It's About Time: Data on Interpregnancy Interval using the National Survey of Family Growth and the National Vital Statistics System

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Abstract

Research shows a relationship between short interpregnanacy intervals (IPI) (< 18 months) and reproductive risk; however, the correlates of longer IPI (60 or more months) have not been examined. Data from the National Survey of Family Growth (NSFG) were used to examine the association between maternal characteristics and IPI among a nationally representative sample of 12,279 women. Adjusting for sociodemographic and childbearing characteristics, short IPI were more likely among women who were younger, married, women with 2 or more prior live births and who reported the pregnancy as unintended. In the adjusted models, Hispanic and non-Hispanic black women had longer IPI than non-Hispanic white women, though we had limited power to detect differences. In the final paper, data from the 2011 birth certificate (revised in 2003 to include date of last live birth) will be compared to the NSFG to provide a more comprehensive picture of IPI in the U.S.

Introduction

Evidence from systematic reviews and meta-analyses indicate that short and long intervals between pregnancies are independently associated with an increased risk of adverse pregnancy, maternal, perinatal, infant and child outcomes (1-3). The World Health Organization (WHO) has recommended waiting at least 2 years between a live birth and a subsequent conception (4). However, national-level estimates in Healthy People 2020 show that about one-third of interpregnancy intervals (IPI) are below an 18-month threshold (5). Explanations for shorter or longer than average IPI include factors such as maternal age, socioeconomic status and lifestyle characteristics (6-7). To avoid short intervals, health care providers have emphasized the importance of providing information and access to family planning services during the postpartum period to reduce adverse perinatal outcomes (8). In comparison, women with longer than average birth intervals, generally defined as more than 60 months, may face perinatal complications as a result of secondary infertility or other factors related to longer conception times, such as advanced maternal age (3).

Currently, the National Survey of Family Growth (NSFG) is one of the few nationally-representative data sources with information on pregnancy spacing in the U.S. Research utilizing nationally representative data from the NSFG has examined proximate determinants of IPI length (9-10). In the NSFG, short IPI (< 18 months) were most common among women aged

15-19, women who were non-Hispanic black, and women who had a Medicaid-funded delivery (9). Similarly, nearly half of women with short IPI reported the pregnancy was unintended (9). In addition to the NSFG, newly available data from the revised 2003 U.S. Standard Certificate of Live Birth includes information on date (month and year) of last live birth, which can be used to calculate the most recent IPI. In 2011, 36 states and the District of Columbia (83% of U.S. births) had revised and information on this item will soon be made available for public use. The complete adoption of the 2003 revised birth certificate by all jurisdictions will provide another nationally-representative data source for which to evaluate sociodemographic characteristics related to IPI and its relationship to birth outcomes. Both data sources enable us to provide a more comprehensive picture of pregnancy intervals in the U.S.

The objectives for this analysis were to compare the distribution and determinants of IPI in data from jurisdictions adopting the revised 2003 U.S. Standard Certificate of Live Birth by January 1, 2011 (hereafter referred to as 2011 revised birth certificate data) and the 2006-2010 NSFG to better understand the correlates associated with short IPI (< 18 months) or long IPI (60 months or more) compared to an "optimal" pregnancy interval length of 18 to 59 months. While the NSFG provides important information on circumstances surrounding the pregnancy, such as intendedness, the 2011 revised birth certificate will enable us to evaluate patterns of IPI using more detailed breakdowns by age, race/ethnicity and nativity. In this abstract, we present data only from the 2006-2010 NSFG, which will be compared with the 2011 revised birth certificate data once the public use data file is released later this year.

Methods

Data Sources and Measures

The National Survey of Family Growth (NSFG)

The detailed pregnancy histories available in the 2006-2010 NSFG make it an ideal data source in which to study pregnancy spacing, as well as the other characteristics of the birth associated with pregnancy intervals, such as pregnancy intention. For these analyses, data for each reported pregnancy were linked to the primary respondent file. The NSFG interviewed national samples of women aged 15-44 in 2006-2010. The variables used in the analyses include several characteristics measured at the time of most recent live birth, including marital status, maternal age, number of previous live births and whether the birth was paid for by Medicaid. Variables measured at the time of interview included Hispanic origin and race and educational attainment. Nativity for Hispanic respondents was identified by whether they self-reported they were born in the United States. Whether the most recent pregnancy (leading to a live birth) was reported as intended (versus mistimed or unwanted) was based on a series of questions asking the woman to think back to right before she became pregnant and report whether she wanted the pregnancy when she had it (intended), later than when she had it (mistimed) or never (unwanted). There are a series of recoded variables in the NSFG that provide dates (in century months) of both the conception and when the pregnancy ended. For these analyses, only pregnancies leading to live births were examined. The interpregnancy interval was calculated as

the time elapsed between the conception date of a second or higher-order birth and the date of a previous birth.

