Exploring Key Dimensions of Pregnancy Intentions

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Background: Widely-used dichotomous categorical measures of pregnancy intentions do not well represent the complexity of factors involved in women's intentions.

Method: We used a variety of exploratory statistical methods to examine measures of pregnancy intention in the 2002 National Survey of Family Growth (n=3,032 pregnancies).

Results: Factor analyses identified two key dimensions of pregnancy intentions: (1) Desire and (2) Mistiming, and two smaller non-dimensional categories (Overdue and Don't Care). Desire included both affective and cognitive variables, as well as partner-specific factors. Similar pregnancy intention dimensions were found for adolescent and adult women, across socioeconomic status, and among racial and ethnic groups. Both Desire and Mistiming were highly predictive of the decision to abort or continue the pregnancy.

Discussion: These analyses strongly support prior demographic thinking about the importance of both timing of pregnancy and wanting a baby, but call into question the use of simple categorical measures.

Introduction

  The concept of "unintended pregnancy" has been essential to demographers seeking to understand fertility patterns and pregnancy decision-making. Pregnancy intentions are important in estimating unmet need for contraceptive services, targeting contraceptive programs, understanding the impact of pregnancy on the health of mothers and children, and advocating for increased governmental support to reproductive health programs (Westoff and Ryder 1977; Brown and Eisenberg 1995; Bankole and Ezeh 1999; Zabin 1999; Klerman 2000; Westoff 2001; Santelli, Rochat et al. 2003; Koenig, Acharya et al. 2006).

  United States data on pregnancy intentions come primarily from the National Survey of Family Growth (NSFG), which has been used to track trends in unintended pregnancy. Pregnancy intentions are collected retrospectively and reference a woman's thinking at the time she became aware that she was pregnant (Brown and Eisenberg 1995). [1] (We would note that this is not the only way to assess unintended pregnancy (Henshaw 1998; Santelli, Rochat et al. 2003; Casterline and El-Zeini 2007) but is the conventional method used in many demographic surveys.) Measured this way, unintended pregnancies are the sum of births reported to be *mistimed* and *unwanted* and those ending as induced abortion. *Unwanted* pregnancies occur when no (or no more) children are desired; *mistimed* pregnancies occur earlier than expected but would be desired at a later time; and *intended* pregnancies happen at the "right time" or may have occurred later than desired (e.g., delayed due to difficulties in conceiving) (Brown and Eisenberg 1995).

  Almost half of pregnancies in the United States are estimated to be unintended with little recent change in this percentage (Finer and Henshaw 2006). Almost equal percentages of unintended pregnancies end in abortions (42%) and live births (44%). Half (48%) of unintended pregnancies are the result of contraceptive failure and the rest (52%) the result of a failure to use any contraception during the month of conception. Unintended pregnancy is more common among young women, unmarried and cohabiting women, those living in poverty, black women, and those who have lower educational

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[1] The Demographic and Health Surveys (DHS) use a similar data collection and measurement approach for pregnancies in the last 5 years ending in a live birth.

attainment (Finer and Henshaw 2006). Pregnancies to teenagers are the most likely to be identified as unintended, but the highest absolute numbers of unintended pregnancy occur among women in their 20s. Unintended pregnancy, as conventionally defined, is associated with adverse child health outcomes and risk factors for poor health outcomes including delayed prenatal care and greater use of alcohol and tobacco during pregnancy (Adams, Bruce et al. 1993; Brown and Eisenberg 1995; Altfeld, Handler et al. 1997; Hellerstedt, Pirie et al. 1998; Kost, Landry et al. 1998; Joyce, Kaestner et al. 2000; Gipson, Koenig et al. 2008) A number of studies have suggested that the severity of "unintendedness" (e.g., a pregnancy that is mistimed by a longer period of time) may be important in understanding health impact (Pulley, Klerman et al. 2002).

From a measurement perspective, it is important to note that the questions used to measure pregnancy intentions do not use the term *unintended*. Estimates for unintended pregnancy are based on an algorithm using the responses to several questions which assess timing and desire for more children. The development of the idea of pregnancy intentions can be traced back to the initial population surveys of fertility, beginning with the Indianapolis Study in 1941 (Campbell and Mosher 2000; Santelli, Rochat et al. 2003). Distinctions between *unwanted* and *mistimed* were first made in the 1965 National Fertility Survey (Campbell and Mosher 2000). While commonly combined as "unintended," unwanted and mistimed pregnancies generally represent different life stages. Un*wantedness* ("want no more children" and "want no children") often reflects the intentions of a woman (and her partner) at the end of her childbearing period (Trussell, Vaughan et al. 1999). *Mistiming* is often the important issue for younger and unmarried women who may not have completed education or who are not yet married. These definitions presume that becoming pregnant is a conscious choice. Intentions are often measured or reported only for pregnancies ending in live births; pregnancies ending in induced abortion are generally assumed to be unintended. Although pregnancy intentions are often collected in cross-sectional surveys, longitudinal studies among women suggest that reproductive intentions are relatively stable over time and that intentions are reasonably good in predicting actual fertility (Westoff and Ryder 1977; Bankole and Westoff 1998; Schoen, Astone et al. 1999; Joyce, Kaestner et al. 2000; Poole, Flowers et al. 2000).

