Pregnancy Intentions and Maternal Health Behaviors Reexamined:

A Multidimensional Analysis

Maggie Rechel and John B. Casterline

I. Abstract

Past research on the relationship between pregnancy intention status and maternal health behaviors has not found a consistent link. Many researchers have suggested the ambiguous findings occur because pregnancy intention status is measured too simplistically and fails to capture true intention status as understood by the women involved. Our research uses suggestions from critics of the current measure to see if an improvement in the measurement of intended pregnancy as it relates to maternal health outcomes can be found. We find that if measures of intentionality are represented as multiple dimensions rather than timing alone, the prediction of smoking cessation during the pregnancy and prenatal care received in the first trimester is strengthened.

****This analysis uses the 2002 NSFG, if this paper were accepted we would update the analysis with new Cycle 7 data, due to be released in late 2009.****

II. Introduction

In 2001, 49 percent of all pregnancies in the United States were unintended and one-third of unintended pregnancies ended in live births (Finer and Henshaw 2006). Pregnancy intention, that is whether a pregnancy is wanted at the time of conception, has been important to demographers and public health researchers to determine unmet need for family planning services and as a determinant of negative maternal health choices and related negative infant health outcomes. The Committee on Unintended Pregnancy at the Institute of Medicine declared in 1995: "The consequences of unintended pregnancies are serious, imposing appreciable burdens on children, women, men, and families" and proposed a goal to eliminate all unintended pregnancies in the United States (Brown and Eisenberg 1995).

Eliminating unintended pregnancies because of their detrimental effects for all involved is a worthy goal. However, the association between unintended pregnancy, as conventionally defined, and adverse maternal health choices is not always found in empirical research (Gipson 2008). Additionally, recent qualitative research indicates that the timing of pregnancy alone, which is the most common way to operationalize pregnancy intention, is not adequate to capture the true planning status of a pregnancy, especially for young and unmarried women (Stanford et al. 2000). Many researchers suggest that these mixed results occur not because of lack of relationship, but because the classification schema for pregnancy intentionality is incorrectly specified and superficial (Bachrach and Newcomer 1999; Fischer et al. 1999, Klerman 2000).

In response to these findings, our research explores alternative ways of operationalizing pregnancy intention. Rather than relying on pregnancy timing alone, we

gauge pregnancy intention using more detailed information on timing of pregnancy, whether the woman wanted to have a child with the father, and attitudinal measures such as happiness to be pregnant. These more nuanced measures of pregnancy intention will help public health officials understand and target family planning programs more effectively.

Our research study utilizes recent data from the 2002 National Survey of Family Growth (NSFG). In contrast to prior national surveys, the 2002 NSFG asked additional questions regarding how hard the woman was trying to avoid pregnancy at the time she became pregnant, how much the woman wanted the pregnancy, whether the woman wanted to have a baby with her partner, and whether the father had planned for the pregnancy. These new questions allow for more depth in understanding pregnancy intention and how intention relates to maternal health behaviors.

III. Literature Review

Academic journals and the popular media use concepts such as intended, planned, wanted, and desired pregnancy interchangeably. Only within the past 15 years have researchers focused on what these terms actually mean to women and their partners, and how they relate to public health outcomes such as abortion rates, effective contraceptive use, and fertility within the United States.

The typical measurement of pregnancy intention based on pregnancy timing is largely a result of federally sponsored surveys dating back to the WWII era. Understanding motivations and goals for the surveys during that time period is necessary to understand the current timing-alone classification scheme utilized by the NSFG. Additionally, the NSFG's measurement and classification of pregnancies is based on

previous surveys that sampled only married women. These surveys also assumed that married couples all had a consistent number of desired children. Because these surveys took place in an era when few births occurred to unmarried women, these limitations and assumptions were appropriate. Today's situation is very different as over half of all pregnancies occur to unmarried women who may not have a set number of desired children (Kaufman et al. 1997). It therefore seems especially timely to consider new ways to try and tap into pregnancy intendedness.

Measuring Pregnancy Intention: Then And Now

The Indianapolis Study of 1941, commissioned by the federal government, was the first survey to try to systematically measure unwanted births to married white couples. The survey classified excess fertility as fertility that occurred when either the husband or the wife had not wanted another child at the time of conception. The fundamental assumption of this survey was that individuals desire a certain number of children and that number does not change over time. Since this survey was attempting to investigate declining birth rates, excess births were not considered problematic and analyses focused instead on what might be done to increase the desired number of children a couple wanted. Only married couples were interviewed in this study primarily because married women were responsible for the vast majority of births at the time. Current surveys, like the NSFG, that still incorporate this classification system may be incorrectly assuming that all women have a set number of desired children throughout their lifetime regardless of marital status, age and income (Campbell and Mosher 2000).

Interestingly, the Indianapolis Study included a "quasi-planned" category which included births that were not planned but which the couple wanted and reported being happy about another child anyway. This distinction is not captured in the current classification system of the NSFG. However, our research examines whether unintended pregnancies for which the mother reports being happy about are more similar in maternal health choices to intended pregnancies than to women experiencing both unhappy and unintended pregnancies.

The 1965 National Family Survey was the first to recognize that a pregnancy may be numerically wanted but occurs at the wrong time (mistimed pregnancy) although a measurement of how soon the pregnancy occurs was not included (Santelli, Rochat et al. 2003). This survey also included only married participants and the assumption that couples have an ideal number and spacing of children that could be assessed was retained.

The 1973 NSFG, sponsored by the National Center for Health Statistics, was the first survey to include unmarried and never married women as participants, owing to the growth in fertility among these groups. The NSFG completed surveys in 1973, 1976, 1982, 1988, 1995, and 2002 and since 1982 has sampled women ages 15-44, regardless of marital status (Campbell and Mosher 2000).

The NSFG is the most commonly used dataset for researchers tracking pregnancy intention in the United States. Most other datasets, such as the National Longitudinal Survey of Youth (NLSY79) and the Pregnancy Risk Assessment Monitoring System (PRAMS), use similar or identical measures of intentionality. The NSFG has always tracked pregnancy intentions retrospectively and asks women to refer back to the time

when they first became aware of their pregnancies. From an algorithm of questions, women are actively classified by the NSFG as having pregnancies that are unwanted, mistimed, or intended i.e. occurring at the right time or later than desired.

The 2002 NSFG retains the number and spacing dimensions of pregnancy intention measures from earlier fertility surveys. If a woman states that prior to becoming pregnant she did not want any children in the future, the pregnancy is classified as unwanted by researchers at the NSFG. If the woman does or probably wants children in the future the woman is asked whether the pregnancy occurred at the right time, was overdue, or happened too soon. If the woman says overdue or right time the pregnancy is classified commonly in the literature as intended. Too soon and unwanted pregnancies are then commonly classified as unintended by researchers using the dataset. Since 1995 the timing question has been supplemented with a measure of how early a particular pregnancy occurred because some researchers have argued that the degree of mistiming may be important in understanding health impacts (Pulley, Klerman et al. 2002).

