**Effect of changes in response options on reported pregnancy intentions: Findings from a
natural experiment in the United States**

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Abstract

Objectives: The Pregnancy Risk Assessment Monitoring System (PRAMS), conducted by the Centers for Disease Control in collaboration with state health departments, is the largest state-level surveillance system that includes a question on the intention status of pregnancies leading to live birth. In 2012, the question was changed with the inclusion of an additional response option describing uncertainty about pregnancy desire prior to the pregnancy. This analysis investigates how this additional response option affected women's responses.

Methods: We use the change in the pregnancy intention question in 2012 as a natural experiment, taking advantage of relatively stable distributions of pregnancy intentions over short periods of time within states. Using PRAMS data from 2009-2014 (N=222,781), we employ a regression discontinuity design to test for differences in the proportion of women choosing each response option in the periods pre- and post-question change.

Results: In the years 2012-2014, 13-15% of women chose the new answer option, "I wasn't sure what I wanted". The addition had a substantial impact on distributions of pregnancy intentions, drawing responses away from all answer choices except for "I wanted to become pregnant then." Effects were not uniform across age, parity and race combined with Hispanic ethnicity, as well as across states.

Conclusions: These effects could impact estimated levels and trends of the proportion of births that are characterized as intended, mistimed or unwanted, as well as estimates of differences between demographic groups. These findings will help to inform new strategies for measuring women's pregnancy and childbearing desires.

Main Text

Virtually all population-based surveys of individual-level fertility experiences include retrospective ‘intention’ questions on past pregnancies. These questions ask women to recall how they had felt, *prior* to the pregnancy, about becoming pregnant or having a baby. The research field has traditionally labeled these reports ‘pregnancy intentions’ even though women are usually not asked about their intentions, but about their desires.

A growing body of research suggests that measures of pregnancy intentions should allow for a wider and more realistic range of potential responses, particularly the ability to characterize prior feelings as ambivalent or unformed.^{1–9} To address this, some surveys have added additional response options to the pregnancy intention measure.^{10,11} This strategy was recently adopted by the Pregnancy Risk Assessment Monitoring System (PRAMS) surveys conducted annually by the Centers for Disease Control (CDC) in collaboration with individual state health departments. In this paper we investigate how the change in response options has affected reporting of pregnancy intentions in the state-specific populations covered by PRAMS, with a particular focus on comparability over time. More broadly, we explore how the addition of a response option that allows women to report having been uncertain prior to their pregnancy may affect measurement of pregnancy intentions.

Background

Pregnancy intentions on the PRAMS questionnaire are obtained by asking respondents to think back to the time just before their pregnancy and to recall how they felt about becoming

pregnant at that time.* The response options, shown below, were unchanged for more than a decade (from 2000 to 2011).[†]

Thinking back to *just before* you got pregnant with your *new* baby, how did you feel about becoming pregnant? (Check one answer)

- I wanted to be pregnant sooner
- I wanted to be pregnant later
- I wanted to be pregnant then
- I didn't want to be pregnant then or any time in the future

Traditionally, researchers refer to pregnancies for which the women selected the first or third response options – indicating she had wanted the pregnancy to occur sooner than it did or at the time it occurred – as “intended.” “Mistimed” pregnancies are those for which she had wanted the pregnancy to occur later, and “unwanted” are those for which she responded that she didn't want to become pregnant then or any time in the future. Because the mistimed and unwanted categories imply that the pregnancy was not desired at the time it occurred or at all, these two groups are often combined and termed “unintended” pregnancies.

Each state participating in PRAMS administers a set of “core” questions on their survey, uniform across states, and has the option of including some additional “standard” questions, as well as questions of their own design. The pregnancy intention question has always been included as

* The National Survey of Family Growth asks a similar but slightly different question which asks women to recall how they had felt about *having a baby* (or, another baby) just before they became pregnant.

part of the core set of questions. Beginning with the 2012 version of the survey (Phase 7), PRAMS added a fifth response option to the core pregnancy intention question: “I wasn’t sure what I wanted”.[‡] It’s important to note that this option specifically refers to uncertainty in the respondent’s feelings *immediately prior to the pregnancy*, not at the time of the survey. This differs from other surveys (such as the National Survey of Family Growth), in which respondent-volunteered “not sure” or “don’t know” options may refer to uncertainty at the time the question was asked.

