



Stability of Retrospective Pregnancy Intention Reporting Among Women with Unwanted Pregnancies in the United States

Corinne H. Rocca¹ · Mark R. Wilson² · Minjeong Jeon³ · Diana G. Foster¹

Published online: 24 June 2019

© Springer Science+Business Media, LLC, part of Springer Nature 2019

Abstract

Objectives Retrospective assessment of pregnancy intention may be unreliable as women’s perceptions of a past conception can change over time. We compared the stability of retrospective pregnancy intention reporting over 5 years among women who sought and either received, or were denied, an abortion. **Methods** We recruited women from 30 abortion facilities across the United States in 2008–2010. Participants, some who received abortions and others who were denied care because they presented beyond facilities gestational limits, were followed prospectively for 5 years (n = 827). At enrollment and semiannually from year-2 to year-5, women completed the London Measure of Unplanned Pregnancy (LMUP), a six-item measure (scored 0–12), regarding the index pregnancy. We used multivariable mixed-effects models to assess the stability of retrospective reports of index pregnancy intendedness and compared trajectories by group, accounting for site and participant clustering. Our hypotheses were that intention would tend towards “more intended” over time among women denied abortions, who carried the pregnancies to term, and remain stable among women who received the abortion. **Results** Baseline LMUP scores were low (mean: 2.8) and similar by study group. Scores increased among women denied the abortion by year-2 (from 2.9 to 3.5; $p < 0.001$) and were steady through year-5. For women having near-limit abortions, reported intentions were steady between baseline (mean: 2.7) and year-2 (2.8), and declined thereafter through year-5 (to 2.5; $p < 0.001$). **Conclusions** Women somewhat shifted their perceptions of their intentions in correspondence with the pregnancy outcome. Retrospective estimates may underestimate the degree to which births result from unintended pregnancy.

Keywords Abortion · Pregnancy intention · Reliability · Retrospective measurement · Stability · Unintended pregnancy

Significance

What is already known on this subject? Research on the stability of retrospective pregnancy intention reporting shows substantial proportions of women change reports over time post-conception, with mixed results regarding the direction. Studies have not examined pregnancies for which women sought abortion nor used psychometrically evaluated intention measures.

What does this study add? Reports of pregnancy intention were largely stable over the 5 years after seeking an abortion. Still, women who were denied abortions (and gave birth) reported the pregnancy as somewhat more intended 2 years after denial. National data may underestimate unintended pregnancy where abortion access is restricted.

Paper presentation Preliminary results were presented at the Annual Meetings of the Population Association of America (PAA), Washington DC, March–April 2016.

✉ Corinne H. Rocca
corinne.rocca@ucsf.edu

¹ Advancing New Standards in Reproductive Health, Bixby Center for Global Reproductive Health, Department of Obstetrics, Gynecology and Reproductive Sciences, School of Medicine, University of California, San Francisco, 1330 Broadway, 11th Floor, Oakland, CA 94612, USA

² Graduate School of Education, University of California, Berkeley, 4415 Berkeley Way Building, Berkeley, CA 94720, USA

³ Graduate School of Education and Information Studies, University of California, Los Angeles, Moore Hall 3141, 405 Hilgard Avenue, Los Angeles, CA 90095, USA

Introduction

Research assessing the prevalence and health consequences of less intended pregnancy requires reliable and valid measurement of pregnancy intention to produce accurate results (Mumford et al. 2016; Rocca et al. 2019; Santelli et al. 2003). Most research in the United States (US), including studies using population survey data like the National Survey of Family Growth (NSFG), relies on questions asking women to report their intentions, feelings and behavior at the time of a past conception (National Center for Health Statistics 2018). Irrespective of the items used, the reliability of retrospective assessment has been questioned based on evidence that women's recollection and perception of intentions at conception can change over the course of a pregnancy, after childbirth, or while raising a child (Bankole and Westoff 1998; Guzzo and Hayford 2014; Joyce et al. 2000; Poole et al. 2000; Rosenzweig and Wolpin 1993; Williams et al. 2001). Estimating how retrospective reporting changes over time is critical to interpreting unintended pregnancy estimates.

Research on the stability of retrospective pregnancy intention reporting has yielded inconsistent results. A study examining changes in retrospectively reported intendedness of the same pregnancy between NSFG 1988 and 1990 found that, among 1347 live births, about 15% of reports became more positive over time (e.g. from unintended to mistimed or intended), while 10% became more negative (Williams et al. 2001). A second, smaller study examined reported intentions among 240 youth in the 1990 and 1992 National Longitudinal Survey of Labor Market Experiences. While 30% of women reporting their pregnancy as unintended during pregnancy reported it as intended 2 years later, after the birth, 10% of women switched reporting from intended to unintended, suggesting that unintended pregnancy is underreported retrospectively (Joyce et al. 2000). In contrast, the most recent study examined changes over 6 years (2001–2002 to 2007–2008) in the reported intendedness of the first birth of 1463 women in the National Longitudinal Study of Adolescent to Adult Health (Guzzo and Hayford 2014), finding that 17% of women reporting their first birth as unintended initially reported it as intended later, while 29% of women reporting an intended pregnancy changed to unintended.

