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Assessing Pregnancy Intention and Associated Risks in Pregnant Adolescents

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Abstract Unintended pregnancy and associated behaviors may play a substantial role in the increased risk of adverse maternal and neonatal outcomes associated with teen pregnancy. We evaluate a multi-dimensional measure of pregnancy intention among pregnant adolescents and quantify the association between intention dimensions and adverse outcomes and risk behaviors. Pregnancy intention measures were examined in a cohort of 300 pregnant adolescent women. We considered 18 items assessing elements of pregnancy intention including pregnancy planning, timing, emotional response, and readiness. Latent class analysis was performed to identify dimensions of pregnancy intention. Parsimonious scores were created by minimizing the number of covariates while maintaining substantial agreement with the latent class. Associations between intention measures and prenatal care, risk behaviors, and pregnancy outcomes were quantified using multivariable logistic regression. Two constructs of pregnancy intention were identified: planning and emotional readiness. Compared with emotionally ready adolescents, adolescents categorized as not emotionally ready had an increased odds of inadequate prenatal care (OR = 2.70, 95% CI:1.27–5.72), delayed prenatal care (OR = 2.54, 95% CI:1.27–5.09), and self-reported depression at the time of the first prenatal visit (OR = 2.21, 95% CI:1.03–4.77). Pregnancy planning was not associated with adverse pregnancy risk factors or outcomes. Among pregnant adolescents, emotional readiness for pregnancy and parenting was inversely associated with known risk factors for adverse pregnancy outcomes, suggesting that emotional readiness rather than pregnancy planning may be the more pertinent intention construct for adolescents.

Keywords Adolescent · Pregnancy in adolescence · Pregnancy unplanned · Pregnancy unwanted · Pregnancy intention

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Introduction

Despite a decline in the rates of teen pregnancy from 1991 to 2005, teen birth rates rose in two consecutive years, 2006 and 2007 [1], and the United States continues to rank highest among industrialized countries for births to teen mothers [2–4]. Risks associated with adolescent pregnancy include poor maternal weight gain, preterm birth, pregnancy induced hypertension, low birth weight, and neonatal death [2, 5–8]. Within the population of childbearing adolescents, risks vary by age, with the youngest mothers having the highest risks of preterm delivery and infant mortality [5, 9–12]. Unintended pregnancy, a significant risk factor for adverse maternal and neonatal outcomes [6], may play a substantial role in the increased risks associated with teen pregnancy. Although most teen pregnancies are considered unplanned or unintended [2, 4, 13], the concept of "unintended pregnancy" has been variably defined and quantified [14]. Pregnancy intention is recognized as a multi-dimensional construct including elements of "timing," "planning," "happiness," and "wantedness" [14,

15]; however, prior studies have not assessed risks associated with specific dimensions of intention among adolescents.

In this study, we evaluate multiple constructs of pregnancy intention in a group of pregnant adolescents attending their first prenatal care visit. To strengthen and validate our understanding of these measures, we examine the association between measures of pregnancy intention and demographic, health behavior, and pregnancy history characteristics. Clinical relevance is assessed through quantifying associations between pregnancy intention measures and adverse pregnancy outcomes and risk factors.

Methods

We assessed pregnancy intention measures in a cohort of 300 pregnant adolescent women [16]. This study was approved by the Women and Infants Hospital Institutional Review Board in December 2001. Informed consent was obtained from the participant and if the participant was younger than 18 years old, consent was obtained from her guardian with assent of the minor (participant). Participant recruitment occurred during their first prenatal care visit to the Women and Infants Hospital Women's Primary Care Center, Providence, RI between March 2002 and February 2005. To be eligible for inclusion, women had to be less than 24 weeks gestation at recruitment, have an estimated date of delivery before their 20th birthday, be able to provide informed consent, and be able to speak and read English or Spanish. Trained research assistants interviewed all participants in a private setting. The 30-min structured interview included questions about the participant's demographic characteristics, life plans, social supports, peer and family relationships, financial support, behavioral risks, and medical history. In cases where a participant's answers raised a concern about safety or depression, the participant was referred to social services for evaluation and management. This notification practice was clearly explained to the participant as part of the informed consent process.

