

# Effect of prospectively measured pregnancy intentions on the consistency of contraceptive use among young women in Michigan

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**STUDY QUESTION:** What is the predictive value of pregnancy intentions on contraceptive behaviours among women aged 18–19?

**SUMMARY ANSWER:** Women aged 18–19 have high levels of inconsistent use of contraception, which mostly occur at times when women strongly wish to avoid a pregnancy.

**WHAT IS KNOWN ALREADY:** Pregnancy intentions provide an indication of how well individuals achieve their reproductive goals. However, retrospective accounts of pregnancy intentions using dichotomous indicators suffer temporal instability and fail to capture the wide range of attitudes towards pregnancy.

**STUDY DESIGN, SIZE, DURATION:** In this study, data are drawn from a population-based survey of 992 women of ages 18–19 years in Michigan, who completed weekly journals assessing contraceptive use, pregnancy intentions and reproductive outcomes during 2.5 years of follow-up. The response rate was 86% for the baseline interview and 65% after 2.5 years of follow-up.

**PARTICIPANTS/MATERIALS, SETTING, METHODS:** We examined 15 446 pairs of journal entries. We used logistic regression with random effects to assess the predictive effect of women's desire to become pregnant and to avoid a pregnancy, measured each week, on consistency of use of contraception the following week.

**MAIN RESULTS AND THE ROLE OF CHANCE:** Women reported inconsistent use of contraception in more than a quarter of weekly journals (28.3%). Consistent use of contraception increased from 22 to 78% as women's intentions to become pregnant decreased and increased from 23 to 78% as motivations to avoid pregnancy increased. The combination of scores of the pregnancy desire and avoidance scales shows indifferent or ambivalent pregnancy attitudes in 8.6% of weekly records. These women were more likely to report inconsistent contraceptive use compared with women who expressed anti-conception attitudes [OR = 2.8 (2.2–3.5)]. However, 23% of women who had unequivocal anti-conception feelings did not use contraception consistently, contributing to 72% of the weeks of inconsistent use in our population.

**LIMITATIONS, REASONS FOR CAUTION:** In this study, consistency of contraceptive use, based on the use of contraception at every act of intercourse, does not fully capture a women's risk of becoming pregnant. The 35% attrition after 2.5 years may have affected the internal validity of our results, although a reanalysis based on the first year of observation produced very similar results.

**WIDER IMPLICATIONS OF THE FINDINGS:** Because most instances of inconsistent use of contraception occur among women who are keen to avoid a pregnancy, our results suggest there is room for improving contraceptive behaviours by promoting use of methods which do not require user adherence.

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**Key words:** contraception behaviour / pregnancy intentions / adolescent / cohort study

## Introduction

Pregnancy intention is commonly used as an indicator of how well individuals achieve their reproductive goals. Grounded in the theory of reasoned action (Fishbein and Ajzen, 1975) and its extension, the theory of planned behaviour (Ajzen, 1985), the dominant approach to measuring pregnancy intentions, rests upon the idea that pregnancy essentially results from rational choices and planned acts and that individuals can always articulate their reproductive goals (Santelli *et al.*, 2009a,b). The standard definition of unintended pregnancies used in the National Survey of Family Growth and the Pregnancy Risk Assessment Monitoring System (PRAMS) encompasses all pregnancies that are unwanted (not wanted at any time) or mistimed (pregnancy wanted at a later date). Based on this conventional measure of fertility intentions, only 20% of the 750 000 women younger than 20 who become pregnant each year in the USA report their pregnancy as intended (Finer and Henshaw, 2006; Kost *et al.*, 2012).

Substantial work has called into question the validity of the dichotomous construct, opposing intended versus unintended pregnancies, which fails to capture the complexity of fertility intentions, at times ambivalent, contradictory or unspecified (Zabin *et al.*, 1993; Bachrach and Newcomer, 1999; Barrett and Wellings, 2002; Barrett *et al.*, 2004; Speizer *et al.*, 2004; Santelli *et al.*, 2009a,b; Santelli *et al.*, 2006). This is particularly true in young women, who are unlikely to have decided their reproductive trajectories at an early age (Zabin, 1999). Based on a study of inner city black teenagers, Zabin *et al.* (1993) stressed the importance of ambivalence in shaping young women's contraceptive behaviours, showing that only unequivocal attitudes seemed to lead to consistent contraceptive use. Reflecting on these results, a growing number of studies have attempted to develop multi-item tools designed to assess the continuum of fertility intentions in order to capture a wider range of attitudes and behaviours (Sable and Libbus, 2000; Barrett *et al.*, 2004; Kavanaugh and Schwartz, 2009; Miller and Jones, 2009; Santelli *et al.*, 2009a,b).