The addition of this answer option responds to concerns that survey questions meant to measure whether a woman had wanted to become pregnant are insufficient for capturing important variation in how women think about their reproductive lives and experiences. In particular, the original question did not include an answer option for women who had not formed clear desires or intentions prior to the pregnancy, or who had had mixed feelings. The addition of the fifth answer option in PRAMS expands the traditional measure of pregnancy intentions to include these women. Prior surveys that included this option found that significant proportions of women chose it.^{10,11}

When women have five answer options, the proportion choosing each option will be smaller than a question with only four answer options. However, what is unknown is how the additional response category will affect the *relative* proportion of women choosing the previously existing response categories. For example, women who would have responded that they “wanted to become pregnant later” if they had been presented with only four answer

[‡] The order of response categories was also changed slightly, with “I wanted to become pregnant later” moving from the second to the first response category (i.e., followed by “I wanted to become pregnant sooner”).

choices may be more likely to choose the new option (“I wasn’t sure what I wanted”) than women who would have responded that they “wanted to become pregnant then.”

Understanding the effects of the change in response options is critical because changes in the proportion of women who select each response category could affect the comparability of estimates of the proportion of births in the state that are identified as intended, mistimed or unwanted across time. This is of special concern given the wide use of these surveys in both tracking statistics over time,^{12–15} as well as investigating associations between pregnancy intention and other maternal health behaviors and infant outcomes, which often involves pooling data across years.^{16–19} Even if the relative proportions selecting each response category did not shift in the overall population, there may have been differential shifts across population groups; if women with specific demographic characteristics were more likely to select the “I wasn’t sure” option (and thus were less likely to select one of the other options), this could affect patterns of group differentials, as well as reported associations with other behaviors.

In this analysis, we use the 2012 change in the PRAMS pregnancy intention question as a natural experiment, taking advantage of the fact that, within states, the distribution of pregnancy intentions among women having births has been fairly stable over short periods of time. After describing overall changes in the proportion of women reporting each response category, we use a regression discontinuity design to formally test for differences between the periods immediately pre- and post-question change. We then examine whether the change had differential effects across demographic groups.

Methods

Data

The PRAMS questionnaire is mailed to women who have had a recent live birth (usually within 2 to 6 months after delivery), with each state's sample drawn from vital records, and including oversampling by specific characteristics to create annual, representative data at the state level of all women delivering in that year.²⁰ As of the end of 2018, forty-seven states, New York City, Puerto Rico, the District of Columbia and the Great Plains Tribal Chairmen's Health Board (GPTCHB) participated in PRAMS, covering approximately 83% of all live births in the United States.²¹

We limit the analytical sample to jurisdictions with data for at least one year in the period 2009-2014, and with response rates not less than 65% in a given year. In total, our sample is comprised of 222,781 women from 36 states and New York City.[§] Not all states contributed data in each of the six years. For all analyses, we performed sensitivity tests using only states with data for all 6 years; these analyses have a sample size of 168,462 women from 16 states. All analyses were conducted using Stata 15.1, with weighted data and the *svy* prefix to adjust for the complex sample design of the PRAMS surveys.

[§] New York state (exclusive of New York City) and New York City field separate PRAMS surveys. Both are included in these analyses.

Measures

We examine pregnancy intention in relation to a limited set of measures from the PRAMS surveys: the year of interview (2009, 2010, 2011, 2012, 2013 or 2014), age at which the woman gave birth, her number of prior live births (zero, one, two or more) and her reported race crossed with Hispanic ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and non-Hispanic other; the latter includes all non-Hispanic women who reported races other than white or black, or reported multiple races). We focus on three commonly used demographic measures – age, parity, and race/ethnicity – because pregnancy intentions are known to vary widely by these characteristics. We reasoned that the extent to which the impact of the question change varies by these three core demographic measures would be sufficient to demonstrate the need for careful consideration of any future analyses using these data; while other measures are also relevant to pregnancy intentions, a comprehensive investigation of differential impacts by other demographic characteristics – and the reasons why they vary – is beyond the scope of this analysis.

Analysis

We first investigate changes in pregnancy intentions over the three years preceding the question wording change (2009-2011) and the three years following it (2012-2014). This approach has two advantages over a simple comparison of the distributions of responses to the pregnancy intention question in 2011 (pre-question change) to those in 2012 (post-question change). First, and most important, is that changes between 2011 and 2012 could be partially

or entirely a reflection of longer-term shifts in the proportion of women in each response category. While this is addressed formally in our regression discontinuity model, visual inspection of trends over a longer period can give a sense of the degree to which effects of the question wording change may be confounded with larger trends over time. Second, including a broader set of years allows us to leverage data from more states, as only a smaller pool (25 states) have data available in both 2011 and 2012.

