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Number of Oral Contraceptive Pill Packages Dispensed and Subsequent Unintended Pregnancies

Diana Greene Foster, PhD, Denis Hulett, Mary Bradsberry, Philip Darney, MD, MSc, and Michael Policar, MD, MPH

OBJECTIVE: To estimate how number of oral contraceptive pill packages dispensed relates to subsequent pregnancies and abortions.

METHODS: We linked 84,401 women who received oral contraceptives through the California family planning program in January 2006 to Medi-Cal pregnancy events and births conceived in 2006. We compared pregnancy rates for women who received a 1-year supply of oral contraceptive pills, three packs, and one pack.

RESULTS: Women who received a 1-year supply were less likely to have a pregnancy (1.2% compared with 3.3% of women getting three cycles of pills and 2.9% of women getting one cycle of pills). Dispensing a 1-year supply is associated with a 30% reduction in the odds of conceiving an unplanned pregnancy compared with dispensing just one or three packs (confidence interval [CI] 0.57–0.87) and a 46% reduction in the odds of an abortion (95% CI 0.32–0.93), controlling for age, race or ethnicity, and previous pill use.

CONCLUSION: Making oral contraceptives more accessible may reduce the incidence of unintended pregnancy and abortion. Health insurance programs and public health programs may avert costly unintended pregnancies by increasing dispensing limits on oral contraceptives to a 1-year supply.

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LEVEL OF EVIDENCE: III

See related articles on pages 551 and 558.

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Oral contraceptive pills are the most commonly used reversible method of contraception in the United States.[1] Although oral contraceptive pills are highly effective when used perfectly (3 pregnancies per 1,000 users in the first year of use[2]), typical patterns of use, with approximately half of women regularly missing one or more pills per cycle,[3,4] is associated with a much higher pregnancy rate (80 pregnancies per 1,000 users in the first year of use).[5]

Recent work has examined whether dispensing a greater number of oral contraceptive pill packs affects contraceptive continuation. Our previous work showed dispensing a 1-year supply at California family planning clinic visits was associated with lower health care costs and higher contraceptive continuation. In our first study, women who received a 1-year supply of pills were more likely to continue use at 15 months after the initial dispensing visit than women who received one or three packs (43% compared with 20%–22%).[6] A study[7] in Jamaica showed higher continuation at 1 month among women who received four cycles of pills at a visit compared with women who received one cycle of pills followed by three cycles of pills at the subsequent visit. However, women who received the larger initial quantity of packs in Jamaica did not show higher continuation at 5 months. Our objective was to estimate how the number of oral contraceptive pill packages dispensed relates to subsequent pregnancies and abortions.

MATERIALS AND METHODS

Five attributes of publicly funded reproductive health care in California permit the comparison of data from the state family planning program on specific number of oral contraceptive packs dispensed and the deliveries and abortions of pregnancies that occur in the subsequent year. First, Medi-Cal, California's Medicaid program, is in one of only 17 states that

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cover both abortion and birth.[8] Second, Family Planning, Access, Care and Treatment (PACT), a Medicaid family planning waiver program that provides contraceptives at no cost to women at risk for pregnancy with incomes up to 200% of the federal poverty level, is a fee-for-service program that records how many packs of pills the women are dispensed. Third, nearly everyone who receives contraceptives under Family PACT would qualify for Medicaid pregnancy-related services if they became pregnant. Fourth, some Family PACT clinics have the authority to dispense pills on site. Those clinics are not bound by the 100-day supply limit at pharmacies and may dispense up to a 1-year supply. And finally, the number of women provided contraceptives within Family PACT is large—almost 1 million receive any contraceptive method each year and more than 80,000 women receive oral contraceptive pills each month, permitting the comparison of events such as births and abortions after contraceptive discontinuation.

We compared pregnancy rates between women who received a 1-year supply (12 or 13 packs) compared with one or three packs using a linkage between contraceptive dispensing claims in Family PACT and pregnancy events in Medi-Cal. We are particularly interested in whether providing a 1-year supply reduces unintended pregnancy rates, believing that it is a better outcome measure than the surrogate markers for pregnancy that have been used previously. To that end, we focused particular attention on abortions because abortions, unlike births, occur only rarely from intended pregnancies.