Another important contribution to the study of fertility intentions is the development of prospective survey designs, which better capture intentions before women become pregnant (Bruckner *et al.*, 2004; Bartz *et al.*, 2007; Schwarz *et al.*, 2007; Kavanaugh and Schwartz, 2009; Rocca *et al.*, 2010). Indeed, retrospective accounts of attitudes towards pregnancy have been proved to be useful at the population level but suffer temporal instability when describing individual level intentions (Bankole and Westoff, 1998; Joyce *et al.*, 2002). Notably, recall bias in the form of post-rationalization was suggested by Bankole and Westoff (1998) in a study comparing women's recollection of pregnancy intentions in 1992 and again in 1995, after demonstrating that of all unwanted pregnancies reported in 1992, only 38% were still viewed as unwanted in 1995.

While intentions do matter, little is known about the overall contribution of ambivalent attitudes to unintended pregnancy risk over time.

Using a longitudinal time series of 2.5 years, we assess the predictive value of pregnancy intentions on contraceptive behaviours and estimate the level of inconsistent (including non-use) of contraception related to equivocal intentions, among women aged 18–19.

## Materials and Methods

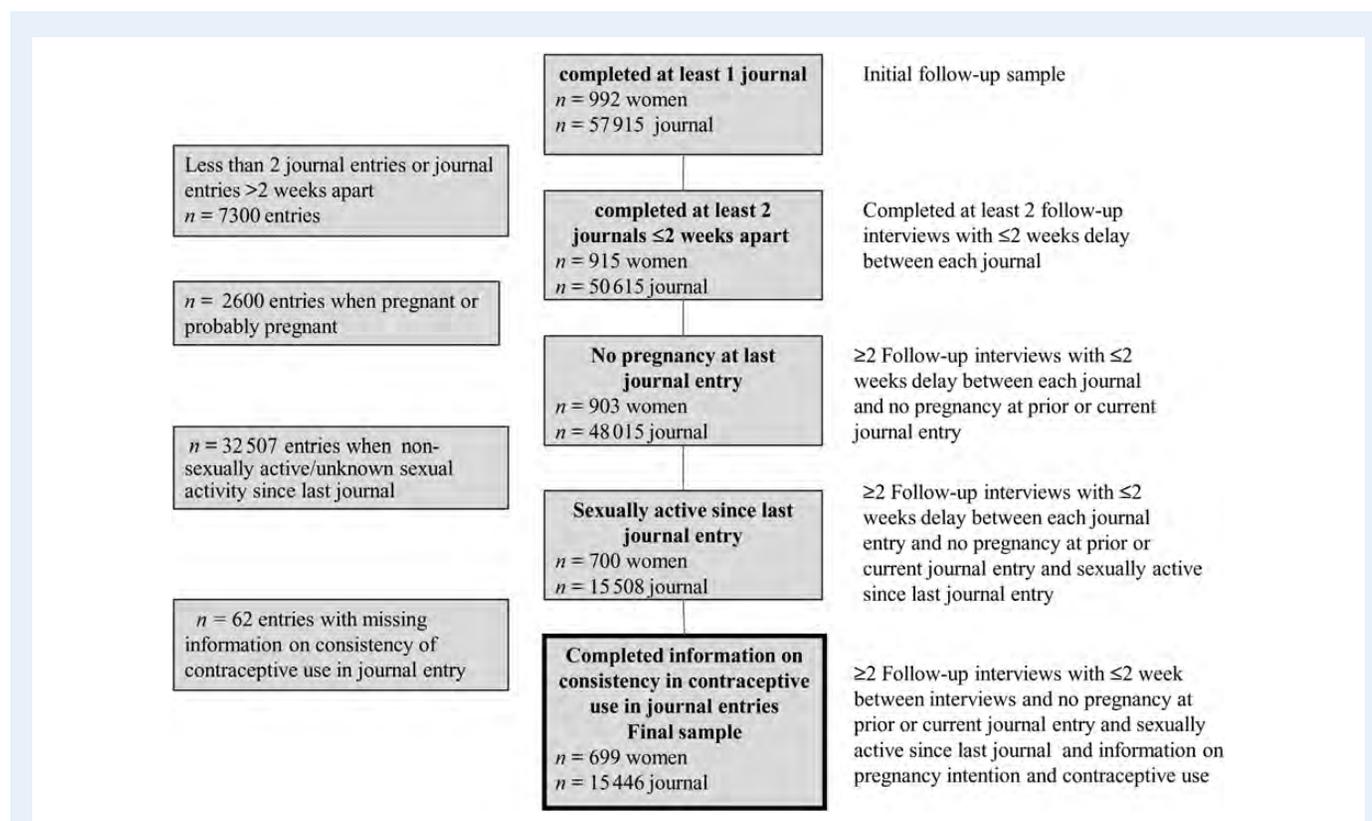
Data are drawn from the longitudinal study 'Young Women's Relationships, Contraception, and Unintended Childbearing' comprising a random sample of 992 women, aged 18–19 years, who were from one county in Michigan and agreed to be followed up. A detailed description of the study protocol is presented elsewhere (Barber *et al.*, 2010).