We considered 18 items assessing elements of pregnancy intention including planning, timing, wantedness, emotional response, and readiness. The survey included validated questions where available and where not available content-relevant questions were assessed for face validity. The surveys underwent a process of review and revision that included both clinical experts and age-relevant volunteers. Pregnancy planning was assessed by asking participants to indicate their level of agreement with the following statements: "I wanted to get pregnant", "I have been trying to get pregnant for a while", and "I have been hoping to get pregnant". Desired timing of pregnancy was assessed by asking "When did you want to be pregnant?" (coded as now, later, never), "How do you feel about being pregnant now?" (coded as wanted pregnancy now or sooner, do not know, wanted pregnancy later or never) and "What did you think the best age would be for you to have your first child?"(coded as current age or younger, 1–2 years older, or greater than 2 years older). Pregnancy wantedness was assessed by asking respondents to report their level of agreement with the following statements: "For me, in my life, this is a good time to be pregnant" and "I want this pregnancy at this time". Emotional response was assessed by asking participants "How did you feel emotionally?" (angry, happy, scared, confused, excited, worried, or sad), "How do you feel about having a baby at this time?" (very glad, somewhat glad, do not know, a little unhappy, or very unhappy), and "How do you feel about having a baby?" (scale from 1 to 10; 1 being unhappy and 10 being happiest ever). Pregnancy readiness was assessed by asking respondents to rate their level of agreement with the following statement: "I am ready to have a baby now".

We conducted exploratory latent class analyses to identify dimensions of pregnancy intention using SAS Proc LCA [17]. The number of classes was determined through minimization of the Bayesian Information Criterion. The LCA procedure estimated latent class parameters using the expectation–maximization algorithm where the convergence criterion was defined as a maximum absolute deviation of 0.000001. We created parsimonious scores to capture the dimensions identified using the latent class analysis with a stepwise elimination process. The process was initiated by quantifying responses to individual questions and obtaining the sum of all relevant intention variables to produce a saturated score. Next, we eliminated the variable which least impacted the observed agreement between the saturated scores and the latent class dimensions. We repeated the elimination step to minimize the number of variables in the scores while maintaining a substantial level of agreement with the latent classes. Substantial agreement was defined as a weighted kappa exceeding 0.7.

Adverse pregnancy outcomes for the prospective analysis of pregnancy intention included preterm delivery (gestational age <37 weeks), low birth weight (<2,500 g), pregnancy complications, and operative delivery. Trained research assistants reviewed prenatal and delivery records to identify gestational age at delivery, birth weight, pregnancy complications, and mode of delivery. Operative delivery included vacuum-assisted vaginal, forcep-assisted vaginal, and cesarean delivery (primary or repeat). Presence of a pregnancy complication was identified by medical record indication of pregnancy induced hypertension, pre-eclampsia, gestational diabetes, preterm delivery,

preterm premature rupture of membrane, intrauterine growth restriction, or spontaneous abortion. We had insufficient power to examine individual pregnancy complications, consequently we created a binary indicator representing the occurrence of at least one complication.

In addition to the adverse pregnancy outcomes, we examined the following potential risk factors: inadequate prenatal care, delayed first prenatal care visit, no prenatal vitamin use prior to first prenatal care visit, recent smoking, drinking since pregnant, recent drug use, and self reported depression. Prenatal and delivery records were reviewed to determine the number of prenatal care visits and the gestational age at first visit. The Kotelchuck Adequacy of Prenatal Care Utilization Index was calculated from the month of first prenatal visit, the number of visits, and gestational age at delivery [18]. For the purpose of this analysis, the adequacy of prenatal care was coded as adequate or inadequate. Delayed prenatal care was defined as a first prenatal care visit occurring after 13 weeks of gestation. Recent smoking was defined as smoking at least one cigarette within the 6-months prior to the interview. Drinking since pregnant was determined by comparing self reported weeks since last drink to the gestational age at the time of interview. If the last drink was consumed after 2 weeks of gestation, participants were categorized as drinking since pregnant. Recent drug use was assessed by asking "Just before you found out you were pregnant, were you using any drugs?" Assessment of depression was based on participants' response to the question "Do you feel you are depressed?"