Various researchers have argued that the NSFG incorrectly measures and operationalizes the concepts of "intention" and "wanted" status (Stanford et al. 2000; Fischer et al. 1999; Bachrach and Newcomer 1999; Klerman 2000). Qualitative research using in-depth, semi-structured interviews with pregnant women has shown that to women, intention means a planning process, and is related to personal assessment of what is necessary to be a good mother and whether a woman has achieved that yet or not. Wantedness, in contrast, is associated with social understanding and availability of social support to raise a child as well as emotional attachment to a fetus. Furthermore, happiness appears to be more closely linked to a wanted status rather than a planning status and

unwanted pregnancies are more likely to be aborted (Luker 1999; Blake et al. 2007; Santelli, Speizer et al 2006). Barrett and Wellings (2002) have suggested that "intention" may emerge only in relation to positive and negative reactions from social support groups like the father, friends, and/or family. They also argue that it may be impossible to accurately assess pre-pregnancy intention and planning in women who are not actively seeking pregnancy, especially among unpartnered women.

This and other research implies that the commonly used classification of pregnancies as unintended if the pregnancy is reported as being mistimed or unplanned is not entirely valid or reliable. Instead it has been suggested that in order to assess pregnancy intentions it is necessary to examine a more complex structure of intentionality (Stanford et al. 2000; Santelli et al. 2003; Luker 1999). Bachrach and Newcomer (1999) suggest that intention should be considered as a continuum rather than categorized as a dichotomy, given the inconsistencies of retrospective reports. Additional research also indicates that if the father intends the pregnancy, then this has a positive association with maternal health behaviors (Martin et al. 2007; Korenman et al. 2002).

Sable and Libbus (2000) studied 510 women at an emergency pregnancy testing center. Based on self reports of pregnancy timing, all of these pregnancies would have been classified as unintended if they had been surveyed by the NSFG. These women were also asked about their happiness levels if they were found to be pregnant and forty-eight percent said they would be somewhat to very happy about the pregnancy and eighty-nine percent of those women said that they would carry the pregnancy to term and raise the child. This study again calls into question the legitimacy of continuing to use the NSFG classification system as it has been used in the past.

Additionally, previous research that has used the NSFG has combined unwanted and mistimed pregnancies into a single "unintended" category. Trussell and colleagues (1999) see this as problematic because unwantedness is more likely to reflect a woman at the end of her childbearing while mistiming is more common among younger women and those who do not yet see themselves as ready to be mothers. I approach this problem by treating mistimed and unwanted pregnancies as exclusive categories.

Trussell and others, using earlier cycles of the NSFG, have pointed to contradictions between traditional measures of pregnancy intention, contraceptive use, and reported happiness about the pregnancy (Trussell et al. 999; Bachrach and Newcomer 1999; Sable 1999). This occurs because contraceptive use questions are not linked to intention questions. Finer and Henshaw (2006), for example, found that nearly half of all pregnancies reported as unintended occur among women who were not using contraception at the time of conception. Trussell and colleagues (1999) suggest that these seeming contradictions result from an imperfect understanding by women of their ultimate numerical fertility desires, and that planning for a pregnancy is different from a desire to be pregnant and ambivalence related to pregnancy.

In response to concerns from the research community, questions designed to more effectively measure pregnancy intentionality and ambivalence were included in the 2002 NSFG (Campbell and Mosher 2000). These new questions are designed to tap into a woman's desire to avoid getting pregnant, and to ascertain whether or not she wanted to get pregnant with that partner, her perceptions of her partner's intentions and how happy she was when she found out she was pregnant. To model these more complicated intentionality statuses we utilize a desire scale created by Santelli and colleagues that

includes all of the new questions. The scale was originally designed to predict odds of the pregnancy ending in abortion but can be readily used to predict odds of certain maternal health behaviors during pregnancy (Santelli et al. 2009, forthcoming).

Maternal Health Behaviors

Maternal health behaviors during pregnancy are firmly linked to pregnancy and birth outcomes. For example, public health researchers and epidemiologists have completed over 120 studies since the 1970s that link smoking during pregnancy to a variety of negative fetus and infant health outcomes such as increased risk of miscarriage, stillbirth, preterm delivery, low birth weight, intrauterine growth retardation, respiratory problems and infections and childhood behavioral problems (Floyd et al. 1993; Kahn et al. 2002; Chomitz et al. 1995). Axinn, Barber and Thornton (1998) also find evidence that intention status can have long term effects on a child's self esteem up to age 23. Barber, Axinn, and Thornton (1999) also find that the affection between mothers and all children in the family are significantly lower in families where one of the children is unintended than in families in which none of the children were unintended. This suggests negative emotional effects for all children in the family rather than just for the child who is reported as having been unwanted, something that is rarely considered when studying the effects of pregnancy intention.

Public health researchers also view prenatal care that begins in the first 3 months of pregnancy as a necessary component for "adequate" care in all but one widely used index. The differing index classifies prenatal care that begins in the first 4 months as adequate, however the Alexander and Kotelchuck (1996) reject this classification system as appropriate in industrialized countries. Adequate prenatal care has also been linked to

a reduced risk of low birth weight, preterm delivery, birth defects like spina bifida, and childhood developmental delays (Floyd et al. 1993; Kahn et al. 2002; Chomitz et al. 1995; Kogan et al. 1998).

Given the extreme negative health outcomes related to these particular health behaviors, public health specialists are eager to ensure all pregnant women receive adequate prenatal care and actively encourage smoking cessation prior to and during pregnancy. Our research will help to identify groups of women likely to be associated with negative health behaviors allowing for policies and programs aimed more specifically at these women.

Intention and Maternal Health Behaviors

Many studies have centered on connecting the traditional wantedness status of a pregnancy to maternal health choices such as alcohol consumption during the pregnancy, prenatal care, and whether or not women smoke during pregnancy. For example, Weller and colleagues (1987) found a positive association between birth planning status and both smoking cessation and early initiation of prenatal care, but not of a magnitude that had been expected. Joyce and Grossman (1990) also found evidence that mothers who experienced unwanted pregnancies were likely to make negative health choices like no prenatal care, smoking during the pregnancy, and lack of breastfeeding but they did not find a connection between wantedness and later cognitive development.

Using data from the 1995 NSFG, Pulley and Klerman (2002) found that mothers who reported that their pregnancies were severely mistimed i.e. more than 24 months too soon were as likely as mothers who reported that their pregnancies were unwanted to

engage in negative health behaviors. Women whose pregnancies were somewhat mistimed i.e. 24 or fewer months too soon chose the same positive health behaviors as women who reported that their pregnancy occurred at the right time.

Using data from the NLSY79, Baydar (1995) finds that when unwanted and mistimed pregnancies are carried to term, these children are given fewer opportunities for skill development and experience lower test scores on the PPVT and PIAT. Their mothers are also more likely to utilize an authoritarian parenting style than are mothers who report that their pregnancies were wanted.

Results from other studies that have used the NSFG or the NLSY79 have found either no association between pregnancy intention and maternal health choices or mixed associations like predicting smoking but not weight gain during pregnancy (McCormick et al. 1987; Marsiglio and Mott 1988; Kost et al. 1998; Korenman et al. 2002).

Marsiglio and Mott (1988) found wantedness to be significantly associated with prenatal care within the first trimester. They also found a greater percentage of women experiencing unwanted pregnancy received prenatal care in the first trimester than quit smoking. They suggest this might occur because getting prenatal care is a cost free benefit for their child whereas giving up smoking or drinking has significant cost to them.