Over the past 10 years, the notion of "unintended pregnancy" has been the recipient of a variety of conceptual and measurement critiques (Bachrach and Newcomer 1999; Luker 1999; Peterson and Mosher 1999; Sable 1999; Trussell, Vaughan et al. 1999; Zabin 1999). Trussell and others have pointed out the seeming contradictions between the conventional measure of pregnancy intentions, contraceptive use, and reported happiness about a pregnancy (Bachrach and Newcomer 1999; Peterson and Mosher 1999; Sable 1999; Trussell and Vaughan 1999; Trussell, Vaughan et al. 1999; Zabin 1999). Intentions to avoid pregnancy often do not translate into contraceptive use; almost half of the pregnancies reported as unintended occur among women who are not using contraception (Henshaw 1998; Finer and Henshaw 2006). Likewise, many women (as many as one quarter) who experience a contraceptive failure (i.e., a pregnancy while using contraception) report feeling happy or very happy when they found themselves pregnant. Trussell and colleagues (Trussell and Vaughan 1999; Trussell, Vaughan et al. 1999) suggest several possible explanations for these seeming contradictions: planning or intending a pregnancy may be distinct from wanting to be pregnant; the concept of planning a pregnancy may not be meaningful to some women; and ambivalence about avoiding pregnancy may be expressed in imperfect use of contraception (Trussell and Vaughan 1999; Trussell, Vaughan et al. 1999). A number of studies have focused on the meaning of unintended pregnancy to individual women. Sable argues that pregnancy intention is a complex concept, involving human emotional and psychological factors that may not be captured by current measures of intention status (Sable 1999). Miller et al. has suggested that motivations to engage in sexual activity may be quite distinct from motivations to have children and "intentions" may emerge only after a pregnancy has occurred (Miller, Pasta et al. 1999). Others have suggested that pregnancy intentions should be scaled; for example, intended and unintended pregnancies could be considered as two ends of a continuum (Bachrach and Newcomer 1999). Alternately, several dimensions may be involved, for example, affective and cognitive dimensions (Santelli, Kaiser et al. 2004; Kendall, Afable-Munsuz et al. 2005). A previous attempt to explore these potential dimensions found that inner city women from New Orleans did not distinguish affective and cognitive questionnaire items when making choices about terminating or continuing a pregnancy (Speizer, Santelli et al. 2004, Santelli, Speizer et

al. 2006). Stanford and colleagues have suggested that an affective dimension (*wanting* a baby) is related to community, partner, and personal values about childbearing (Stanford, Hobbs et al. 2000;). They suggest that a planning dimension concerns preparation for pregnancy, life goals, and education.

Ethnographic studies of pregnancy intentions have noted the importance of social context: the complex set of relationships within which pregnancies occur, including women's relationships to partners, family, peer groups, and health care providers (Moos, Petersen et al. 1997; Petersen and Moos 1997; Forte and Judd 1998; Santelli, Rochat et al. 2003; Kendall, Afable-Munsuz et al. 2005). This work suggests that pregnancy intentions are the product of multiple, complexly interwoven social and economic forces. Likewise, these studies have suggested the need to consider the attitudes, intentions, and behaviors of male partners and the influence of partners on women's intentions, contraceptive use, and fertility decisions (Santelli, Speizer et al. 2006). Until recently, most demographic surveys have focused exclusively on the intentions of women.

In response to these types of concerns, beginning with the 1995 survey, the NSFG has added questions to improve the measurement of pregnancy intentions, including questions exploring ambivalence in pregnancy intentions and happiness in response to a pregnancy (Piccinino 1999). The 2002 NSFG included questions about happiness to be pregnant, wanting to become pregnant, trying to become pregnant, wanting a pregnancy with a specific partner, and the woman's perception of her male partner's intentions. These new questions allow one to more fully explore the meaning of unintended pregnancy to individual women and to refine the measurement of pregnancy intentions.

This study examined the multiple measures of pregnancy intention collected in the 2002 NSFG, using exploratory statistical methods. Our primary research goal was to determine if separable dimensions of pregnancy intentions exist, based on the specific questions and created variables that describe pregnancy timing, wantedness, and planning; emotional reactions to a pregnancy; and partner intentions. Exploring these new questions and the conventional pregnancy intention questions, we attempted to find a parsimonious set of items or scale dimensions that would capture the essence of pregnancy decision making. To validate the identified dimensions, we examined their ability to predict a pregnant woman's decision to continue or terminate a pregnancy.

Finally, we identified differences in predictive value by age, race/ethnicity, and socio-economic status.

Methods

We examined all pregnancies occurring to women 15-44 years between 1999 and 2001 in Cycle 6 of the NSFG (5,033 women and 3,032 pregnancies). Through 2002, the NSFG was conducted as a periodic national probability survey of the non-institutionalized population (15-44 years) in the United States (Abma, Martinez et al. 2004). Methods of data collection and dissemination of the public use dataset are reviewed by the Institutional Review Board at the National Center for Health Statistics (NCHS) for protections of human subjects. Further information about the design of the NSFG is available at http://www.cdc.gov/nchs/nsfg.htm.

Measures of Pregnancy Intention

The NSFG uses a contraceptive calendar to assess pregnancies occurring in the three years before 2002. Data are collected in a face-to-face interview. For each pregnancy reported, the woman is asked a series of questions about that pregnancy, including attitudes and intentions about each. The outcome of the pregnancy (live birth, induced abortion, and miscarriage) is also determined. Comparisons of the numbers of abortions reported in the NSFG to abortions reported by abortion providers in the U.S. suggest that women only report about half of abortions in the NSFG face-to-face questionnaire (Jones and Kost 2007), which requires statistical adjustment for this under counting (see below).

For each pregnancy reported, the NSFG asks a series of questions to estimate the conventional trichotomous measure of pregnancy intentions. These questions assess a woman's feelings right before she became pregnant. The woman is asked about wanting to have another baby then or at any time in the future, whether the timing of the pregnancy was right (or too soon or too late), and how much too soon. This series of questions is used to classify each pregnancy into the conventional categories of intended (wanted and on time or later than wanted), unwanted, or mistimed (occurring sooner than desired) and to determine the degree of mistiming.

For our analyses, we deconstructed the conventional measure into a set of dichotomous variables. For these exploratory analyses, we wanted to examine these categories independently and not assume they represented similar ideas. The independent categories of pregnancy intendedness examined were overdue, wanted and on time, wanted and too soon, unwanted, don't care, and don't know. Similarly, a woman's perceived understanding of her partner's intentions was deconstructed. We would note that certain of these categories are generally combined in demographic reports; pregnancies reported as overdue, don't care and don't know are conventionally combined with wanted and on time and reported as "intended."