All descriptive statistics are produced by logistic regressions predicting the proportion of women reporting each of the response categories in each year; results are presented as predicted probabilities from these regressions. Because some differences could be driven by which states fielded surveys in which year (as the proportion of women reporting each response category varies substantially by state), we included state fixed effects in each regression to control for the fact that data for each year in the sample is contributed by a different set of states.

In survey design research, changes in question wording is often evaluated using randomized experiments, in which respondents are randomly assigned by the researchers to receive different versions of the questionnaire. The mean difference in responses between the groups is typically defined as an estimate of the “average treatment effect”, or ATE, where the “treatment” is exposure to a different version of the questionnaire. PRAMS, however, is an observational dataset, not a randomized experiment; in place of randomization, starting in 2012, all respondents in all states were administered the version of the question with the additional response option included.

Consequently, we use a quasi-experimental approach employing a regression discontinuity model. Regression discontinuity designs take advantage of sharp cut-off points that determine which respondents were assigned different versions of the treatment of interest. They fundamentally rely on the assumption that respondents on either side of the cut-off are *similar in all ways save treatment assignment*; in other words, that assignment of the treatment was “as good as random,” and that differences between the groups can be solely attributed to the treatment in question.²² In our case, respondents were “assigned” to a different treatment based on the year in which they were surveyed. The model assumes that respondents on either side of the cut-off year – those interviewed in 2009-2011 and those interviewed in 2012-2014 – are similar in all ways except for the question version they received.

In order to make this assumption plausible, we need to account for trends over time in the responses within the pre and post periods; we also need to control for any other factors likely to be confounded with the question change. This latter condition motivates our use of state fixed effects (although it is important to note that these control for the presence or absence of a given state in the sample in any year, but not shifts in the demographic composition of women giving birth within a state, which we feel is unlikely to have shifted drastically over the short time period under study.)

The log odds of selecting each intention question response option were predicted using an equation of the form:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 YEAR + \beta_2 POST + \beta_3 POST * YEAR + \beta_j \gamma_j$$

Where YEAR represents year of the survey, POST is an indicator variable marking whether the respondent was asked the intention question pre- or post- response option change, and γ_j is a vector of dummy variables indicating each state (to capture state fixed effects). We also include an interaction term between POST and YEAR to allow the slopes within the two time periods (pre- and post-) to differ.** Without the inclusion of this interaction term, the model would constrain trends over time in the proportion of respondents choosing a given response option to be identical in the pre (2009-2011) and post (2012-2014) periods.

A major assumption of regression discontinuity designs is that the functional form of the assignment variable (in this case, year of the survey) is correctly specified. In other words, in order to be able to compare 2009-2011 to 2012-2014, we need to have correctly modeled time trends in both these periods, so that we are comparing the mean response net of those trends. If we didn't do this, any changes between the pre and post periods could just be a reflection of longer term trends; for example, if the proportion of women responding that they "wanted to become pregnant later" had been declining over time (and this decline was not accounted for in our model) we could falsely ascribe these declines to the treatment (i.e., the question change). We opted to use linear time trends based on visual inspection of the trends in our first descriptive model (which were highly linear in both the pre- and post- period); we also tested the addition of higher order terms, but none significantly improved model fit.

The model described above estimates an average treatment effect: the impact of the question change averaged across all respondents. It is possible, however, that the addition of a response

** The YEAR variable is centered at 2011 in order to make this interaction term more easily interpretable.

category affected different groups of women in different ways; in other words, that there is *heterogeneity of treatment effects* across population groups. We tested for this by running models with interaction terms between the treatment assignment variable and demographic covariates. Specifically, we present findings testing interactions by age, race combined with Hispanic ethnicity, parity and state of residence. Age and parity are highly correlated; therefore, in order to identify differences in average treatment effects by parity net of differences by age, we control for age in models testing interactions by parity. In models of the interactions with state of residence, we include controls for both age and race combined with Hispanic ethnicity to account for variation across states in demographic composition. In the models estimating interactions by state we also limited our sample to states contributing data for all six years (2009-2014).

Finally, given the large sample size of the pooled PRAMS surveys, we chose to use a more conservative alpha level of .001 for evaluation of statistical significance in all analyses. For all analyses, we also tested an alternate specification (not shown) in which we restricted our sample to only states with data for all six years; results were substantively unchanged.

Findings

Predicted proportion of each response category, by year of survey

Table 1 shows the percent distribution of responses across the pregnancy intention question for each year of the PRAMS surveys, from 2009 to 2014. The categories shown in Table 1

appear in the same order as they appeared on the 2012 questionnaire. We include “missing” as a valid response to examine item non-response rates pre and post question change.