The 2011 revised birth certificate from the National Vital Statistics System (NVSS)

Data from the 2011 revised birth certificate data of the NVSS contain information on the month and year of the last live birth among all women who give birth in the United States in 2011, thus providing an important benchmark for measuring the average interval length of a pregnancy in that year. The 2011 revised birth certificate data was used because it contains the most number of revised jurisdictions (83% of all U.S. births) compared to prior years and is closest to the time period of the most recent NSFG sample. To create IPI using the 2011 revised birth certificate data, a live birth interval was calculated by subtracting the date of the recent birth for that year from the date of the last live birth (in months). Then, an IPI (in months) was computed by subtracting the gestational age (computed to months) from the live birth interval. Explanatory variables were chosen based on comparability with NSFG variables and included maternal characteristics at the time of most recent birth (age, marital status, race/ethnicity, nativity, and education) as well as the number of prior live births, and source of payment at delivery. The variable definitions were comparable with NSFG with the exception of source of payment at delivery and nativity. Source of payment in the birth certificate was limited to primary source of payment, whereas, NSFG could list any source of payment. Foreign-born status in the birth certificate was determined by the maternal country at birth, whereas, in the NSFG it was determined by whether the mother reported she was born outside the United States.

Analytic Sample

The analytic samples for both data sources include all women aged 15-39 years at last live birth with 2 or more live births whose most recent live birth was a singleton. The age range of 15-39 years at most recent birth was chosen to make the age distributions comparable across both data sources, since there were too few women aged 40-44 years at last live birth who had two or more births in the NSFG to reliably measure pregnancy intervals among this older age group. Multiple births were excluded from these analyses because in the birth certificate, the date of last live birth is coded differently for plural births depending on the birth order. For both data sources, implausible IPI (i.e, IPI ≤ 0) were excluded. In the 2006-2010 NSFG, births included in the analyses were limited to second or higher-order births in the 5 years preceding the interview (N=2,327).

Statistical Analyses

Median IPI and interquartile ranges (IQR) were compared overall and by explanatory variables. Differences in the median IPI by data source was compared using a frequency weighted Wilcoxon rank-sum test. Unadjusted and adjusted multinomial logistic regression models were used to assess the relationships between characteristics and short or long IPI compared to an optimal IPI length across both data sources. In sensitivity analyses, we also assessed how these relationships changed when controlling for pregnancy intentions in the NSFG models.

Results

Table 1 shows the overall distribution and median length of IPI for women aged 15-39 at last live birth in the 2006-2010 NSFG. The total median length of IPI for these women was 24 months with an IQR of 14-43 months. Median IPI was longer for women whose recent births were intended (28 months), women who were unmarried (27 months), women who were aged 30-39 years (28 months), and women with only one previous live birth (25 months). There were no discernible patterns of IPI length by maternal education and whether births were paid for by Medicaid. In contrast, the median IPI varied by race and ethnicity, with foreign-born Hispanic women having the longest IPI (30 months), followed by U.S born Hispanic women (28 months), non-Hispanic black women (24 months) and non-Hispanic white women (23 months).

Results from multivariate analyses predicting the likelihood of having a short (< 18 months) or a long (60 or more months) IPI compared to an optimal length (18-59 months) among women aged 15-39 at last live birth in the NSFG are shown in **Table 2**. Among the 2,327 pregnancies in our sample, 35% were conceived within 18 months of a previous birth, while 16% had an IPI of 60 or more months. Model 2 shows the odds of having a short IPI were 4.5 times as high for women who reported their births as mistimed and 2.3 times as high for women who reported these births as unwanted, compared with women who reported their recent births as intended. Short IPI were more likely for women who were married, women with a Bachelor's degree or higher and women with 2 or more previous live births. Maternal age at time of recent birth was significantly inversely associated with having a short IPI. The odds of having a short IPI were not significantly different by whether the delivery had been paid for with Medicaid and by race/ethnicity; however, point estimates suggested foreign- and native-born Hispanic women were less likely to have short intervals compared to non-Hispanic white women. Removing pregnancy intentions from the model had little impact on the overall relationships of other covariates with the exception of Medicaid-funded delivery, which increased in magnitude in predicting a short IPI but was not significant.

