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Postpartum Contraception and Interpregnancy Intervals Among Adolescent Mothers Accessing Public Services in California

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Abstract *Objective* To determine the association of age at index birth with postpartum contraceptive use and optimal interpregnancy interval (IPI, defined as delivery to next pregnancy >18 months), controlling for provider type and client demographics among adolescent mothers who have repeat pregnancies. *Methods* California's 2008 birth records were linked to California's Medi-Cal and Family PACT claims data to identify 26,393 women with repeat births between 2002 and 2008, whose index birth occurred as an adolescent, and who received publicly-funded services within 18 months after the index birth. Multivariable regression analyses were conducted to examine the relationship between timing of contraception provision and interpregnancy intervals, adjusting for socio-demographic factors. *Results* Seventy-eight percent of adolescent women did not receive contraception at their first postpartum visit, and twenty-eight percent of adolescent women never received contraception from a Family PACT or Medi-Cal provider. Adolescents who were older at their index birth had lower rates of optimal IPIs. Native American, Asian-Pacific Islander and Latina women had lower rates of optimal IPIs compared to white women. Compared to those using only barrier methods, adolescent women receiving highly effective contraceptive methods had a 4.25 times higher odds of having an optimal IPI than those receiving hormonal methods (OR 2.10), or using no method (OR 0.70). *Conclusion* Effective postpartum contraceptive use and being a Family PACT provider were associated with optimal birth spacing among adolescent mothers, yet racial and ethnic disparities persisted. A missed opportunity was the provision of contraception at the first postpartum visit. Providers should aim to remove barriers to initiation of contraception at this visit.

Keywords Adolescent mothers · Contraception · Interpregnancy intervals · Repeat pregnancy

Significance

What is already known on this subject? Rapid repeat pregnancies to adolescent mothers significantly impact maternal and neonatal health outcomes. Provision of long-acting reversible contraception helps to reduce rapid repeat pregnancies and increase the rates of optimal IPIs.

What this study adds? This study identifies a missed opportunity in the provision of family planning care to adolescent mothers. After removing barriers of cost and access, more than a quarter of adolescent mothers did not receive any contraception in the 18-month postpartum period. This study also identifies an area for improvement in the provision of family planning services to high-risk

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young women. After adjustment for socio-demographic factors, type of contraception, and length of contraceptive coverage, racial and ethnic disparities in optimal IPIs persisted among adolescent mothers.

Introduction

Nationwide and in California, early childbearing continues to decline to historic lows (Ventura et al. 2014; Hamilton et al. 2015). However, nearly twenty percent of births to adolescents were repeat births, and use of the most effective contraceptive methods postpartum was reported by twenty-two percent of adolescent mothers (Gavin et al. 2013). In California, the adolescent birth rate declined by 34 percent between 2009 and 2013, yet the percentage of repeat births to adolescent mothers declined by only five percent (California Department of Public Health, Maternal Child and Adolescent Health. California Teen Births 2000). Furthermore, more than 75 percent of births to adolescents are paid for by California's Medicaid program, in comparison to thirty to fifty percent of births to women ages 25 and above, netting significant costs to public taxpayers (Maternal and Infant Health Statistics 2014).

The adverse health, educational, and economic outcomes of teenage pregnancy for both teen mothers and their children have been well documented (Hoffman 2006; Gilbert et al. (2004; Emerging Answers 2007). Studies suggest that adolescent mothers experiencing a second birth within a short time frame of a previous birth are even less likely to overcome these detrimental outcomes (Klerman 2004; Horwitz et al. 1991; Polit and Kahn 1986).

The importance of birth spacing for optimal perinatal outcomes has also been well documented, with interpregnancy intervals less than 18 months (defined as the interval between a woman's previous live birth and her next conception) associated with adverse perinatal outcomes (e.g., low birth weight infants, preterm delivery) for women of all ages (DeFranco et al. 2007; Conde-Agudelo et al. 2006).

Effective and consistent contraceptive use is key to reducing suboptimal interpregnancy intervals, yet adolescents are inconsistent contraception users (Manlove et al. 2004; Paukku et al. 2003). Studies suggests that race and ethnicity play a role in adolescent women's contraceptive method selection and consistency of use, with non-Hispanic black and Hispanic adolescents least likely to use effective forms of contraception compared to white teenagers (Centers for Disease Control and Prevention 2012a, b; Waddell et al. 2010; Sterling and Sadler 2009).