In the 2002 NSFG, each woman was asked attitude questions on a ten or eleven point scale about:

- o   Happiness to be pregnant when she found out she was pregnant (Happiness)
- o   Trying to get pregnant right before she became pregnancy (Trying)
- o   Wanting to get pregnant right before she became pregnancy (Wanting)
- o   Wanting to have a baby with her current partner (Wanting with partner)

Each woman was also asked about her perception of the partner's intentions including whether he wanted a baby and the desired timing (Partner Intentions). The method of determining Partner Intentions used a series of questions which were similar to those used in assessing pregnancy intentions for the conventional measure.

Correlation Among Intention Questions

We used correlation matrices to examine the relationship among various intention questions: attitude questions, the deconstructed categories of the conventional variables, and the deconstructed categories of her male partner's intentions. Separate correlation matrices were calculated for the following groups: teen and adult women, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic), and socio-economic status (highest and lowest quartiles on percentage of poverty level).

Exploratory Factor Analysis and Scale Creation

We employed exploratory factor analysis to examine the underlying dimensions among the categories of the conventional measures of pregnancy intention, the degree of mistiming, and

newer measures of pregnancy intention. We used an Eigenvalue of 1.0 as the cutoff in these factor analyses. Factors analysis was conducted for the entire sample and for teen and adult women, racial and ethnic groups, and socio-economic status categories. With a few specific exceptions as noted in the text of the results sections, the patterns found in the stratified factor analyses were the same as those found in the overall sample.

A separate factor analysis was conducted for each of the six dichotomous variables which were created from the six level conventional measure: "Overdue", "On Time", "Too Soon", "Unwanted", "Don't Care", and "Not Sure/Don't Know" (Not Sure/Don't Know included those who refused the questions). Each factor analysis used the same sample; only an individual's value on the dichotomous variable was altered among analyses. This was necessary because the levels of the conventional measure were not statistically independent. Thus, in practice, each factor analysis checked whether each dichotomous variable loaded with the newer measures of pregnancy intention. In these analyses, we replaced the mistimed category with a continuous variable measuring the number of years to which the pregnancy was considered too soon. If a pregnancy was not mistimed, this was coded as a zero.

We created two scales for the dimensions of pregnancy intention we identified in the factor analysis, "Mistiming" and "Desire." The scale for "Mistiming" was simply the woman's report of the degree of mistiming in years, as reported by the woman on the NSFG questionnaire. As such, Mistiming is only directly calculable for women who reported a pregnancy was mistimed. When we used Mistiming in multivariate regression, all women not reporting any mistiming were assigned a zero on this scale. The Mistiming scale was truncated at 15 years, if women reported more than 15 years.

"Desire" was created by combining the responses on six questions or categories that load highly together: Happiness, Wanting, Trying, Wanting With Partner, On Time, and Unwanted. The exact calculation of Desire gave equal weighting to each question by dividing responses by the number of potential categories. For example scores for Happiness were divided by 10 and varied between 0 and 1. Questions with dichotomous responses were coded 0 or 1. Unwanted was reverse coded. Thus the arithmetic formula for the Desire scale = Happiness/10) + (Wanting/11) + (Trying/11) + (Wanting With Partner/4) + OnTime - Unwanted. (We would note that Happiness was asked on a 10 point scale, Wanting and Trying used 11 point scales, and

Wanting With Partner had four ordinal categories.) The use of equal weights for the scale items was justified because the factor loadings for these items were relatively homogenous.

Validating the Identified Dimensions of Pregnancy Intentions

To validate the categories and dimensions of pregnancy intentions that were identified using the factor analysis technique, we examined the association of the identified dimensions with pregnancy outcomes: live birth, induced abortion, and miscarriage. On virtually every measure of pregnancy intentions, miscarriages represented a similar percentage of pregnancy outcomes; the one exception (Don't Care) is noted in the text. To simplify the presentation of data, we examined the association between the intention measures and the abortion ratio (the number of induced abortions divided by the number of live births).

Multivariate Logistic Regression

We used multivariate logistic regression to assess the independent influence of identified pregnancy intention dimensions and categories on the decision to continue or terminate a pregnancy. These analyses controlled for demographic factors such as age of woman, cohabitation with partner, race/ethnicity and poverty level. Model I examines the influence of pregnancy intention dimensions (Mistiming and Desire) and the Overdue category. Model II is an alternative model using the Happiness variable in place of the Desire scale, as Happiness is easier to measure and model and correlates highly with Desire in the NSFG data.

These data have four characteristics that must be considered when making inferences about the odds ratios. They are weighted, stratified, clustered, and have multiple observations per respondent (in many cases). In order to accommodate all these factors with respect to the standard errors, we used a bootstrapping algorithm which draws a simple-random sample from each and all stratum/cluster combinations and then scales the regression weights by a factor that represents the number of times each pregnancy was sampled. We used 300 draws. Then each regression analysis was conducted 300 times (once per bootstrap draw), providing a distribution of 300 values for each regression coefficient. Each regression analysis used generalized estimating equations to account for the multiple observation within each respondent and incorporated the modified bootstrap weights to account for oversampling, etc. (Lohr 1999). The

confidence intervals, in Table 3, were computed from the sample standard deviations of the empirical bootstrap distributions of the 300 runs.

Adjustment for Underreporting of Abortion

Underreporting of abortion in the NSFG is well described in the published literature and procedures have been developed to adjust for this underreporting in presenting data on abortion, pregnancy, and unintended pregnancy (Finer and Henshaw 2006). Estimates for the degree of abortion underreporting among subgroups are based on abortion provider reports of the number of abortions and demographic characteristics of the women for whom abortions are reported (Jones and Kost 2007).