The sampling frame used for the selection of eligible young women was the state driver's license and personal identification card data set. Driver's licences and personal identification (PID) cards (replacing a driver's licence in the absence of a permit) serve as proof of identification in the USA. Each Department of State keeps an updated list of driver's license and PIDs with a current address. Comparison of Michigan Department of State's driver's license and PID data by zip code to 2000 Census-based projections revealed 96% agreement (Barber *et al.*, 2010). An initial 60-min face-to-face baseline interview was conducted between March 2008 and March 2009 to assess key demographic, social, reproductive history and relationship characteristics. Participants were then invited to participate in the weekly journal-based study [via Internet or Interactive Voice Response (telephone)] for a period of 2.5 years (maximum of 183 journal entries if responded every 5 days). The response rate for the baseline interview was 86%, with 84% of women completing at least the first 6 months and 78% completing at least 12 months and 65% completing the full 2.5-year survey follow-up period.

Women completed 57 915 journal entries over the 2.5-year study. We excluded entries: (i) corresponding to first journal entries with no subsequent follow-up or with a >2-week delay between entries to limit recall bias (7300 journal entries); (ii) in which women were pregnant or probably pregnant (2600 journal entries); (iii) in which women were not sexually active during the previous week (32 507 journal entries), because in that case they were not asked about their contraceptive behaviours and (iv) with missing information on consistency of use of contraception (62 journal entries). Our final sample included 699 women who completed a total of 15 446 pairs of journal entries, in which women reported in the second entry that they were not pregnant at last interview and had had intercourse since the last interview (Fig. 1).

## Pregnancy intention scales and contraceptive use practices

We focused on weekly measures of pregnancy desire and pregnancy avoidance as the key predictor variables. On a scale from 0 to 5, women responded each week on how much they wanted to avoid pregnancy during the next month (0 = not at all, 5 = really) and conversely how much they wanted to get pregnant during the next month (0 = not at all, 5 = really). We further considered the interrelation of women's responses to these questions by constructing a four-category paired



**Figure 1** Study flow chart.

measure of pregnancy desire/avoidance in order to distinguish a range of attitudes from pro-natalist [really want to become pregnant (score 4 and 5 on the desire scale) and did not want to avoid a pregnancy at all (score 0 and 1 on the avoidance scale)] to anti-conception (really wanted to avoid a pregnancy (score 4 and 5 on the avoidance scale) and did not want to become pregnant at all (score 0 and 1 on the desire scale)]. Intermediate categories comprised women who were indifferent (scores 2 and 3 on both scales) or women who were considered ambivalent (all other combinations).