Research on the stability of retrospective pregnancy intention reporting has suffered important methodologic limitations, and substantial gaps remain in the literature. First, research has relied on simple categorical measures that classify pregnancies as intended, mistimed, or unintended. Yet the feelings women have about pregnancies

can be more nuanced than these categories allow (Barrett and Wellings 2002; Kendall et al. 2005). For instance, some women may desire a pregnancy yet feel they are unable to care for a child (Aiken et al. 2015). Additionally, research reveals that women interpret the terms intend, plan, and desire differently (Barrett and Wellings 2002), and some do not “intend” pregnancies but instead hold vague or unclear preferences (Borrero et al. 2015; Rocca et al. 2019). Simplistic operationalization of the concept of “pregnancy intention” limits our ability to interpret prior results. Studies have not examined the stability of retrospective reporting using a purposefully developed instrument that better captures ranges of feelings and desires people have surrounding pregnancy.

A second limitation is that research has compared women's reporting for the same pregnancy over two points in time. However, changes in reporting may not be linear, and likely differ from during pregnancy to after birth, or over time after birth (Williams and Abma 2000). Examining reports over multiple time points can better reveal important changes in trajectory over time or trends that might account for some of the discordant findings from prior research.

Finally, research has focused exclusively on pregnancies ending in birth using population-based samples. There is a gap in our knowledge of intention reporting among women with undesired pregnancies. Indeed, 45% of pregnancies are considered “unintended,” and nearly one in five are estimated to end in abortion (Finer and Zolna 2016), with additional women carrying to term pregnancies they might have preferred to terminate (Foster 2016). As access to abortion becomes increasingly restricted in the US (Guttmacher Institute 2018), women will be increasingly unable to obtain the abortion care they desire. If these women's retrospectively reported intention changes over time, we may increasingly misestimate the proportion of births that were “unintended.” Relatedly, no data exist on the stability of reporting of the intention of pregnancies ending in abortion.

Despite concerns about stability, retrospective approaches to intention assessment are necessary, as following cohorts of women over time, a design required for prospective intention measurement, is difficult and expensive (Casterline and El-Zeini 2007). Understanding how women's recall and reporting of the intendedness of their past pregnancies changes over time is thus important for interpreting estimates of the intendedness of pregnancies and births assessed at different time points after their occurrence. In settings where access to abortion is restricted, it is important to know how retrospective reporting of intention changes by pregnancy outcome to better understand the degree to which women are able to accomplish their reproductive desires.

We used 5 years of longitudinal data from the Turnaway Study to address these gaps and examine changes over time in women's retrospective reports of the intendedness of pregnancies for which they sought an abortion. In this study, participants were recruited from 30 abortion facilities across the US; while some women received abortions, others were denied abortions and then carried their pregnancies to term. This study design allowed us to directly compare changes in retrospective reporting among women who were unable to get desired abortions to similar women who received their abortion. Our hypotheses were that reports of the intendedness of the pregnancy would become "more intended" over time for women who were denied abortions and gave birth but would remain stable over time among women receiving abortions, with the pregnancy outcome matching women's desires.

Methods

Sample and Procedures

The Turnaway Study is a longitudinal study examining the health and socioeconomic consequences of receiving or being denied a wanted abortion (Biggs et al. 2017; Foster et al. 2018). Between 2008 and 2010, we recruited 956 women seeking abortions from 30 US facilities, selected based on having the highest gestational limit within a 150 mile radius (Dobkin et al. 2014). Due to variation in facility policy and state law, the gestational limits at recruitment facilities ranged greatly, from 10 weeks through the second trimester.

Women were recruited into three groups: (1) women who received abortions within 2 weeks prior to the facility's gestational limit (near-limit abortion group); (2) women who were denied abortions because they presented within 3 weeks over the gestational limit at the facility (turnaway group); and (3) women receiving first-trimester procedures at the same facilities (first-trimester abortion group). The first-trimester group was included to determine whether the experiences of women having later abortions differed from experiences of women having procedures in the first-trimester, when 92% of US abortions occur (Jatlaoui et al. 2017).

Participant recruitment is described in detail elsewhere (Dobkin et al. 2014; Rocca et al. 2013). Women presenting for pregnancy termination were eligible if they were ≥ 15 years old, English- or Spanish-speaking, and had pregnancies with no fetal anomalies. Facility staff connected eligible participants by telephone to study staff, who obtained verbal informed consent; participants signed consent forms, which were sent via FedEx and stored in the research office, separate from data. Written parental or guardian consent was obtained for minors in states where

parental consent was required for abortion. Because we anticipated relatively few women would meet turnaway group eligibility criteria and to maximize power for primary analyses, twice as many participants were enrolled into the near-limit abortion group as the other groups.

Participants were followed for 5 years through January 2016, completing semiannual telephone interviews. At the baseline visit, conducted approximately 8 days after receiving or being denied the abortion, participants provided sociodemographic information and responded to items about their intentions at the time the index pregnancy occurred. At all follow-up interviews between year-2 and year-5, participants were again asked the index pregnancy intendedness items. Women received \$50 gift cards after each interview. University of California, San Francisco's Committee on Human Research approval was received.