Women’s responses to the pregnancy intention question were stable over the period 2009-2011, with each response category changing by no more than one percentage point over the three year period. Just less than one-third (31-32%) of women reported that they had wanted the pregnancy to occur later; 17-18% said they had wanted it to occur sooner; 39%-40% said they had wanted it to occur then; and, 9-10% said they did not want to be pregnant then or at any time in the future. Around 2% of women skipped the question entirely; this proportion remained stable over the full 2009-2014 year period.

After the introduction of the additional response category in 2012, 13-15% of women selected this option in 2012-2014. This drew responses away from all other categories except “I wanted to become pregnant then,” which remained stable. The proportion responding that they had wanted the pregnancy to occur later dropped seven percentage points between 2011 and 2012 (from 31% to 24%), the proportion responding that they had wanted the pregnancy to occur sooner dropped five percentage points (18% to 13%), and the proportion stating that they did not want the pregnancy then or at any time in the future dropped four percentage points (10% to 6%). As in the period 2009-2011, the proportion of respondents selecting each category remained largely stable in the years 2012-2014, varying by no more than one or two percentage points over the three year period.

Selection of “not sure” category by characteristics of women

There were substantial differences across demographic groups in which women were most likely to select the response “I was not sure if I wanted to become pregnant”. Figures 1a-c show differentials by age, by race and ethnicity, and by parity.

Women in the three youngest age groups (15-17, 18-19 and 20-24) were significantly more likely than women aged 25-29 to select the “I was not sure” category to describe their intention at the time of the pregnancy (Figure 1a). Women in the oldest age category were also significantly more likely to respond “I was not sure”; no other age groups were significantly different from 25-29 year olds at $p < .001$.

Non-Hispanic black and non-Hispanic women of races other than black or white were significantly more likely to respond “I was not sure” than non-Hispanic white women (Figure 1b). There were no significant differences between non-Hispanic white women and Hispanic women in the proportion reporting this “I was not sure” category.

Finally, women with two or more prior births were much more likely to select the “I was not sure” response than women with zero or one live birth prior to the pregnancy (Figure 1c).

Overall effects of question change

Table 2 shows the results of our regression discontinuity models for each question response category (these results are also expressed graphically in Figure 2). In Table 2, the coefficients associated with the treatment variable correspond to the estimated average treatment effect of the question change on the log odds of selecting each answer choice. For example, a

significant negative coefficient means that respondents given the post-change questionnaire were less likely to choose that answer choice than those given the pre-change questionnaire. The coefficients associated with year (and their interactions with treatment) represent the linear trends in the log odds of each response over time.

After the question change in 2012, women were significantly less likely to respond that they wanted to become pregnant “later” ($b=-.30$) or “sooner” ($b=-.33$). They also were significantly less likely to respond that they “did not want to become pregnant then or at any time in the future” ($b=-.43$). There was no significant change in women’s odds of selecting the option “I wanted to become pregnant then.” Linear time trends were also not significant for any of the response categories, suggesting there were no changes in the proportions of women choosing each category *within* the pre- and post- periods, respectively.

Effects of question change by age, race and Hispanic ethnicity, and parity

Average treatment effects by age, race and Hispanic ethnicity, and parity are shown graphically in Figure 3; full results from the models that produced them are shown in Appendix Tables 1-3. Figure 3 shows the average treatment effect for each category of the demographic characteristic (e.g. age groups), and can be interpreted as the predicted effect of the change in the question on the odds of women in that demographic group choosing the specified response category relative to the odds that women with that same characteristic would have chosen it in the survey periods before the question change. Significance tests for interaction effects – shown in Appendix Tables 1-3 and described below – describe differences in these average treatment effects between demographic groups.

There were no significant interactions between treatment and age for any intention category except “I wanted to become pregnant then.” Younger women (those ≤ 17 and those aged 18-19) had significantly larger treatment effects than women aged 25-29. These younger women were less likely to select this option post-2012 than they were in the period before the question change (with changes in log odds of $-.69$ and $-.22$, respectively; Appendix Table 1) while older women had no change in their odds.

In contrast, there were no significant interactions between treatment and race combined with Hispanic ethnicity for any intention response category except “I wanted to become pregnant sooner” (Figure 2 and Appendix Table 2). Hispanic women had significantly smaller treatment effects than non-Hispanic white women (reference group).^{††} For all non-Hispanic women (of any race) the question change had a significantly negative effect on their odds of selecting this category. For Hispanic women, the effect of the question change was statistically indistinguishable from zero.