In California, low-income women and adolescents may receive family planning services through Medi-Cal, California's Medicaid program, or California's Medicaid family planning expansion, Family Planning, Access, Care, and Treatment (Family PACT) (Bixby Center for Global Reproductive Health 2009). Any Medi-Cal provider can enroll as a clinician provider in Family PACT. Upon enrollment, they agree to adhere to Family PACT program standards, such as making all FDA-approved contraceptive methods available to clients, and providing comprehensive family planning counseling (Office of Family Planning 2008). Family PACT also focuses on facilitating teen-friendly family planning services and establishing connections between teen pregnancy prevention programs and family planning providers. A large study examined California women of all ages accessing Medi-Cal and Family PACT services and their interpregnancy intervals (Thiel de et al. 2013; Thiel de Bocanegra et al. 2014). The authors found that use of highly and moderately effective methods of contraception was associated with higher odds of optimal interpregnancy intervals, yet racial and ethnic disparities persisted. In this analysis, we examine whether the association between postpartum contraceptive use, interpregnancy intervals, and race and ethnicity are similar among women whose index birth occurred as a teenager, controlling for provider type and client demographics.

Materials and Methods

The data analysis was approved by the University of California, San Francisco Committee of Human Subjects Approval and the California State Committee of Human Subjects Protection. We identified mothers accessing Medi-Cal and Family PACT services, whose index birth occurred as an adolescent and who had a subsequent birth within 6 years to examine the relationship between the delivery of subsidized contraceptive services to postpartum adolescents and their subsequent IPIs. As part of a larger study on IPIs among women receiving publicly funded services, (Thiel de Bocanegra et al. 2013; Thiel de Bocanegra et al. 2014) we conducted a probabilistic linking methodology of Birth Statistical Master File (BSMF) data to Medi-Cal and Family PACT claims data to identify teenage mothers receiving contraceptive services from these programs. Using birth records from California's 2008 BSMF, we identified women with repeat births whose previous birth occurred as a teenager. We defined the birth immediately prior to their 2008 birth as the "index birth." Adolescent mothers with previous births dating back to 2002 were included. Adolescent mothers who met the following criteria were excluded: non-singleton birth; first birth or undetermined birth; BSMF information on live births and mother's age missing or inaccurate; adolescent mothers with an index birth outside of California; date of index birth prior to January 1, 2002; birth record not matched to previous BSMF record; age at index birth older

than twenty; and birth records not matched to Family Pact and Medi-Cal claims. After applying all of the exclusion criteria, our final sample was comprised of 26,393 mothers with repeat births whose previous birth occurred as a teenager and who accessed Family PACT or Medi-Cal services in the 18-month postpartum period.

Measures

Interpregnancy interval (IPI) was defined as the interval between the date of the index birth and the conception date of the birth in 2008. An optimal IPI was defined as greater than 18 months (Office of Disease Prevention and Health Promotion 2020). The conception date was defined as date of last menses plus nine days. In cases of missing values in the BSMF, the date of the last menses was calculated by subtracting the length of gestation from the child's date of birth or estimated date of birth using a regression model with data on birth weight, parity, and race/ethnicity.

We constructed two primary exposure variables based on contraceptive provision for assessing the relationship to interpregnancy intervals. Contraceptive coverage reflected the cumulative sum of coverage and maximum tier reflected the most effective contraceptive method provided a woman over the course of the study time frame. The maximum length of contraceptive coverage counted was up to 18 months from a teenager's index birth. Months of coverage were calculated based on the type of contraceptive coverage and the number of units received. Unless a removal of an intrauterine device or implant had been specified, we assigned the maximum length of coverage to these methods. We calculated coverage for user-dependent hormonal methods and barrier methods using an algorithm based on the specified type of method and the quantity (for example, the number of pill packs or condoms distributed). Emergency contraception and no method were not assigned any days of coverage. The length of coverage was summed across the service dates, from first visit postpartum until the 18 month cut-off. If a teen switched methods, coverage was calculated on the cumulative length of both methods without double counting periods of overlap.

