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## Is a Previous Unplanned Pregnancy a Risk Factor for a Subsequent Unplanned Pregnancy?

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### Abstract

**Objective**—To determine whether a history of unplanned pregnancy was a risk factor for a subsequent unplanned pregnancy.

**Study Design**—We analyzed 542 women aged 14 to 35, enrolled in Project PROTECT, a randomized clinical trial to promote dual method contraception use to prevent sexually transmitted diseases and unplanned pregnancy. Predictors of unplanned pregnancy were assessed by comparing women with and without a history of unplanned pregnancy.

**Results**—More than one in five women (22.5%) experienced an unintended pregnancy. History of an unintended pregnancy was a predictor of unintended pregnancy (adjusted odds ratio (OR) 1.91, 95% CI 1.09–3.34). Other factors that were significantly associated with unplanned pregnancy included: young age (<20 years), low educational status, and >2 sexual partners within the last month.

**Conclusions**—Future efforts should focus on bridging the gap between identifying risk factors for unplanned pregnancy and interventions aimed at reducing the incidence in high-risk groups.

### Keywords

unintended pregnancy; risk factors; contraception

## INTRODUCTION

Unintended pregnancy remains a serious public health concern in the United States, accounting for 49% of all pregnancies (excluding miscarriages) and 44% of pregnancies resulting in a live

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birth. (2) The repercussions of unintended pregnancies are extensive, raising a spectrum of concerns that range from economics to the social, psychological, and physical consequences impinged upon maternal and child health. Based on data from the 2002 National Survey of Family Growth, the direct medical cost of unintended pregnancies for the United States alone was estimated at \$5 billion.(3) Also of concern is the influence an unplanned pregnancy can have on a woman's state of health, especially her behavior during pregnancy and subsequent care of the newborn.(4) Women who report an unintended pregnancy are not only at an increased risk of experiencing physical violence by their husband or partner,(5) but many women, especially those in developing countries, are subjected to unsafe abortions. Such factors significantly contribute to high rates of maternal morbidity and mortality.(6) Women experiencing unintended pregnancies often do not initiate early prenatal care(7) and are more likely to engage in unhealthy behaviors such as binge drinking,(8) smoking, illicit drug use, and lack of vitamin intake during their first trimester of pregnancy.(9) Consequently, birth outcomes for unplanned pregnancies place the newborn at an increased risk for premature birth, low birth weight, infant abuse and neonatal death.(10–12)

Key to alleviating these health concerns is the need to reduce the incidence of unplanned pregnancies. Before interventions can be designed and tested, it is critical to identify specific demographic and historical risk factors. According to the National Survey of Family Growth, disparities in rates of unintended pregnancy in the United States are attributed to young age (18–24 years old), unmarried marital status, low income, low educational level (did not complete high school), and minority (particularly Black and Hispanic) race/ethnicity. (2) Smaller population-based studies have reproduced these results and identified additional risk factors related to unplanned pregnancy. Risk factors include no insurance, no primary care provider, using contraception sometimes or never, drug use, alcohol consumption, cigarette smoking, and involvement with a partner who had not wanted the pregnancy.(2,13–15) Such findings not only warrant clinical attention, but they also raise the need to further evaluate the potential for colinearity or correlation among these factors.

Despite our growing knowledge of demographic risk factors of unintended pregnancy, few studies have specifically addressed the relationship between history of an unplanned pregnancy and subsequent unintended pregnancy. At best, studies have reported data on parity and shown that women with an unintended pregnancy have more children than those with a planned pregnancy. (16,17) Further clarification about the intendedness of these pregnancies was not included in their investigation. Interestingly, an epidemiological study conducted in Yamagata, Japan (18) found that the number of previous unplanned pregnancies was significantly correlated with the number of pregnancies, live births, and abortions among women aged 35–49. Of particular interest was their report that 40% of Japanese women who experienced an unplanned pregnancy had repeated experiences.

Furthermore, most studies of unplanned pregnancies are retrospective, cross-sectional analyses. Such methodological design is subject to data recall bias as well as inability to establish temporal sequence. These issues merit further investigation of additional risk factors that carry predictive value for a subsequent unplanned pregnancy. Few prospective investigations have been performed to evaluate risk factors for incident unplanned pregnancies.

The specific aim of this report is to further elucidate risk factors for incident unplanned pregnancy by performing an analysis among women aged 14–35. Our hypothesis is that a previous unplanned pregnancy is a risk factor for a subsequent unplanned pregnancy, even when other demographic and historical factors are controlled for in the analysis.