Time-varying consistency of contraceptive use was our dependent variable. Women described their use of contraception in each week, including the type of method used and consistency of use since the last interview. More specifically, women were asked every week whether they had done anything that would help to avoid becoming pregnant. They were also asked if they had used birth control pills, the Nuva ring, DepoProvera or any other type of contraceptive injection, an implant or an IUD. In case they had not used any of these methods, they were further asked if they had avoided having sex because it was the time of the month when they could get pregnant. Women who reported having had sexual intercourse since the last interview were also asked if they had used any coital-specific method since the last interview, including condoms, diaphragm/cervical cap, spermicide, female condom, emergency contraception, withdrawal or another method. Finally, women who were sexually active since the last interview were asked whether they had used a method every time they had intercourse since the last interview. Our primary outcome was woman-weeks of consistent contraceptive use, defined as weeks in which women had used a method of contraception every time they had sexual intercourse.

We also investigated fluctuation in women's individual pregnancy intentions and its association with changes in contraceptive practices. Using the

paired measure of pregnancy desire/avoidance, we defined four patterns of pregnancy intentions over time: consistent anti-conception feelings over time, ambivalent or indifferent feelings in 10% of weekly records or less, ambivalent or indifferent feelings in  $> 10\%$  of weekly journals, and pro-natalist attitudes at some point during follow-up. We also identified four patterns of contraceptive behaviours, depending on the proportion of weeks women reported consistent use of contraception:  $< 50\%$ , 50–85%,  $> 85 - < 100\%$  and 100% of weeks.

## Background information and partnership status

Information concerning age, race/ethnicity and socio-economic status including school enrolment, employment status, parental income and receipt of public assistance were collected from the women at baseline. Women also described their religious affiliation and provided information about their family structure and their mother's level of education. They were also asked about their sexual and reproductive histories, including gravidity, and whether they ever had sexual intercourse and had ever used contraception. Each week during the follow-up, women reported on their relationship status defined in four categories, based on questionnaire items (married or engaged; in a romantic relationship; has physical or emotional contact with someone or none).

## Analysis

We first describe the socio-demographic and reproductive characteristics of participants at baseline. We then turn to the analysis of weekly reports by exploring the prospective effects of the two pregnancy intention scales from each journal on consistency of contraceptive use measured the following week. We pursued the analysis by determining how important

these associations were beyond those explained by women's socio-demographic and reproductive characteristics at baseline as well as by time-varying partner relationship status. We used a random effect logistic regression model to account for the interdependence of journal weeks reported by the same women. We present the results of the most parsimonious regression model in which we retained only the factors that had a significant effect on the outcome (consistency of contraceptive use). Results are presented as adjusted odds ratios with 95% confidence intervals. A two-tailed alpha of  $<0.05$  was considered significant. We also tested for possible changes in the association between pregnancy intentions and consistency of contraceptive use over time, as women may have altered their attitudes and practices toward pregnancy as a result of weekly inquiries about their behaviours. We therefore investigated changes in pregnancy intentions, consistency of contraceptive use and the relationships between both of these dimensions between three study time periods (0–6, 6–12 and 12–36 months). In the final part of this paper, we investigated individual woman's fluctuation in pregnancy intentions and its association with individual changes in contraceptive practices.

All data were analysed using Stata 11.0 (StataCorp LP, College Station, TX). The Institutional Review Boards from the University of Michigan and Princeton University approved this study.

## Results

Table I presents sociodemographic and reproductive characteristics of the sample at baseline. The women's mean age at enrolment was 18.7. The majority identified themselves as white (58.7%) or black (30.2%). Over half of the women (55.8%) had achieved some higher education. Half of the women were employed (50.9%) but one in five (22.7%) reported receiving public assistance. The vast majority of participants (87.1%) were sexually experienced and two-thirds (66.0%) were in a special romantic relationship, married or engaged at the time of enrolment. A quarter of women had been pregnant before, and 37.6% reported having had four or more lifetime sexual partners. Among sexually experienced women, 84.7% had used contraception at least one. A little more than half of women in the sample were current contraceptive users at the time of enrolment (57.9%).