Among all eligible women, 37.5% consented to participate (36.7% among turnaways), 85% of whom completed baseline interviews ($n = 956$) (Dobkin et al. 2014). Overall, 93% completed at least one follow-up interview. The final sample size for analyses was 827. Analyses excluded participants recruited from one site at which all but one turnaway later obtained an abortion elsewhere. We also excluded turnaways who reported miscarriages or abortions after abortion denial and one first-trimester and two near-limit group participants who decided not to terminate their pregnancy.

Measures

Our outcome was reported intention of the index pregnancy, measured at baseline and each semiannual interview between year-2 and year-5, using the London Measure of Unplanned Pregnancy (LMUP) (Barrett et al. 2004). The LMUP is a retrospective measure developed in the United Kingdom (UK) based on qualitative research (Barrett and Wellings 2002). It includes six items covering three domains: stance prior to conception (expressed intention of the pregnancy, desire for a baby); context (timing of the pregnancy, partner influences); and behavior (contraceptive non-use, preparatory health behaviors).¹ Responses to each item are 0, 1 or 2; item responses are summed for scores ranging from 0 to 12, with a higher score indicating a more intended pregnancy. Because it demonstrates high internal consistency in the US and UK (Barrett et al. 2004; Morof et al. 2012) and captures multiple domains making up "intention," the measure

¹ At baseline, study interviewers perceived that participants incorrectly understood item-6 regarding pregnancy preparatory behaviors. Although the item asks only about behaviors conducted specifically to prepare for pregnancy, participants were reporting whether they had engaged in the behavior for any reason. As a result, we added an interviewer prompt to clarify the item's meaning. We excluded from analysis responses to item-6 prior to the addition of the prompt.

is increasingly being implemented in research and national surveys (Wellings et al. 2013). Given that the underpinnings of changes in reports of past behaviors may differ from those of changes in reports of context and stance—and given questions in the literature about whether contraceptive use is an accurate indicator of feelings and desires about pregnancy (Jones 2017; Moreau et al. 2013; Rocca et al. 2010)—we also examined a version of the LMUP with only the four stance and context items (LMUP-4, items 2, 3, 4, and 5, score range 0–8).

We used measures of study group (near-limit abortion, runaway, first-trimester abortion) and time (years from recruitment). Group-by-time interaction terms were included to assess group differences in changes in reported intendedness over time. We also included baseline covariables that could confound group differences in intentions, including age, self-reported race/ethnicity, number of children the participant was raising, relationship with the man involved in the pregnancy, and whether the participant was in school and/or employed.

Analyses

We assessed differences in baseline characteristics by study group using a series of bivariable mixed-effects regression models, including random facility effects to account for the clustering of participants within recruitment sites (Rabe-Hesketh and Skrondal 2005). We used a linear, logistic, multinomial logistic or ordinal logistic model, depending on the measurement of the characteristic. We assessed the internal consistency of the LMUP and LMUP-4 using Cronbach's α . For exploratory purposes, we examined patterns over time in responses to each LMUP item individually, using multinomial logistic regression models, accounting for clustering.

We described the stability of LMUP scores between baseline and each participant's last observation between 4 and 5 years. To assess group changes in retrospective pregnancy intention over 5 years, we used a mixed-effects model with random effects for facility and participant clustering, with LMUP score as the outcome.² The model included study group, years, baseline covariables, and group-by-year interaction terms to determine whether changes in intendedness over time differed significantly by pregnancy outcome. We included a spline at year-2 to allow trajectories to differ

between baseline and year-2, versus between year-2 and year-5, and to account for the gap in outcome data between baseline and year-2. Using post-estimation tests, we calculated the statistical significance of group trajectory slopes and differences between groups. We included a random time effect to allow changes in LMUP scores over time (or trajectories) to differ across participants; we determined that inclusion of a random slope improved model fit, based on a log-likelihood ratio test. We calculated predicted LMUP scores by group using trajectories from this model. Models also included baseline variables thought to differ by study group that might affect pregnancy intention. All analyses were repeated using the LMUP-4 as the outcome. Stata version 14 was used for analyses.

Results

Participants were 24 years old on average and were of diverse races/ethnicities (Table 1). Compared to women in the near-limit abortion group, women in the runaway group were younger, less likely to be raising children, and, by study design, had pregnancies that were on average 3 weeks later in gestation. Women having first-trimester abortions were older and more likely to be white and in school or employed than women having abortions near gestational limits.

Scores on the LMUP at baseline, or 1 week after receipt or denial of the abortion, were low, on average 2.8 [standard deviation (SD) = 1.7] on the 0–12 scale, with a slightly right-skewed distribution. The internal consistency of the scale was 0.53; this figure was low in large part because, as expected for individuals seeking abortions, participants fell at pregnancy intention levels lower than the LMUP is targeted for. Excluding the two behavioral items (LMUP-4), internal consistency was slightly higher (0.57), and baseline scores were 1.5 overall (SD = 1.3) on the 0–8 scale. Overall, 92% of participants reported they did not intend the pregnancy and 80% that the pregnancy came at the wrong time (Table 2). One in five (19%) of women reported consistently using contraception at the time of conception, and 45% used a method inconsistently.