There were also significant interactions between treatment and parity, even after adjusting for mother’s age (Figure 2 and Appendix Table 3). Higher parity women (two or more births prior to the pregnancy) saw steeper declines in the odds of choosing “I wanted to become pregnant later” after the question change ($b = -.45$) as compared to women with zero ($b = -.27$) or only one ($b = -.28$) prior birth. There were no significant differences in estimated treatment effects on the other intention response categories.

^{††} In fact, Hispanic women had significantly smaller treatment effects compared to non-Hispanic black and non-Hispanic other women as well (not shown).

Effects of question change by state

Finally, using a sample limited to 16 states that contributed data in all six years (2009-2014), we estimated models predicting each response category while allowing for interactions between state of residence and a dichotomous indicator of treatment (absence or presence of the additional “not sure” response category). These models adjusted for both age and race combined with Hispanic ethnicity, and joint hypothesis tests were used to evaluate the state-indicator interaction terms as a block, to test if *any* of the state interaction terms were significantly different from zero. Figure 4 shows estimated effects of the question change on the proportion of women choosing each response category by state, along with associated 95% confidence intervals. There was significant heterogeneity in the estimated effects of the question change by state within each of the response categories except “I did not want to become pregnant then or at any time in the future”.

Limitations

This paper attempts to infer causal effects from observational data. Some important and unobserved factors may not be adequately accounted for in our analyses, although regression discontinuity designs are generally robust to omission of unobservables as long as the functional form is correctly specified.²²

In particular, if there were specific events that occurred at the beginning of 2012 (coinciding with the question change in PRAMS) that affected how all women in the country, or all women in a particular state, might respond to questions characterizing their desires prior to pregnancy, then our results could be confounded with that change. However, we know of no national or

state policy changes that went into effect at that time that would have had a substantial impact on women's responses.

Finally, while we focus only on the impact of the addition of a fifth response category, it is unknown whether the slight re-ordering of the answer categories in 2012 had any impact on the proportions selecting each option. The reordering affected only the first and second response options and respondents were able to see all answer options simultaneously, so we expect that the reordering likely had little impact. However, because both changes occurred simultaneously – reordering of the answer categories, and the addition of the “I wasn't sure” category – we have no way of distinguishing the relative impact of each.

Discussion

Expanding the measure of pregnancy intentions in the PRAMS surveys to include a response option for women who recall having been unsure of their desire for pregnancy prior to their most recent pregnancy appears to offer a more salient answer category for a significant proportion of women than the more limited options available in prior surveys. In the years 2012 to 2014, 13-15% of women whose pregnancy led to a live birth chose the new answer option, “I wasn't sure what I wanted”.

It was inevitable that the addition of another response option would impact the proportions of respondents choosing the existing options. However, the addition did not affect the likelihood of women selecting all other options equally. Instead, it drew responses away from all answer choices except for “I wanted to become pregnant then.” The more limited construct of the

pregnancy intentions question may have been constraining women's responses, by failing to recognize uncertainty as a valid state of mind prior to pregnancy and thereby forcing respondents to choose among answer choices that may not have accurately represented how they recall their attitudes toward pregnancy.

The impact on the proportion of women who said "I wanted to become pregnant sooner" suggests that this group may be heterogeneous in their pregnancy desires. Past research has typically paid little attention to this group, or characterized them as women who were having difficulty conceiving⁹ or had been trying to get pregnant and conceived later than they preferred. Because of this, these pregnancies are often interpreted as an unambiguously positive – and wanted – experience. But, the substantial shift away from this category when the "not sure" option is included suggests this may not be true for all women in this group. For example, it is possible some women who responded that they had wanted to become pregnant sooner are actually reflecting on a better time in their life for that pregnancy to have occurred rather than a strong desire for pregnancy. In addition, not all women have clear preferences or plans for the timing of their pregnancies as demonstrated in prior qualitative work in this area.²³ Other research suggests that uncertainty and variation in pregnancy intentions across the life course is common.^{24–26}

The new answer category also drew more women from some population groups than from others. For example, women in the youngest and oldest age groups (15-17, 18-19, 20-24 and 40-44) were more likely than women aged 25-29 and women aged 30-34 to select the "not sure" answer option. Similarly, non-Hispanic black women and non-Hispanic women of other

racers were more likely to select the “not sure” option than non-Hispanic white women and Hispanic women.

Further, the effect of the new question option was not uniform across demographic groups. For example, among the youngest women (<20 years of age), the “not sure” category drew responses away from the category typically classified as intended pregnancies (“wanted the pregnancy then”). And, for all non-Hispanic women—regardless of their race—the new question option significantly reduced their odds of selecting the “I wanted to become pregnant sooner” option, while it had no effect on Hispanic women’s odds of selecting that option. We examined only three key demographic measures, but the evidence of significant variation in the impact of the question change suggests that even more variation may exist among other socioeconomic and demographic factors we didn’t examine. It’s also possible that the patterns we found for age, race and Hispanic ethnicity, and parity are not stable across states, especially given the wide variation in the effect of the question change across states. Consequently, it may be especially difficult to predict the specific impact of the question change in ways that could allow researchers to make prior estimates of pregnancy intentions comparable.