Kost and colleagues (1998) only found a significant association between pregnancy wantedness and smoking for women whose pregnancies were unintended. Mothers experiencing unintended pregnancies were 26 percent less likely to quit smoking than were mothers whose pregnancies were intended.

To summarize, for many years, researchers have explored the association between pregnancy intention and maternal health behaviors. Often, however, the expected

relationship was not found or the magnitude of the relationship was smaller than expected (Weller et al. 1987; Marsiglio and Mott 1988). As a result, researchers then reassessed how pregnancy intention was classified in relation to how women actually feel about and plan for their pregnancies. This research indicated a need to consider alternative conceptualizations of pregnancy intention that included father's intention and support, how hard women might be trying to avoid pregnancy including contraceptive behaviors, varying levels of mistiming, their desire to have a child with this partner, and their happiness with being pregnant.

Data with this depth of information was not available when these hypothesis and suggested improvements were made. The 2002 NSFG responded to these concerns by gathering such data. Our research is the first of its kind to examine concerns over the traditional dichotomoy/trichotomy of pregnancy intention using the new 2002 NSFG data and test these varying operationalizations of pregnancy intentions and happiness as they relate to maternal health behaviors.

IV. Data and Methods

Data

We use data from Cycle 6 of the National Survey of Family Growth which was collected in 2002. The NSFG is a nationally representative sample of women ages 15-44 in the United States. In-person interviews were completed with 7,643 women who were asked questions about each reported pregnancy. Overall, 13,593 pregnancies were reported.

Our research sample is limited because the new set of questions regarding happiness and intentionality are only asked of women whose pregnancies ended in January 1999 or later. Additionally, our sample size is restricted to pregnancies that end in live births because maternal health behaviors affecting infants are only relevant to births not pregnancies that end in abortion. Our sample size is thus the 1,767 live births, one randomly selected birth per woman, occurring in January 1999 or later reported in the NSFG for prenatal care assessment.

In our analysis of smoking cessation, the sample is further limited to only those mothers who smoked prior to the pregnancy which reduces the sample size to 432. Operationalizing smoking cessation this way allows us to look at groups that independently quit smoking and avoid our findings being confounded by the vast majority of women who didn't smoke prior to the pregnancy. Because of the small sample size it may be difficult to isolate significant associations, however.

These data are particularly useful because the NSFG's criteria and classification system of pregnancies has long been the gold standard and has influenced nearly all surveys and studies about this topic since it was first implemented in 1973. In addition, the 2002 dataset has yet to be used to test the more nuanced understanding of wantedness and intention as related to maternal health choices. This provides a rich data set ripe for a re-examination of the concepts of wantedness and intention of pregnancy as well as a more social understanding of these concepts.

Methods

The purpose of this research is to re-examine the relationship between maternal health behaviors and intentionality by measuring intentionality in a variety of ways. The 2002 NSFG only asks questions related to smoking and initial prenatal care timing so we are limited to investigating only these maternal health behaviors. Additionally, the independent, control variables we incorporate are similar to those used in previous studies so as to make results more comparable.

We use logistic regression to calculate odds ratios and test for significantly different groups regarding smoking during pregnancy and initiation of prenatal care during the first trimester. The various operationalizations of pregnancy intention groups result largely from critiques of the previous method of pregnancy intention measures.

When appropriate, we performed a likelihood ratio test to assess if the new operationalization of pregnancy intention significantly increases the statistical power of the model compared to the conventional pregnancy intention trichotomy of mistimed, unwanted, and intended pregnancies.

Dependent Variables

Smoking

Smoking is linked to a variety of negative health outcomes for infants born to mothers who smoke while pregnant. (Chomitz et al. 1995; Floyd et al. 1993; Kahn et al. 2002). My dependent variable is dichotomized based on whether a woman smoked prior to becoming pregnant but quit once she learned of the pregnancy or whether she continued to smoke. Limiting the sample to only those pregnancies where women were

previous smokers allows us to more closely examine who ceases smoking rather than obscuring results with those that never smoke to begin with.

Prenatal Care

Medical research shows that prenatal care that begins in the first trimester is best for infant health outcomes (Alexander and Kotelchuck 1996; Kogan et al. 1998). Thus, pregnancies were dichotomously classified by whether prenatal care began in the first trimester or not. Descriptively, a high frequency of pregnancies had prenatal care that began in the 12th week, possibly indicating that many women are aware of the importance of prenatal care beginning in the first trimester (the first three months of a pregnancy). This lends credibility to measuring prenatal care this way.

Independent Variables: Controls

Our choice of control variables is primarily based on results of previous research that has used NSFG data. Marital status is measured dichotomously based on whether the woman was married at the time of conception or not. My measure of poverty divides women into those who were living at or below 150 percent of the poverty line versus those with family incomes above that cutoff. Maternal educational attainment is classified as less than high school, high school completion and some college, and bachelor's degree or more. A woman's race/ethncity is classified as white, African-American, Hispanic and Other. Finally, we also control for the mother's age at conception as well as whether this is the first pregnancy, second or third pregnancy, or fourth or greater pregnancy for a woman.

All of these variables are important to control for because previous research has shown that smoking during pregnancy and inadequate prenatal care tend to be more common among unmarried, poor, less educated, minority, young, and first time mothers (Kahn et al. 2002; Brown and Eisenberg 1995; Joyce et al. 2000, Weller et al. 1987; Altfeld et al. 1997; Than et al. 2005; D'Angelo et al. 2004).

Table 1
Descriptive Statistics For Prenatal Care Models n=1767

Predictor	Mean	S.D.
Received Prenatal Care	0.89	
Intended	0.63	
Mistimed	0.21	
≤24 Months Too Soon	0.12	
≤24 Months Too Soon & Happy	0.16	
>24 Months Too Soon & Unhappy	0.03	
>24 Months Too Soon	0.09	
≤24 Months Too Soon & Happy	0.06	
>24 Months Too Soon & Unhappy	0.03	
Unwanted	0.16	
Unwanted & Happy	0.08	
Unwanted & Unhappy	0.08	
Married	0.54	
Age at Conception	26.45	5.95
# of Pregnancies		
1st Pregnancy	0.31	
2nd or 3rd Pregnancy	0.48	
≥4th Pregnancy	0.21	
≥150% Poverty Line	0.44	
Education		
Less than HS	0.21	
<College Completion	0.59	
≥College Completion	0.21	
Race/Ethnicity		
White	0.49	
Hispanic	0.26	
Black	0.20	
Other	0.05	

Table 1 displays the mean and standard deviation for each of the variables used in models with prenatal care in the first trimester as the outcome of interest. Since most variables used are dichotomous, the mean can also be thought of as the proportion of people in the sample that have a certain characteristic. Descriptive statistics for variables used in the smoking cessation models were very similar in their distribution and are included in Appendix A.

Independent Variables: New Operationalizations of Pregnancy Intentions and Attitudinal Factors

My research is distinctive because it steps beyond the conventional measure of pregnancy intention and operationalizes pregnancy intention in a variety of ways, guided by critiques of the conventional measure. The identified control variables will remain the same for each model allowing for comparability of results. We choose to operationalize pregnancy intention in 6 different ways and test each measure's association with smoking during pregnancy and early initiation of prenatal care. Table 1 provides a summary description of how intentionality is assessed in the following models.