Examining individual items, we detected unique trajectories for the two behavioral items. For contraceptive non-use (item-1), the predicted percentage of participants reporting they had not used contraception at the time of conception was 32% at baseline, 45% at year-2, and 38% at year-5, with similar patterns across groups. For preparatory health behaviors (item-6), 7% of participants reported at least one behavior at baseline; this figure dropped to 4% at year-2 and 1% at year-5, based on the predicted percentages from the multivariable model, with similar trends by group.

Describing stability of LMUP scores over 4 to 5 years post-abortion-seeking, about two-thirds (67%) of scores

² We modeled summed LMUP score as the outcome, rather than using a latent growth model examining latent scores to items, due to the complexity of our longitudinal model. Modeling a Generalized Linear Latent and Mixed Model with three-category outcomes, three study groups, group-by-time interactions, a spline, three levels of hierarchy, and a random time effect was too computationally intensive. Our approach of using summed LMUP scores likely produced very similar results as would have the more complex approach.

Table 1 Participant characteristics, by study group: percentages, Turnaway Study (n = 827)

	Near-limit abortion (n = 413)	Turnaway (n = 160)	p ^b	First-tri abortion (n = 254)	p ^b
Pregnancy intention, score (range 0–12)	2.8	3.1	0.14	2.6	0.11
Age, years (range 14–46 ^a)	24.9	23.4	<0.01	25.9	0.04
Race/ethnicity					
White	32.0	25.0	0.24	39.0	0.03
Black	31.7	33.8		31.5	
Latina	21.1	28.1		21.3	
Other	15.3	13.1		8.3	
Children raising					
0	36.4	49.4	0.04	40.6	0.66
1	30.3	21.3		24.8	
2 Or more	33.3	29.4		34.7	
In school or employed	66.8	60.6	0.16	76.3	0.01
Relationship with the man involved in the pregnancy					
Husband	7.5	9.0	0.90	9.9	0.54
Boyfriend or partner	53.0	54.2		49.6	
Friend or acquaintance	13.9	13.6		16.3	
No current relationship	25.6	23.2		24.2	
Difficulty deciding to have the abortion					
Very easy	10.4	13.2	< 0.001	16.9	0.65
Somewhat easy	15.7	10.7		22.1	
Neither easy nor difficult	15.7	10.1		14.6	
Somewhat difficult	27.1	37.1		26.8	
Very difficult	31.0	28.9		19.7	
Gestational age, weeks (range 3–29)	19.7	23.1	<0.001	7.6	<0.001

^aOne participant aged 14 was recruited before the minimum age was changed to 15

^bCompared to near-limit abortion

overall remained within one point of baseline responses; 18% declined two or more points, and 15% increased two or more points (Fig. 1a). Among women who had abortions, about 13% of scores increased two or more points, compared to 21% among turnaways. Using the LMUP-4, 79% of scores at 4–5 years remained within one point of baseline responses, with about 10% changing two or more points in either direction (Fig. 1b). Among women who had abortions, about 8% increased two or more points, compared to 19% among turnaways.

In the multivariable mixed-effects model examining trajectories of retrospective pregnancy intention reports over time, average baseline scores were 2.8 for the near-limit group, 3.1 for turnaways, and 2.6 for the first-trimester group. Scores did not differ significantly by study group (Table 3). Between baseline to year-2, intention scores increased significantly among turnaways, from 2.9 to 3.5 ($p < 0.001$) (Table 4 and Fig. 2). Scores were steady after year-2. For women having near-limit

abortions, intention scores were steady between baseline (2.7) and year-2 (2.8), and declined thereafter through year-5 (to 2.5; $p < 0.001$). Women having first-trimester abortions had similar trajectories as women having near-limit abortions, though the decline in reported intendedness from year-2 to year-5 did not reach statistical significance ($p = 0.08$).

Analyses excluding the two behavioral items yielded consistent results as when using the full LMUP scale, with small differences. Baseline LMUP-4 scores were higher among turnaways than near-limits (1.8 vs. 1.4, adjusted coefficient = 0.26; 95% CI 0.05, 0.47) (Table 5). As in the model using the full LMUP, among Turnaways, retrospective reporting of pre-pregnancy intention increased significantly from baseline to year-2 (mean scores 1.8 and 2.0, respectively, $p = 0.01$), leveling off after year-2. Reported intentions about the index pregnancy were steady among near-limits (mean scores 1.4 at baseline, 1.4 at year-2, 1.3 at year-5) (Table 6 and Fig. 3).