All analyses were performed with SAS version 9.1 (SAS Institute; Cary, NC). Descriptive covariates were summarized by pregnancy intention dimensions using cross tabulations and omnibus chi-square tests. To assess construct validity of the parsimonious scores, we examined the associations between intention and contraceptive use near the time of conception (yes/no) and consideration of abortion. Associations between pregnancy intention dimensions and adverse pregnancy risk factors and outcomes were quantified using odds ratios from unadjusted and multivariable adjusted logistic regressions. Adjusted regressions simultaneously modeled each of the identified intention dimensions. Additional covariates were selected for inclusion in the multivariable model if their inclusion altered the pregnancy intention measures of association by more than 10%. Due to the heterogeneity of the outcomes assessed in this study, separate multivariable models were developed for each outcome.

Results

The participants ranged in age from 12 to 19 years old, with 21% under 16 years of age. Most were currently enrolled in school (53%) and unmarried (93%) at the time of their first prenatal visit. For analyses of preterm birth, low birth weight, and operative delivery, twenty-four adolescents were excluded due to pregnancy loss or termination (n = 7), delivery at an outside hospital (n = 13), or being lost to follow-up (n = 4).

The latent class analysis identified four classes of pregnancy intention. Based on the response probabilities within latent class categories and review of response patterns, we characterized the classes as a 2-level measure of planning and timing (hereafter referred to as planning) and a 3-level measure of emotional response and readiness (hereafter referred to as emotional readiness). Observed classes included (1) planned and emotionally ready, (2) unplanned and emotionally ready, (3) unplanned and discrepant emotional readiness, and (4) unplanned and not emotionally ready. The parsimonious score for "planning" had substantial agreement with the latent class planning dimension (kappa = 0.84) and included the items "when did you want to get pregnant?" and "I have been trying to get pregnant". Pregnancies were categorized as unplanned if respondents disagreed with the statement "I have been trying to get pregnant", reported that they never wanted to become pregnant, or were unsure how to respond to the statement "I have been trying to get pregnant" and reported that they wanted to get pregnant at later time. The parsimonious score for emotional readiness had substantial agreement with the latent class dimensions of emotional readiness (weighted kappa = 0.74) and included items "How did you feel emotionally?" and "I am ready to have a baby." Participants were identified as "emotionally ready" if they reported being happy in response to pregnancy and agreed with the statement "I am ready to have a baby". Those who were unhappy and agreed with being ready or happy and disagreed with being ready were categorized as "discrepant emotional readiness". Those who reported being unhappy in response to their pregnancy and disagreed or were unsure about the statement "I am ready to have a baby" were categorized as being "not emotionally ready". Using the parsimonious scores allowed us to assess both classes of pregnancy intention using only 4 of the 18 questions included in the latent class analysis.

Demographic, reproductive, and behavioral covariate distributions were examined by level of the planning and readiness scores (Table 1). Participants with pregnancies characterized as "planned" (n = 41) were older than participants whose pregnancies were characterized as "unplanned" (n = 259). Prior pregnancy was reported by 51% of those with planned pregnancies and 26% of those with unplanned pregnancies. Participants with planned pregnancies also reported more sexual partners and sexually transmitted diseases as compared to those with unplanned pregnancies. Adolescents categorized as "emotionally ready" (n = 133) reported greater reliance

Table 1 Characteristics of pregnant adolescents by measures of pregnancy intention