For this study, we used previously calculated estimates of abortion underreporting in the 2002 NSFG among demographic subgroups from Jones and Kost (Jones and Kost 2007). Adjusted abortion ratios are presented in Tables 2 and 4. Abortion Ratios were calculated as follows: $A/(LB*(1-UR))$; where A= proportion of pregnancy outcomes in the sample as abortions, LB=proportion of pregnancy outcomes as live birth, and UR=Underreporting rate of abortion based on estimates from Jones and Kost (Jones and Kost 2007). Because there is no way to adjust the individual-level data in the NSFG for abortion underreporting, the odds ratios presented in the logistic regression models (Table 3) are not adjusted for underreporting of abortion. Likewise, we could not adjust for underreporting based upon pregnancy intentions as data for such an adjustment are not available. Therefore, our adjustment approach assumes equal underreporting of abortions regardless of pregnancy intentions.

Results

Correlations among question responses and factor analyses

We attempted to identify dimensions of pregnancy intentions by examining correlation of responses on various questions and then subjecting these questions to factor analyses. Correlations among individual intention questions varied greatly. The correlation matrices and factor analyses suggested certain clusters of responses that were highly correlated (Tables 1a and 1b). The strongest, positive correlations were found among the four questions measuring happiness, planning, trying, and wanting with a specific partner. Reporting that a pregnancy was "on time" by the woman or by her partner also correlated with these four questions. Stronger

correlations among the four questions were found for adults (R=0.52-0.76) compared to teens (0.32-0.76). Similar correlations were found for race and ethnic groups and by socio-economic status as measured by household income by percent of the poverty level.

Moderately strong correlations (0.42-0.62) were found between a woman's report of her own pregnancy intentions and those she reported for her partner. For example, the correlation of responses from the two members of the couple was 0.62 for "on time" for adult women, 0.60 for "overdue," and was 0.42 for "unwanted." These correlations were higher for adults compared to teens.

Not surprisingly, negative correlations were found between the attitudinal variables such as happiness to be pregnant and trying to get pregnant and a woman's report that a pregnancy was unwanted and too soon.

Factor analyses identified the same clusters of questionnaire responses. These clusters included two dimensions of pregnancy intentions: (1) Desire and (2) Mistiming, and two smaller non-dimensional categories (Overdue and Don't Care). Desire included a women's report of: happiness to be pregnant, planning to get pregnant, trying to get pregnant, wanting a baby with a specific partner, and considering the pregnancy to be "on time." The Desire dimension also included the woman's report that her partner considered the pregnancy to be "on time." For the Overdue, two items loaded on each category: the woman's response of Overdue and the woman's report of her partner's response on this same item. Similarly, for Don't Care, both the women's response and her partner's response loaded on the Don't Care category. Tables 1a and 1b demonstrate the strong relationships among these items.

We also conducted stratified factor analyses by age, race/ethnicity and SES. The major discernable difference among these was found in factor structure by age; for teens, unwanted by the woman and her partner did not load on the Desire dimension but loaded on a separate, additional factor. It is probable that the meaning of "don't want any children" for teens may be qualitatively different than for adult women, perhaps representing a developmentally understandable denial of childbearing desire among teenagers.

Based on the factor analysis, we created scales for Desire and Mistiming as described in the methods section. Mistiming as measured in years represents a natural scale. The Desire scale ranges from 0.53 to 6 (mean = 3.98, s.d. =1.77) and represents the equal additive contribution of each of the attitudinal variables and On Time or Unwanted from the conventional

measure. The Desire scale reflects the dimension which emerged from the factor analysis. Cronbach's alpha for the Desire scale was high at 0.85.

Dimensions of Pregnancy Intentions and Pregnancy Outcome

A principal goal of this study was to understand the relation between pregnancy intention and pregnancy outcomes. Table 2 shows adjusted abortion ratios for all respondents and for demographic subgroups by pregnancy attitudes, the conventional measure's deconstructed categories, women's report of partner intentions, and the two dimensions of Mistiming and Desire.

Overall 3032 pregnancies were reported; 69% ended as a live birth, 10% as an induced abortion, and 21% in miscarriage (weighted percentages). The unadjusted abortion ratio was 0.14 abortions per live birth; after adjusting for abortion underreporting, this ratio was 0.31. Pregnancies among teens were more likely to end in abortion (adjusted abortion ratio=0.56) compared to adults (AAR=0.27). Blacks were also generally more likely to report that pregnancies ended in abortion (AAR= 0.83), compared to whites (AAR=0.20).

Adjusted abortion ratios varied considerably across the categories of the attitudinal measures and conventional measure and by degree of mistiming. Abortion was more common where women reported low values of happiness, wanting, and trying to become pregnant. For example, abortion ratios ranged from 1.76 for pregnancies with low happiness scores to 0.04 for those with high happiness. Where the woman reported the pregnancy was wanted or wanted with her partner, overdue, or on time, pregnancies uncommonly ended in abortion.

Examining the deconstructed categories of the conventional measure, one finds low use of abortion among pregnancies reported as overdue or on time (adjusted abortion ratios= 0.02 and 0.04 respectively), but much higher use of abortion for those reported as too soon or unwanted (0.85 and 0.82). Thus, these abortion ratios vary as much as 40 fold. A similar pattern and wide range in pregnancy outcomes were found for male partner intentions.

In the deconstructed conventional measure, among pregnancies reported in the NSFG, 8% were Overdue, 48% On Time, 25% Too Soon, and 17% Unwanted. A small group of woman (1.5%) reported they did not care about getting pregnant (Don't Care); these women also had the highest rate of miscarriage of any response category (54%). Thus, a response of "don't

care" after a miscarriage may reflect more the *reaction* to the lost pregnancy, than the *intentions* of woman before the pregnancy.

Pregnancy outcomes also varied greatly based on the strength of Mistiming and Desire. For Mistiming, abortion ratios ranged from 0.31 for those with mistiming of less than one year to 1.87 for those with Mistiming greater or equal to 5 years; a 6-fold difference. Comparing pregnancies that were "on time" (abortion ratio= .04) to those that were most severely mistimed (AAR= 1.87), gave a 47-fold difference.