Table 2 Distribution of responses to the London Measure of Unplanned Pregnancy items, baseline (n = 827)

	%
Stance domain	
3. Intention	
2—Intended	1.1
1—Intentions kept changing	6.6
0—Did not intend	92.4
4. Wantedness	
2—Wanted a baby	6.8
1—Mixed feelings about baby	23.3
0—Did not want a baby	69.9
Context domain	
2. Timing	
2—Right time	2.3
1—Ok but not quite right	17.6
0—Wrong time	80.1
5. Partner discussion	
2—We agreed we would like pregnancy	2.2
1—We discussed but hadn't agreed	73.7
0—We never discussed having children	24.2
Behavior domain	
1. Contraceptive non-use	
2—Always used	18.6
1—Used inconsistently	45.2
0—Did not use	36.2
6. Pregnancy preparatory behaviors	
2—2 Behaviors to prepare	3.4
1—1 Behavior to prepare	4.1
0—No behaviors	92.5

Discussion

In this study, women’s retrospectively reported pregnancy intentions were fairly stable over the 5 years after seeking an abortion, with roughly one in six participants’ reports increasing or decreasing more than one point in either direction on the 12-point LMUP over 4–5 years. Among women who had abortions, reported intendedness was steady over time, with a slight tendency to report the pregnancy as less “intended” from year-2 through year-5 post-abortion. Among women who sought, but were denied, abortions and carried unwanted pregnancies to term, in comparison, retrospective reports of pregnancy intentions became somewhat more “intended” between pregnancy and year-2. While the magnitude of the increasing trajectory was small based on both the LMUP and LMUP-4, it reached

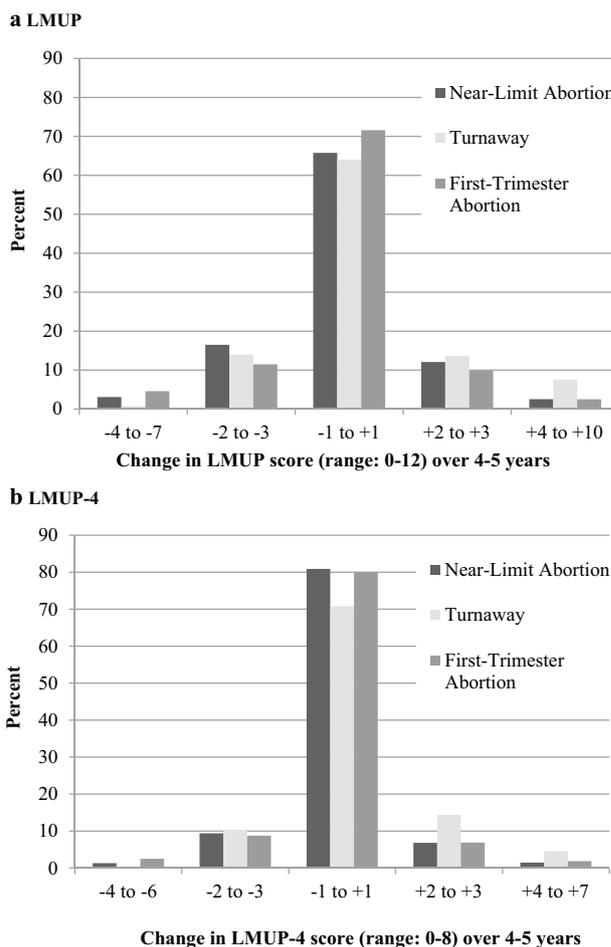


Fig. 1 Changes in retrospective pregnancy intention scores using **a** the London Measure of Unplanned Pregnancy [LMUP] and **b** LMUP-4 (excluding behavioral items) between baseline and 4-5 years follow-up: percentages by group

statistical significance and could be non-trivial in larger samples. Results suggest that some women with unwanted pregnancies who are unable to terminate may—consciously or subconsciously—revise their perceptions of their intentions at the time of the pregnancy after abortion-seeking as they carry the pregnancy to term and after giving birth. Estimates of unwanted birth, measured retrospectively, should consider that women who are unable to obtain abortions for their pregnancies may report higher intention after the birth of the child than before. Importantly, many women who desire abortion for unwanted pregnancies are unable to find and present for care (Foster 2016). Alternatively, intentions may be depressed at the time of abortion seeking, and then rebound as women carry the pregnancy and give birth.

Table 3 Retrospective pregnancy intentions using the LMUP over 5 years post-abortion seeking: adjusted coefficients from a multivariable mixed-effects model

	LMUP, range 0–12	
	Adjusted coefficient ^a	95% CI
Study group (ref: near-limit abortion)		
Turnaway	0.22	−0.08, 0.52
First-trimester abortion	−0.16	−0.41, 0.10
Years, from 0 to 2 years	0.02	−0.07, 0.11
Group by years 0–2 interactions		
Turnaway * years	0.27**	0.09, 0.44
First-trimester * years	0.03	−0.11, 0.17
Years, from 2 to 5 years	−0.14*	−0.27, −0.01
Group by years interactions		
Turnaway * years	−0.24	−0.51, 0.03
First-trimester * years	0.03	−0.18, 0.23

**p ≤ .01

*p ≤ .05

^aModel controls for: age, race/ethnicity, children raising, relationship with the man involved in the pregnancy, and school/work at baseline