	Planning		*P* value*	Emotional readiness			*P* value*
	Planned (n = 41) n (%)	Unplanned (n = 259) n (%)		Ready (n = 133) n (%)	Discrepant (n = 111) n (%)	Not Ready (n = 56) n (%)	
Age							
12–15	3 (7.32)	58 (22.39)	0.038	21 (15.79)	25 (22.52)	15 (26.79)	0.464
16–17	15 (36.59)	98 (37.84)		52 (39.10)	42 (37.84)	19 (33.93)	
18–19	23 (56.10)	103 (39.77)		60 (45.11)	44 (39.64)	22 (39.29)	
Race							
White	8 (19.51)	48 (18.53)	0.200	25 (18.80)	22 (19.82)	9 (16.07)	0.316
Black	6 (14.63)	73 (28.19)		28 (21.05)	31 (27.93)	20 (35.71)	
Hispanic	25 (60.98)	117 (45.17)		72 (54.14)	48 (43.24)	22 (39.29)	
Other	2 (4.88)	21 (8.11)		8 (6.02)	10 (9.01)	5 (8.93)	
Highest grade completed							
6th–8th	5 (12.82)	37 (14.40)	0.522	21 (16.03)	12 (10.91)	9 (16.36)	0.716
9th–11th	18 (46.15)	139 (54.09)		69 (52.67)	58 (52.73)	30 (54.55)	
12th, college, GED	16 (41.03)	81 (31.52)		41 (31.30)	40 (36.36)	16 (29.09)	
Financial support							
Self	30 (73.17)	174 (67.18)	0.445	104 (78.20)	70 (63.06)	30 (53.57)	0.002
Partner	27 (65.85)	154 (59.46)	0.437	98 (73.68)	57 (51.35)	26 (46.43)	<0.001
Relative	15 (36.59)	146 (56.37)	0.018	74 (55.64)	60 (54.05)	27 (48.21)	0.643
Physical abuse							
Partner	8 (19.51)	22 (8.49)	0.029	15 (11.28)	9 (8.11)	6 (10.71)	0.700
Family	7 (17.07)	47 (18.15)	0.868	20 (15.04)	21 (18.92)	13 (23.21)	0.390
Sexual abuse							
Partner	2 (4.88)	4 (1.54)	0.157	2 (1.50)	2 (1.80)	2 (3.57)	0.639
Family	2 (4.88)	20 (7.72)	0.516	5 (3.76)	9 (8.11)	8 (14.29)	0.037
Reproductive							
Prior pregnancy	21 (51.22)	68 (26.25)	0.001	53 (39.85)	22 (19.82)	15 (25.00)	0.002
Prior children	5 (12.20)	41 (15.83)	0.548	24 (18.05)	11 (9.91)	11 (19.64)	0.131
Prior abortion	5 (12.20)	16 (6.18)	0.161	10 (7.52)	9 (8.11)	2 (3.57)	0.529
Prior miscarriage	11 (26.83)	26 (10.04)	0.002	27 (20.30)	4 (3.60)	6 (10.71)	<0.001
Prior sexual partners							
1	8 (20.00)	88 (34.24)	0.001	41 (31.30)	38 (34.23)	17 (30.91)	0.544
2–3	10 (25.00)	101 (39.30)		45 (34.35)	41 (36.94)	25 (45.45)	
>3	22 (55.00)	68 (26.46)		45 (34.35)	32 (28.83)	13 (23.64)	
Sexual episodes with father of baby							
1–10	12 (39.27)	104 (40.15)	0.340	46 (34.59)	50 (45.05)	20 (35.71)	0.292
10–50	14 (34.15)	84 (32.43)		43 (32.33)	37 (33.33)	18 (32.14)	
>50	15 (36.59)	71 (27.41)		44 (33.08)	24 (21.62)	18 (32.14)	
Prior STD	15 (39.47)	54 (21.69)	0.017	33 (25.98)	21 (20.19)	15 (26.79)	0.512
Behavior							
Ever smoke	23 (56.10)	125 (48.26)	0.351	67 (50.38)	49 (44.14)	32 (57.14)	0.270
Alcohol	33 (80.49)	207 (79.92)	0.933	103 (77.44)	93 (83.78)	44 (78.57)	0.448
Drugs	17 (41.46)	107 (41.31)	0.986	54 (40.60)	44 (39.64)	26 (46.43)	0.684

* Threshold for statistical significance is 0.00124: based on a family wild alpha of 0.05 and a total of 40 comparisons

on self or partner's earnings as compared to those who were categorized as "discrepant emotional readiness" (n = 111) or "not emotionally ready" (n = 56).

We examined the distributions of responses to the questions "have you considered having an abortion" and "Were you using birth control when you became pregnant"

to assess the construct validity of the planning and emotional readiness metrics. None of the adolescents categorized as a planned and 25% (n = 64) of those categorize as an unplanned pregnancy reported considering an abortion. Emotional readiness was similarly associated with considering abortion; 8% (n = 11) of emotionally ready, 26% (n = 29) of discrepant, and 43% (n = 24) of not emotionally ready considered abortion. Birth control use at the time of pregnancy was reported by 7% (n = 3) of planned pregnancies and 25% (n = 64) of unplanned pregnancies.