Demographic subgroups showed patterns similar to the overall group, although certain subgroups showed larger differences in abortion ratios. Notably, the differences in the abortion ratios were greater among whites than among blacks for the pregnancy attitude questions, Desiring, and Mistiming dimensions. The largest difference between blacks and whites was on the Mistimed scale. On Mistimed, whites showed a 180-fold difference between on time and 5+ years of mistiming, while blacks showed only a 9-fold difference. On the Desire scale, a 136-fold difference between high and low was found for whites and a 39-fold difference for blacks.

Multivariate Logistic Modeling

We next used multivariate logistic regression to examine the association between pregnancy intention dimensions and categories on the outcome of pregnancy—live birth or induced abortion-- controlling for demographic differences. Since abortion underreporting can not be adjusted with individual level data, these regressions refer only to those pregnancies reported in the NSFG. Pregnancies reported as ending in spontaneous loss, miscarriage, and stillbirth were also excluded from these models.

Both demographic factors and pregnancy intentions were significant predictors of the decision to terminate a pregnancy. Desire, Mistiming and Overdue were highly predictive, after controlling for demographic differences. Each 1-point increase in Desire increased the odds of a live birth by 2.16. Each 1-year increase in Mistiming reduced the odds of a live birth by 0.78. Overdue pregnancies had an odds ratio of 6.12, compared to pregnancies that were not Overdue. Pregnancy was also more likely to end in a live birth if the couple was cohabiting or married at the time of conception, compared to those who were not. Pregnancy was more likely to end in abortion if the woman was black or was of a lower poverty level.

Model II substitutes the Happiness variable (a woman's report of happiness to be pregnant) for Desire. We examined Happiness, because of the strong correlation between the Desire dimension and the Happiness question (R=.80) and its greater ease in measurement. Happiness is measured directly in the NSFG while Desire requires the scaling of 6 variables. The impact of Happiness on pregnancy outcomes was similar to Desire and Model II was similar to Model I.

Another way to illustrate the importance of pregnancy intention dimensions is provided in Table 4, which examines pregnancy outcomes of both dimensions simultaneously. Both Mistiming and Happiness have independent effects on the abortion ratio. Abortion ratios varied considerable along both dimensions. Comparing pregnancies where happiness was low and mistiming was high (AAR=5.50) to those where happiness was high and mistiming was low (AR= 0.03), we found a 210-fold difference in abortion ratios. The Happiness variable also had considerable influence across the non-dimensional categories such as Overdue, On Time, and Unwanted. In general, higher levels of happiness was associated with lower abortion ratios and higher unhappiness was associated with higher abortion ratios, especially for pregnancies also reported to be unwanted (AR=1.48). Thus, Happiness, Mistiming, and non-dimensional categories were strongly related to pregnancy outcomes.

Discussion

The results from this study demonstrate the importance of dimensionality in understanding pregnancy intentions. Our analyses identified two key dimensions of pregnancy intentions: (1) Desire and (2) Mistiming - plus two smaller non-dimensional categories (Overdue and Don't Care). Both Desire and Mistiming were highly and independently predictive of the decision to continue the pregnancy. Abortion ratios varied considerably across both dimensions. Similar pregnancy dimensions were found for adolescent and adult women, across socioeconomic status, and among racial and ethnic groups. We believe these dimensions provide a more nuanced understanding of pregnancy intentions than the conventional three category approach. Identification of pregnancy intention dimensions also led us to suggest a potential new multi-category measure of pregnancy intentions.

Desire included both affective variables (happiness about pregnancy, wanting a baby with partner), as well as variables that might be considered cognitive (trying to get pregnant). In a previous study, we found that both affective and cognitive factors related to pregnancy intentions worked together and did not operate as separate dimensions in understanding pregnancy decision making (Santelli, Speizer et al. 2006). While Mistiming in this study has some aspects of a cognitive factor, Mistiming also appears to be a *post hoc* planning factor (i.e., "now that I'm pregnant how does pregnancy fit into my life goals'"). Future studies should attempt to disentangle cognitive and affective factors in understanding pregnancy planning and decision-making.

Our findings reinforce earlier demographic thinking (Campbell and Mosher 2000) about the importance of both timing of pregnancy and wanting a baby, but call into question the use of the conventional categorical measure of pregnancy intentions. The 1965 National Fertility Survey was the first time that demographers attempted to measure both timing and wanting. However, conventional reporting of unintended pregnancy has combined these as "unintended." A single category of unintended has some utility in assessing the overall prevalence or proportion of pregnancies that are unintended, particularly when combining unintended births and abortions, as distinctions between mistimed and unwanted pregnancy are not often measured for abortions. When reporting pregnancy intentions, demographic surveillance systems should consider reporting the degree of pregnancy desire and mistiming.

While many commentators have stressed the importance of relationship context and male partner intentions (Zabin, Huggins et al. 2000; Korenman, Kaestner et al. 2002; Santelli, Rochat et al. 2003), our analysis of women's perceptions of male partner intentions suggests considerable correlation between the two partners. In our data, responses of the woman and her perceptions of her partner's reactions were generally highly correlated. An exception to this general finding was seen for teenagers, a group whose partnerships are often new and more likely to be short-lived. Some of this correlation may be due to proxy reporting. However, it should not be surprising that couples in settled relationships share pregnancy intentions. In such relationships, childbearing may be actively discussed and mutually agreed upon. Now that

demographic surveys are beginning to measure the pregnancy intentions of men, further work is needed to define the value added by these questions.

These explorations suggest clear differences in pregnancy intentions by race and ethnicity but smaller differences by socioeconomic status. Unintended pregnancy, as measured conventionally, is systematically higher among black Americans (Henshaw 1998; Finer and Henshaw 2006). African-Americans have suffered not only poverty but systematic racism and discrimination in this country (Jones 1981; Geronimus, Bound et al. 1999; Camara 2000). Some would define this situation as a lack of social capital. We found that Desire was highly predictive of pregnancy outcomes for black woman but mistiming was much less salient. Pregnancy timing is closely tied to life opportunities and life goals such as educational attainment and career advancement. Thus it is not surprising that woman whose life circumstances are constrained by racism, discrimination, and limited educational and vocational choices would see pregnancy timing as less salient. Such limited life options would have less influence on the emotional aspects of pregnancy such as happiness, consistent with our findings.