Table 2 Description of Models		Intention Measured:	Suggested By:
Model 1	Conventional Intention Status	Intended Mistimed Unwanted	Commonly Used
Model 2	Degree of Mistiming	Intended Mistimed: ?24 Months Too Soon Mistimed: >24 Months Too Soon Unwanted	Pulley, Klerman
Model 3	Pregnancy Happiness	Intended Mistimed & Happy Mistimed & Unhappy Unwanted & Happy Unwanted & Unhappy	Sable, Libbus Luker
Model 4	Intended & Unintneded	Intended Unintended	Korenman, Kaestner & Joyce
Model 5	Mother and Father's Intention	Mother & Father Intended Mother Intended, Father Unintended Mother Unintended, Father Intended Mother & Father Unintended	Korenman, Kaestner & Joyce
Model 6	Desire Scale	Desire to Have a Child Intended Mistimed Unwanted	Santelli, Lindberg, Orr & Finer

MODEL 1 –Conventional Model

We utilize Model 1 to investigate the relationship between conventionally defined pregnancy intentions and smoking and prenatal care. Pregnancy intention groups are comprised of women experiencing conventionally defined intended pregnancies as the reference group compared to groups of women who report their pregnancies as either mistimed or unwanted pregnancies.

We expect to find that women experiencing mistimed or unwanted pregnancies will be less likely than women experiencing intended pregnancies to a) quit smoking and b) obtain prenatal care within the first trimester of the pregnancy.

MODEL 2 – Magnitude of Mistiming Considered

In this model, we split mistimed pregnancies into 24 or fewer months too soon and more than 24 months too soon (Pulley, Klerman et al. 2002). Because this classification system nests the conventional measures, we employ a likelihood ratio test to see if there is significant explanatory improvement in Model 2 over Model 1.

We expect to find that pregnancies that are mistimed by more than 24 months will be less likely to be associated with prenatal care in the first trimester and quitting smoking during the pregnancy than moderately mistimed pregnancies. Additionally, we do not expect women who experience pregnancies that are mistimed by 2 years or less to have different maternal health behaviors than women who reported that their pregnancy was intended.

MODEL 3 –Intention and Happiness about Pregnancy

In Model 3, we investigate how happiness interacts with conventional measures of pregnancy intention. Researchers have suggested that happiness may be important to maternal health behaviors, especially when the pregnancy is unintended (Sable and Libbus 2000). This model directly tests these suggestions.

Happiness is dichotomously coded based on whether women reported any level of happiness related to the pregnancy or not. This measure is then interacted with intention status.

We expect to find that pregnancies classified as happy without regard to the intention classification to be associated with positive maternal health behaviors based on the results of the research by Sable and Libbus (2000).

MODELS 4 & 5

In Model 5, we incorporate partner intentionality in addition to the woman's reported intentionality and in order to test Korenman's proposed dose-response hypothesis (2002) which conceives that a child has the best odds of positive maternal health choices if both parents intended pregnancy than if one or both did not. Koreman (2002) also posits that the choices made for a child that is intended by one parent are better than the choices made in a pregnancy in which neither parent intended the pregnancy. The maternal dominance corollary i.e. that in a split intention pregnancy the best maternal health choices will be made if the mother is the parent that intended the pregnancy, will also be examined. We expect to find results similar to those that Korenman and colleagues have suggested. Thus far we have used a trichotomous measurement of intention status (intended, mistimed, unwanted), Model 4 will

dichotomize intention (intended or unintended) as suggested by Korenman for comparative purposes.

MODEL 6–Attitudinal Assessment

In Model 6, we measure pregnancy intention as it relates to a more complete attitudinal assessment toward the pregnancy. Model 6 utilizes Santelli and colleagues' desire scale which is derived from a factor analysis that finds two distinct dimensions of pregnancy intention (Santelli et al. 2009). In the 2002 NSFG each woman was asked attitudinal questions on a four, ten or eleven point scale about her happiness to be pregnant, whether she was trying to get pregnant, whether she wanted to get pregnant right before she became pregnant, and whether she wanted to have a baby with her current partner (Santelli et al. 2009). The scale assumes that each factor has an equal weight with regard to desire for the pregnancy so each factor is divided by the potential number of possible answers. Each factor is ordinal with a higher score being associated with a greater desire for the pregnancy. The desire scale as constructed by Santelli et al. is arithmetically derived as Desire scale= (Happiness/10) + (Wantedness/11) + (Trying/11) + (WantWithPartner/4) (2009). The possible range of the desire scale is then 0-4 yet the actual values for the "desire" scale range from .3-3.82 suggesting that no pregnancy is completely undesired nor completely desired.

We expect to find that the greater the desire to have a child the greater the odds of prenatal care in the first trimester, as well as increased odds of smoking cessation. In

addition, we expect the explanatory power of this model as measured by the pseudo-R^2 to be the greatest of all the models given the comprehensive nature of the scale.

V. Results and Analysis

Do different operationalizations of pregnancy intention have different degrees of association with maternal health behaviors? We begin with an analysis of maternal health behaviors and their associations with intention status.

Smoking

In Table 3, we present the estimated odds ratios of smoking cessation for common predictors of maternal health behaviors. Model 1 measures pregnancy intention in the conventional manner whereas Model 2 further considers the degree of mistiming as being predictive of quitting smoking. In Model 1, unwanted pregnancies have significantly reduced odds (OR=.55) of smoking cessation when compared to conventionally defined intended pregnancies. Mistimed pregnancies are not significantly different from intended pregnancies but the predicted odds are less than those of intended pregnancies. These general findings support previous research using the trichotomous measure of pregnancy intentions.

Model 2 investigates whether moderately and severely mistimed pregnancies differ significantly from intended pregnancies as related to smoking cessation. Neither moderately nor severely mistimed pregnancies differ significantly from intended pregnancies. Additionally, the odds ratios, though not significant, are not in the expected direction, with severely mistimed pregnancies having higher odds of maternal smoking cessation compared to moderately mistimed pregnancies. The likelihood ratio test is

insignificant being that differentiating between moderately and severely mistimed pregnancies does not significantly improve our ability to predict smoking cessation. Because significant differences between moderately and severely mistimed pregnancies were not found, the

Table 3
Logistic Regression Predicting Smoking Cessation During Pregnancy

	Model 1 Conventional Intention Status		Model 2 Degree of Mistiming		Model 3 Pregnancy Happiness	
Predictor	Odds Ratio	S.E.	Odds Ratio	S.E.	Odds Ratio	S.E.
Intention (ref=intended)						
Mistimed	0.88	0.25				
≤24 *Months Too Soon*			0.74	0.25		
>24 Months Too Soon			0.83	0.31		
Mistimed & Happy					1.15	0.37
Mistimed & Unhappy					0.53	0.22
Unwanted	.55*	0.15	.53*	0.14		
Unwanted & Happy					0.56	0.21
Unwanted & Unhappy					0.54	0.18
Married	1.09	0.27	1.08	0.26	1.09	0.27
Age at Conception	0.96	0.02	0.96	0.02	0.96	0.02
# of Pregnancies (ref=1)						
2nd or 3rd Pregnancy	.53*	0.14	.53*	0.14	.51**	0.13
≥4th Pregnancy	.50*	0.16	.50*	0.16	.50*	0.16
<150% Poverty Line	.56**	0.13	.56**	0.13	.56*	0.13
Education (ref <HS						
<College Completion	1.90*	0.49	1.90*	0.49	1.90*	0.49
≥College Completion	3.57**	1.72	3.56**	1.75	3.67**	1.78
Race/Ethnicity (ref=white)						
Hispanic	2.38**	0.79	2.35*	0.80	2.35*	0.78
Black	2.58**	0.78	2.55**	0.79	2.56**	0.77
Other	1.60	0.86	1.59	0.92	1.49	0.80
Note: *p<.05; **p<.01; ***p<.001 N=432						
	Pseudo R^2=.0778		Pseudo R^2=.0788 Likelihood Ratio Test: (Model 1 & Model 2) Chi^2=.62 p-value=.4299		Pseudo R^2=.0824 Likelihood Ratio Test: (Model 1& Model 3) Chi^2=2.74 p-value=.2546	

conventional singular mistimed status will be considered in additional models predicting smoking cessation.

