Using Longitudinal Data to Understand Changes In Consistent Contraceptive Use

CONTEXT: *Most studies of contraceptive behavior rely on cross-sectional data and are unable to adequately measure fluctuations in contraceptive use or changes in circumstances and attitudes that are likely to be associated with this outcome.*

METHODS: *Between November 2012 and May 2014, four waves of data were gathered from a national sample of 1,842 women aged 18–39 at baseline. Cross-tabulations were used to examine change and stability in time-varying characteristics theorized to be associated with consistent contraceptive use. Random-effects and fixed-effects logistic regression models were used to examine variables associated with consistent contraceptive use.*

RESULTS: *While a majority of women were at risk of unintended pregnancy during each survey period, only 42% were at risk during all four. Random-effects logistic regression analysis revealed that the odds of being a consistent contraceptive user were 10 times as high for a woman who expressed a strong pregnancy avoidance attitude as for a woman who had a weak attitude. This strong association was confirmed in the fixed-effects model. However, having a strong desire to avoid pregnancy was not static; among women at risk of unintended pregnancy during at least one survey period, 53% reported a change in attitude.*

CONCLUSIONS: *These findings build on prior research suggesting that pregnancy avoidance attitudes are an important motivator for contraceptive use. It is critical to recognize that the context in which many women make decisions about pregnancy and contraceptive use changes over relatively short periods of time.*

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The overwhelming majority of women at risk of unintended pregnancy use contraceptives.[1] Yet women who do not want to become pregnant but fail to use contraceptives account for 54% of unintended pregnancies, while women who use contraceptives inconsistently account for an additional 41%.[2] In an effort to help reduce levels of unintended pregnancy, a large body of research has examined reasons for nonuse and inconsistent use of contraceptives.[3–10]

Most research examining patterns of contraceptive use has relied on cross-sectional data, and these studies often assume that the sexual and reproductive behaviors measured at one point in time are relatively stable in the short term and reflect women's typical behavior. For example, some studies that have examined associations between women's characteristics and contraceptive nonuse[3,4,9,10] have assumed that nonuse is a somewhat stable pattern of behavior and have treated risk as a fixed trait.

Other research suggests that contraceptive use, as well as such related behaviors as sexual activity, changes over time for a nontrivial proportion of women. For example, several studies have used data collected at a single point in time to "dynamically" assess contraceptive use. Grady et al. used calendar data from the 1995 National Survey of Family Growth (NSFG) to assess method switching among new users and found that 40% of married and 61% of unmarried women switched methods over a two-year period.[11] Using 2002 NSFG data, Vaughan et al. reported that 67% of all newly adopted methods were discontinued within 12 months.[12]

Data from a nationally representative cross-sectional survey of women in 2004[5,6,13] were used to construct a typology of contraceptive use over a 12-month period. Thirty-eight percent of women used the same method all year.[13] Some 24% switched methods at least once, though they did not have a gap in use when they were at risk of pregnancy. Fifteen percent experienced at least a month of nonuse when they were at risk of pregnancy, and the same proportion had gaps in use during which they were sexually inactive or pregnant. Eight percent of women at risk failed to use any method during the year. A notable finding was the importance of pregnancy attitudes across a range of contraceptive measures. Women who exhibited a weak desire to avoid pregnancy were more likely than those with a strong desire to avoid one to be nonusers, to have gaps in use, to use the least effective methods and to use coital methods inconsistently.[5,6]

A small but growing number of studies have used longitudinal data to examine contraceptive use. The Australian Longitudinal Study of Women's Health collected information at four points in time between 1996 and 2006 from a nationally representative sample of women aged 18–23 at baseline. Analyses showed that use increased between

the first two waves, as young adults became sexually active but, presumably, were not ready to start a family.[14] Use decreased in each of the subsequent waves as more women became pregnant, were trying to conceive or reported an inability to conceive.[15]