## MATERIALS AND METHODS

Data for this study is derived from Project PROTECT, a multicenter, randomized clinical trial funded by the National Institute of Child Health and Human Development to encourage the use of dual contraceptive methods for STD and unplanned pregnancy prevention. Prior to the initiation of the study, all procedures were reviewed and approved by the Institutional Review Board. A complete and detailed report of the methods of Project PROTECT is described elsewhere; (1) a summary of these methods is provided below. The two arms of Project PROTECT included an individualized intervention and a control arm. The individualized intervention arm received a computer-assisted, stage-tailored contraceptive feedback based on the Transtheoretical Model of Behavior Change. The control arm received a computer-assisted, no-tailored information regarding the use of contraceptive methods. The primary outcomes of Project PROTECT were self-reported behavioral use of dual methods of contraception as well as biological endpoints such as unintended pregnancy or incident or recurrent STD. Since the intervention was not found to be associated with incident unplanned pregnancy, as reported in the primary outcomes paper, (19) we combined both arms to assess risk factors for unplanned pregnancy. Furthermore, in keeping with the objective of our secondary analysis, we included the intervention group in our logistic regression model in order to accurately assess whether it had confounding effects on the relationship between history of an unplanned pregnancy and subsequent unplanned pregnancies. Specifically, were we able to adjust for subtle differences in sexual risk variables between groups that remained despite proper randomization at the start of Project PROTECT.

Screening and enrollment of women for Project PROTECT began in October 1999 and continued until October 7, 2003. Women were recruited from primary care, gynecology and family planning clinics at 3 locations: Women and Infants Hospital in Providence, Pawtucket Memorial Hospital, and Planned Parenthood of Rhode Island. Recruitment was also achieved through high schools, colleges, and advertisements in newspapers and on local cable and radio stations.

Subjects recruited for this trial were eligible if they were English speaking, aged 13 to 35 and competent to give informed consent. Eligibility for subjects under 18 years of age was contingent upon receipt of parental consent and minor assent. Women were included if they were sexually active with a male partner in the past 6 months and specifically expressed the desire to avoid pregnancy for 24 months after initiation of the study. All women between 13 and 25 years of age were eligible, as age is a known risk factor for sexually transmitted infections. Women 26–35 years old were eligible if they had a factor felt to place them at high risk for STDs or unplanned pregnancy (e.g. history of STDs, inconsistent use of contraception, substance abuse, etc.). Women were excluded from participation if they were consistently using dual methods of contraception. Project PROTECT screened 1,112 women for eligibility and recruited 542 women into the randomized clinical trial.

At the time of the initial visit, each subject completed a self-administered survey. Questions assessed demographic information (e.g. age, marital status, educational level, employment, insurance coverage, and race/ethnicity), history of unplanned pregnancy, number of sexual partners, history of STDs, current contraceptive use, and plans for future contraceptive use. All enrolled subjects also had a physical examination, laboratory testing for STDs, and a pregnancy test prior to enrollment.

Participants were followed over a 2-year period for incident STDs and unplanned pregnancy. Subjects were interviewed by phone at 6 and 18 months, and seen for a study visit at 12 and 24 months. Information extracted from the baseline and follow-up questionnaires were used to assess whether a previous unplanned pregnancy (primary exposure) is a risk factor for a

subsequent unplanned pregnancy (primary outcome of this analysis). History of an unintended pregnancy at baseline was defined by a positive answer to the following question: “Have you ever had an unplanned pregnancy?” Response options were “yes” or “no”. An incident unplanned pregnancy was defined as a positive pregnancy test at a study visit or a patient report of a pregnancy that could be verified with medical records review and documentation. Each incident unplanned pregnancy was confirmed at the time it was reported by asking the participant whether her desire to become pregnant had changed since enrollment into Project PROTECT.

We evaluated a number of potential covariates as confounders. They included demographic characteristics (age, race/ethnicity, education and household income), lifestyle factors (stress and coping scores, substance use in past year, smoking, and alcohol/substance use before sex) and reproductive history (gravidity, parity, number of lifetime sexual partners, number sexual partners in past month, hormonal contraceptive use, condom use, and history of abortion). Psychological status in the past month was measured using the Rhode Island Stress and Coping Inventory.<sup>(20)</sup> Intervention arm (individualized vs. enhanced standard of care) was also evaluated as a potential confounder and we included intervention arm in the logistic model.