Model 3 examines the interaction between conventional intention status and happiness to be pregnant. None of the interactions between happiness and intention status were significant in the model. However, happiness associated with mistimed pregnancies does seem to have higher odds of smoking cessation (OR=1.15) compared to both unwanted and happy pregnancies (OR=.56) and unwanted and unhappy pregnancies (OR=.54), although none are significant.

Models 1, 2 and 3 also show that 2nd and higher order pregnancies as well as pregnancies that occur to women living at or below 150 percent of the poverty line have significantly lower odds of smoking cessation than first pregnancies and pregnancies that occur to women living above 150 percent of the poverty line. Higher educational attainment is also associated with significantly greater odds of smoking cessation. Also of note is that black (OR=2.37) and Hispanic (OR=2.24) mothers have significantly higher odds of smoking cessation than their white counterparts when intention status is controlled for. This finding is at odds with similar studies that have also controlled for intention status. The may be because previous studies have looked at all individuals without regard to their smoking status prior to the pregnancy and if whites are less likely to smoke overall, this might have confounded their findings.

In Table 4, we present the logistic regression results for Models 4 and 5. In Model 4, intention status is defined dichotomously as either intended or unintended, both mistimed and unwanted. Model 5 allows us to compare whether consideration of the father's intention status increases the predictive power of the model. In Model 5, the mother and father's intention status interactions are not significant. These results do not support the Korenman dose-response hypothesis, although the point estimates of the odds

ratios are supportive of the hypothesis. For pregnancies that either parent intended, the odds of smoking cessation are higher than pregnancies in which neither parent intended the pregnancy.

Table 4
Logistic Regression Predicting Smoking Cessation During Pregnancy

	Model 4 Intended & Unintended		Model 5 Mother and Father's Intentions	
Predictor	Odds Ratio	S.E.	Odds Ratio	S.E.
Intention Status:				
Unintended	0.69	0.15		
Mother and Father's Intention Status:				
(ref=Mother and Father Intended)				
Mother Intended & Father Unintended			1.33	0.42
Mother Unintended & Father Intended			1.10	0.28
Mother Unintended & Father Unintended			0.79	0.20
Married	1.05	0.26	1.09	0.27
Age at Conception	.96*	0.02	0.96	0.02
# of Pregnancies (ref=1)				
2nd or 3rd Pregnancy	.51**	0.13	.51**	0.13
≥4th Pregnancy	.48*	0.15	.49*	0.15
≥150% Poverty Line	.55**	0.12	.56**	0.13
Education (ref <HS)				
<College Completion	1.87*	0.47	1.88*	0.48
≥College Completion	3.62**	1.75	3.79**	1.83
Race/Ethnicity (ref=white)				
Hispanic	2.24*	0.73	2.17*	0.71
Black	2.37**	0.70	2.43**	0.66
Other	1.61	0.86	1.66	0.88
Note: *p<.05; **p<.01; ***p<.001 N=432				
	Pseudo R^2=.0743		Pseudo R^2=.0730	

In Table 5, we compare the results of Model 1 (Conventional Intention Status), and Model 6 in which we utilize a multidimensional index of desire to have a child which includes how much the woman wanted the pregnancy, how hard she was trying to avoid the pregnancy, whether she wanted to have a child with her partner, and how happy she was to be pregnant. When the desire scale is included, unwanted pregnancies are no

longer significantly different from intended pregnancies in odds of smoking cessation. Additionally, the odds ratios for unwanted pregnancies (OR=.89) predicting smoking cessation are much closer to 1 in Model 5. This suggests that the nuanced intention status suggested by Santelli and colleagues does a better job predicting smoking cessation than the conventional trichotomy of intended, mistimed, and unwanted pregnancies.

Table 5
Logistic Regression Predicting Smoking Cessation During Pregnancy

	Model 1 Conventional Intention Status		Model 6 Desire Scale	
Predictor	Odds Ratio	S.E.	Odds Ratio	S.E.
Desire Scale (.3-3.8182)			1.32*	0.19
Intention (ref=intended)				
Mistimed	0.88	0.25	1.20	0.39
Unwanted	.55*	0.15	0.89	0.33
Married	1.09	0.27	0.99	0.25
Age at Conception	0.96	0.02	0.96	0.02
# of Pregnancies (ref=1)				
2nd or 3rd Pregnancy	.53*	0.14	.53*	0.14
≥4th Pregnancy	.50*	0.16	.50*	0.16
<150% Poverty Line	.56**	0.13	.59*	0.13
Education (ref <HS				
<College Completion	1.90*	0.49	1.90*	0.49
≥College Completion	3.57*	1.72	3.37*	1.64
Race/Ethnicity (ref=white)				
Hispanic	2.38*	0.79	2.18*	0.73
Black	2.58**	0.78	2.56**	0.78
Other	1.60	0.86	1.63	0.88
Note: *p<.05; **p<.01; ***p<.001 N=432				
	Pseudo R^2=.0778		Pseudo R^2=.0843	

Prenatal Care

In Tables 6-8 the dependent variable is whether or not the mother sought prenatal care in the first trimester of her pregnancy. Model 1 measures pregnancy intention in the conventional manner whereas Model 2 considers degree of mistiming being predictive of prenatal care acquisition in the first trimester. In Model 1, unwanted pregnancies (OR=.54) and mistimed pregnancies (OR=.64) have significantly reduced odds of first trimester