In a more intensive longitudinal data collection effort, the Relationship Dynamics and Social Life study collected weekly data over two and one-half years from 1,003 Michigan women aged 18–19 at baseline.[16] Hall et al. found that women at risk of unintended pregnancy were using contraceptives during 90% of the weeks.[17] While women reported nonuse in only 10% of weeks, they reported inconsistent use in 18%.[18] Moreau et al. used these data to examine associations between pregnancy attitudes and contraceptive use patterns.[8] In line with cross-sectional research,[5,13] the investigators found that a strong desire to avoid pregnancy was associated with consistent contraceptive use. The study also found that attitudes changed over time. Although 89% of young women were strongly motivated to avoid pregnancy in a given week, only 69% expressed this outlook consistently every week of the study period.[8] Moreover, in a given week, 3% of women reported both that they had a low motivation to avoid pregnancy and that they would be happy if they got pregnant, while 13% expressed these attitudes in at least one weekly journal. However, these findings refer to the experiences of young women; the extent to which women of reproductive age more generally experience dynamic patterns of pregnancy attitudes and contraceptive behaviors is not well understood.

The current study builds on the nascent body of social science research that has prospectively examined contraceptive use patterns. Specifically, we use longitudinal data collected from a national sample of U.S. adult women to examine characteristics associated with consistent contraceptive use over an 18-month period. We describe change and stability in contraceptive use at four points in time, as well as change in the components of risk—sexual activity, fertility intentions and pregnancy—over this period. We use random-effects and fixed-effects logistic regression models to examine associations between consistent contraceptive use and baseline and time-varying demographic, attitudinal and partnership variables.

METHODS
Sample
Data for this analysis come from the Continuity and Change in Contraceptive Use study, whose survey was administered four times between November 2012 and May 2014 to a national sample of women aged 18–39 at baseline. We opted for online administration because it is the most efficient way to collect information from large national samples.[19] We subcontracted with GfK, an online recruitment company, to administer the survey using its KnowledgePanel, which comprises approximately 50,000 individuals and is intended to be representative of the U.S. population. GfK uses address-based sampling to recruit members; if an invited household lacks a computer or Internet access, the company provides it free of charge. GfK obtains informed consent from all individuals, and we obtained expedited approval from the institutional review board of the Guttmacher Institute.

To best capture the experiences of women at risk of pregnancy, the baseline survey was restricted to women aged 18–39 who had ever had vaginal intercourse with a man, were not pregnant, had not had a tubal ligation and did not currently have a male sexual partner who had had a vasectomy. Over a three-week period in November and December of 2012, a total of 11,365 women were invited to participate. Of those, 6,658 answered the four screening items, yielding a response rate of 59%; of these women, 4,647 were eligible to participate, and 4,634 completed the full survey. Subsequent surveys were conducted six, 12 and 18 months later.

Variables
• *Contraceptive use and pregnancy risk.* Our main outcome was consistent contraceptive use. Analyses involving this variable were limited to women at risk of unintended pregnancy, typically defined as those who recently had had sex with a man, were not trying to get pregnant and were not pregnant or postpartum.[1,6,10,17,20] We found that these characteristics changed over time for a nontrivial proportion of women. Because many of these characteristics have not been examined over time in prior U.S. studies, we show the degree to which each changed. Respondents who answered "no" to the question "In the past 30 days, have you had sex with a man at least once?" were considered sexually inactive and not at risk. All respondents were asked, "Which of the following best describes your current plans regarding having a(nother) baby?" Response categories were "I am trying to get pregnant now," "I am not trying to get pregnant now but expect to try in the future," "I don't want to have any (more) children" and "I'm not sure if I want to have a(nother) baby." Women who indicated they were trying to get pregnant were not considered to be at risk of unintended pregnancy. Pregnant women were screened out of the baseline survey, but subsequent surveys assessed recent pregnancy experiences. At these surveys, women who were currently pregnant or who reported a birth within three months of the survey but were not using a contraceptive method were considered to not be at risk of unintended pregnancy.

Our measure of consistent contraceptive use involved several variables. All women were asked whether, in the last 30 days, they or their partner had used any of 12 methods (pill; patch; ring; injectable; implant; IUD; pulling out, or withdrawal; condoms; natural family planning; calendar method; vasectomy; and spermicide or other barrier method). Women were then asked about their method-specific consistency of use. For example, pill users were asked how many pills they had missed in the last 30 days, and coital method users were asked how often they had used their method (every time they had sex, more than half the time, about half the time or less than half the time). Women

who reported using more than one method were asked if the methods were used at the same time, if they switched off between them or if they adopted both of these strategies.