We present unadjusted and multivariable adjusted odds ratios for the association between our intention measures and known risk factors for adverse pregnancy outcomes (Table 2). After adjustment for potential confounders, the estimates for the associations between pregnancy planning and the known risk factors were not statistically significant; however, a suggestive association was observed between planning and delayed prenatal care (OR = 2.36, 95% CI = 1.00–5.61).

The analysis of emotional readiness and risk factors revealed significant associations. When compared with those categorized as emotionally ready, pregnant teens who were not emotionally ready had 2.7 (95% CI = 1.27–5.72) times the odds of having inadequate prenatal care and 2.5 (95% CI = 1.27–5.09) times the odds of having delayed prenatal care. The measures of association for recent smoking and drug use were not stable enough to precisely quantify the magnitude of the effect; however, the magnitudes of the observed associations suggest that those categorized as not emotionally ready had increased odds of recent smoking and drinking. Participants who were not emotionally ready had 2.2 times the odds of reporting to be depressed as compared to those who were ready (95% CI = 1.03–4.77). None of the effect estimates in the

Table 2 Association between pregnancy intention measures and risk factors for adverse pregnancy outcomes among pregnant adolescents

	Planning		Emotional readiness		
	Planned	Unplanned	Ready	Discrepant	Not ready
Prenatal care					
Inadequate care, n (%)	8 (22.22)	78 (33.33)	30 (25.42)	32 (31.68)	24 (47.06)
Unadjusted OR	1.00 (–)	1.75 (0.76–4.02)	1.00 (–)	1.36 (0.75–2.45)	2.61 (1.31–5.19)
Adjusted OR[a]	1.00 (–)	1.00 (0.39–2.55)	1.00 (–)	1.38 (0.72–2.65)	2.70 (1.27–5.72)
First PNC visit >13 weeks, n (%)	8 (20.51)	122 (48.61)	44 (34.38)	52 (48.15)	34 (62.96)
Unadjusted OR	1.00 (–)	3.67 (1.62–8.29)	1.00 (–)	1.77 (1.05–3.00)	3.25 (1.67–6.29)
Adjusted OR[b]	1.00 (–)	2.36 (1.00–5.61)	1.00 (–)	1.44 (0.83–2.50)	2.54 (1.27–5.09)
No prenatal vitamin use, n (%)	17 (41.46)	125 (48.26)	58 (43.61)	53 (47.75)	31 (55.36)
Unadjusted OR	1.00 (–)	1.32 (0.68–2.57)	1.00 (–)	1.18 (0.71–1.96)	1.60 (0.86–3.01)
Adjusted OR[b]	1.00 (–)	1.18 (0.58–2.42)	1.00 (–)	1.16 (0.68–1.97)	1.59 (0.82–3.07)
Social behavior					
Recent smoking, n (%)	12 (29.27)	76 (29.34)	39 (29.32)	29 (26.13)	20 (35.71)
Unadjusted OR	1.00 (–)	1.00 (0.49–2.07)	1.00 (–)	0.85 (0.49–1.50)	1.34 (0.69–2.60)
Adjusted OR[c]	1.00 (–)	1.63 (0.69–3.86)	1.00 (–)	0.90 (0.48–1.68)	1.63 (0.78–3.44)
Recent drinking, n (%)	7 (17.07)	65 (25.10)	23 (17.29)	33 (29.73)	16 (28.57)
Unadjusted OR	1.00 (–)	1.58 (0.67–3.73)	1.00 (–)	2.02 (1.10–3.71)	1.91 (0.92–3.98)
Adjusted OR[b]	1.00 (–)	1.33 (0.52–3.36)	1.00 (–)	2.09 (1.09–3.98)	2.04 (0.93–4.48)
Recent drug use, n (%)	4 (9.76)	11 (4.25)	6 (4.51)	5 (4.50)	4 (7.14)
Unadjusted OR	1.00 (–)	0.41 (0.12–1.36)	1.00 (–)	1.00 (0.30–3.36)	1.63 (0.44–6.01)
Adjusted OR[b]	1.00 (–)	0.30 (0.07–1.25)	1.00 (–)	1.52 (0.39–5.90)	2.79 (0.61–12.68)
Mental health					
Depressed, n (%)	10 (24.39)	56 (21.62)	25 (18.8)	22 (19.82)	19 (33.93)
Unadjusted OR	1.00 (–)	0.86 (0.40–1.85)	1.00 (–)	1.07 (0.56–2.02)	2.22 (1.10–4.48)
Adjusted OR[b]	1.00 (–)	0.76 (0.31–1.83)	1.00 (–)	1.13 (0.57–2.26)	2.21 (1.03–4.77)