Table 6
Logistic Regression Predicting Prenatal Care Sought in First Trimester

	Model 1 Conventional Intention		Model 2 Degree of Mistiming		Model 3 Pregnancy Happiness	
Predictor	Odds Ratio	S.E.	Odds Ratio	S.E.	Odds Ratio	S.E.
Intention (ref=intended)						
Mistimed	.64*	0.13				
≤24 *Months Too Soon*			0.94	0.25		
≤24 Months Too Soon & Happy					0.91	0.26
≤24 Months Too Soon & Unhappy					1.06	0.58
>*24 Months Too Soon*			.38***	0.09		
>24 Months Too Soon & Happy					.40***	0.11
>24 Months Too Soon & Unhappy					.33***	0.12
Unwanted	.54**	0.11	.52**	0.11		
Unwanted & Happy					.49**	0.13
Unwanted & Unhappy					.56*	0.15
Married	1.80**	0.36	1.74**	0.35	1.75**	0.35
Age at Conception	1.07***	0.02	1.07***	0.02	1.07***	0.02
# of Pregnancies (ref=1)						
2nd or 3rd Pregnancy	0.74	0.15	0.71	0.14	0.71	0.14
≥4th Pregnancy	.49**	0.12	.46**	0.12	.46**	0.12
≥150% Poverty Line	1.09	0.19	1.07	0.19	1.07	0.19
Education (ref <HS)						
<College Completion	1.54*	0.29	1.54*	0.28	1.53*	0.28
≥College Completion	2.28*	0.83	2.22*	0.81	2.21*	0.81
Race/Ethnicity (ref=white)						
Hispanic	0.89	0.18	0.87	0.18	0.87	0.18
Black	0.94	0.20	0.97	0.21	0.96	0.21
Other	0.74	0.28	0.71	0.26	0.71	0.27
Note: *p<.05; **p<.01; ***p<.001						
N=1767						
	Pseudo R^2=.0928		Pseudo R^2=.1015		Pseudo R^2=.1018	
			Likelihood Ratio Test: (Model1&Model 2)		Likelihood Ratio Test: (Model 2 & Model 3)	
			Chi^2=10.59		Chi^2=.45	
			p-value=.0011**		p-value=.9307	

prenatal care when compared to conventionally defined intended pregnancies. Previous research supports this finding but these results, as with the smoking cessation results, do not prove that there is not a comprehensive and more predictive pregnancy intention status that could be derived from multiple dimensions, rather than timing alone.

Model 2 investigates whether moderately and severely mistimed pregnancies differ significantly from intended pregnancies in terms of first trimester prenatal care.

Model 8 provides evidence that moderately mistimed pregnancies do not differ significantly from intended pregnancies whereas severely mistimed pregnancies are significantly different from intended pregnancies at the .001 alpha level in odds of first trimester prenatal care. Mothers experiencing moderately mistimed pregnancies are only 6 percent less likely than intended mothers to acquire prenatal care in the first trimester compared to mothers experiencing severely mistimed pregnancies who are 62 percent less likely to receive prenatal care in the first trimester. Model 2 was found to significantly improve the explanatory power of Model 1 at the .01 alpha level using a likelihood ratio test. Because significant differences between moderately and severely mistimed pregnancies were found, the remainder of the models predicting prenatal care in the first trimester will continue to make the distinction between moderately and severely mistimed pregnancies.

Model 3 examines the interaction between conventional intention status and happiness to be pregnant. Mistimed pregnancies, no matter the woman's happiness to be pregnant, do not differ significantly from intended pregnancies, whereas unwanted pregnancies have significantly lower odds of prenatal care in the first trimester. The difference between unwanted and unhappy compared to unwanted and happy pregnancies is not significant. These results are not supportive of the hypothesis that pregnancies where the mother is unhappy will be less likely to receive prenatal care regardless of the intention status. However, because the same significant difference is found between severely and moderately mistimed pregnancies, there is continued support that these categories are distinct and significantly different in predicting prenatal care acquisition in the first trimester.

Models 1, 2, and 3 also show that 4th and higher order pregnancies have significantly lower odds of prenatal care in the first trimester than first, second or third pregnancies. Marriage, age at conception, and higher educational attainment is also associated with significantly greater odds of prenatal care in the first trimester when intention status is controlled for. Additionally, when conventional intention status is controlled, minorities and those living at or below 150 percent of the federal poverty line do not have significantly lower odds of prenatal care. This result, in particular, points to intention status, no matter how it is measured, as being more predictive of prenatal care in the first trimester regardless of race or income level.

Table 7
Logistic Regression Predicting Prenatal Care Sought in First Trimester

	Model 4 Intended & Unintended		Model 5 Mother and Father's Intentions	
Predictor	Odds Ratio	S.E.	Odds Ratio	S.E.
Intention Status:				
Unintended	.59**	0.10		
Mother and Father's Intention Status				
(ref=Mother and Father Intended)				
Mother Intended & Father Unintended			0.91	0.28
Mother Unintended & Father Intended			1.00	0.18
Mother Unintended & Father Unintended			.59**	0.11
Married	1.80**	0.36	1.82**	0.36
Age at Conception	1.07**	0.02	1.08***	0.02
# of Pregnancies (ref=1)				
2nd or 3rd Pregnancy	0.73	0.14	0.73	0.15
≥4th Pregnancy	.47**	0.12	.47**	0.12
≥150% Poverty Line	1.08	0.19	1.07	0.18
Education (ref<HS)				
<College Completion	1.54*	0.28	1.55*	0.29
≥College Completion	2.28*	0.83	2.31*	0.84
Race/Ethnicity (ref=white)				
Hispanic	0.88	0.18	0.86	0.17
Black	0.92	0.20	0.87	0.19
Other	0.73	0.27	0.75	0.28
Note: *p<.05; **p<.01; ***p<.001				
n=1767	Pseudo R^2=.1015		Pseudo R^2=.11	

Table 7 shows the logistic regression results for Models 4 and 5. In Model 4, intention status is defined dichotomously as either intended or unintended (mistimed or unwanted). Model 5 allows us to compare whether consideration of the father's intention status increases predictive power of the model. In Model 4, unintended pregnancies (OR=.59) have significantly lower odds of prenatal care in the first trimester compared to intended pregnancies. However, Model 5 finds that only pregnancies in which the pregnancy was unintended for both the mother and father (OR= .59) have significantly lower odds of prenatal care than pregnancies in which both parents intended the pregnancy. These results lend partial support to the Korenman dose-response hypothesis.

Table 8 compares the results of Model 2, Conventional Intention Status with Degree of Mistiming Considered, and Model 6 which utilizes a multidimensional index of desire to have a child which includes how much the woman wanted the pregnancy, how hard she was trying to avoid the pregnancy, whether she wanted to have a child with her partner, and how happy she was to be pregnant. When the desire scale is included, unwanted pregnancies are no longer significantly different from intended pregnancies and mistimed pregnancies occurring 24 months or less too soon remain statistically insignificant. When desire is controlled for, unwanted pregnancies predicted odds ratio is 96 percent and not significantly different from intended pregnancies suggesting that desire is a better predictor of prenatal care in the first trimester. Additionally, the odds ratios for mistimed pregnancies occurring 24 months or more too soon increase from 62 percent less likely to receive prenatal care to only 42 percent less likely when desire is considered. . This suggests that the nuanced intention status suggested by Santelli and

Table 8
Logistic Regression Predicting Prenatal Care Sought in First Trimester

	Model 2 Degree Mistimed		Model 6 Desire Scale	
Predictor	Odds Ratio	S.E.	Odds Ratio	S.E.
Desire Scale (.3-3.81)			1.43***	0.16
Intention (ref=intended)				
Mistimed				
≤24 Months Too Soon	0.94	0.25	1.29	
>24 Months Too Soon	.38***	0.09	.57*	0.16
Unwanted	.52**	0.11	0.96	0.27
Married	1.74**	0.35	1.56*	0.32
Age at Conception	1.07***	0.00	1.07***	0.02
# of Pregnancies (ref=1)				
2nd or 3rd Pregnancy	0.71	0.14	0.71	0.15
≥4th Pregnancy	.46**	0.12	.46**	0.12
≥150% Poverty Line	1.07	0.19	1.12	0.20
Education (ref<HS)				
<College Completion	1.54*	0.28	1.56*	0.29
≥College Completion	2.22	0.81	2.11*	0.78
Race/Ethnicity (ref=white)				
Hispanic	0.87	0.18	0.79	0.16
Black	0.97	0.21	0.96	0.21
Other	0.71	0.26	0.70	0.26
Note: *p<.05; **p<.01; ***p<.001				
n=1767	Pseudo R^2=.1015		Pseudo R^2=.11	

colleagues is more accurate at predicting prenatal care in the first trimester than the conventional trichotomy of intended, mistimed, and unwanted pregnancies. Furthermore, the amount of variance explained in Model 6 is greater than in Model 2, suggesting an improvement in explanatory power, although this difference cannot be tested using a likelihood ratio test because the models are not nested.