Women who reported missing no pills, who started their hormonal methods on time or who used the same coital method every time they had sex were considered to be consistent users. Women who reported missing only one pill or who were one day late with the patch or ring were also considered consistent users, because clinical studies have shown that these women are not at increased risk of pregnancy.[21] Those who reported slightly imperfect use of hormonal methods (e.g., up to four days of missed pills) but also use of a coital method during the last 30 days were classified as consistent users.* Finally, women who reported using multiple coital methods in a way that suggested at least one method was used every time they had intercourse (e.g., using condoms and withdrawal, using each more than half the time or not using them at the same time) were also categorized as consistent users.

•*Baseline characteristics.* We assessed whether women had ever had an unintended pregnancy with the question "Have you ever gotten pregnant when you were not planning or wanting to be pregnant?" Fatalism toward pregnancy and contraception was determined with the item "It doesn't matter whether I use birth control, when it is my time to get pregnant, it will happen." Women were provided with a five-point Likert scale, and we collapsed responses into three categories: fatalistic (agree or strongly agree), neutral and not fatalistic (disagree or strongly disagree). Contraceptive knowledge was assessed using two questions drawn from a survey designed to assess knowledge among young adults.[22] The first asked whether birth control pills or condoms were more effective at preventing pregnancy, and the second asked whether the pill or the IUD was more effective (the correct answers are the pill and the IUD, respectively). We combined both questions into a single measure of the number of correct responses. All multivariate analyses also controlled for women's baseline reports of age, race or ethnicity, income level and number of births.

•*Time-varying characteristics.* Our measure of union status categorized women as married, cohabiting, dating or not in a relationship at each wave. We classified as dating all unmarried and noncohabiting women who answered affirmatively when asked, "Is there someone whom you see or date on a more or less regular basis?" Pregnancy avoidance attitude was measured by asking "How important is it to you to AVOID becoming pregnant now?" Women answered using a six-point scale, on which 1 indicated not at all important and 6 denoted very important; we then created a three-category variable, for which scores of 1–2 represented a weak pregnancy avoidance attitude, 3–4 a neutral one and 5–6 a strong one. Contact with the health care system can facilitate access to highly effective methods; thus, we included a measure assessing whether, in the last six months, women had made a visit for women's health care services, including basic gynecologic care, contraceptive services, STD testing, breast exams and pregnancy-related care. We assessed type of health insurance at each wave according to whether women had private, public (i.e., state or Medicaid) or no insurance coverage. Finally, at each wave, we asked women whether they had been exposed to any of eight potentially disruptive events in the last six months. We examined models that took into account the total number of events, as well as models that looked at the individual events themselves. We determined that the latter strategy was more informative and included the three events that were most commonly associated with consistent contraceptive use: worsening finances, the death of a close friend or family member, and receiving professional counseling for emotional or mental health problems.

Analysis

Our analysis was limited to the 1,842 women who participated in all four waves of the survey. Most analyses rely on the "long format" version of the data, meaning that each woman's participation in each wave counts as one observation (yielding 7,368 observations maximum).

We first examined the extent to which women's reports of the three components of risk—sexual activity, fertility intentions and pregnancy—changed over the 18-month period. We then assessed the distribution of women at risk of unintended pregnancy by baseline and time-varying covariates at each wave. Analyses of time-varying characteristics included as many women as possible. For example, women not at risk at baseline were included in Wave 2, 3 or 4 tabulations if they had transitioned to being at risk. We tested for significant differences in all bivariate distributions over time using Rao-Scott corrected chi-square tests to account for clustering of data within individuals.[23]

We ran several multivariate models in which consistent contraceptive use was the outcome. Random-effects logistic regression models allowed us to examine the subject-specific relationships of the variables with consistent use. The coefficients from these models can be interpreted as showing how an individual woman's contraceptive behavior changes when an independent variable changes in value, taking into account that our data set contained repeated measures from the same subjects.[24] Because the IUD, implant and sterilization do not allow room for user error, we also examined models that excluded periods when these methods were used. In addition, we ran fixed-effects models using data only from women who reported a change in consistent contraceptive use over time. These models examined associations between the independent variables and contraceptive use, and account for unobserved heterogeneity because they control for all stable characteristics of individuals.[24]

Finally, we compared the proportion of consistent contraceptive users at Waves 1 and 4 according to change

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*This coding strategy assumed that the coital methods were used when the pills were missed, even though no survey questions asked about this. In each wave, an average of 17 women missed 2–4 pills and also reported using a coital method.

and stability in their pregnancy avoidance attitudes. These analyses were limited to women who were at risk of unintended pregnancy at both waves; t tests were used to assess significant differences between proportions.