Bivariate analyses evaluated the association between demographic, personal behaviors and reproductive history, and incident unplanned pregnancy using t-tests (continuous data), chi-square tests (categorical data) and Fisher’s exact tests where appropriate. We evaluated for the presence of strong correlations between variables to evaluate for potential multicollinearity. More specifically, we conducted correlation analyses and examined beta estimates with the addition of a second covariate for the variables education and income and history of pregnancy and abortion. Given the information obtained from these analyses, history of abortion and gravidity were excluded from the final adjusted model. Estimates of odds ratios (OR) and corresponding 95% confidence intervals (CI) were derived from logistic regression models where the dependent variable was incident unplanned pregnancy. The final logistic regression model adjusted for age, race/ethnicity, education, household income, number of sexual partners in the past month, hormonal contraceptive use at baseline, coping score, and intervention group. Model fit for the adjusted analysis was good (c-statistic = 0.75). Because the odds ratio may result in biased estimates of the relative risk in the case of common outcomes (> 10%),<sup>(21)</sup> we also estimated the relative risk using Poisson regression with robust error variance.<sup>(22)</sup> These analyses confirmed the conclusions from the logistic regression analyses. All statistical analyses were completed using SAS (v 9.1, SAS Institute, Cary, NC).

## RESULTS

During the study period, 542 women were enrolled in the study, of which 122 (22.5%) experienced an unplanned pregnancy during the 2 year follow-up. Table 1 summarizes the demographic and health behaviors of the study sample. Ages ranged from 14–35 years old, with a median value of 21, and 50% of our sample population between 20 and 24 years old. Age was inversely associated with an unplanned pregnancy ( $p=0.01$ ). Women younger than 20 years old were at greatest risk for an unplanned pregnancy (28%), followed by women aged 20–24 years old (23%), and those older than 24 years old (12%).

Our study sample represented a diverse population. Forty-five percent of the population was white, 26% was African American, and 17% was Hispanic. The rate of unintended pregnancy was highest among African American women (30%) compared to 24% of Hispanic and 17% of white women ( $p = 0.03$ ).

Low educational status was significantly associated with an increased risk of unplanned pregnancy at the 24-month follow up. As the level of education increased, the likelihood of an

unplanned pregnancy decreased. Thirty-two percent of women with less than a high school education experienced an unplanned pregnancy compared to 12% with a post high school education ( $p < 0.0001$ ).

History of an unplanned pregnancy was also associated with incidence of an unplanned pregnancy. Of those women who reported a previous unintended pregnancy, 27% experienced a subsequent unplanned pregnancy ( $p=0.01$ ) compared to 17% of those women without a positive history. Other significant risk factors for unintended pregnancy by chi-square tests were low yearly household income, the number of sexual partners within the past month, hormonal contraceptive use, history of an abortion, and coping skills. Factors that were not associated with an unintended pregnancy included the following: the number of lifetime sexual partners, substance use in the past year, partner's willingness to use condoms, the number of times sex occurred after drinking alcohol within the past month, physical abuse in the past year and stress score.

Crude and adjusted results of the logistic regression model are shown in Table 2 (Table). Factors included in the model were age, race/ethnicity, education status, annual household income, parity, number of sexual partners within the past month, hormonal contraception, coping score, and intervention group. In our adjusted regression model, history of an unplanned pregnancy had a significant effect on the incidence of unplanned pregnancy (OR 1.91, 95% confidence interval [CI] 1.09 to 3.34). This result was relatively unchanged from the calculated crude odds ratio. The significant relationships for young age and low education status still held true in the adjusted multivariable regression model. Age was the strongest predictor of unintended pregnancy, revealing that women younger than 20 years of age were more than 3 times more likely than women aged  $\geq 24$  years to have an unintended pregnancy (OR 3.50, 95% CI 1.48–8.30). Also, women with less than a high school education had an approximately 3-fold increased risk for an unplanned pregnancy compared to women who achieved higher than a high school education. Compared to women having one sexual partner, participants with  $\geq 2$  sexual partners within the past month was significantly associated in the crude analysis, but not in the adjusted model (OR 1.69, 95% CI 0.94–3.03). Other factors that did not reach statistical significance after adjusting for potential confounders were race/ethnicity, annual household income, parity, hormonal contraception at baseline, coping score and intervention group.

## COMMENT

In our study of women aged 14 to 35, who were at risk for unplanned pregnancy, 23% had an incident unplanned pregnancy over the 2 year study period. We found that history of an unplanned pregnancy was a statistically significant risk factor for a subsequent unplanned pregnancy, nearly doubling the odds of a future pregnancy. Other factors that positively associated with unintended pregnancy included young age and low educational attainment; all of which are consistent with other studies.(2,13–15)

Results from our study also revealed that the apparent association between race/ethnicity and incident unplanned pregnancy was no longer statistically significant after adjusting for confounding factors such as education and income. This finding parallels that of previous research conducted among poor women in New York City.(13) A lack of racial/ethnic diversity was cited as a limitation in their study. Despite having an adequately diverse population, our study population excluded non-English speaking women. While this shortcoming may limit the applicability of our results, we recognize that race/ethnicity has a historical association with low socioeconomic status and educational level. Therefore our results may alternatively suggest that education is a more significant risk factor for unplanned pregnancy than race/ethnicity.