To identify pregnancy events among Family PACT clients, this study linked Family PACT client eligibility records with both the Medi-Cal beneficiary records in Medi-Cal Eligibility Data System and the California Birth Statistical Master File. A probabilistic linking algorithm was used because unique identifiers such as social security numbers are not available in many records.[9] Consequently, approximately half of the Medi-Cal Eligibility Data System records, more than two-thirds of the Birth Statistical Master File records, and fewer than half of the Family PACT records contain a social security number. The probabilistic linking process linked individuals based on comparisons of birth date, name, gender, ethnicity, country of birth, language, county of residence, and postal code, as well as social security number, when available. We received approval from the University of California San Francisco Institutional Review Board to perform the claims data analysis and link to birth and Medi-Cal records (University of California San Francisco Committee for Human Research H429-16233-12A).

The Fellegi-Sunter model of record linkage[10,11] offers the ability to mathematically decide if a pair of records from two disparate data files belongs to the same person. A vector of weighted scores is created, indicating the levels of agreement and disagreement between corresponding variables within a record pair. This vector is used to create a composite score for the pair. The scores form a bimodal distribution of scores, one peak at the mean of the links and another at the mean of the non-links. Sensitivity and specificity analyses provide an optimal score threshold, above which the record pairs are considered links and below which are non-links. The threshold of the linking process for this analysis was set to obtain an equal number of errors among the links as among the non-links. Among the links, the error was estimated to be between 2% and 6%. Among the Family PACT to Medi-Cal Eligibility Data System links, 46% agreed fully on social security number. Among Family PACT to Medi-Cal Eligibility Data System links verified by social security number agreement, 95% agreed on seven or more other demographic variables. Among the links without benefit of social security number agreement, 86% agreed on seven or more variables. Among the Family PACT to Birth Statistical Master File links, 45% agreed fully on social security number. Among Family PACT to Birth Statistical Master File links verified by social security number agreement, 90% agreed on seven or more other variables. Among links without benefit of social security number agreement, 88% agreed on seven or more variables.

We ran a linkage from the 84,401 women who received oral contraceptive pills in January 2006 to 397,187 women whose Medi-Cal or Birth Statistical Master File pregnancy event (birth, miscarriage, abortion, or ectopic pregnancy) was conceived between January 2006 and January 2007. Exact dates of conception are not available in the Medi-Cal Eligibility Data System database. However, links made between Family PACT mothers and the Birth Statistical Master File births in 2006 and 2007 allowed us to obtain the date of last menses associated with 96% of linked births. In cases in which a matched record was found in the Birth Statistical Master File but no last menstrual period was recorded, we estimated the length of gestation by creating a linear model on birth weight and ethnicity. Conception for deliveries is set at 14 days after the date of last menses. For pregnancy events obtained from Medi-Cal Eligibility Data System when last menstrual period was not available, average gestation periods were used. Pregnancies

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ending in surgical or spontaneous abortions were assumed to have been conceived 8 weeks before the abortion (10 weeks since last menstrual period). Pregnancies ending in medication abortion and ectopic pregnancies were assumed to have been conceived 5 weeks before the termination of the pregnancy (7 weeks since last menstrual period).

Women were considered to be continuously protected if they received enough pill cycles to continue pill use without a break. There was a 28-day grace period in our calculations of contraceptive protection to allow for the use of a remaining cycle from a previous visit for women not new to the pill and for new users to wait one menstrual cycle before initiating pill use. We assumed that women were not using oral contraceptive pills on an extended regimen in which they skip the inactive pills. We consider that a woman has switched to another contraceptive method if she receives an injectable, patch, ring, intrauterine device, or sterilization procedure. Women who receive condoms after having been dispensed oral contraceptive pills are not assumed to have switched methods because they may be using condoms concurrently as a back-up method or for prevention of sexually transmitted infections. A pack of oral contraceptive pills in this article refers to a supply sufficient for a 28-day period. A 1-year supply is considered to be 12 or 13 packs.