The stability of pregnancy intention scores was largely similar including and excluding the two behavioral LMUP items about contraceptive non-use and preparatory health behaviors. Nevertheless, exploratory results indicated some instability in reporting of behaviors conducted prior to pregnancy: women decreasingly reported pregnancy preparatory behaviors over time, and contraceptive use reporting fluctuated. Based on substantial evidence that contraceptive use is often inconsistent with verbalized feelings about a potential pregnancy (Jones 2017; Moreau et al. 2013; Rocca et al. 2010)—and that many women do not proactively plan

Table 4 Significance of change in LMUP score over time, by study group

Study group	Years	Trajectory difference from zero (p value) ^a	Trajectory difference from reference (p value) ^b
Near-limit abortion	0–2 years	0.61	Reference
	2–5 years	< 0.001	Reference
Turnaway	0–2 years	< 0.001	0.04
	2–5 years	0.12	0.10
First-trimester abortion	0–2 years	0.36	0.96
	2–5 years	0.08	0.03

^aIndicates whether the slope of the trajectory, depicted in Fig. 2, differs significantly from zero, based on the model presented in Table 3

^bIndicates whether the slope of the trajectory, depicted in Fig. 2, differs significantly from the near-limit abortion group, based on the model presented in Table 3

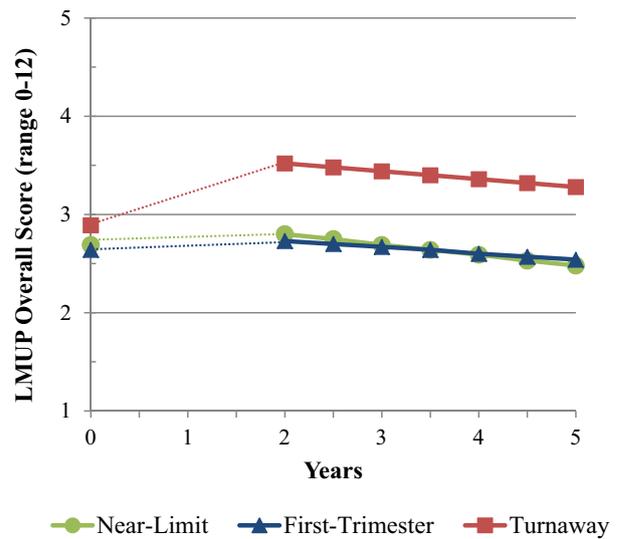


Fig. 2 Retrospective pregnancy intention using the LMUP over 5 years post-abortion seeking, by study group

pregnancies—it remains unclear whether behavioral measures should be used to measure intentions. Future research should examine explicitly how recall of pre-pregnancy behavior changes over time. Importantly, our study included only women seeking an abortion; whether similar trends would be found among women with more desired pregnancies is unknown.

This study has limitations. Because we did not include conventional measures of pregnancy intention, we were unable to compare directly our stability estimates to prior studies assessing stability of retrospective reporting between during pregnancy and after birth (Guzzo and Hayford 2014; Joyce et al. 2000). Also, the LMUP assumes that individuals hold conscious and clear “intentions” regarding pregnancy, which is not always the case (Rocca et al. 2019), and the measure is geared toward more planned pregnancies than those in our sample of women seeking abortion. Our results cannot be interpreted as an analysis of the stability of the LMUP as an instrument because all pregnancies in our sample were unwanted, and results cannot be generalized to women with more desired pregnancies. Baseline assessment of pregnancy intention was conducted 1 week after abortion seeking and thus cannot be interpreted as intendedness during pregnancy for individuals who had abortions. Finally, due to a gap in our data between baseline and year-2, we are unable to decipher the patterns of stability within this period.

This prospective study is the first to capture the stability of intention reporting among women who sought to terminate pregnancies. We used a psychometrically evaluated measure of pregnancy intention and examined retrospective pregnancy intention reporting over multiple time points. Our

Table 5 Retrospective pregnancy intentions using the LMUP-4 (excluding behaviors) over 5 years post-abortion seeking: adjusted coefficients from a multivariable mixed-effects model

	LMUP-4, range 0–8	
	Adjusted coefficient ^a	95% CI
Study group (ref: near-limit abortion)		
Turnaway	0.26*	0.04, 0.49
First-trimester abortion	-0.08	-0.27, 0.11
Years, from 0 to 2 years	-0.01	-0.08, 0.06
Group by years 0–2 interactions		
Turnaway * years	0.17*	0.03, 0.30
First-trimester * years	0.03	-0.08, 0.14
Years, from 2 to 5 years	-0.03	-0.14, 0.07
Group by years interactions		
Turnaway * years	-0.11	-0.32, 0.10
First-trimester * years	-0.02	-0.19, 0.14

*p ≤ .05

^aModel controls for: age, race/ethnicity, children raising, relationship with the man involved in the pregnancy, and school/work at baseline

analysis approach allowed us to examine individual trajectories over time, accounting for loss-to-follow-up. Finally, our sample was drawn from 30 geographically diverse facilities, improving the generalizability of our results to US women having abortions.