Differential impacts of the question change by age, race and Hispanic ethnicity, and parity also suggest that the change may affect estimates of trends in differences between demographic groups, if researchers are comparing estimates pre- and post-2012. Separately, research examining the relationship between pregnancy intentions and other measures will be affected by the question change. We only looked at three demographic characteristics in this analysis, but there are likely differences in treatment effects of the question change across other characteristics as well; consequently, estimates of the association between respondent

characteristics and pregnancy intention will be affected in potentially unpredictable ways.

Another implication of these findings is that researchers should not pool PRAMS surveys across the year in which the question change occurred if the measure of pregnancy intentions is used in analyses.

The question change is likely to have substantial impacts on state-level estimates of the percent of births from pregnancies categorized as unintended (mistimed and unwanted). In particular, estimates of unintended pregnancy from the 2012 surveys and later are likely to be lower than those from prior years. In many cases, the proportion of births resulting from unintended pregnancies will appear to have declined from 2011 to 2012, but the decrease may be entirely attributable to the addition of the new answer option. This issue is complicated by the fact that the impact of the question change varies substantially by state of residence. For example, if one was to recalculate unintended pregnancy rates for the year 2011 substituting in the proportion of births in each response category from 2012,^{††} unintended pregnancy rates in 2011 would be 16% lower, on average; percent declines would range from 3% (in Maine) to close to 30% (in Georgia). Thus, any ongoing surveillance of pregnancy intentions at the state-level should not consider estimates to be comparable pre and post-2012.

Conclusions

The effects of the question change identified in this analysis underscores the need for further work on how best to characterize women's childbearing desires. Our results do not suggest

^{††} Calculated among states with data in both 2011 and 2012; for details on the calculation of unintended pregnancy rates for each state see Kost K, *Unintended Pregnancy Rates at the State Level: Estimates for 2010 and Trends Since 2002*, New York: Guttmacher Institute, 2015.

that research using the “new” pregnancy intention question in PRAMS are less valid than prior analyses; in fact, the substantial proportions of women selecting “I was not sure if I wanted to become pregnant” implies latent demand for an option describing uncertainty around fertility intentions prior to pregnancy. Changes in how we measure important demographic measures can be significant contributions to advance science and measurement, and the addition of the response option in PRAMS to capture uncertainty related to pregnancy desires has likely improved the measure. In this analysis, we find that the question change leads to insights about how response option selection may change when additional ones are offered, how this movement may alter our interpretations of the existing response options, and caution that researchers using these data should be aware of the impact of that change for further work using this measure.

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Table 1. Percent distribution of intention status by year, PRAMS 2009-2014

Intention	Year					
	2009	2010	2011	2012	2013	2014
<i>I wanted to be pregnant later</i>	32%	31%	31%	24%	23%	22%
<i>I wanted to be pregnant sooner</i>	17%	17%	18%	13%	14%	14%
<i>I wanted to be pregnant then</i>	39%	40%	40%	41%	41%	42%
<i>I didn't want to be pregnant then or at any time in the future</i>	10%	9%	10%	6%	6%	6%
<i>I wasn't sure what I wanted</i>	na	na	na	13%	14%	15%
<i>Missing/blank</i>	2%	2%	2%	2%	2%	2%
<i>Total</i>	100%	100%	100%	100%	100%	100%

Notes: na = not applicable. Proportions predicted from logistic regression models including state fixed effects to control for annual differences in sets of states contributing data.

Figure 1a. Proportion of women reporting "I was not sure" by maternal age adjusted for state and year of survey, pooled 2012-2014 PRAMS

Figure 1b. Proportion of women reporting "I was not sure" by race and ethnicity adjusted for state and year of survey, pooled 2012-2014 PRAMS

Figure 1c. Proportion of women reporting "I was not sure" by parity adjusted for state and year of survey, pooled 2012-2014 PRAMS

Table 2. Logistic regressions predicting pregnancy intention from year and question wording, adjusting for state fixed effects, PRAMS 2009-2014

Covariate	Pregnancy intention							
	<i>I wanted to be pregnant later</i>		<i>I wanted to be pregnant sooner</i>		<i>I wanted to be pregnant then</i>		<i>I didn't want to be pregnant then or at any time in the future</i>	
	b	p-value	b	p-value	b	p-value	b	p-value
Year (centered)	-0.02	0.12	0.02	0.30	0.02	0.13	-0.03	0.18
Treatment	-0.30	<.001	-0.33	<.001	0.04	0.21	-0.43	<.001
Year x Treatment	-0.03	0.15	-0.01	0.80	-0.01	0.43	0.00	0.91

Note: All models also include state dummy variables in order to adjust for variation across states.