We use χ^2 tests to examine differences in continuation, method switching, and pregnancy rates by number of pill packs dispensed. We used multivariable logistic regression models to examine the effect of number of cycles of pills, controlling for other factors that may affect pregnancy rate such as age, parity, race or ethnicity, whether the woman is new to Family PACT (and may be more motivated to prevent pregnancy), and, if an established Family PACT client, whether they have received oral contraceptive pills in the previous year. Demographic data came from the client enrollment records. Women who reported being Hispanic were separated by primary language because English-speaking Latinas in California have been shown to have lower fertility and greater motivation to avoid pregnancy than Spanish-speaking Latinas.[12] At the time our analysis began, January 2006 was chosen as the index month because it was the latest month for which both Family PACT and Medi-Cal data were complete.

RESULTS

Table 1 describes the 84,401 women who were dispensed oral contraceptive pills through Family PACT in January 2006. Most women (58%) received three packs, one in five (20%) received one pack, 11% received 12 or 13 packs, and 10% received another quantity of pill packs. Young women (younger than age

Table 1. Characteristics of Women Receiving Oral Contraceptives in Family PACT in January 2006 by Number of Cycles Dispensed

	Number of Cycles Dispensed in January 2006						
	1	3	6	10	12 or 13	Other	n
Total	20	58	2	1	11	7	84,401
Age (y)							
10–19	17	47	4	2	18	11	15,180
20–29	20	57	2	1	12	7	45,201
30–39	21	66	2	1	5	6	18,904
40 or older	20	69	1	1	4	5	5,104
Race or ethnicity							
Missing	18	51	3	2	18	9	2,648
Asian or Pacific Islander	18	49	3	2	20	8	6,130
African American	19	54	3	1	15	8	2,965
Latina	22	51	3	2	14	9	13,140
Latina, Spanish	20	70	1	0	3	5	36,132
White, non-Latina	17	47	4	2	19	11	23,386
Parity							
0	18	50	3	2	17	9	45,558
1	21	64	2	1	6	6	14,400
2 or more	21	70	1	1	3	5	24,443
Type of provider dispensing							
Pharmacy	24	74	0	0	0	3	56,472
Clinic	11	27	7	4	34	17	27,929

PACT, Planning, Access, Care, and Treatment.
Data are % unless otherwise specified.

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20) were most likely to receive a 1-year supply (18%) and women 40 and older were least likely (4%). Asians and white non-Latina women (20% and 19%, respectively) were more likely to get a 1-year supply; Spanish-speaking Latinas were least likely to get a 1-year supply (3%). Nulliparous women were more likely to get a 1-year supply than women with one or more children. Consistent with dispensing policy, pharmacies always dispensed a maximum of three packs of oral contraceptive pills, which is the maximum number allowable with a 100-day supply limitation. One-quarter (24%) of women receiving their pills at pharmacies received one cycle and three-quarters (74%) received three cycles. In January 2006, one-third of women received their pills at clinics that can dispense a 1-year supply. At these clinics, 11% of women got one cycle, 27% got three cycles, and 34% got a 1-year supply.

In Family PACT as a whole, teenagers are more likely than older women to receive a 1-year supply because they disproportionately receive care in clinics that are able to dispense a 1-year supply. However, at these clinics, teenagers are less likely than older women to receive the full 1-year supply (odds ratio [OR], .76). Women in their 20s and 30s are more likely than teenagers and women in their 40s to receive a 1-year supply. Racial ethnic differences are prominent. Asians are more likely (OR 1.15) and Latinas, particularly Spanish-speaking Latinas (OR .66), are less likely to receive a 1-year supply compared with white non-Latina women in the program as a whole and within clinics that are able to dispense a 1-year supply. Independent of age, ethnicity, and language, women who have no children are more likely than women with one or more children to get a 1-year supply (OR 2.04). Women who were dispensed oral contraceptive pills in the previous year are less likely to get a 1-year supply, even at clinics that can dispense a 1-year supply on site (OR .69). New clients to the Family PACT Program are more likely to get a 1-year supply of oral contraceptive pills than established clients (OR 1.48; Table 2).

Women who receive a 1-year supply of oral contraceptive pills are more likely to continue to use them than women who get one or three packs of pills. Just more than one in five (21%) of women who received one pack in January 2006, 25% of women who received three packs, and 40% of women who receive a 1-year supply had received sufficient packs of pills in time to continuously use oral contraceptive pills for the subsequent 15-month period. Women who received a 1-year supply were less likely (7%) to switch to another method of contraception than women who received one cycle (11%) or three cycles (10%) in the next 18 months (Table 3).