Retrospective assessments often rely on single items for estimates of unintended pregnancy, though researchers have advocated for the use of scaled measures of pregnancy intention that capture ranges of feelings and desires (Mumford et al. 2016; Rocca et al. 2019). As the demography and reproductive health fields move toward use of more purposefully developed measures, we need to understand not only

Table 6 Significance of change in LMUP-4 score over time, by study group

Study group	Years	Trajectory difference from zero (p value) ^a	Trajectory difference from reference (p value) ^b
Near-limit abortion	0–2 years	0.77	Reference
	2–5 years	0.06	Reference
Turnaway	0–2 years	0.01	0.06
	2–5 years	0.91	0.15
First-trimester abortion	0–2 years	0.59	0.59
	2–5 years	0.24	0.31

^aIndicates whether the slope of the trajectory, depicted in Fig. 3, differs significantly from zero, based on the model presented in Table 5

^bIndicates whether the slope of the trajectory, depicted in Fig. 3, differs significantly from the near-limit abortion group, based on the model presented in Table 5

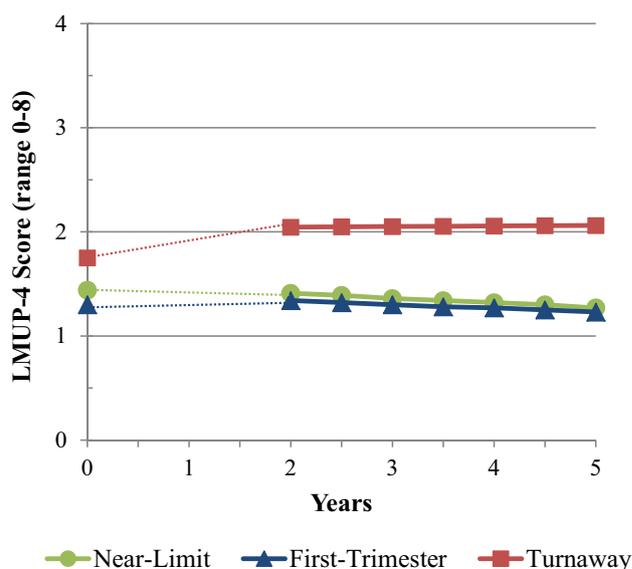


Fig. 3 Retrospective pregnancy intentions, excluding behavioral items, using the LMUP-4 over 5 years post-abortion seeking, by study group

the psychometric properties of the scales, but also the stability of scores to understand the reliability of these approaches and to potentially revise estimates of unintended pregnancy and birth accordingly.

Acknowledgements The authors thank Rana Barar, Heather Gould, and Sandy Stonesifer for study coordination and management; Mattie Boehler-Tatman, Janine Carpenter, Undine Darney, Ivette Gomez, Selena Phipps, Brenly Rowland, Claire Schreiber and Danielle Sinkford for conducting interviews; Michaela Ferrari, Debbie Nguyen and Elisette Weiss for project support; Jay Fraser and John Neuhaus for database and statistical assistance; and all the participating providers for their assistance with recruitment.

Funding This study was supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, Office of Research on Women’s Health, Building Interdisciplinary Research Careers in Women’s Health Grant #K12 HD052163; the Wallace Alexander Gerbode Foundation; an anonymous foundation; and the David and Lucile Packard Foundation. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Compliance with Ethical Standards

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

References

Aiken, A. R. A., Dillaway, C., & Mevs-Korff, N. (2015). A blessing I can’t afford: Factors underlying the paradox of happiness