The seeming disconnect between pregnancy intentions as conventionally measured and contraceptive use has been widely noted (Trussell and Vaughan 1999; Trussell, Vaughan et al. 1999). Many unintended pregnancies result from incorrect and inconsistent contraceptive use and many result from a failure to use contraception at all (Finer and Henshaw 2006). Ambivalence about pregnancy has been suggested as an important explanation for this disconnect. Discontent with current contraceptive options has also been suggested. An alternative perspective suggests that pregnancy intentions are multi-dimensional and not well captured by dichotomous categories (Luker 1999; Speizer, Santelli et al. 2004; Kendall, Afable-Munsuz et al. 2005; Santelli, Speizer et al. 2006). This study strongly supports the notion that pregnancy intentions are multi-dimensional and that one needs to consider the strength of pregnancy intentions. Clearly, better measures of pregnancy intentions will help us disentangle this debate.

Factor analysis identified two non-dimensional categories (Overdue and Don't Care) which generally are included in the conventional category of intended pregnancies. Although these responses are less common (7% and 1.2% respectively), they appear distinct. Overdue pregnancies are those that are highly desired and these uncommonly

end in abortion. Pregnancies identified as Don't Care commonly ended in miscarriage. Women's response to pregnancy intention questions after a woman has experienced a miscarriage probably represents post hoc rationalization rather than failure to plan a pregnancy. Thus, while Overdue can be safely combined with On Time, Don't Care should probably not be combined in this way.

These analyses lead us to propose a new multi-category measure of pregnancy intentions which includes the two dimensions of Mistiming and Happiness and the non-dimensions of Overdue and Don't Care. We believe that this measure - which can be readily calculate from the questions found in the NSFG - provides a more nuanced understanding of pregnancy intentions, particularly in relationship to decisions about continuing or terminating a pregnancy. In some cases, such as public health monitoring of pregnancy intentions, this more nuanced measure may be too detailed. For research purposes, such a measure may be highly useful. For example, the research literature on the effects of unintended pregnancy on infant, child and parental health often demonstrates equivocal findings (Gipson, Koenig et al. 2008). Thus, a more nuanced measure of pregnancy intentions would be highly useful in further exploring these effects and clarifying the impact of pregnancy intentions on child health.

Limitations

Our study has several limitations including the underreporting of abortion in the NSFG, the retrospective assessment of pregnancy intentions, and the limited range of questions on pregnancy intentions. While we adjusted for underreporting of abortion based on well accepted procedures (Jones and Kost 2007) that consider demographic subgroups, we could not adjust for underreporting by specific intention categories. For example, abortions that are the consequence of more severely mistimed pregnancies might be more likely to be underreported than those that are less severely mistimed. As such Guttmacher Institute is planning to add questions to future surveys of abortion patients to improve capability to estimate underreporting by pregnancy intentions.

While others have critiqued the retrospective nature of pregnancy intentions reporting, this is the conventional way of assessing these. This practice is widespread, primarily given its practicality of measurement on demographic surveys. Longitudinal surveys (Bankole and

Westoff 1998) demonstrate that intentions may change over time and after birth, however this change is not so severe as to invalidate the method of retrospective reporting. Clearly, new longitudinal research on pregnancy intentions should be considered as newer ways of assessing pregnancy intentions are devised. Likewise, a broader array of questions in demographic surveys about women's desires and life circumstances about pregnancy may provide additional insight about the process of decision-making about pregnancy and childbearing.

This study could not effectively examine the impact of pregnancy intentions on women's use of contraception at the time of conception, because intentions are not assessed in the NSFG monthly calendar for women who used contraception and successfully avoided pregnancy. If pregnancy intentions are an important determinant of decisions about pregnancy termination, they may also be an important determinant of contraceptive use. Longitudinal research assessing dimensions of pregnancy intentions before pregnancy occurs would be helpful in elucidating the importance of this influence. Such an examination would provide additional evidence for the importance of these dimensions.

Implications

Although many have criticized the current categorical measure of pregnancy intentions, these analyses suggest that a more nuanced (i.e., dimensional) measure of pregnancy intentions is highly salient in women's decision to continue or terminate a pregnant. These dimensions need to be examined in other populations and for other outcomes, such as contraceptive use and maternal behaviors. A more nuanced measure could lead to greater ability to understand women's pre- and post-natal behaviors (e.g., drinking in pregnancy or adherence to well child care) and the role of intentions in shaping these.

When reporting pregnancy intentions, demographic surveillance systems should begin reporting the degree of pregnancy desire and mistiming. While our Desire dimension had strong psychometric qualities, Happiness - which is easier to compute - appears to provide similar predictive value. We would note that based on the work of Pulley and others, the NSFG has begun reporting pregnancy intention by mistiming that is less than and greater than two years (Pulley, Klerman et al. 2002). While our research supports this new practice, a finer gradient may be preferred in specific reports.

While more methodological work with these measures is warranted, the inclusion of pregnancy desire or happiness and degree of pregnancy mistiming in other reproductive health surveys such as the Demographic and Health Survey (DHS) seems advisable. The DHS questionnaires measure the degree of mistiming for pregnancies in the last five years but lack additional measures such as the Happiness question that could be used to assess the strength of pregnancy Desire. The addition of a single question about Happiness to the current Model DHS Questionnaire would allow analysts to assess both the degree of mistiming and Desire (Measure DHS).

Ultimately, a better understanding of the dimensions of pregnancy intentions should lead to improved efforts to help women prevent unplanned pregnancy.