RESULTS
Sample Characteristics and Attrition

Our baseline sample consisted of 4,634 women. Twenty-seven percent were aged 18–24, 37% were aged 25–29 and another 37% were 30 or older (Table 1). Nearly two-thirds were white, and one-fifth were Hispanic. The majority of

respondents had either some college (38%) or a college degree (41%); more than half had incomes greater than or equal to 200% of the federal poverty line. At baseline, half had never given birth, and one-fifth had had one child; 46% were married, 21% were cohabiting and 21% were in a dating relationship.

Only 40% of baseline respondents participated in all four waves, and the proportion of the sample who were Hispanic, poor or without a college degree decreased over the study period, suggesting that these groups had higher rates of attrition than did whites or those with greater incomes or education, respectively. Most attrition was due to respondents' failure to fill out the survey, but GfK estimates that 10% of the loss in each wave was from turnover—the fact that individuals are dropped from the KnowledgePanel after a specified amount of time. When turnover is taken into account, levels of attrition between surveys were comparable to those in other national longitudinal studies.[25,26] Nonetheless, loss to follow-up compromises the representativeness of the data.

Change over Time

• *Risk of unintended pregnancy.* Over the survey period, the proportion of women who were at risk of unintended pregnancy decreased from 71% to 65%, while the proportion who were not at risk increased from 29% to 36%; both of these trends were statistically significant (Table 2). Women's exposure to risk was quite dynamic. Overall, 15% of respondents were not at risk of unintended pregnancy during all four survey periods, and 58% were not at risk during at least one. At each survey wave, 7–8% of women were not at risk because they were actively trying to get pregnant. However, these similar levels mask change among individual women. For example, only 2% of women were trying to get pregnant at all four points, but 17% were trying to do so at least once. The proportion of women who were pregnant or postpartum increased from 1% to 6% across surveys, and 15% were pregnant or postpartum at some time over the study period. The most common reason women were not at risk was that they had not been sexually active in the last month (22–24%). While 11% of women had not recently had sex with a man at all four points, 40% were not at risk during at least one survey period for this reason.

• *Covariates.* Our examination of independent and dependent variables over time is restricted to women who were at risk of unintended pregnancy during a given period (Table 3). At baseline, 30% of women reported that they had ever had an unintended pregnancy. Nearly one-third agreed that it did not matter whether they used a contraceptive, because they believed that when it was their time to get pregnant, it would happen. Only 15% of women answered both contraceptive knowledge items correctly, and 47% answered one item correctly. (Forty-six percent knew that the pill is more effective than condoms, and 28% knew that the IUD is more effective than the pill—not shown.)

TABLE 1. Percentage distribution of women participating in each survey wave, by selected baseline characteristics, Continuity and Change in Contraceptive Use, 2012–2014

Characteristic	Wave 1 (N=4,634)	Wave 2 (N=3,207)	Wave 3 (N=2,398)	Wave 4 (N=1,842)
Age				
18–24	27	26	26	26
25–29	37	35	35	35
30–34	20	21	21	21
35–39	17	18	18	18
Race/ethnicity				
White	63	66	68	69
Black	10	9	9	8
Hispanic	19	17	15	14
Other	8	8	9	9
Education level				
<high school	5	5	4	4
High school	16	14	13	12
Some college	38	36	35	34
College degree	41	46	47	50
Income as % of federal poverty level				
<100	23	20	18	16
100–199	23	23	24	22
≥200	55	57	58	62
No. of births				
0	50	52	54	56
1	21	20	20	20
≥2	30	28	26	25
Union status				
Married	46	47	50	47
Cohabiting	21	20	18	20
Dating	21	21	21	21
Not in a relationship	12	12	12	12
Total	100	100	100	100

Note: Percentages may not total 100 because of rounding.