The prospective analysis of weekly reports shows that sexually active women relied on long-acting methods of contraception (IUD or implant) in only 1.9% of weekly reports; they used the pill in 39.1% of weekly observations, other user-dependent hormonal methods (injectable, patch or ring) in 8.2% of weeks, coital-only methods in 37.3% of weeks and no form of contraception in 11.4% of weeks. In addition, women reported inconsistent use of contraception (defined as non-use of a contraceptive method during at least one sex act) in more than a quarter of weekly journals (28.3%). Inconsistent use of contraception was more frequent in weeks in which women were using coital-only methods (36.3% of inconsistent use among all weeks of use of coital-only methods) as compared with weeks in which they were using the pill (5.4% of inconsistent use among all weeks of use of the pill) or other hormonal user-dependent contraceptives (4.8% of inconsistent use among all weeks of use of other hormonal user-dependent methods). Contraceptive behaviours varied by pregnancy intentions. Consistent use of contraception increased from 21.7 to 77.8% as women's intentions to become pregnant decreased and increased from 23.4 to 77.8% as women's motivation to avoid pregnancy increased (Table II). While pregnancy desire

and avoidness scales were highly correlated ( $r = 0.85$ ), results from the multivariate analysis show that each of these measures had an independent effect on contraceptive behaviours, after controlling for age, gravidy, educational attainment and number of lifetime sexual partners at baseline, as well as time varying partner relationship status (the only factors that remained significant in the regression model). Compared with women who scored 0 on the pregnancy avoidance scale (did not want to avoid a pregnancy at all), the threshold score for an increased odds of consistent contraceptive use was 5 on the avoidance scale (OR = 2.6; CI = 1.6–4.2). Compared with the women who scored 5 on the pregnancy intention scale (really wanted to become pregnant), women who scored 3 (OR = 2.8; CI = 1.6–5.1) or below 3 on the intention scale were more likely to be consistent contraceptive users (Table II).

The combination of scores of the avoidance and wantedness scales shows pro-natalist attitudes in 2.8% of weekly records, indifferent attitudes in 4.5% of weekly records and ambivalent attitudes in 4.1% of weekly records (Tables III and IV). In the remaining 88.6% of weekly records, women expressed strong anti-conception attitudes. Using this combined pregnancy intention scale, we found a gradual increase in consistency of contraceptive use as women expressed stronger anti-conception attitudes (Table IV). The minority of women who reported either indifferent or ambivalent motivations were more likely to report inconsistent contraceptive use than women who expressed anti-conception attitudes [OR = 2.8 (2.2–3.5)]. However, because of their overwhelming majority, young women who unequivocally wished to avoid a pregnancy contributed 72.1% of the weeks of inconsistent use. On the other hand, women who did not have firm convictions contributed 19.4% of segments of inconsistent use (11.1% when indifferent and 8.3% when ambivalent), while those who wished to become pregnant accounted for 8.4%. The analysis revealed no overall change in consistency of contraceptive use by time in the study ( $P = 0.18$ ) and no overall change in the predictive value of pregnancy intentions on contraceptive behaviours over time (test of interaction  $P = 0.35$ ). Other predictors of consistent use of contraception included higher education, higher parental income, being older, having fewer lifetime partners and being in a romantic relationship as opposed to being married or engaged.

Using the combined pregnancy intention scale, we explored individual women's changing attitudes towards pregnancy over time and the association of such fluctuations with their contraceptive behaviours. Results presented in Table V show that two-thirds of women (68.7%) consistently stated they did not wish to become pregnant, 18.4% reported ambivalent or indifferent feelings at some point and 12.9% expressed pro-natalist attitudes at some point during follow-up. A quarter of women were consistent contraceptive users less than half of the time, 40.6% of whom had unequivocal anti-conception attitudes. Half of the women (49.4%) who always stated they did not wish to become pregnant reported no instances of inconsistent use of contraception, while 14.8% were inconsistent users more than half of the time (Table V). The same analysis restricted to the 381 women who contributed  $>10$  pairs of weekly journals shows a higher proportion of women who reported pro-natalist feelings and a smaller proportion of those who had unequivocal feelings throughout (60.1%) (Table V). However, the relationship between pregnancy intention fluctuation and changes in contraceptive behaviours was very similar (Table V).