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Table 1a. Correlation Matrix for Unintended Pregnancy Variables, Adult Women

	Happy	Wantness	Trying	Want W/Part	Overdue Resp.	Overdue Part.	On Time Resp.	On Time Part.	Too Soon Resp.	Too Soon Part.	Don't Care Resp.	Don't Care Part.	Unwant Resp.	Unwant Part.	NS/DK Resp.	NS/DK Part.
Happy	1.00															
Wantness	0.73	1.00														
Trying	0.65	0.87	1.00													
Want W/Part	0.60	0.61	0.52	1.00												
Overdue Resp.	0.18	0.23	0.24	0.15	1.00											
Overdue Part.	0.10	0.14	0.15	0.05	0.60	1.00										
On Time Resp.	0.51	0.59	0.50	0.44	NA	-0.24	1.00									
On Time Part.	0.44	0.52	0.47	0.39	-0.16	NA	0.62	1.00								
Too Soon Resp.	-0.28	-0.37	-0.35	-0.02	NA	-0.10	NA	-0.32	1.00							
Too Soon Part.	-0.23	-0.30	-0.29	-0.03	-0.13	NA	-0.27	NA	0.44	1.00						
Don't Care Resp.	-0.01	-0.08	-0.08	-0.01	NA	-0.02	NA	0.10	NA	0.03	1.00					
Don't Care Part.	-0.03	-0.02	-0.03	0.00	0.04	NA	-0.12	NA	0.03	NA	0.24	1.00				
Unwant Resp.	-0.54	-0.54	-0.46	-0.68	NA	-0.03	NA	-0.32	NA	0.01	NA	0.01	1.00			
Unwant Part.	-0.37	-0.41	-0.37	-0.49	-0.09	NA	-0.29	NA	0.04	NA	-0.01	NA	0.42	1.00		
NS/DK Resp.	0.00	-0.04	-0.04	-0.02	NA	-0.01	NA	0.02	NA	-0.01	NA	-0.01	NA	0.04	1.00	
NS/DK Part.	-0.14	-0.20	-0.19	-0.15	-0.05	NA	-0.11	NA	0.02	NA	0.19	NA	0.10	NA	0.03	1.00

Table 1b. Correlation Matrix for Unintended Pregnancy Variables, Teens

	Happy	Wantness	Trying	Want W/Part	Overdue Resp.	Overdue Part.	On Time Resp.	Ont Time Part.	Too Soon Resp.	Too Soon Part.	Don't Care Resp.	Don't Care Part.	Unwant Resp.	Unwant Part.	NS/DK Resp.	NS/DK Part.
Happy	1.00															
Wantness	0.63	1.00														
Trying	0.52	0.76	1.00													
Want W/Part	0.40	0.40	0.32	1.00												
Overdue Resp.	0.18	0.19	0.20	0.06	1.00											
Overdue Part.	0.04	0.07	0.14	-0.01	0.12	1.00										
On Time Resp.	0.48	0.55	0.49	0.29	NA	0.04	1.00									
On Time Part.	0.38	0.43	0.40	0.27	0.15	NA	0.51	1.00								
Too Soon Resp.	-0.20	-0.27	-0.25	0.09	NA	-0.02	NA	0.30	1.00							
Too Soon Part.	-0.11	-0.17	-0.17	0.14	-0.11	NA	-0.27	NA	0.34	1.00						
Don't Care Resp.	0.01	0.04	0.07	0.05	NA	-0.02	NA	-0.05	NA	0.00	1.00					
Don't Care Part.	0.04	0.02	0.05	0.04	-0.02	NA	-0.05	NA	-0.03	NA	0.11	1.00				
Unwant Resp.	-0.30	-0.30	-0.28	-0.43	NA	-0.05	NA	-0.18	NA	-0.11	NA	0.06	1.00			
Unwant Part.	-0.26	-0.25	-0.26	-0.42	-0.05	NA	-0.21	NA	-0.05	NA	-0.06	NA	0.30	1.00		
NS/DK Resp.	0.02	0.05	0.05	0.03	NA	-0.01	NA	-0.02	NA	-0.03	NA	0.00	NA	0.06	1.00	
NS/DK Part.	-0.05	-0.06	-0.03	-0.03	-0.04	NA	-0.04	NA	0.00	NA	0.16	NA	0.01	NA	-0.01	1.00

Note: NA indicates that computing a correlation coefficient was not appropriate due to a lack of statistical independence between the two variables. All cases of NA arose from our deconstruction of the conventional measure of pregnancy intentions into a set of dichotomous variables.

Table 2. Abortion Ratio by Measures of Pregnancy Intentions and Demographic Factors, Adjusted for Underreporting of Abortion

		All Women	Adults	Teens	White	Black	Hispanic	Low SES♪	High SES♪	Weighted % of All Women	N
Sample N			2547	485	1451	689	745	798	727	100.0	3032
Abortion Ratio											
Overall		0.31	0.27	0.56	0.20	0.83	0.36	0.34	0.28	100.0	3032
Measures of Pregnancy Intentions											
Attitudes about Pregnancy											
Happy to be Pregnant	Low	1.76	1.65	1.70	1.42	2.29	1.85	1.71	3.35	17.7	624
	Medium	0.48	0.39	0.62	0.29	0.77	0.73	0.32	0.62	19.6	608
	High	0.04	0.04	0.08	0.02	0.26	0.05	0.04	0.04	62.7	1800
Pregnancy was Wantness	Low	0.96	0.90	0.92	0.67	1.41	1.11	0.84	1.59	33.1	1110
	Medium	0.21	0.18	0.25	0.13	0.52	0.26	0.08	0.20	19.7	609
	High	0.04	0.03	0.15	0.02	0.29	0.03	0.04	0.03	47.3	1313
Trying to become Pregnant	Low	0.86	0.76	0.97	0.61	1.32	0.99	0.71	1.37	32.6	1081
	Medium	0.21	0.20	0.23	0.13	0.57	0.24	0.17	0.21	28.9	899
	High	0.04	0.03	0.10	0.01	0.31	0.04	0.05	0.02	38.5	1052
Want a Baby With Partner	Definite No	1.10	1.05	1.00	0.95	1.32	1.49	0.72	3.00	11.9	443
	Probably No	0.69	0.80	0.24	0.69	0.58	0.70	0.31	1.05	7.1	220
	Probably Yes	0.57	0.40	0.80	0.59	0.77	0.28	0.44	1.23	10.0	333
	Definite Yes	0.16	0.13	0.38	0.07	0.69	0.19	0.21	0.11	70.9	2036
Deconstructed Conventional Measure of Pregnancy Intentions											
OverDue		0.02	0.02	0.00	0.00	0.12	0.07	0.06	0.00	8.3	224
On Time		0.04	0.04	0.05	0.01	0.18	0.10	0.01	0.02	48.4	1376
Don' Care		0.36	0.37	0.00	0.11	2.83	0.00	0.40	0.90	1.5	37
Too Soon		0.85	0.78	0.80	0.66	1.56	0.63	0.66	1.70	25.0	795