Contraceptive methods were categorized into tiers based on effectiveness: (Trussell 2012).

- Tier 1: Long acting reversible contraception (LARCs)—implants, intrauterine contraceptives [IUCs].
- Tier 2: User-dependent hormonal—oral contraceptives, injection, patch, ring.
- Tier 3: Barrier method and supplies—condoms, diaphragm, spermicides.
- No method in claims.

When a teenager received multiple types of contraception falling into different tiers, the most effective method used following the index birth was defined as the "max tier" and used for descriptive and regression analyses. Given that contraceptive methods were derived from claims data, methods like lactational amenorrhea and natural family planning were not accounted for.

The birth record files contained information for each teen, including race, ethnicity, country of birth, education level, and parity, which were used as control variables. We categorized teenager's race and ethnicity as White, Black, Latina, Asian/Pacific Islander, Native American, or other. Nativity status was categorized as either U.S. born or foreign born. Age at index birth and current education level were determined from 2008 birth certificates. Education level was classified into two categories: 12^{th} grade education or less and high school graduate or some college.

To identify Family PACT providers, we used the provider enrollment status from the Medi-Cal Provider Master File, which contains provider information entered at the time of enrollment and is updated periodically. Medi-Cal providers not enrolled in the Family PACT program are referred to as Medi-Cal only providers. In our analysis, we categorized providers by their enrollment status (enrolled in Family PACT, Medi-Cal only, or both), independent of which Medi-Cal delivery system paid for the claims.

We present characteristics of adolescent women who had a Medi-Cal or Family PACT claim after the index birth, and descriptive analyses of timing and type of contraceptive method provision. We constructed two multivariable logistic regression models to examine the relationship between interpregnancy intervals with contraceptive method effectiveness and contraceptive coverage among women receiving Medi-Cal and Family PACT services. Model 1 examines the relationship between contraceptive method effectiveness and optimal IPIs, and model 2 examines the relationship between months of contraceptive coverage and IPIs. Both models controlled for age at index birth, race and ethnicity, country of birth, parity, and education level. We used SAS version 9.2 for all analyses.

Results

Demographic Characteristics of Adolescent Women

Of the 26,393 adolescent women in the sample, 64 % (n = 16,777) had optimal IPIs. Among adolescent women with suboptimal IPIs, nearly a quarter (24 %) conceived within twelve months of their index birth. Rates of suboptimal IPIs were similar across racial and ethnic groups (between 35 and 40 %), except among Native American women who had an elevated rate (47 %) (Table 1).

Table 1 Sample characteristics of Medi-Cal and Family PACT clients (n = 26,393)

	N	Percent total
Birth interval length		
18 months+	16,777	63.57
<18 months	9616	36.43
Providers seen		
Family PACT only	2778	10.53
Medi-Cal only	8728	33.07
Both Medi-Cal and Family PACT seen	14,887	56.40
Race/ethnicity		
White	3395	12.86
Latina	19,609	74.30
Black	2139	8.10
Asian/Pacific Islander	814	3.08
Native American	184	0.70
Other/unknown	252	0.95
Country of birth		
U.S.-born	17,409	65.96
Foreign-born	8984	34.04
Education		
Less than 12th grade	12,160	46.08
High school graduate	9986	37.83
Some college or more	3661	13.87
Missing	586	2.22
Age at index birth		
Younger than 15	350	1.32
15–17	8862	33.58
18–19	17,181	65.09
Parity		
2 live births	21,155	80.15
More than 2 live births	5236	19.83
Missing	2	–

Method Type, Contraceptive Coverage, and Provider Type

Seventy-eight percent of adolescent women in the sample did not receive any contraceptive method at their first visit after delivery (n = 20,665) and twenty-eight percent (n = 7519) did not receive any contraception during the 18-month period. Most received user-dependent hormonal methods as their most effective method (61 % Tier 2, n = 16,134). A much smaller percentage of women received barrier methods (7 % Tier 3, n = 1753), and an even smaller percentage received long-acting reversible methods (4 % Tier 1, n = 987). In the entire cohort, the average length of contraceptive coverage over the 18-month postpartum period was 5.66 months (SD = 4.94). Coverage varied by the maximum tier received, as adolescent women who received LARCs had the highest mean contraceptive coverage (Tier 1, 10.29 months, SD = 6.14), followed by Tier 2 methods (mean = 5.93 months, SD = 4.70), and Tier 3 methods (mean = 0.58 months, SD = 0.40) (Table 2).