TABLE 2. Percentage distribution of women, by unintended pregnancy risk status at each wave, at all waves and at any wave

Risk status	Wave 1	Wave 2	Wave 3	Wave 4	All	Any
At risk***	**71**	**66**	**64**	**65**	**42**	**85**
Not at risk***	**29**	**34**	**36**	**36**	**15**	**58**
Trying to get pregnant	8	8	8	7	2	17
Pregnant/postpartum***	1	5	6	6	na	15
No sex in last 30 days	22	22	24	24	11	40
Total	100	100	100	100	na	na

***Differences among waves are significant at p<.001. *Notes:* Percentages are based on the 1,842 women who participated in all four survey waves. Because some women reported multiple reasons for not being at risk, those percentages do not add up to the wave subtotals. na=not applicable.

TABLE 3. Percentage distribution of women at risk of unintended pregnancy, by selected characteristics, at each wave, at all waves and at any wave

Characteristic	Wave 1 (N=1,293)	Wave 2 (N=1,199)	Wave 3 (N=1,147)	Wave 4 (N=1,161)	All (N=1,566)	Any (N=1,566)
BASELINE						
Ever had unintended pregnancy	30	na	na	na	na	na
Fatalism about pregnancy/contraception						
Fatalistic	31	na	na	na	na	na
Neutral	17	na	na	na	na	na
Not fatalistic	52	na	na	na	na	na
Contraceptive knowledge score†						
0	30	na	na	na	na	na
1	47	na	na	na	na	na
2	15	na	na	na	na	na
Don't know either	8	na	na	na	na	na
TIME-VARYING						
Union status						
Married	51	52	53	55	48	56
Cohabiting	23	24	23	22	11	28
Dating	22	21	21	19	8	31
Not in a relationship	4	4	3	3	1	9
Pregnancy avoidance attitude*						
Weak	10	10	12	12	3	32
Neutral	24	22	22	24	3	45
Strong	66	67	66	64	41	82
Made women's health care visit in last six months*	63	54	53	54	21	90
Health insurance*						
Private	69	71	72	76	62	80
Public	14	12	12	13	7	21
None	17	16	16	11	6	25
Exposure to disruptive events in last six months						
Financial situation got worse***	21	18	20	15	2	41
Death	15	14	13	13	0	39
Counseling	7	6	5	5	1	13
Consistent contraceptive use	85	85	85	84	45	93

*Differences among waves are significant at p<.05. ***Differences among waves are significant at p<.001. †The score reflects the number of correct responses to two questions; the "don't know" option was included to identify women who knew they did not know the answers. *Notes:* Women at risk of unintended pregnancy had had sex in the last 30 days, were not trying to get pregnant, and were not pregnant or postpartum. Percentages may not total 100 because of rounding. na=not applicable.

The time-varying covariates showed a fair amount of change across the four surveys. Overall patterns in union status did not change significantly over time. However, among individual women, 11% were cohabiting at all four points, and 28% were cohabiting during at least one. Approximately two-thirds of women at risk of unintended pregnancy indicated a strong pregnancy avoidance attitude at each wave, but attitudes changed among individuals. While 82% of women had a strong desire to avoid pregnancy during at least one period, only 41% said it was important to avoid pregnancy during all periods. Fifty-three percent of women experienced a change in attitude over the study period (not shown).

At all four surveys, the majority of women had made a visit for women's health care in the last six months. A higher proportion reported a visit at the baseline survey (63%) than at Waves 2–4 (53–54%); the difference may reflect that subsequent waves had a well-defined frame of reference for the six-month period (i.e., since the last survey), whereas at baseline, women may have reported visits

that occurred seven or more months in the past. The proportion of women with private health insurance increased from 69% to 76% across surveys, while the proportion who were uninsured decreased from 17% to 11%. Only one type of disruptive event differed in frequency across the surveys: The proportion of women reporting worsening finances declined from 21% at the first wave to 15% at the final survey; 41% of women reported such difficulties at least once.