- about unintended pregnancy. *Social Science and Medicine*, 132, 149–155.
- Bankole, A., & Westoff, C. F. (1998). The consistency and validity of reproductive attitudes: evidence from Morocco. *Journal of Biosocial Science*, 30(4), 439–455.
- Barrett, G., Smith, S. C., & Wellings, K. (2004). Conceptualisation, development, and evaluation of a measure of unplanned pregnancy. *Journal of Epidemiology and Community Health*, 58(5), 426–433.
- Barrett, G., & Wellings, K. (2002). What is a ‘planned’ pregnancy? Empirical data from a British study. *Social Science and Medicine*, 55(4), 545–557.
- Biggs, M. A., Upadhyay, U. D., McCulloch, C. E., & Foster, D. G. (2017). Women’s mental health and well-being 5 years after receiving or being denied an abortion: A prospective, longitudinal cohort study. *JAMA Psychiatry*, 74(2), 169–178.
- Borrero, S., Nikolajski, C., Steinberg, J. R., Freedman, L., Akers, A. Y., Ibrahim, S., et al. (2015). “It just happens”: A qualitative study exploring low-income women’s perspectives on pregnancy intention and planning. *Contraception*, 91(2), 150–156.
- Casterline, J. B., & El-Zeini, L. O. (2007). The estimation of unwanted fertility. *Demography*, 44(4), 729–745.
- Dobkin, L. M., Gould, H., Barar, R. E., Ferrari, M., Weiss, E. I., & Foster, D. G. (2014). Implementing a prospective study of women seeking abortion in the United States: Understanding and overcoming barriers to recruitment. *Women’s Health Issues*, 24(1), e115–e123.
- Finer, L. B., & Zolna, M. R. (2016). Declines in unintended pregnancy in the United States, 2008–2011. *New England Journal of Medicine*, 374(9), 843–852.
- Foster, D. G. (2016). Unmet need for abortion and women-centered contraceptive care. *Lancet*, 388(19941), 216–217.
- Foster, D. G., Biggs, M. A., Ralph, L., Gerds, C., Roberts, S., & Glymour, M. M. (2018). Socioeconomic outcomes of women who receive and women who are denied wanted abortions in the United States. *American Journal of Public Health*, 108(3), 407–413.
- Guttmacher Institute. (2018). “An overview of abortion laws.” *State Laws and Policies*. <https://www.guttmacher.org/state-policy/explore/overview-abortion-laws>. Accessed 3 Mar 2019.
- Guzzo, K. B., & Hayford, S. R. (2014). Revisiting retrospective reporting of first-birth intendedness. *Maternal and Child Health Journal*, 18(9), 2141–2147.
- Jatlaoui, T. C., Shah, H., Mandel, M. G., Krashin, J. W., Suchdev, D. B., Jamieson, D. J., et al. (2017). Abortion surveillance—United States, 2014. *Morbidity and Mortality Weekly Report*, 66(24), 1–48.
- Jones, R. K. (2017). Change and consistency in US women’s pregnancy attitudes and associations with contraceptive use. *Contraception*, 95(5), 485–490.
- Joyce, T., Kaestner, R., & Korenman, S. (2000). The stability of pregnancy intentions and pregnancy-related maternal behaviors. *Maternal and Child Health Journal*, 4(3), 171–178.
- Kendall, C., Afaible-Munsuz, A., Speizer, I., Avery, A., Schmidt, N., & Santelli, J. (2005). Understanding pregnancy in a population of inner-city women in New Orleans: results of qualitative research. *Social Science and Medicine*, 60(2), 297–311.
- Moreau, C., Hall, K., Trussell, J., & Barber, J. (2013). Effect of prospectively measured pregnancy intentions on the consistency of contraceptive use among young women in Michigan. *Human Reproduction*, 28(3), 642–650.
- Morof, D., Steinauer, J., Haider, S., Liu, S., Darney, P., & Barrett, G. (2012). Evaluation of the London measure of unplanned pregnancy in a United States population of women. *PLoS ONE*, 7(4), e35381.
- Mumford, S. L., Sapra, K. J., King, R. B., Louis, J. F., & Louis, G. M. B. (2016). Pregnancy intentions—a complex construct and call for new measures. *Fertility and Sterility*, 106(6), 1453–1462.
- National Center for Health Statistics. (2018). *National Survey of Family Growth 2015–2017*. <http://www.cdc.gov/nchs/nsfg/>. Accessed 1 Jan 2019.
- Poole, V. L., Flowers, J. S., Goldenberg, R. L., Cliver, S. P., & McNeil, S. (2000). Changes in intendedness during pregnancy in a high-risk multiparous population. *Maternal and Child Health Journal*, 4(3), 179–182.
- Rabe-Hesketh, S., & Skrondal, A. (2005). *Multilevel and longitudinal modeling using Stata*. College Station, TX: StataCorp LP.
- Rocca, C. H., Hubbard, A. E., Johnson-Hanks, J., Padian, N. S., & Minnis, A. M. (2010). Predictive ability and stability of adolescents’ pregnancy intentions in a predominantly Latino community. *Studies in Family Planning*, 41(3), 179–192.
- Rocca, C. H., Kimport, K., Gould, H., & Foster, D. G. (2013). Women’s emotions 1 week after receiving or being denied an abortion in the United States. *Perspectives on Sexual and Reproductive Health*, 45(3), 122–131.
- Rocca, C., Ralph, L. J., Wilson, M., Gould, H., & Foster, D. G. (2019). Psychometric evaluation of an instrument to measure prospective pregnancy preferences: The desire to avoid pregnancy scale. *Medical Care*, 57(2), 152–158.
- Rosenzweig, M. R., & Wolpin, K. I. (1993). Maternal expectations and ex post rationalizations: the usefulness of survey information on the wantedness of children. *Journal of Human Resources*, 28(2), 205–229.
- Santelli, J., Rochat, R., Hatfield-Timajchy, K., Gilbert, B. C., Curtis, K., Cabral, R., et al. (2003). The measurement and meaning of unintended pregnancy. *Perspectives on Sexual and Reproductive Health*, 35(2), 94–101.
- Wellings, K., Jones, K. G., Mercer, C. H., Tanton, C., Clifton, S., Datta, J., et al. (2013). The prevalence of unplanned pregnancy and associated factors in Britain: Findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *Lancet*, 382(9907), 1807–1816.
- Williams, L., & Abma, J. (2000). Birth wantedness reports: A look forward and a look back. *Social Biology*, 47(3–4), 147–163.
- Williams, L., Piccinino, L., Abma, J., & Arguillas, F. (2001). Pregnancy wantedness: Attitude stability over time. *Social Biology*, 48(3–4), 212–233.

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.