Among the 4 % of adolescents who received Tier 1 contraception, rates of uptake ranged from 4 to 5 % among Native American, White, and Latina adolescents, to 1 %, among Asian/Pacific Islanders and Black adolescents. Rates of Tier 2 and Tier 3 contraception use are described in Table 3.

More than half of the sample (n = 14,887, 56 %) was served by both Family PACT and Medi-Cal only providers. Ten percent (n = 2778) were served solely by Family PACT providers and 33 % (n = 8728) were served solely by Medi-Cal providers.

Multivariable Logistic Regression Analyses

The two logistic regression models estimated the relationship between adolescent women achieving optimal interpregnancy intervals, the type of contraception received, and length of contraceptive coverage. The models controlled for other variables influencing achieving an optimal IPI (race/ethnicity, nativity, education level, age at index birth, parity, and provider enrollment status). See Table 4.

Model 1 examined the association among adolescent women between effectiveness of contraceptive method used 18 months after delivery and optimal interpregnancy intervals. Use of a Tier 1 method was associated with significantly higher odds of an optimal IPI (OR 4.25, CI 3.47–5.21) compared to use of a Tier 3 method. Adolescent women using Tier 2 methods had a 2.10 times higher odds of an optimal IPI than women using a Tier 3 method (CI 1.89–2.32). Adolescent women using no method had significantly lower odds of an optimal IPI than women using a Tier 3 method (OR 0.70, CI 0.62–0.78).

Model 2 examined the association between adolescent women's contraceptive coverage and optimal interpregnancy intervals. Longer contraceptive coverage was significantly associated with greater odds of having an optimal IPI (OR 1.10, CI 1.09–1.11). For each additional month of contraceptive coverage, the odds of having an optimal IPI increased by 10 %. Adolescent women receiving a Tier 1 method were excluded from Model 2, as those clients were assigned the maximum length of contraceptive coverage (unless a removal was noted), so there was little variation in the amount of coverage assigned in that group.

In both models, when controlling for socio-demographic factors, adolescents who were older at the index birth had a lower odds of an optimal IPI. The two models found that with each additional year of age at index birth, adolescent women had significantly lower odds of an optimal IPI. In both models, having completed a high school education or

Table 2 Contraceptive method and coverage in 18-month postpartum period (n = 26,393)

Method (Maximum tier) received	n	Percent total	Contraceptive coverage	
			Mean	SD
1—Long acting reversible contraception	987	3.74	10.29	6.14
2—User dependent hormonal	16,134	61.13	5.93	4.70
3—Barrier method and supplies	1753	6.64	0.58	0.40
No method	7519	28.49	–	–
Any contraceptive coverage (maximum tiers 1–3)	18,874	71.51	5.66	4.94

Table 3 Maximum tier contraception by race and ethnicity (n = 26,393)

	Tier 1	Row %	Tier 2	Row %	Tier 3	Row %	Tier 99	Row %	Total
Race/Ethnicity									
White	127	4	2075	61	124	4	1069	31	3395
Latina	805	4	12,258	63	1377	7	5169	26	19,609
Black	24	1	1154	54	171	8	790	37	2139
API	8	1	427	52	48	6	331	41	814
Native American	10	5	86	47	9	5	79	43	184
Other	13	5	137	54	22	9	80	32	252

Table 4 Adjusted odds ratio for having an optimal interpregnancy interval, by max tier and contraceptive coverage (n = 26,393)