Among women at risk of unintended pregnancy, 84–85% said they were using contraceptives consistently at each survey, and 93% reported doing so at least once. Only 45% were consistent users across all four periods, perhaps, in part, because a nontrivial proportion of women were not at risk of unintended pregnancy during at least one period. Among women who were at risk at all four survey points, 70% reported consistent use at all waves (not shown). The pill was the most commonly used method (reported by 40% at baseline), followed by condoms (21%), long-acting reversible methods (the IUD and implant—13%),

TABLE 4. Odd ratios from random-effects logistic regression analysis assessing associations between selected characteristics and consistent contraceptive use over 18 months, among all women and among women not using long-acting or permanent methods

Characteristic	All women (N=1,544)	Women not using long-acting/permanent methods (N=1,368)
BASELINE		
Ever had unintended pregnancy		
No (ref)	1.00	1.00
Yes	0.68*	0.55**
Fatalism about pregnancy/contraception		
Fatalistic	0.52***	0.53**
Neutral	0.76	0.68
Not fatalistic (ref)	1.00	1.00
Contraceptive knowledge score†		
0 (ref)	1.00	1.00
1	1.42	1.14
2	2.12**	1.06
Don't know either	0.69	0.68
TIME-VARYING		
Union status		
Married (ref)	1.00	1.00
Cohabiting	1.87**	1.75**
Dating	2.05**	2.06**
Not in a relationship	1.92	1.79
Pregnancy avoidance attitude		
Weak (ref)	1.00	1.00
Neutral	2.94***	2.84***
Strong	9.96***	9.15***
Made women's health care visit in last six months		
No (ref)	1.00	1.00
Yes	1.30*	1.36*
Health insurance		
Private (ref)	1.00	1.00
Public	0.88	0.81
None	0.87	0.92
Financial situation got worse in last six months		
No (ref)	1.00	1.00
Yes	0.69*	0.67*
Exposure to death in last six months		
No (ref)	1.00	1.00
Yes	0.63**	0.60**
Exposure to counseling in last six months		
No (ref)	1.00	1.00
Yes	2.03*	1.68
Survey wave		
1 (ref)		
2	0.96	0.96
3	1.01	0.94
4	0.91	0.78
Intercept	*0.85*	*0.94*
Observations	*4,728*	*3,915*

*p<.05. **p<.01. ***p<.001. †The score reflects the number of correct responses to two questions; the "don't know" option was included to identify women who knew they did not know the answers. *Notes*: Both models control for baseline reports of age, race or ethnicity, income level and number of births. Long-acting methods are the IUD and implant. ref=reference group.

*We also ran models that included women who did not participate in all waves. The findings were largely similar, though two variables became marginally significant (p<.10): making a recent visit for women's health care and recent death of a close friend or family member. We expect that the power of these variables was reduced in the models that included more women but fewer opportunities for (repeated) exposure to these events, since some respondents participated in only one or two surveys.

withdrawal (11%) and other methods (9%; most commonly the injectable or ring). Six percent of women were not using any contraceptive at baseline. This distribution remained largely consistent over the study period; however, 6% of respondents reported that they or their partner had undergone sterilization by Wave 4, and hence reliance on the most common reversible methods declined slightly.

Correlates of Consistent Use

Random-effects logistic regression analysis identified a number of baseline characteristics that were associated with consistent contraceptive use in the overall sample (Table 4). A woman who had had an unintended pregnancy was less likely than one who had not to be a consistent contraceptive user (odds ratio, 0.7). Similarly, a respondent who agreed with the fatalistic statement about contraception and pregnancy was less likely than one who disagreed to report consistent use (0.5). And a woman who correctly answered both contraceptive knowledge items was more likely than one who answered incorrectly to be a consistent user (2.1).

Most of the time-varying measures also were associated with consistent use. A woman who was cohabiting or dating was more likely than a married respondent to be a consistent user (odds ratios, 1.9 and 2.1, respectively). Compared with a woman who had a weak pregnancy avoidance attitude, one who expressed a strong attitude had an elevated likelihood of consistent contraceptive use (10.0). In addition, a respondent who had made a visit for women's health care in the last six months was more likely than one who had not to be a consistent user (1.3). Notably, this measure may be a proxy for the type of method used, as a woman who had made such a visit was more likely than one who had not to be using a prescription method (69% vs. 45% at Wave 4—not shown).