**Table 1** Demographic, social and sexual reproductive characteristics of the sample at baseline.

Baseline characteristics (n = 699 women)	%
Age (years)	
18	43
19	49
20	9
Race/ethnicity	
Non-Hispanic White	59
Non-Hispanic Black	30
Hispanic	9
Asian/Native American/Pacific Islander	2
Educational attainment/enrollment	
Not enrolled	23
High school	13
2-year college/vocational/technical school	30
4-year college	26
High school drop-out	8
Employment status	
Employed	51
Unemployed	49
Receiving public assistance	
Yes	23
No	73
Parental income	
≤\$14 999	14
\$15 000–\$44 999	29
\$45 999–\$74 999	20
≥\$75 000	19
Don't know/refused	19
Childhood family structure	
Lived with two biological/adoptive parents	53
Lived with single biological parent	40
Other situations	8
Age of mother at first birth	
<20 years	38
≥20 years	62
Mother's education level	
<High school diploma	9
≥High school diploma	91
Frequency of religious service attendance	
Never	22
<Weekly	55
≥Weekly	24
Relationship status	
Married	2
Engaged	9
In special romantic relationship	56
Having physical/emotional contact with someone	17

Continued

**Table 1** Continued

Baseline characteristics (n = 699 women)	%
None	17
Age at first vaginal intercourse	
No sexual intercourse experience at enrollment	13
<14 years	20
15–16 years	40
≥17 years	27
Lifetime number of sexual partners	
0	13
1	19
2	14
3	17
≥4	38
Pregnancies	
0	76
1	16
≥2	8
Ever use of contraception	
Yes	85
No	15
Currently using a contraceptive method	
Yes	58
No	35
Missing	7

## Discussion

Consistent with the earlier work, this study illustrates the value of examining a continuum of pregnancy intentions (Zabin et al., 1993; Barrett et al., 2004; Kavanaugh and Schwartz, 2009; Santelli et al., 2009a,b), as a way of partially resolving the discrepancies between intentions and behaviours. We found that, while they were highly correlated, positive and negative attitudes towards pregnancy had an independent effect on contraceptive behaviours, suggesting that they may partly capture different concepts, including how much contraceptive effort women are willing to take on to avoid a pregnancy. Thus, only strong motivations to avoid a pregnancy increased the odds of using contraception consistently. These findings mirror the conclusions of Zabin (1999) who argues 'it is only when we deeply care about an outcome that we are willing to assume the costs of achieving it'. The combination of responses on the intention and avoidance scales revealed indifferent or ambivalent attitudes toward a future pregnancy in less than 10% of weekly reports. As previously noted (Zabin et al., 1993; Bartz et al., 2007), women who expressed such feelings at some point during the follow-up period were less likely to use contraception and more likely to report inconsistent use of contraception when compared with those who always expressed strong anti-conception feelings. An understanding of the reasons for fluctuation in pregnancy intentions relative to women's life circumstances and the effects of these transitions on contraceptive behaviours is beyond the scope of this study, but needs further analysis.

**Table II** Consistent contraceptive use by summary of responses on the pregnancy avoidance and intention scales.

	<i>n</i>	% Giving response	% consistent Contraceptive use	Adjusted OR* consistent contraceptive use	95% CI		<i>P</i>
Pregnancy avoidance scale ('how much do you want to avoid getting pregnant?')							
5 = (really)	13 374	86.6	77.8	2.6	1.6	4.2	<0.001
4	593	3.8	50.4	1.3	0.8	2.3	0.28
3	610	3.9	31.6	1.3	0.7	2.2	0.36
2	288	1.9	31.6	1.6	0.9	2.9	0.12
1	179	1.2	15.6	0.5	0.3	1.1	0.10
0 = (not at all)	402	2.6	23.4	1			
Pregnancy desire scale ('how much do you want to get pregnant?')							
5 = (really)	383	2.5	21.7	1			
4	264	1.7	20.1	1.1	0.6	2.1	0.68
3	649	4.2	28.5	2.8	1.6	5.1	<0.001
2	314	2.0	47.4	4.8	2.6	8.8	<0.001
1	418	2.7	57.7	4.3	2.4	8.0	<0.001
0 = (not at all)	13 418	86.9	77.5	5.8	3.3	10.2	<0.001

Model adjusted for baseline characteristics: age, gravidity, parent's income, educational attainment and school attendance, and number of lifetime partners.