Unexpectedly, socioeconomic status, measured by annual household income, did not reach statistical significance after controlling for potential confounders. However, the reliability of this specific measure in our dataset is limited, as adolescents and young adults are often not fully aware of their annual household income and therefore may estimate this value. Other limitations of our study were due to the constraints of a secondary analysis. We were unable to obtain information about depression or specify the number of previous unplanned pregnancies. Also, distinguishing unintendedness as mistimed versus unwanted was not possible within our dataset. Lastly, our study may have been underpowered to detect certain associations, such as the number of recent sexual partners and unintended pregnancy.

The major strengths of this analysis are its prospective design and adequate sample size. Much of the current literature on unintended pregnancy is limited to retrospective or cross-sectional analyses. Project PROTECT was adequately powered and included 542 women, all who expressed a desire to avoid pregnancy 24 months after randomization. Therefore, we were able to minimize recall bias as well as contribute statistically significant data that carry predictive value for a subsequent unplanned pregnancy.

A nationally representative telephone survey of 2,002 adults indicated that virtually 90% believe that unplanned pregnancy is a serious problem.(23) However, there still remains an inconsistency between this public perception and contraceptive use among women at risk for unplanned pregnancy. A survey conducted in California found that 49% of women aged 18–44, were considered at risk of unintended pregnancy and 9% of this population was engaging in unprotected sex. When asked their main reason for not using any method of contraception, one third of the women stated that they did not consider themselves to be at risk.(14) Other studies have confirmed this finding(24) and reported other reasons for contraceptive nonuse leading to unintended pregnancy. These reasons included problems gaining access to contraception and subsequent discontinuation, fear of parents finding out about sexual activity, and ambivalence about contraception. Appropriately identifying women at risk for an unintended pregnancy is an initial step toward reducing the incidence of such unintended events. Future studies are necessary to bridge the gap between identifying risk factors and reducing the incidence of unplanned pregnancy. Efforts should focus on improving patient awareness of the associated risk factors, ensuring access to family planning services, promoting effective usage of contraception, and providing appropriate support and resources to a woman should she experience an unintended pregnancy.

## CLINICAL IMPLICATIONS

- Unintended pregnancy remains a serious public health concern in the United States, raising concerns about the social, psychological, and physical consequences impinging upon maternal and child health.
- Inquiring about a woman's history of an unplanned pregnancy is a useful predictor to assess her risk of future unplanned pregnancy.
- There remains a concerning inconsistency between the public perception of unplanned pregnancy as a serious problem and actual practice contraceptive use among women at risk for unplanned pregnancy.
- Ensuring access to family planning services, promoting usage of the most reliable forms of contraception, and providing appropriate support and resources is essential in the effort to prevent unplanned pregnancy.

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**Table 1**

Demographic, reproductive and behavioral characteristics by incident unplanned pregnancy, N=542

	All women N=542	No Incident Unplanned Pregnancy N=420	Incident Unplanned Pregnancy N=122	p-value
<b>Age</b>				
< 20 years	155 (29%)	111 (72%)	44 (28%)	0.01
20 to 24 years	273 (50%)	209 (77%)	64 (23%)	
> 24 years	114 (21%)	100 (88%)	14 (12%)	
<b>Race/Ethnicity</b>				
White, non-Hispanic	243 (45%)	202 (83%)	41 (17%)	0.03
Black, non-Hispanic	141 (26%)	99 (70%)	42 (30%)	
Hispanic	93 (17%)	71 (76%)	22 (24%)	
Other	65 (12%)	48 (74%)	17 (26%)	
<b>Education</b>				
Less than high school	133 (25%)	91 (68%)	42 (32%)	<0.0001
High school/GED	200 (37%)	144 (72%)	56 (28%)	
More than high school	208 (38%)	184 (88%)	24 (12%)	
<b>Annual household income</b>				
\$0 to \$12,999	335 (62%)	246 (73%)	89 (27%)	0.01
\$13,000 to \$39,999	149 (28%)	123 (83%)	26 (17%)	
\$40,000 or more	57 (11%)	50 (88%)	7 (12%)	
<b>History of unplanned pregnancy *</b>				
History of unplanned pregnancy *	263 (49%)	191 (73%)	72 (27%)	0.01
History of abortion	135 (25%)	96 (71%)	39 (29%)	0.04
<b>Gravidity</b>				
Zero	245 (45%)	203 (83%)	42 (17%)	0.02
One	115 (21%)	85 (74%)	30 (26%)	
Two	77 (14%)	52 (68%)	25 (32%)	
Three or more	105 (19%)	80 (76%)	25 (24%)	
<b>Parity</b>				
Zero	330 (61%)	265 (80%)	65 (20%)	0.02
One	105 (19%)	72 (69%)	33 (31%)	
Two	53 (10%)	37 (70%)	16 (30%)	
Three or more	54 (10%)	46 (85%)	8 (15%)	
<b>Number of sexual partners (lifetime)</b>				
1 to 2	70 (13%)	53 (76%)	17 (24%)	0.68
3 to 5	189 (35%)	142 (75%)	47 (25%)	
6 to 10	129 (24%)	101 (78%)	28 (22%)	
11 or more	153 (28%)	123 (80%)	30 (20%)	
<b>Number of sexual partners (past month)</b>				
0	73 (14%)	62 (85%)	11 (15%)	0.02
1	386 (71%)	302 (78%)	84 (22%)	