Figure 2. Predicted probabilities of pregnancy intention from regression discontinuity model, pooled PRAMS 2009-2014

Figure 3. Predicted treatment effect (with 95% CI) by demographic categories, PRAMS 2009-2014

Figure 4. Predicted treatment effect (with 95% CI) by state, PRAMS 2009-2014, among states with data for all years

Appendix Table 1. Logistic regressions predicting pregnancy intention from year and question wording, with interactions by maternal age groups, PRAMS 2009-2014

Covariate	Pregnancy intention							
	<i>I wanted to be pregnant later</i>		<i>I wanted to be pregnant sooner</i>		<i>I wanted to be pregnant then</i>		<i>I didn't want to be pregnant then or at any time in the future</i>	
	b	p-value	b	p-value	b	p-value	b	p-value
Year (centered)	0.00	0.81	0.00	0.96	0.01	0.63	-0.03	0.19
Treatment	-0.30	<.001	-0.35	<.001	0.07	0.054	-0.46	<.001
Year x Treatment	-0.04	0.08	0.00	0.93	-0.01	0.50	0.00	0.97
Age								
15-17	1.63	<.001	-1.96	<.001	-1.45	<.001	0.43	<.001
18-19	1.34	<.001	-1.25	<.001	-0.95	<.001	0.07	0.399
20-24	0.80	<.001	-0.63	<.001	-0.54	<.001	0.14	0.01
25-29 (ref)								
30-34	-0.50	<.001	0.29	<.001	0.15	<.001	0.10	0.05
35-39	-1.02	<.001	0.56	<.001	0.06	0.074	0.53	<.001
40+	-1.47	<.001	0.93	<.001	-0.46	<.001	1.17	<.001
Age x Treatment								
15-17 x Treatment	-0.04	0.70	-0.03	0.91	-0.77	<.001	0.08	0.64
18-19 x Treatment	-0.07	0.35	0.06	0.71	-0.30	<.001	0.13	0.34
20-24 x Treatment	-0.04	0.33	-0.02	0.80	-0.08	0.06	-0.03	0.72
25-29 x Treatment (ref)								
30-34 x Treatment	0.01	0.81	0.04	0.38	0.00	0.91	-0.01	0.91
35-39 x Treatment	0.00	0.96	-0.06	0.32	-0.04	0.39	0.13	0.13
40+ x Treatment	-0.19	0.31	-0.06	0.50	0.05	0.58	0.02	0.89

Note: All models also include state dummy variables in order to adjust for variation across states.

Age	Average treatment effects by age (with 95% CIs) [†]							
	ATE	95% CI	ATE	95% CI	ATE	95% CI	ATE	95% CI
15-17	-0.34	(-0.56, -0.13)	-0.38	(-0.96, 0.19)	-0.69	(-1.02, -0.37)	-0.38	(-0.71, -0.04)
18-19	-0.37	(-0.51, -0.23)	-0.29	(-0.61, 0.02)	-0.22	(-0.39, -0.06)	-0.33	(-0.59, -0.07)
20-24	-0.34	(-0.44, -0.25)	-0.37	(-0.50, -0.24)	-0.01	(-0.09, 0.08)	-0.49	(-0.64, -0.33)
25-29	-0.30	(-0.39, -0.21)	-0.35	(-0.45, -0.25)	0.07	(0.00, 0.15)	-0.46	(-0.61, -0.30)
30-34	-0.29	(-0.39, -0.19)	-0.31	(-0.41, -0.21)	0.07	(-0.01, 0.15)	-0.46	(-0.62, -0.31)
35-39	-0.31	(-0.45, -0.16)	-0.41	(-0.53, -0.29)	0.03	(-0.06, 0.13)	-0.33	(-0.49, -0.16)
40+	-0.49	(-0.85, -0.13)	-0.41	(-0.60, -0.23)	0.12	(-0.05, 0.30)	-0.44	(-0.68, -0.20)

[†] Also shown in Figure 2

ATE = Average treatment effect

Appendix Table 2. Logistic regressions predicting pregnancy intention from year and question wording, with interactions by maternal race and Hispanic ethnicity, PRAMS 2009-2014