										N
Unwanted		0.82	0.83	0.60	0.67	1.21	0.79	0.66	1.21	16.7	593
NS/DK		0.00	0.00	--	0.00	--	0.00	--	--	0.2	7

Partner Intentions, as Reported by Woman

										N
OverDue		0.04	0.04	0.00	0.02	0.22	0.06	0.09	0.04	7.6	199
On Time		0.11	0.08	0.41	0.06	0.36	0.13	0.17	0.06	51.2	1499
Don' Care		0.17	0.13	0.51	0.06	1.54	0.00	0.00	0.46	1.4	44
Too Soon		0.60	0.51	0.67	0.35	1.69	0.55	0.53	0.97	19.3	611
Unwanted		0.87	0.93	0.57	0.76	1.03	1.03	0.57	1.24	15.8	524
NS/DK		0.84	0.80	0.84	0.47	1.34	1.59	0.59	1.61	4.8	155

Dimensions of Pregnancy Intentions

											N
Mistiming	Less 1 year	0.31	0.23	0.56	0.22	1.74	0.17	0.16	0.74	3.5	102
	1 - 2 years	0.43	0.38	0.49	0.17	1.28	0.30	0.42	0.57	9.6	298
	3 - 4 years	1.26	1.30	0.97	1.33	1.72	0.55	0.84	6.62	4.6	149
	5+ years	1.87	2.63	1.07	1.94	1.66	1.58	1.52	6.23	6.3	208
Desire Scale	0 - .99	1.67	1.82	0.88	1.38	2.10	1.96	1.18	3.13	6.6	234
	1 - 1.99	0.99	0.83	1.45	0.79	1.40	1.28	0.82	2.14	9.3	331
	2 - 2.99	1.08	1.05	0.90	0.83	1.29	0.89	0.79	2.30	13.3	436
	3 - 3.99	0.29	0.25	0.33	0.22	0.55	0.20	0.26	0.33	12.5	385
	4 - 4.99	0.10	0.10	0.08	0.03	0.32	0.25	0.03	0.06	11.9	379
	5 - 5.99	0.03	0.03	0.07	0.01	0.42	--	0.01	0.04	26.7	747
	6	0.02	0.01	0.06	0.01	0.05	0.04	0.00	0.01	19.8	520

†Excludes currently pregnant respondents.

♪Low / High SES represents the lowest and highest quartile, respectively, on percent of Poverty for Household

N includes birth, reported abortions, and miscarriages. Abortion ratios calculated using only births and abortions

Table 3. Multiple Logistic Regression Modeling of Live Birth∫ vs. Abortion, 2002 NSFG

		Model 1				Model 2			
	Variable	Odds Ratio	Lower CI	Upper CI	P-value	Odds Ratio	Lower CI	Upper CI	P-value
Demographics-Background	Age at Preg. Outcome	0.98	0.95	1.02	0.15	0.98	0.95	1.02	0.15
	Cohabiting or Married at Conception.	2.42	1.79	3.27	0.00	2.94	2.26	3.83	0.00
	Black	0.62	0.44	0.87	0.00	0.60	0.43	0.83	0.00
	Hispanic	1.05	0.64	1.73	0.43	0.90	0.58	1.40	0.32
	Other	0.39	0.27	0.57	0.00	0.45	0.31	0.64	0.00
	% Poverty Level (0-5)†	0.78	0.71	0.86	0.00	0.81	0.73	0.90	0.00
Intention	Desire Additive (0-6)*	2.16	1.94	2.41	0.00	nc			
	Happiness (1-10)	nc				1.51	1.45	1.57	0.00
	Mistiming in Years‡	0.78	0.73	0.83	0.00	0.82	0.77	0.87	0.00
	Pregnancy Overdue	6.12	2.13	17.59	0.00	5.17	1.82	14.69	0.00
	Sample N			n=2379				n=2379	

Notes. Dropped respondents for this analysis who answered "Don't Care & "DK/NS"

Reference group for cohabiting or married were all others

Reference group for race/ethnicity was White

∫Comparing only live birth and abortion outcomes
†Percent poverty level is calculated by dividing the respondent's family income by the poverty threshold.   We truncated this variable from a 0 to 500 % range to a 0 to 5 range by dividing the percent poverty level by 100.

*Constructed to = HappyAboutPreg+PregTrying+PregWantness+WantWithPartner+OnTime-Unwant

‡Cut-off at > 15 years

nc = not calculated in this model

Table 4. Abortion Ratios by Happiness to be Pregnant and Mistiming, 2002 NSFG, Adjusted for Underreporting of Abortion

| | Happiness | | | | | |
| | Unhappy | | Neutral | | Happy | |
	n	Abortion Ratio	n	Abortion Ratio	n	Abortion Ratio
Overdue	7	0.39	15	0.00	202	0.01
On Time	46	0.16	125	0.14	1205	0.03
Mistimed						
Less 1 year	14	0.45	27	0.58	61	0.16
1 - 2 years	60	0.76	115	0.57	123	0.15
3 - 4 years	57	4.98	54	0.63	38	0.18
5 or More yrs.	89	5.50	79	1.42	40	0.16
Unwanted	334	1.59	162	0.29	97	0.08
Not Care	8	1.48	10	0.45	19	0.00
Don't Know	1	0.00	1	0.00	5	0.00

N=2994