An estimated 2.8% of women who were dispensed oral contraceptive pills in January 2006 conceived a pregnancy in the subsequent year and the resolution (birth, induced abortion, ectopic pregnancy, or spontaneous abortion) was paid for by Medi-Cal. Women who received a 1-year supply

Table 2. Odds of Receiving a 1-Year Supply of Oral Contraceptives: Results of Multivariable Logistics Models

	All Family PACT	Only Providers Who Can Dispense 1-Year Supply
Age (y)		
10–19	1.33* (1.13–1.57)	0.76* (.63–0.92)
20–29	1.58* (1.35–1.86)	1.21* (1.01–1.45)
30–39	1.33* (1.12–1.57)	1.23* (1.02–1.48)
40 or older	Reference	Reference
Missing race or ethnicity	0.94 (0.85–1.05)	1.10 (.97–1.24)
Asian or Pacific Islander	1.09* (1.02–1.18)	1.15* (1.06–1.25)
African American	.73* (.66–.82)	.93 (.82–1.05)
English-speaking Latina	.70* (.65–.74)	.86* (.80–.92)
Spanish-speaking Latina	.23* (.21–.24)	0.66* (0.60–.72)
White, non-Latina	Reference	Reference
Nulliparous	2.39* (2.17–2.62)	2.04* (1.83–2.27)
1 child	1.36* (1.23–1.52)	1.42* (1.26–1.60)
2 or more children	Reference	Reference
Received pills in 2005	.38* (.36–.40)	.69* (.65–.73)
New client in January 2006	1.80* (1.68–1.92)	1.48* (1.38–1.60)
Established client, new pill user	Reference	Reference
n	84,389	27,927

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Data are odds ratio (95%) confidence interval unless otherwise specified.
* $p < 0.05$.

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Table 3. Contraceptive Continuation and Pregnancies Conceived in the Subsequent Year by Number of Oral Contraceptive Packs Dispensed in January 2006

No. of Cycles Received at First Visit in January 2006	n	Continuation at 15 mo	Switch to Another Primary Method	Pregnancy Conceived*	Induced Abortion*
1	16,471	21	11	2.9	.52
3	49,024	25	10	3.3	.63
12–13	9,549	40	7	1.2	.18
Other	9,357	38	10	2.0	.35
Total	84,401	27	10	2.8	.53

Data are % unless otherwise specified.
All differences by number of packs dispensed are significant at the .05 level using c^2 test.
*Includes only those pregnancies in which medical care for the pregnancy outcomes were paid for by Medi-Cal.

were less likely to have a pregnancy (1.2% compared with 2.9% of women getting one cycle and 3.3% of women getting three cycles; $P<.05$). Almost one-fifth (19%) of pregnancies ended in an induced abortion. The rate of Medi-Cal–funded induced abortions ranged from 0.18% among women who received a 1-year supply to 0.63% among women who received three cycles ($P<.05$; Table 3).

Results of a multivariable analysis of the pregnancy rate and abortion rate in the context of client demographics, family planning history, and number of cycles dispensed are shown in Table 4. Dispensing a 1-year supply is associated with a 30% reduction in the odds of conceiving a pregnancy in the subsequent year and a 46% reduction in the odds of an abortion, controlling for age, race or ethnicity, and previous pill use.

DISCUSSION

Dispensing a 1-year supply is associated with a significant reduction in the odds of conceiving an unplanned pregnancy compared with dispensing just

Table 4. Predictors of Conceiving a Pregnancy and Terminating a Pregnancy in the Subsequent Year by Number of Oral Contraceptive Packs Dispensed in January 2006: Results of a Multivariable Model