Covariate	Pregnancy intention							
	<i>I wanted to be pregnant later</i>		<i>I wanted to be pregnant sooner</i>		<i>I wanted to be pregnant then</i>		<i>I didn't want to be pregnant then or at any time in the future</i>	
	b	p-value	b	p-value	b	p-value	b	p-value
Year (centered)	-0.02	0.21	0.01	0.44	0.02	0.17	-0.03	0.25
Treatment	-0.28	<.001	-0.35	<.001	0.05	0.154	-0.46	<.001
Year x Treatment	-0.04	0.08	0.00	0.97	-0.01	0.57	0.00	0.94
Race and Hispanic ethnicity								
<i>White, not Hispanic (ref)</i>								
Hispanic	0.48	<.001	-0.61	<.001	-0.18	<.001	0.23	<.001
Black, not Hispanic	0.70	<.001	-0.66	<.001	-0.89	<.001	1.07	<.001
Other, not Hispanic	0.06	0.09	0.27	<.001	-0.35	<.001	0.27	<.001
Race and Hispanic ethnicity x Treatment								
<i>White, not Hispanic X Treatment (ref)</i>								
Hispanic x Treatment	0.00	0.96	0.22	<.001	-0.09	0.04	0.21	0.01
Black, not Hispanic x Treatment	-0.11	0.02	-0.05	0.49	-0.04	0.39	-0.03	0.64
Other, not Hispanic x Treatment	0.05	0.31	-0.17	0.00	0.05	0.26	0.00	0.99

Note: All models also include state dummy variables in order to adjust for variation across states.

Race and ethnicity	Average treatment effects by race and ethnicity (with 95% CIs) [†]							
	ATE	95% CI	ATE	95% CI	ATE	95% CI	ATE	95% CI
White, not Hispanic	-0.28	(-0.36, -0.21)	-0.35	(-0.43, -0.26)	0.05	(-0.02, 0.11)	-0.46	(-0.59, -0.32)
Hispanic	-0.28	(-0.38, -0.18)	-0.12	(-0.26, 0.01)	-0.04	(-0.13, 0.05)	-0.25	(-0.42, -0.07)
Black, not Hispanic	-0.40	(-0.50, -0.29)	-0.39	(-0.53, -0.25)	0.01	(-0.10, 0.11)	-0.49	(-0.64, -0.33)
Other, not Hispanic	-0.23	(-0.34, -0.12)	-0.52	(-0.64, -0.40)	0.10	(0.00, 0.20)	-0.46	(-0.64, -0.27)

[†] Also shown in Figure 2

ATE = Average treatment effect

Appendix Table 3. Logistic regressions predicting pregnancy intention from year and question wording, with interactions by maternal parity, PRAMS 2009-2014

Covariate	Pregnancy intention							
	<i>I wanted to be pregnant later</i>		<i>I wanted to be pregnant sooner</i>		<i>I wanted to be pregnant then</i>		<i>I didn't want to be pregnant then or at any time in the future</i>	
	b	p-value	b	p-value	b	p-value	b	p-value
Year (centered)	0.00	0.91	0.00	0.99	0.01	0.64	-0.03	0.23
Treatment	-0.27	<.001	-0.38	<.001	0.05	0.20	-0.50	<.001
Year x Treatment	-0.04	0.10	0.00	0.95	-0.01	0.55	0.00	0.98
Parity								
0 (ref)								
1	0.02	0.56	-0.37	<.001	0.08	0.002	0.41	<.001
2+	0.34	<.001	-1.06	<.001	-0.30	<.001	1.55	<.001
Parity x Treatment								
0 x Treatment (ref)								
1 x Treatment	-0.01	0.84	0.03	0.47	0.01	0.69	0.03	0.69
2+ x Treatment	-0.18	<.001	0.05	0.30	-0.07	0.06	0.08	0.24

Note: All models also include state dummy variables in order to adjust for variation across states, as well as controls for age.

Parity	Average treatment effects by parity (with 95% CIs) [†]							
	ATE	95% CI	ATE	95% CI	ATE	95% CI	ATE	95% CI
0	-0.27	(-0.35, -0.19)	-0.38	(-0.48, -0.29)	0.05	(-0.02, 0.12)	-0.50	(-0.65, -0.34)
1	-0.28	(-0.37, -0.19)	-0.35	(-0.45, -0.25)	0.06	(-0.01, 0.13)	-0.46	(-0.62, -0.31)
2+	-0.45	(-0.55, -0.36)	-0.33	(-0.44, -0.22)	-0.02	(-0.10, 0.05)	-0.42	(-0.55, -0.28)

[†] Also shown in Figure 2

ATE = Average treatment effect