Sample size varies between analyses due to availability of outcome data

[a] Models include planning, readiness, age, STD history, and number of sexual partners

[b] Models include planning, readiness, and age

[c] Models include planning, readiness, age, and number of sexual partners

Table 3 Association between pregnancy intention measures and adverse pregnancy outcomes among pregnant adolescents

	Planning		Emotional readiness		
	Planned	Unplanned	Ready	Discrepant	Not ready
Preterm birth, n (%)	6 (16.67)	51 (21.25)	22 (18.18)	23 (22.33)	12 (23.08)
Unadjusted OR	1.00 (–)	1.35 (0.53–3.42)	1.00 (–)	1.29 (0.67–2.49)	1.35 (0.61–2.99)
Adjusted OR[a]	1.00 (–)	1.18 (0.43–3.27)	1.00 (–)	1.42 (0.71–2.86)	1.35 (0.58–3.15)
Low birth weight, n (%)	4 (11.11)	27 (11.34)	16 (13.33)	9 (8.82)	6 (11.54)
Unadjusted OR	1.00 (–)	1.02 (0.34–3.12)	1.00 (–)	0.63 (0.27–1.49)	0.85 (0.31–2.30)
Adjusted OR[b]	1.00 (–)	1.13 (0.34–3.74)	1.00 (–)	0.63 (0.57–1.55)	0.80 (0.28–2.26)
Pregnancy complications, n (%)	14 (36.84)	74 (30.58)	44 (35.48)	28 (27.18)	16 (30.19)
Unadjusted OR	1.00 (–)	0.76 (0.37–1.54)	1.00 (–)	0.68 (0.38–1.20)	0.79 (0.39–1.57)
Adjusted OR[a]	1.00 (–)	0.83 (0.37–1.53)	1.00 (–)	0.80 (0.43–1.46)	0.83 (0.40–1.73)
Operative delivery, n (%)	9 (25.00)	64 (26.89)	29 (24.17)	28 (27.45)	16 (30.77)
Unadjusted OR	1.00 (–)	1.10 (0.49–2.47)	1.00 (–)	1.19 (0.65–2.17)	1.40 (0.68–2.87)
Adjusted OR[c]	1.00 (–)	0.91 (0.37–2.24)	1.00 (–)	1.16 (0.59–2.25)	1.40 (0.64–3.08)

[a] Models include planning, readiness, age, and STD history

[b] Models include planning, readiness, and age

[c] Models include planning, readiness, age, and education

analysis of adverse pregnancy outcomes approached statistical significance (Table 3).

Discussion

Previous studies have suggested that current measures of pregnancy intention do not adequately capture emotional and psychological aspects of pregnancy intention [15, 19]. In our study investigating pregnancy intention among adolescents, we took a broad approach to pregnancy intention and delineated two significant dimensions of intention representing emotional readiness and planning. The dimensions were distilled into accessible component questions that have the potential to be used in clinical settings after they have been further evaluated. While neither of these dimensions of pregnancy intention were statistically associated with adverse pregnancy outcomes in our cohort, we did observe significant associations between our pregnancy intention metrics and known risk factors for poor outcomes. Of the two dimensions of pregnancy intention we assessed, emotional readiness was more strongly associated with risk factors for adverse pregnancy outcomes. Pregnant teens identified as not emotionally ready were at increased risk for delayed prenatal care, inadequate prenatal care utilization, delayed use of prenatal vitamins, recent smoking, recent drinking, recent drug use and depression. This suggests that a traditional concept of pregnancy intention may be less important than emotional readiness among adolescents.