**Table III** Number of pairs of weekly responses to the pregnancy intention and avoidance scales.

	Avoidance scale (Want avoid pregnancy)						Total	
	(0=not-at-all)			(5=really)				
	0	1	2	3	4	5		
Intention scale (Want pregnancy) (0= not at all)	0	61	10	6	51	98	13,192	13,418
	1	1	8	2	9	310	88	418
	2	2	9	59	98	122	24	314
	3	36	21	124	410	31	27	649
	4	28	106	64	27	24	15	264
(5= really)	5	274	25	33	15	8	28	383
Total	402	179	288	610	593	13,374	15,446	
		Pro-natalist	Indifferent	Ambivalent	Anti-conception			

Nonetheless, while women who had equivocal feelings were at greater risk of becoming pregnant because of inconsistent contraceptive use (including non-use), our findings also indicate that most instances of inconsistent use of contraception occurred in the majority of weeks in which women expressed strong anti-conception feelings. In a recent study on the predictive value and stability of pregnancy attitudes on teenage pregnancies in a Latina community in the USA, the authors also acknowledge that while probabilities of a pregnancy increased incrementally with intention levels, most pregnancies occurred in young women reporting 'the lowest levels of intention' (Rocca *et al.*, 2010). Thus, as noted by Schumann and Glasier (2006) based on a survey of women undergoing an abortion in Scotland, most of the challenges in reducing unintended pregnancies lie in improving contraceptive effectiveness among the majority of young women who clearly do not want to become pregnant but either temporarily discontinue their method or use it imperfectly.

Previous work has illustrated the difficulties women experience in their daily use of contraception, such difficulties translating into high discontinuation rates (Vaughan *et al.*, 2008) as well as a wide gap between perfect-use and typical-use failure rates (Trussell, 2004; Kost *et al.*, 2008). Many competing rationales such as preserving a relationship, gender norms and partner's intentions may interfere with young women's decision to use contraception and their ability to use their methods consistently over time (Zabin *et al.*, 1993; Luker, 1999; Bajos *et al.*, 2002; Bartz *et al.*, 2007; Rocca *et al.*, 2010). In particular, the diversity of romantic trajectories and relationship instability make difficult the acquisition of contraceptive competency for young women. Additional barriers, including difficulties of access and negative attitudes towards contraception, act as further competing rationales for young women's contraceptive decision-making (Zabin, 1999; Bruckner *et al.*, 2004; Glasier *et al.*, 2008). While emergency contraception provides an opportunity to reduce the risk of a pregnancy in

**Table IV** Type of method used and consistency in the weekly use of contraception by a combined pregnancy intention scale: results from bivariate analysis and multivariate regression model.

Paired intention	n (%)	No contraception	Coital methods	Non-coital methods	% Consistent use of contraception	Adjusted OR for consistency of contraceptive use
Avoid	13 688 (88.6)	7	38	55	77	16.0 (10.4–24.6)
Ambivalent	634 (4.1)	30	37	33	43	5.9 (3.6–9.6)
Indifferent	691 (4.5)	48	35	17	30	5.7 (3.4–9.3)
Intend	433 (2.8)	74	20	6	15	1

Model adjusted for baseline characteristics: age, gravidy, parent's income, educational attainment and school attendance, number of lifetime partners and type of relationship with partner in prior week.

**Table V** Proportion of weeks women were consistent users of contraception as a function of their changes in pregnancy intentions throughout the study period.

	Patterns of pregnancy intentions %	% of time when consistent contraceptive user				
		<50%	50–85%	86–99%	100%	
Among all women (n = 699)						
Patterns of consistency in contraceptive use		25.0	25.2	12.0	37.8	
Consistently stated they did not wish to become pregnant	68.7	14.8	22.7	13.1	49.4	100
Reported ambivalent or indifferent feelings ≤ 10% of weekly records	7.7	33.3	38.9	14.8	13.0	100
Reported ambivalent or indifferent feelings > 10% of weekly records	10.7	48.0	26.7	6.7	18.7	100
Expressed pro-natalist attitudes at some point during follow-up	12.9%	55.6	28.9	8.9	6.7	100
Among women who report > 10 pairs of journal entries (n = 381)						
Patterns of consistency in contraceptive use		24.9	28.9	19.2	27.0	
Consistently stated they did not wish to become pregnant	60.1	9.6	26.6	23.6	40.2	100.0
Reported ambivalent or indifferent feelings ≤ 10% of weekly records	14.2	33.3	38.9	14.8	13.0	100.0
Reported ambivalent or indifferent feelings > 10% of weekly records	6.3	62.5	16.7	16.7	4.2	100.0
Expressed pro-natalist attitudes at some point during follow-up	19.4	54.1	32.4	9.5	4.0	100.0