Covariate	Model 1 odds ratio estimates	Model 2 odds ratio estimates
Contraceptive provision		
Max tier received		–
Tier 1 (Long-acting contraception)	4.25 (3.47–5.21)***	–
Tier 2 (User-dependent hormonal)	2.10 (1.89–2.32)***	–
Tier 3 (Barrier methods/supplies)	1.00 (ref)	–
No method	0.70 (0.62–0.78)***	–
Months of contraceptive coverage[a]	–	1.10 (1.09–1.11)***
Providers seen		
Medi-Cal only	1.00 (ref)	1.00 (ref)
Family PACT	1.89 (1.71–2.09)***	1.99 (1.73–2.28)***
Both seen	1.28 (1.21–1.36)***	1.42 (1.32–1.53)***
Highest education level		
12th grade or less	1.00 (ref)	1.00 (ref)
High school graduate or some college	1.69 (1.60–1.79)***	1.61 (1.50–1.73)***
Race/ethnicity		
White	1.00 (ref)	1.00 (ref)
Latina	0.86 (0.79–0.93)**	0.79 (0.71–0.88)**
Black	1.14 (1.01–1.29)*	1.19 (1.01–1.40)*
Asian/Pacific Islander	0.77 (0.65–0.91)*	0.79 (0.63–0.99)**
Native American	0.68 (0.49–0.93)*	0.56 (0.37–0.87)*
Other	0.76 (0.47–1.24)	0.69 (0.36–1.32)
Foreign born	1.36 (1.27–1.45)***	1.25 (1.16–1.35)***
Age at index birth	0.88 (0.87–0.91)***	0.89 (0.87–0.92)***
Parity		
2 births	1.00 (ref)	1.00 (ref)
>2 births	1.14 (1.07–1.22)**	1.16 (1.07–1.27)**

* $p < 0.05$; ** $p < 0.001$; *** $p < .0001$

[a] User dependent contraception only, Tier 1 methods excluded

some college at the time of the repeat birth was associated with increased odds of an optimal interpregnancy interval.

In both models, Latina women, Native American women, and Asian/Pacific Islander women had significantly lower odds of having an optimal IPI compared to white women when controlling for covariates. Black women had significantly higher odds of having an optimal IPI compared to White women. Women who were foreign-born had significantly higher odds of having an optimal IPI compared to U.S. born women.

In both models, seeing a provider who was Family PACT only, or enrolled in both Family PACT and Medi-Cal was associated with greater odds of an optimal IPI compared to seeing a Medi-Cal provider only.

Discussion

California's publicly funded family planning programs eliminate many of the barriers to accessing services by providing free or low-cost care to low-income and adolescent women. Consistent with prior studies, (Damle et al. 2015; Wilson et al. 2013) use of long-acting reversible contraception was associated with increased rates of optimal IPIs in this population of adolescent mothers. However, many adolescent women accessing these services continue to have rapid repeat pregnancies. In this study, we identify an important opportunity for improvement of family planning counseling and care delivery to adolescent mothers.

Despite the removal of many of the traditional barriers to care, seventy-eight percent of adolescent mothers did not receive contraception at their first postpartum visit (in contrast to ten percent of California women in the larger cohort of reproductive-aged women) (Thiel de Bocanegra et al. 2013) and more than a quarter of adolescent mothers (28 %) who presented for care postpartum did not receive contraception during the 18-month period. The first postpartum visit typically occurs approximately 6 weeks after a woman gives birth. If adolescent mothers have not received contraceptive counseling during the prenatal period or in the hospital after delivery, it may be difficult to address contraceptive needs and preferences in a single postpartum visit. As a result, they may leave their first visit without contraception. A study of non-pregnant low-income young women and contraceptive method selection found that "even basic contraceptive education is too comprehensive to be taught in a single clinical encounter." (Harper et al. 2010) Adolescent mothers receiving prenatal care present an opportunity to continue family planning counseling over a series of visits, allowing provider and client to review pre-pregnancy contraceptive methods and patterns of use, to determine the best postpartum method for each mother.

We also identified significant disparities in the timing of interpregnancy intervals in this population. After controlling for demographic factors, length of contraceptive coverage, and contraceptive efficacy, older adolescents, and Latina, Asian-Pacific Islander, and Native American adolescent women have lower rates of optimal IPIs compared to white women. These results are consistent with those found by Thiel de Bocanegra et al., (Thiel de Bocanegra et al. 2014) however they examine a higher-risk subset of the population—adolescent mothers who have repeat pregnancies within eighteen months of their last birth. As such, this population has potentially far greater consequences resulting from such rapid repeat pregnancies.