Regardless of pregnancy planning or emotional readiness, the majority of adolescents included in this study were not using contraception at the time of pregnancy. The most common reasons for not contracepting among our study participants included "I didn't think I could get pregnant" (46%) and "I didn't want to use birth control" (52%). Though not directly asked, we believe that most had access to contraception based on the observation that 80% reported using contraception in the past. Reduction of unintended pregnancies in this adolescent population may be attained through providing further education on fertility and by better understanding factors contributing to the large percentage of adolescents who reported that they did not want to use birth control.

The pregnancy intention dimensions evaluated in this study were intended to help develop component questions that could be used to screen high-risk teens in a clinical setting. Though the initial intention dimensions were identified using a total of 18 questions, we were able to develop parsimonious scores relying on a smaller subset of questions. To assess pregnancy planning and emotional readiness, patients need only to respond to four questions ("When did you want to get pregnant?", "I have been trying to get pregnant", "How did you feel emotionally?", and "I am ready to have a baby."). Measures of planning and readiness were correlated with use of birth control and consideration of abortion, providing an indication of the validity of these constructs. Future work should aim to replicate the identified dimensions in other adolescent populations.

The adolescent women included in this study may not be representative of all adolescents at risk for pregnancy. This study only enrolled pregnant teens attending prenatal care prior to 24 weeks of gestation, thus this study does not

capture pregnant teens intending to terminate their pregnancy, pregnant teens with delayed prenatal care, or non-pregnant teens. Prior studies in the general population of adolescent women have reported that less than 5% of adolescents want to become pregnant [20]. In our study among adolescents seeking prenatal care, we observed that approximately 15% of pregnancies were planned and 40% of pregnant adolescents were emotionally ready. In addition to focusing on a study population in which intention and readiness are likely to be higher than in the general population, participants may have selected response options which were most socially appropriate. If this occurred, we hypothesize that this would lead to an overestimation of pregnancy intention while biasing the association between adverse outcomes and pregnancy intention towards the null. The perception of intention and the association between pregnancy intention and adverse outcomes may differ by ethnicity. Our study sample was drawn from a source population in which a large proportion of teen mothers were Hispanic in origin. We believe that the metrics and associations reported in this paper are informative to external populations; however, caution should be taken when making inference to populations with notably different ethnicity distributions.

Our analyses provides some evidence to support the hypothesis that adolescents who are not emotionally ready for their pregnancy have an increased risk of prenatal depression. However, it is important to note that our assessment of this association is cross-sectional in nature and that both depression and readiness are assessed relying on self reported measures. Given these limitations, the reported association between readiness and depression needs to be interpreted with some caution. Future studies should aim to assess this association in a prospective design with diagnosed depression to confirm our results.

Our ability to detect associations between the intention dimensions and adverse pregnancy outcomes may have been hindered by unmeasured confounding and a lack of outcome specificity. We observed that adolescents categorized as having a planned pregnancy were more likely to have had a prior miscarriage. This observation is consistent with what has been observed in population based studies [21] and suggests that adolescents with planned and unplanned pregnancies may differ in their baseline risk for adverse pregnancy outcomes in the current pregnancy. We considered prior miscarriage as a potential confounder; however, data on other prior adverse pregnancy outcomes were not available. Additionally, we had insufficient power to examine individual adverse pregnancy outcomes such as low birth weight, pre-eclampsia, IUGR, fetal anomalies, spontaneous abortion, or low Apgar score. We combined several events to create the pregnancy complications outcome; however, the heterogeneity of events included in our combined pregnancy complications outcome may limit our ability to observe a valid measure of association.

This study identified emotional readiness as a significant predictor of risk factors related to prenatal care, social behaviors, and mental health. Furthermore, we observed that the majority of adolescents reporting unintended pregnancy were not using any method of contraception. Identifying those adolescents who are not emotionally ready may be an important screening tool in identifying and intervening in high risk adolescent pregnancies. Future research is needed with sufficient power to assess the association between these pregnancy intention measures and adverse pregnancy outcomes and to further validate these measures in other adolescent populations. Furthermore, subsequent studies should aim to extend the methods implemented in this paper to non-pregnant adolescents and pregnant adolescents intending to terminate their pregnancy. Contributions to our understanding of the relevant components of pregnancy intention in teens may reveal intervention opportunities to reduce high risk behaviors and prevent adverse maternal and birth outcomes.

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Conflict of interest The authors have no conflicts of interest to report.

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