case of contraceptive errors or inconsistent use, studies have shown that women take little advantage of using emergency contraception in case of need (Raymond et al., 2010). Alternately, long-acting contraceptive (LARC) methods are thought to be the most cost-effective way of reducing unintended pregnancies, including teenage pregnancies, because they do not require user adherence. Based on these arguments, the American congress of obstetricians and gynecologists (ACOG) committee opinion on LARC methods recommends that these methods be considered the first-line choice for adolescent women (ACOG, 2012). Supporting this statement, results from the contraceptive Choice project in Saint Louis has demonstrated that the uptake of LARC methods, including among young women, results in lowering unintended pregnancy rates (Peipert et al., 2012). In our study however, very few young women relied on these methods (which accounted for less than 2% of weekly observations) while a vast majority reported having user-dependent methods. Such results suggest that teenage pregnancies are likely to reflect inadequate contraceptive choices more than ambivalent fertility intentions.

Our study has several limitations. Most notably, the information on consistency of contraceptive use, based on the use of contraception at every act of intercourse does not fully capture women's risk of becoming pregnant. In particular in the case of adherence to the hormonal methods, information on the number and timing of missed pills per cycle or possible delays in changing devices (patch or ring) or getting injections was not available. Likewise, the absence of information on menstruation did not allow for a precise description of contraceptive behaviours relative to cycle day. This may have resulted in the misclassification of women who rely on fertility awareness methods or on non-systematic use of barrier methods depending on cycle day, as inconsistent users. We also acknowledge the possibility of a Hawthorne effect due to multiple repeated observations. Weekly reports of fertility intentions and contraceptive behaviours are likely to have resulted in some women formulating pregnancy intentions which would have remained unspecified otherwise and to have increased women's contraceptive awareness. However, a complementary methodological sub-study, conducted on 200 women to compare

pregnancy and contraceptive outcomes according to interview schemes showed no significant difference between groups. Women who reported on their pregnancy status and contraceptive behaviours on a weekly basis for a period of 12 months were no more likely to use contraception and no less likely to become pregnant than women in the control group who were interviewed at the beginning of the study (baseline interview) and 12 months later (closeout interview) (Barber *et al.*, 2012). Furthermore, the association between pregnancy intentions and consistency in contraceptive use did not vary over time.

Study attrition may also have affected the internal validity of our results, as 35% of the initial sample was lost to follow-up at the end of the 2.5-year study period. However, a reanalysis of the data including only the first 12 months of observation (attrition rate of 14%) produced very similar results. In this analysis, we relied solely on women's attitudes towards pregnancy rather than on both partner's pregnancy intentions. The study among teenagers from a Latino community shows that beyond individual intentions, partners' attitudes towards pregnancy also predict contraceptive behaviours and the occurrence of subsequent pregnancies. Pregnancy intentions seem to fluctuate substantially among young girls depending on the nature of their relationships (Zabin *et al.*, 2000; Rocca *et al.*, 2010). While the frequency and reasons for changes in pregnancy intentions is beyond the scope of this analysis, the weekly assessment of pregnancy intentions and their predictive value on contraceptive behaviours takes into account the instability of young people's pregnancy attitudes and their impact on contraceptive behaviours. Furthermore, we partially controlled for the evolving nature of partnerships by introducing a time-varying indicator of the type of relationship with the partner, measured concomitantly with pregnancy intentions.

In conclusion, our results indicate high levels of inconsistent use of contraception, which occurs mostly at times women strongly wish to avoid a pregnancy and with methods which have effectiveness that depend upon correct and consistent use. In the broader context of declining U.S. teenage pregnancy rates, our results suggest there is room for improving young people's contraceptive behaviour by promoting access to and use of the most highly effective methods which do not require user adherence and are less likely to compete with women's motivations to avoid an unwanted pregnancy.

## Authors' roles

C.M. was involved in designing the study and analysing the data, and wrote the first draft of the paper. K.H. and J.T. were involved in designing the study, analysing the data and revising the paper. As principal investigator of the survey, J.B. was responsible for designing the study. She participated in the analysis and revised the paper.

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## Conflict of interest

None of the authors have a conflict of interest. The authors alone are responsible for the content and the writing of the paper.

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