VI. Conclusion and Discussion

The results from this study lend support to researchers that suggest timing is not the only relevant dimension determining pregnancy intention as it relates to maternal health behaviors Considering multiple dimensions of pregnancy intention as predictors of positive maternal health behaviors is supported both theoretically and empirically as a result of this study.

Specifically, the conventional trichotomous measure of pregnancy intention is not a particularly bad predictor of prenatal care in the first trimester. However, further analysis reveals that more nuanced intention status can highlight with greater accuracy groups that have significantly lower odds of both smoking cessation and prenatal care in the first trimester.

We do find significant support for degree of mistiming being important to the likelihood of prenatal care in the first trimester as suggested by Pulley and Klerman (2002). We find little support for the hypothesis that intention status and happiness to be pregnant is a better predictor of maternal health behaviors than intention status alone. Korenman's dose response theory is partially supported by these results. It does seem that pregnancies where both the mother and father did not intend the pregnancy have lower odds of prenatal care in the first trimester. However, the limited significant findings make this difficult to interpret. We also find that the desire scale which comprises multiple dimensions of suggested pregnancy intentionality is significantly different from conventional intention status and an improved predictor of both smoking cessation and first trimester prenatal care.

Additionally, we find in this analysis different predictors affecting odds of prenatal care and smoking cessation. For instance, when intention is controlled for, age,

marital status and high parity are significant predictors of prenatal care within the first trimester. However, multiparity, poverty level, and race are significant predictors of smoking cessation. Educational attainment is the only consistent significant predictor of both smoking cessation and prenatal care in the first trimester. These relationships need to be investigated further to better understand these differences when intention is controlled for. Further consideration needs to more clearly specify mediating variables in predicting prenatal care and smoking cessation.

Limitations

This research is limited in a number of ways. Primarily, small sample size- especially for smoking cessation- makes substantive and meaningful analysis difficult. We are also limited by common critiques of research of this sort, namely the retrospective reports of pregnancy intention and the still limited algorithm of questions that create the desire scale. However, since all pregnancies occurred within 3 years of the interview, this sample may be less affected by respondent memory lapses which might be more common in full life course retrospectives.

The desire scale used in this analysis is modeled after Santelli's scale which was used to predict abortion ratios. It is important, however, to not treat this desire scale as the best or only way to consider pregnancy intention in a multidimensional manner. Its main function is to demonstrate the improvement that is possible when a multidimensional scale is used opposed to the traditional trichotomy which relies only on timing and ultimate known fertility desires. Further research is necessary to more systematically establish the dimensions and the theoretical weights they are associated with in the minds of the individuals being asked to assess the intendedness of their

pregnancy. Additionally, these dimensions may be weighted differently dependent on race, age, marital status or other demographic or socioeconomic considerations. Furthermore, the Santelli model gives equal weight to attitudinal and cognitive factors and only acknowledges four dimensions. Other dimensions such as behavioral factors including contraceptive use could potentially be important.

Future Research

In the future, we would like to expand on this research by considering other scales of intention and isolating which dimensions of pregnancy intention are most closely associated with prenatal care choices. Additionally, we would like to consider whether the improved intention measurement differentially affects certain age, minorities, income or educationally distinct groups, but current samples sizes do not support this level of analysis.

We would also like to consider happiness to be pregnant as more than a dichotomous variable. It is possible that very unhappy and very happy are distinct from those in the middle in predicting maternal health behaviors. In this research, we were limited by the small sample size when intentionality and happiness were interacted. However, we may find that even with an overall larger sample size it is simply the case, for example, that conventional intention status is a proxy for happiness to be pregnant and most women experiencing unintended pregnancies are truly unhappy.

We would also like to find a dataset with a larger sample of initial smokers to more completely understand the relationship between pregnancy intention and smoking cessation. It is difficult with such a small sample size to make definitive conclusions of any kind.

We will also be reevaluating these models utilizing the 2009 NSFG which will be released in late 2009. This dataset will likely include a larger sample size for consideration and hopefully will further unravel what true intentionality status means with an even more detailed set of questions related to intention status than those available in the 2002 dataset.

Works Cited

Alexander, Greg R., Milton Kotelchuck. 1996. “Quantifying the Adequacy of Prenatal Care: A Comparison of Indices.” *Public Health Reports* 111:408-418.

Altfeld, Susan, Arden Handler, Dee Burton and Beatrice Berman. 1997. "Wantedness of Pregnancy and Prenatal Health Behaviors." *Women & Health* 26(4):29-43.

Bachrach, Christine A., Susan Newcomer. 1999. "Intended Pregnancies and Unintended Pregnancies: Distinct Categories or Opposite Ends of a Continuum?" *Family Planning Perspectives* 31(5):251.

Barrett, Geraldine Kaye Wellings. 2002. “What is a ‘planned’ pregnancy? Empirical Data from a British Study.” *Social Science and Medicine* 55:545-557.

Baydar, Nazli. 1995. "Consequences for Children of Their Birth Planning Status." *Family Planning Perspectives* 27(6):228-245.

Blake, Susan M., Michelle Kiely, Charlotte Gard, Ayman El-Mohandes and M. N. El-Khorazaty. 2007. "Pregnancy Intentions and Happiness Among Pregnant Black Women At High Risk for Adverse Infant Health Outcomes." *Perspectives on Sexual and Reproductive Health* 39(4):194-205.

Brown, Sarah S., Leon Eisenberg, eds. 1995. The Best Intentions: Unintended Pregnancy and Well-Being of Children and Families. Washington DC, National Academy Press.

Campbell, Arthur A. and William D. Mosher. 2000. "A History of the Measurement of Unintended Pregnancies and Births." *Maternal and Child Health Journal* 4(3):163.

Chomitz, Virginia R., Lilian W. Cheung and Ellice Lieberman. 1995. "The Role of Lifestyle in Preventing Low Birth Weight." *The Future of Children* 5(1):121-138.

D'Angelo, Denise, Brenda C. Gilbert, Roger W. Rochat, John S. Santelli and Joan M. Harold. 2004. "Differences Between Mistimed and Unwanted Pregnancies Among Women Who Have Live Birhts." *Perspectives on Sexual and Reproductive Health* 36(5):192-197.