Model 4 displays the odds of having a long IPI among women aged 15-39 at last live birth in the NSFG. The demographic characteristics shown stand in contrast to the short interval panel estimates. In adjusted analyses, the odds of having a long IPI were more likely for women who were unmarried and had lower education and less likely for women who were younger or had 3 or more prior live births. While the odds of having a long IPI were about 75% higher for U.S born Hispanic women and 50% higher for foreign-born Hispanic women than for non-Hispanic white women, these were not significant in adjusted analyses. Removing pregnancy intention from the adjusted model predicting a long IPI did not have any significant effects on the variables included.

Conclusion and Next Steps

Overall, short and long IPI in the NSFG were related to marital status, age, education, and prior live births; however, pregnancy intentions were only associated with short IPI. While the magnitude of the association varied by race/ethnicity and nativity in the NSFG data, we had

limited power to detect differences. In the final paper, detailed analyses from the 2011 revised birth certificate will assess differences in these variables related to IPI. A detailed comparison between these two data sources is important because both the similarities and differences in these key variables will help explain how IPI may be a mediating factor in disparities in birth and maternal health outcomes in the U.S.

Short IPI are a primary focus of national public health priorities (e.g., Healthy People 2020). Short IPI can be prevented when women have access to effective contraceptive methods; thus, women at risk of short IPI are often the focus of targeted public health efforts put in place to reduce the risk of adverse perinatal outcomes. Less often examined is the relationship between key demographic variables and long IPI. These analyses showed that women with long intervals are distinct from those with "optimal" birth intervals, supporting evidence for the "J" shaped relationship between IPI and adverse birth outcomes shown in other population research (2). The number of births in the 2011 revised birth certificate would support a stratified analysis by our selected covariates and allow us to further explore the full spectrum of the IPI by using various cutoff points.

The next steps for this paper involve an analysis of age at first birth and IPI using the NSFG, as well as a stratified analysis by race/ethnicity, nativity and parity and its relationship to IPI using the 2011 revised birth certificate. Although not statistically significant, the longer birth intervals for Hispanic and non-Hispanic black women compared with non-Hispanic white women in the NSFG mirror another recent study showing older black women have longer IPI (11). To our knowledge, patterns of IPI among Hispanic women have not been explored. The combination of rich, descriptive pregnancy histories in the NSFG and the detailed subgroup analysis possible in the 2011 revised birth certificate data provides a framework for future research in IPI and birth outcomes using both these data sources.

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Table 1. Median (interquartile range) of live birth intervals for births in the past 5 years among women aged 15-39 at most recent live birth by demographic characteristics, NSFG 2006-2010

Characteristic	Pregnancy interval
Interval length	24 (14-43)
Pregnancy intention	
Intended	28 (17-48)
Mistimed	24 (12-45)
Unwanted	14 (8-29)
Marital status at most recent live birth	
Married	23 (14-41)
Unmarried	27 (13-47)
Age at most recent live birth (in years)	
15-19	11 (5-24)
20-24	19 (11-32)
25-29	25 (15-43)
30-39	28 (17-56)
Hispanic origin and race	
Hispanic	29 (15-56)
Foreign-born	30 (15-58)
Native-born	28 (15-52)
NH White	23 (14-37)
NH Black	24 (11-44)
NH Other	24 (15-42)
Education at interview	
No high school diploma or GED	23 (11-45)
High school diploma or GED	26 (15-48)
Some college	28 (15-46)
Bachelor's degree or higher	21 (15-34)
Prior live births	
1	26 (15-43)
2	25 (14-45)
3 or more	22 (12-43)
Source of payment at recent delivery	
Medicaid	24 (12-45)
No Medicaid	25 (15-42)

Table 2. Unadjusted and adjusted odds ratios for short and long interpregnancy intervals among women aged 15-39 at most recent live birth[1]: NSFG 2006-2010