Racial disparities documented in this and other studies demonstrate the need to better understand the contraceptive patterns and use by minority populations. While pregnancy intendedness may be a factor associated with contraceptive use in the Latina population, (Braveman et al. 2011) it has not been assessed to what extent rapid repeat pregnancies in the Latina population are intended.

Studies have similarly noted increased rates of short interpregnancy intervals among Asian Pacific Islanders and Native American women (Delara et al. 2014; Khoshnood et al. 1998). This may be partially explained by breastfeeding rates among different racial and ethnic groups, which provides additional protection from pregnancy. Foreign-born Latinas are more likely to breastfeed and to breastfeed longer than U.S.-born Latinas, (Chapman and Perez-Escamilla 2013); (Heck et al. 2006); (Sparks 2011) while Asian-Pacific Islanders are least likely to initiate exclusive breastfeeding after birth compared to white women. Teenage mothers are the least likely to initiate breastfeeding compared to other reproductive-aged women, so the effect of not breastfeeding observed may be even stronger among U.S.-born Latina and API teenagers (Heck et al. 2006).

Black adolescents were an exception in this study, in that they were significantly more likely to have optimal IPIs compared to white adolescents when controlling for covariates. Programs like California's Black Infant Health Program, which provides support and education services to Black women age 18 years or older may have contributed to Black women's increased odds of optimal IPIs.

Education level was associated with an increased likelihood of an optimal IPI. It is unclear whether the desire to get an education leads to increased uptake and utilization of contraception, or delaying childbirth allows women to progress further in their education, but this relationship is consistent with existing research (James et al. 1999; Zhu et al. 2001).

Age was associated with a decreased likelihood of an optimal IPI. Because this study utilized claims data for our analysis, we were unable to assess this population's pregnancy intentions. However, it is possible that after having

one birth, older adolescents at the time of their index birth may have more "permanent partners" as compared to younger adolescents and thus the likelihood of conceiving soon after the index birth may be higher. The limited research examining pregnancy intentions among varying ages of pregnant and parenting adolescents found that a higher percentage of older adolescents (ages 18–19) desired to get pregnant at the time of conception compared to younger adolescents (ages 12–15 and 16–17) (Phipps et al. 2008).

Adolescent women cared for by Family PACT providers were more likely to have optimal IPIs than those seen by non-Family PACT providers. Program standards, which define the scope, type, and quality of care, include the ongoing assessment of clients' health education and counseling needs such as a reproductive life plan and preconception health. Family PACT providers have access to professional training in client-centered counseling and contraception provision. These findings support previous research demonstrating that providing providers with evidence-based training, and eliminating financial barriers to reimbursement for services increases postpartum contraception uptake and prevents unintended teenage pregnancies (Chabot et al. 2014).

Because our study uses claims data, we are unable to determine whether provider or patient factors contributed to whether or not a woman received contraception. Another limitation of this study is that it captures adolescent women who accessed family planning services; it does not measure all women eligible for services. Adolescent women whose second birth was out of state or who had private insurance were excluded, unless they also received services from Family PACT or Medi-Cal. We controlled for variations in demographic factors, but were unable to control for breastfeeding practices, contraceptive methods preferences, pregnancy intention, and ease of access to services that influence whether an adolescent woman accessed family planning services and how consistently those services were used. Similarly, emergency contraceptives were grouped under "no method," so clients using emergency contraception to prevent pregnancy were not captured. However, adolescent women with no contraceptive claims were least likely to have optimal IPIs, suggesting that they did not receive other contraceptive services. Because this study population is restricted to adolescent women in California who have repeat pregnancies within 6 years of their prior pregnancy, another limitation of this study is that our results may not be generalizable to populations of adult women.

Our findings demonstrate the need to better understand the provider and system barriers that prevent more complete integration of family planning services into pre-conceptual, prenatal and postpartum care. Providers should identify patients in high-risk groups and provide comprehensive family planning counseling in the prenatal period and contraception at the first postpartum visit. In recognizing these high-risk groups, providers can mobilize other resources after an initial birth (public health nurse home visits, closer follow-up visits, educational tools) to help these populations achieve optimal interpregnancy intervals.

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Compliance with Ethical Standards

Conflicts of interest The authors declare that they have no conflicts of interest.

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