (Ananat and Hungerman 2012; Browne and LaLumia 2014; Goldin and Katz 2002), however, our analysis requires caution in generalizing to fertility given the nuances of our interpretation. The policy may have affected subgroups of women (e.g. race, ethnicity, age, income, etc.) in different ways. Our aggregate sales data might mask these subgroup effects, which is important for estimating the impacts of the policy on fertility.

The ACA also mandates zero-copayment well-woman visits, which should improve women's ability to have an annual visit without cost sharing. Future work of the ACA's preventive services mandate should incorporate other women's health preventive services. Understanding the impact of insurance coverage on contraceptive decisions will also become important when looking beyond 2014 as insurance coverage continued to increase into 2015.

Compliance with Ethical Standards

Conflict of interest No conflicts of interest.

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