All three disruptive events were associated with consistent use. A woman whose financial situation had worsened in the last six months had decreased odds of being a consistent user (odds ratio, 0.7), as did one who had experienced the death of a close friend or family member (0.6). Finally, a respondent who had received psychological counseling was more likely than one who had not to report consistent use (2.0).*

In the models excluding women who used long-acting or permanent methods, two of the foregoing associations disappeared: A woman who correctly answered both contraceptive knowledge items no longer had elevated odds of being a consistent user, and the relationship between psychological counseling and consistent use lost significance.

We ran a fixed-effects multivariate logistic regression model among the 365 women who went from inconsistent to consistent use, or vice versa, over the 18-month period. Changes in several covariates were associated with these changes in consistent use (not shown). When a woman transitioned to having a strong pregnancy avoidance attitude, the odds of her becoming a consistent user almost tripled (odds ratio, 2.8; p<.001). Furthermore, a woman

who had recently had a close friend or family member die was less likely than others to maintain consistent use (0.7, p<.05), and one who had initiated psychological counseling had an increased likelihood of becoming a consistent user (3.2, p<.01).

Because of the strong associations between pregnancy avoidance attitudes and consistent contraceptive use in the multivariate models, we took a closer look at how each changed in relation to the other between Waves 1 and 4 (Table 5). Among the 55% of women who had a strong pregnancy avoidance attitude during both time periods, the overwhelming majority (91–92%) reported consistent use at both surveys. Some 14% of respondents went from expressing a strong avoidance attitude to having a neutral or weak attitude; the proportion of these women reporting consistent contraceptive use declined from 90% to 75% between the two waves. A change in similar magnitude, but in reverse, was seen among the 10% of women who transitioned to having a strong pregnancy avoidance attitude (from 74% to 90%). Finally, among the 20% of women who did not express a strong pregnancy avoidance attitude at either time point, 73–75% were consistent users.

DISCUSSION

Pregnancy avoidance attitudes—specifically, the extent to which women deem it important to avoid a pregnancy— are critical in understanding consistent contraceptive use. Several studies,[6,8,22,27–29] including one using longitudinal data,[8] have documented similar associations between women's attitudes and consistent use. In our analyses, the strong association between attitudes about pregnancy avoidance and consistent use was robust and held across models using different data analytic techniques. These findings suggest that research attempting to understand consistent contraceptive use should include a measure of pregnancy avoidance; failure to do so excludes an important component.

While two-thirds of women who were at risk of unintended pregnancy indicated a strong desire to avoid pregnancy at any given point, only 41% had a consistently strong desire to do so; in fact, 53% of women reported a change in attitude over the study period. This is a higher proportion than was found by Moreau et al., whose study determined that 28% of women aged 18–23 were inconsistent in their desire to avoid pregnancy over two and a half years.[8] Childbearing is not normative among young adults in the United States, and this may account for the more consistent attitudes among this younger sample. In a study of Honduran family planning clients aged 15–44, Speizer et al. found that 51%—most of whom were married— reported a change in pregnancy attitude over a 13-month period.[30] The similar magnitude of change observed in our sample and in the Honduran study may indicate that age and relationship status are contextual factors that transcend cultures when it comes to understanding pregnancy attitudes. Further work should examine fertility experiences across different cultures.

TABLE 5. *Percentage distribution of women at risk of unintended pregnancy, by pregnancy avoidance attitude; and percentage with each attitude who reported consistent contraceptive use, Waves 1 and 4*

Pregnancy avoidance attitude	All women at risk	Consistent users	
		Wave 1	Wave 4
Strong at both	55	91	92
Strong to neutral/weak	14	90	75**
Neutral/weak to strong	10	74	90***
Neutral/weak at both	20	75	73
Total	100	na	na

p<.01.*p<.001.*Notes:*Percentages are based on the 976 women who were at risk of unintended pregnancy during Waves 1 and 4. Women at risk had had sex in the last 30 days, were not trying to get pregnant, and were not pregnant or postpartum. Percentages of women by attitude do not total 100 because of rounding. na=not applicable.

Yet pregnancy avoidance attitude is not always associated with consistent use.[6,31] Among women in our sample who strongly wanted to avoid pregnancy, approximately one in 10 used contraceptives inconsistently. More research is needed to understand why, for some women, a strong desire to avoid pregnancy does not translate into the expected behavioral response.