	All women N=542	No Incident Unplanned Pregnancy N=420	Incident Unplanned Pregnancy N=122	p-value
2 or more	81 (15%)	54 (67%)	27 (33%)	
Current smoker	260 (48%)	200 (77%)	60 (23%)	0.78
Had sex after drinking (past month)				
Never	263 (49%)	207 (79%)	56 (21%)	0.78
1 to 2 times	163 (30%)	125 (77%)	38 (23%)	
3 or more times	115 (21%)	87 (76%)	28 (24%)	
Substance use in past year *	326 (61%)	256 (79%)	70 (21%)	0.55
Physical abuse in past year	101 (19%)	74 (73%)	27 (27%)	0.47
Hormonal contraception at baseline	177 (33%)	146 (82%)	31 (18%)	0.05
Consistent condom use at baseline	116 (21%)	95 (82%)	21 (18%)	0.19
Stress and coping *				
Stress score <i>mean (SD)</i>	15.49 (4.2)	15.47 (4.2)	15.55 (4.2)	0.87
Coping score <i>mean (SD)</i>	16.95 (3.9)	17.15 (4.0)	16.27 (3.7)	0.02

\* Some missing data (<2%). History of unplanned pregnancy missing for 7 respondents. Substance abuse data missing for 5 respondents. Stress missing for 10 respondents. Coping missing for 9 respondents.

**Table 2**

Crude and adjusted odds ratios for incident unplanned pregnancy and selected characteristics

	Crude	Adjusted
History of unplanned pregnancy	1.80 (1.19, 2.73)	1.91 (1.09, 3.34)
Age		
< 20 years	2.83 (1.46, 5.47)	3.50 (1.48, 8.30)
20 to 24 years	2.19 (1.17, 4.09)	3.31 (1.55, 7.06)
> 24 years	--	--
Race/Ethnicity		
White, non-Hispanic	--	--
Black, non-Hispanic	2.09 (1.28, 3.42)	1.55 (0.89, 2.71)
Hispanic	1.53 (0.85, 2.74)	0.96 (0.49, 1.91)
Other	1.75 (0.91, 3.33)	1.28 (0.62, 2.66)
Education		
Less than high school	3.56 (2.03, 6.23)	3.17 (1.57, 6.38)
High school/GED	3.00 (1.77, 5.07)	2.64 (1.45, 4.82)
More than high school	--	--
Annual household income		
\$0 to \$12,999	--	--
\$13,000 to \$39,999	0.59 (0.36, 0.96)	0.81 (0.47, 1.39)
\$40,000 or more	0.39 (0.17, 0.89)	0.53 (0.21, 1.32)
Parity		
Zero	--	--
One	1.87 (1.14, 3.06)	0.93 (0.48, 1.80)
Two	1.76 (0.92, 3.36)	1.19 (0.51, 2.78)
Three or more	0.71 (0.32, 1.58)	0.59 (0.21, 1.69)
Number of sexual partners (past month)		
0	0.64 (0.32, 1.27)	0.52 (0.24, 1.15)
1	--	--
2 or more	1.81 (1.07, 3.05)	1.69 (0.94, 3.03)
Hormonal contraception at baseline	0.63 (0.40, 1.00)	0.69 (0.41, 1.14)
Coping score	0.94 (0.90, 0.99)	0.99 (0.93, 1.05)
Intervention arm	0.95 (0.63, 1.42)	1.10 (0.71, 1.74)