Finer, L.B. and S.K. Henshaw. 2006. "Disparities in rates of unintended pregnancy in the United States, 1994 and 2001." *Perspectives on Sexual and Reproductive Health* 38(2):90-96.

Fischer, Rachel C., Joseph B. Stanford, Penny Jameson and M. J. DeWitt. 1999. "Exploring the Concepts of Intended, Planned, and Wanted Pregnancy." *The Journal of Family Practice* 48(2):117.

Floyd, R. Louise, Barbara K. Rimer, Gary A. Giovino, Patricia D. Mullen and Susan E. Sullivan. 1993. "A Review of Smoking in Pregnancy: Effects on Pregnancy Outcomes and Cessation Efforts." *Annual Review of Public Health*14:379-411.

Gipson, Jessica D., Michael A. Koenig and Michelle J. Hindin. 2008. "The Effects of Unintended Pregnancy on Infant Child and Parental Health: A Review of the Literature." *Studies on Family Planning* 39(1):18-38.

Joyce, Ted, Robert Kaestner and Sanders Korenman. 2000. "The Stability of Pregnancy Intentions and Pregnancy-Related Maternal Behaviors." *Maternal and Child Health Journal* 4(3):171.

Joyce, Theodore J. and Michael Grossman. 1990. "Pregnancy Wantedness and the Early Initiation of Prenatal Care." *Demography* 27(1):1-17.

Kahn, Robert S., Laura Certain and Robert C. Whitaker. 2002. "A Reexamination of Smoking Before, During, and After Pregnancy." *American Journal of Public Health* 92(11):1801-1808.

Kaufman, Rachel B., Leo Morris and Alison Spitz.1997. "Comparison of Two Question Sequences for Assessing Pregnancy Intentions." *American Journal of Epidemiology* 145(9):810-816

Kendall, Carl, Aimee Afable-Munsuz, Ilene Speizer, Alexis Avery, Norine Schmidt and John Santelli. 2005. "Understanding Pregnancy in a Population of Inner-City Women in New Orleans-Results of Qualitative Research." *Social Science and Medicine* 60:297-311.

Klerman, Lorraine. 2000. "The Intendedness of Pregnancy: A Concept in Transition." *Maternal and Child Health Journal* 4(3):155.

Kogan, Michael D., Joyce A. Matlin and Greg R. Alexander. 1994. "Relation of the Content of Prenatal Care to the Risk of Low Birth Weight: Maternal Reports of

Health Behavior Advice and Initial Prenatal Care Procedures." *The Journal of the American Medical Association* 271(17):1340-1345.

Korenman, Sanders, Robert Kaestner and Ted Joyce. 2002. "Consequences for Infants of Parental Disagreement in Pregnancy Intention." *Perspectives on Sexual and Reproductive Health* 34(4):198-205.

Kost, Kathryn, David L. Landry and Jacqueline E. Darroch. 1998. "Predicting Maternal Behavior During Pregnancy: Does Intention Status Matter?" *Family Planning Perspectives* 30(2):79-88.

Luker, Kristin. 1999. "A Reminder that Human Behavior Frequently Refuses To Conform To Models Created By Researchers." *Family Planning Perspectives* 31(5):248.

Marsiglio, William and Frank L. Mott. 1988. "Does Wanting to Become Pregnant with a First Child Affect Subsequent Maternal Behaviors and Infant Birth Weight?" *Journal of Marriage and Family* 50(4):1023-1036.

Martin, Laurie T., Michelle J. McNamara, Alyssa S. Milot, Tamara Halle, and Elizabeth C. Hair. 2007. "The Effects of Father Involvement during Pregnancy on Receipt of Prenatal Care and Maternal Smoking." *Maternal and Child Health Journal* 11: 595-602

McCormick, M. C., J. Brooks-Gunn, T. Shorter, C. Y. Wallace, J. H. Holmes and M. C. Heagarty. 1987. "The Planning of Pregnancy Among Low-Income Women in Central Harlem." *American Journal of Obstetrics and Gynecology* 156(1):145-149.

Pulley, LeaVonne, Lorraine V. Klerman, Hao Tang and Beth A. Baker. 2002. "The Extent of Pregnancy Mistiming and Its Association with Maternal Characteristics and Behaviors and Pregnancy Outcomes." *Perspectives on Sexual and Reproductive Health* 34(4):206-211.

Sable, Marjorie R. and M. K. Libbus. 2000. "Pregnancy Intention and Pregnancy Happiness: Are They Different." *Maternal and Child Health Journal* 4(3):191-195.

Santelli, John. Roger Rochat et al. 2004. "The Measurement and Meaning of Unintended Pregnancy." *Perspectives on Sexual and Reproductive Health* 35(2):94-101.

Santelli, John, Ilene S. Speizer, Alexis Avery, Carl Kendall. 2006. "An Exploration of the Dimensions of Pregnancy Intentions Among Women Choosing to Terminate Pregnancy or to Initiate Prenatal Care in New Orleans, Louisiana." *American Journal of Public Health* 96(11): 2009-2015.

Santelli, John, Laura D. Lindberg, Mark G. Orr, and Lawrence P. Finer. 2009. "Toward a Multidimensional Measure of Pregnancy Intentions: Evidence from the United States." *Studies in Family Planning* 40(2): 87-100.

Stanford, Joseph B., Rachel Hobbs, Penny Jameson, M. J. DeWitt and Rachel C. Fischer. 2000. "Defining Dimensions of Pregnancy Intendedness." *Maternal and Child Health Journal* 4(3):183.

Than, Lara C., Margaret A. Honein, Margaret L. Watkins, Paula Yoon, Katherine Daniel and A. A. Correa. 2005. "Intent to Become Pregnant as a Predictor of Exposures During Pregnancy: Is Ther A Realtion?" *Journal of Reproductive Medicine* 50(6):389-396.

Trussell, James, Barbara Vaughan and Joseph Stanford. 1999. "Are All Contraceptive Failures Unintended Pregnancies? Evidence from the 1995 National Survey of Family Growth." *Family Planning Perspectives* 31(5):246-270.

Weller, Robert H., Isaac W. Eberstein and Mohamed Bailey. 1987. "Pregnancy Wantedness and Maternal Behavior During Pregnancy." *Demography* 24(3):407-412.

Appendix A
Descriptive Statistics For Smoking Cessation Models

Predictor	Mean	S.D.
Quit After Learning of Pregnancy	0.89	0.31
Intended	0.56	0.50
Mistimed	0.21	0.41
≤24 *Months Too Soon*	0.10	0.30
>24 Months Too Soon	0.11	0.31
Mistimed & Happy	0.14	0.35
Mistimed & Unhappy	0.07	0.26
Unwanted	0.23	0.42
Unwanted & Happy	0.10	0.30
Unwanted & Unhappy	0.13	0.34
Married	0.31	0.47
Age at Conception	25.18	5.96
# of Pregnancies (ref=1)		
1st Pregnancy	0.28	0.45
2nd or 3rd Pregnancy	0.46	0.50
≥4th Pregnancy	0.26	0.44
≥150% Poverty Line	0.53	0.50
Education		
Less than HS	0.26	0.44
<College Completion	0.66	0.48
≥College Completion	0.08	0.27
Race/Ethnicity		
White	0.66	0.47
Hispanic	0.13	0.33
Black	0.18	0.38
Other	0.04	0.19