Making a recent visit for women's health care was associated with consistent contraceptive use. This measure may have been a proxy for the use of more effective methods, as hormonal and long-acting contraceptives are highly effective but require a prescription and, in some cases, regular visits to a health care provider. Still, some prescription methods (the pill, patch and ring) require that women use them regularly, and it is possible that contact with the health care system facilitated more consistent use. Indeed, even after we excluded women who were using long-acting reversible methods or sterilization, making a recent visit for women's health care was associated with consistent use.

Over the study period, we found a substantial increase in the proportion of women with private health insurance. Health care reform likely contributed to this, as the change was concentrated between Waves 3 and 4, when the Affordable Care Act took effect for many individuals. In our analyses, health insurance coverage was not associated with consistent use, but it is possible that more women will have access to women's health care services in the future and, in turn, will become more consistent users.

Associations between consistent contraceptive use and several baseline characteristics are worth noting. Negative associations between contraceptive use and a fatalistic attitude about contraception and pregnancy have been found in other studies.[5,6,32,33] Still, that this attitude was reported by nearly one-third of women in our sample suggests that much can be done to assure women that contraceptives substantially reduce the risk of pregnancy. That a majority of women in our sample failed to correctly answer both contraceptive knowledge items, coupled with the finding that a woman who answered both questions correctly had increased odds of consistent use, suggests that strategies to increase knowledge may have some value in improving use.

Consistent use of any method is more likely than inconsistent use of a highly effective method to prevent pregnancy,[7] and this is why our analyses focused on consistent

use as opposed to type of method. Still, it is possible that individuals who are highly motivated to avoid pregnancy both choose more effective methods and use them more consistently. In future analyses, we hope to develop a model that simultaneously analyzes method choice and consistent use, as we expect that some individual characteristics are directly associated with each outcome and that consistent use is mediated by method choice.

Finally, our longitudinal study shows that exposure to the risk of unintended pregnancy is itself a moving target. This finding has implications for a larger body of reproductive health research as well as clinical practice. The majority of women in our sample were not at risk of unintended pregnancy for at least one study period, and the proportion at risk changed substantially depending on whether we examined a specific point in time, all four waves or any wave. Risk of unintended pregnancy is a key measure, or restricting criterion, for many researchers,[1,6,10,17,20] but few studies account for the fact that this risk status changes for many women over a relatively short period of time. The fact that some women's pregnancy intentions or attitudes change may provide insights into seemingly inconsistent associations regarding unintended pregnancy. For example, changes in pregnancy attitudes over a brief period may help explain why nearly one-third of pregnancies resulting from contraceptive failures are classified as intended.[34] These changes emphasize the importance of clinicians' and family planning providers' assessment of immediate fertility intentions at each visit. Finally, shifts in the risk of pregnancy provide context for better understanding the frequency with which women switch and discontinue contraceptive methods.[11,12]

Limitations

We note several study limitations. Fewer than half of the original sample participated in all four waves, and loss to follow-up compromised the representativeness of the sample. Moreover, rates of attrition appeared to be higher among respondents who were Hispanic, poor or without a college degree than among those who were white, better off or more educated, respectively, and the sample may also be biased in other ways that we did not capture. (For example, the significant decline in the proportion of respondents reporting worsening finances across waves could have been due to improvements in the economy that occurred during the survey period,[35] or to the fact that individuals who experienced financial problems dropped out of the study.) Still, our final sample contained data from more than 1,800 women, allowing for robust analyses, and many of the associations we found likely apply to a number of populations.

We expect that women's reporting of sexual activity and contraceptive use over the last 30 days is more accurate than that over the last three, six or 12 months.[36] Yet it is possible, if not likely, that our measure of consistent contraceptive use is inaccurate because of response bias. For example, prior research has documented that women overreport

consistent use of condoms and hormonal methods,[37,38] and it is unclear how this type of bias would affect our findings. Finally, the current models examine consistent use but do not take into account the type of method used, in part because these two measures were too highly correlated.

Conclusions

It is critical to recognize that the context in which women make decisions about pregnancy and contraceptive use changes over a relatively short period of time for many women. In turn, these changes are associated with how well women use their chosen contraceptive method. Thus, there is a need to ensure that women and couples find the method best suited to their current fertility intentions. Giving women information and access to a broad range of methods offers the best opportunity for addressing their dynamic contraceptive needs.

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