	Odds of Conceiving a Pregnancy in the Subsequent 12 mo	Odds of Terminating a Pregnancy Conceived in the Subsequent 12 mo
Race or ethnicity		
Missing	2.15* (1.59–2.90)	2.23* (1.11–4.48)
Asian or Pacific Islander	1.56* (1.22–1.99)	2.06* (1.21–3.52)
African American	1.87* (1.38–2.53)	2.15* (1.10–4.22)
Latina	2.46* (2.07–2.93)	2.55* (1.69–3.85)
Latina, Spanish	4.65* (4.01–5.39)	4.35* (3.06–6.19)
White, non-Latina	Reference	Reference
Number of pill packs dispensed		
1	Reference	Reference
3	1.08 (.97–1.20)	1.16 (.91–1.47)
12–13	.70* (.57–0.87)	.54* (.32–0.93)
Other	.91 (.76–1.08)	.91 (.61–1.37)
Age (y)		
10–19	1.46* (1.16–1.83)	1.74 (.96–3.13)
20–29	1.78* (1.47–2.16)	2.24* (1.35–3.74)
30–39	1.65* (1.35–2.01)	2.43* (1.45–4.07)
40 or older	Reference	Reference
Client status		
Established client, new pill user	Reference	Reference
Established client, established pill user	.96 (.87–1.06)	.86 (.69–1.06)
First visit to Family PACT (n=84,389)	.57* (.45–.72)	.55* (.32–0.96)

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Data are odds ratio (95%) confidence interval.
* $p < 0.05$.

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one or three packs. The cause of this reduction in pregnancies cannot be determined from these data. Most obviously, a greater supply of oral contraceptive pills may facilitate continuation of use by obviating the need for repeated time-consuming visits to a clinic or pharmacy for resupply; improved access and convenience may explain higher continuation among women given a 1-year supply. There is also a psychological explanation: each resupply visit is an opportunity to reconsider continuation of use. Being given a 1-year supply may enhance the expectation that the method is acceptable and safe, whereas fewer packs may suggest that the woman is likely to experience side effects and needs to reconsider use of the method at each resupply visit.

Our results are likely affected by a selection effect whereby more compliant users are given a larger supply of oral contraceptive pills. The women receiving oral contraceptive pills in Family PACT were not randomized to receiving one, three, or 13 packs. We cannot control for strength of intentions to avoid pregnancy or continue oral contraceptive pill use. However, we have controlled for factors that may be related to pill continuation, including age, race or ethnicity, and pill use in the previous year. We were not able to control for educational attainment; however, the population served by Family PACT has low income and likely has disproportionately low educational attainment as well. The effect of a 1-year supply of oral contraceptive pills on abortion rates controlling for demographic and previous use does indicate that not all pregnancies were planned in advance, and dispensing a greater supply of pills may reduce unintended pregnancy.

Another potential source of bias lies in which providers are permitted to dispense a 1-year supply. Only providers who dispense on-site, typically Planned Parenthood clinics, county health departments, student health clinics, and privately owned family planning clinics, can dispense a 1-year supply of oral contraceptive pills. For a variety of reasons, private practice providers do not stock and dispense oral contraceptive pills and instead write prescriptions that are transmitted to pharmacies. To the extent that the first group of providers takes more care in contraceptive counseling, differences in observed pregnancy rates may be attributable to differences in counseling rather than number of packs dispensed. However, there is no formal evidence that, even if the quality of counseling was higher at the first provider group, contraceptive counseling is associated with higher continuation.

Our study is limited to only those pregnancies with a resolution covered by the Medi-Cal program. The total pregnancy rate of 2.8% is significantly lower than we would have expected based on typical use failure rates of the oral contraception of 8%.[13] Induced abortions appear to be particularly undercounted; if there were no planned pregnancies in this group, then we would have expected to see an equal ratio of births to abortions rather than a ratio of 5 to 1.[14] Pregnancies ending in induced abortion may have been paid out of pocket because women may not know that Medi-Cal covers abortion, they may have been unable to find a provider who accepts Medi-Cal, or they may have decided to pay cash to maintain confidentiality. Even if induced abortions are undercounted in these data, the extent of abortion undercounting is unlikely to vary by number of packs dispensed.

Making oral contraceptive pills more accessible may reduce the incidence of unintended pregnancy and abortion. If all 65,000 women who received only one or three packs of pills experienced the same pregnancy and abortion rates as women who received a 1-year supply, then almost 1,300 publicly funded pregnancies and 300 abortions would have been averted. Health insurance programs and public health programs may avert costly unintended pregnancies by increasing dispensing limits on oral contraceptive pills to a 1-year supply.

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