	Short (Less than 18 months)			Long (60 or more months)		
	%	Unadjusted OR	Adjusted OR	%	Unadjusted OR	Adjusted OR
		Model 1	**Model 2**		**Model 3**	**Model 4**
Total	34.9 (1.3)			15.5 (1.3)		
Pregnancy intention						
Intended	25.3 (1.6)	Ref	Ref	16.8 (1.6)	Ref	Ref
Mistimed	59.7 (3.6)	2.37 (1.72-3.24)***	4.56 (3.17-6.53)***	8.9 (2.5)	0.97 (0.54-1.75)	0.88 (0.46-1.67)
Unwanted	39.0 (4.0)	3.97 (2.96-5.35)***	2.31 (1.53-3.49)***	19.2 (3.5)	1.58 (0.96-2.60)^	1.17 (0.65-2.09)
Marital status (recent live birth)						
Married	35.3 (1.7)	Ref	Ref	14.5 (1.7)	Ref	Ref
Unmarried	34.2 (1.9)	0.99 (0.79-1.24)	0.70 (0.51-0.94)**	16.7 (1.8)	1.20 (0.83-1.72)	1.64 (1.03-2.62)**
Age (recent live birth, years)						
< 25 years	47.1 (2.8)	1.49 (1.14-1.94)**	1.85 (1.24-2.74)***	2.5 (0.7)	0.11 (0.06-0.18)***	0.04 (0.02-0.07)***
25-29 years	33.9 (2.3)	1.17 (0.87-1.58)	1.38 (0.93-2.05)	15.4 (1.8)	0.65 (0.47-0.91)**	0.37 (0.25-0.54)***
30-39 years	28.0 (2.3)	Ref	Ref	23.0 (2.4)	Ref	Ref
Race/ethnicity						
Foreign-born Hispanic	29.6 (3.7)	1.13 (0.77-1.66)	0.78 (0.50-1.24)	24.7 (3.8)	2.23 (1.47-3.39)***	1.53 (0.86-2.72)
U.S born Hispanic	32.2 (4.5)	0.96 (0.62-1.47)	0.90 (0.56-1.44)	19.9 (3.4)	1.71 (1.04-2.83)^	1.74 (0.98-3.10)^
NH White	36.5 (2.1)	Ref	Ref	12.3 (1.7)	Ref	Ref
NH Black	40.0 (3.8)	1.10 (0.80-1.50)	1.15 (0.75-1.77)	16.2 (2.4)	1.53 (0.97-2.40)^	1.33 (0.78-2.29)
NH Other	29.1 (4.2)	0.72 (0.46-1.11)	0.71 (0.40-1.24)	12.3 (3.0)	0.86 (0.47-1.57)	0.99 (0.53-1.85)
Maternal Education						
No HS diploma or GED	38.3 (2.8)	1.25 (0.87-1.79)	0.70 (0.40-1.26)	17.8 (2.4)	2.58 (1.60-4.17)***	4.19 (2.02-8.67)***
HS diploma or GED	33.1 (2.6)	0.94 (0.67-1.31)	0.55 (0.33-0.91)**	18.3 (2.2)	2.41 (1.51-3.86)***	3.98 (2.29-6.2)***
Some college	29.9 (3.4)	0.77 (0.54-1.11)	0.49 (0.30-0.80)**	17.4 (2.6)	2.10 (1.23-3.60)**	3.38 (1.78-6.40)***
Bachelor's degree or higher	38.1 (3.1)	Ref	Ref	8.4 (1.7)	Ref	Ref
Prior live births						
1 birth	31.7 (2.9)	Ref	Ref	14.2 (1.7)	Ref	Ref
2 births	37.1 (2.8)	1.45 (1.09-1.94)**	1.40 (1.01-1.94)	16.7 (2.3)	0.38 (0.90-2.12)	0.92 (0.59-1.43)
3 or more births	37.3 (2.6)	1.57 (1.19-2.09)**	1.57 (1.09-2.28)***	16.2 (2.7)	1.33 (0.83-2.12)	0.54 (0.30-0.96)**
Payment source (recent live birth)						
No Medicaid	32.2 (1.9)	Ref	Ref	17.6 (1.7)	Ref	Ref
Medicaid	37.8 (1.8)	1.57 (1.19-2.09)**	1.06 (0.77-1.46)	13.6 (1.5)	1.56 (1.15-2.12)**	1.30 (0.89-1.90)

1 Among live births within 5 years of the interview date.

^p<.10

**p<.05

***p<.001