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ORIGINAL ARTICLE

Friendship networks and adolescent pregnancy: Examining the potential stigmatization of pregnant teens

Elizabeth Humberstone

Johns Hopkins University, 2800 N Charles Street, Baltimore, MD 21218, USA
Email: ehumber3@jhu.edu

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Abstract

Though declining since the 1990s, adolescent pregnancy remains common in the United States. Social supports appear to improve outcomes for pregnant teens; however, teen pregnancy introduces social obstacles, such as stigma. This study investigates how currently or previously pregnant teens' friendship networks differ from nonpregnant girls using data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) and multilevel regression models. To mitigate concerns that background differences contribute to both pregnancy risk and social networks, girls who experience a pregnancy prior to one data collection time point are compared girls who experience their first pregnancy after this time point. This group who become pregnant after the time point is presumably more similar to already pregnant teens than those never experiencing teen pregnancy. When compared to these girls who become pregnant in the future, those who have already experienced a teen pregnancy report similar numbers of friends (out-nominations) and perceived social acceptance, but are predicted to have fewer peers reporting them as friends (in-nominations) and fewer reciprocated friendships. This suggests that pregnant teens may face stigmatization, of which they may be unaware. It further highlights a new comparison group to account for selection in studies of adolescent pregnancy.

Keywords: teen pregnancy, friendships, social networks, adolescence, hierarchal modeling

Teenage pregnancy continues to be a problem in the United States. Despite public policy efforts, approximately 5% of teen girls still become pregnant each year (Guttmacher Institute, 2016). While these incidence rates reflect an overall decline in teen pregnancy since the 1990s (Guttmacher Institute, 2014), the United States remains the leader in adolescent childbearing among industrialized nations (Kearney & Levine, 2012; National Campaign to Prevent Teen and Unplanned Pregnancy, 2014). Teens who become pregnant during adolescence report facing a variety of difficulties and stresses, such as juggling pregnancy demands and school (Clemmens, 2003). Teen pregnancy has also been associated with future outcomes, such as educational attainment, economic position, and child health (e.g., Assini-Meytin & Green, 2015; Hoffman & Maynard, 2008; Kane et al., 2013; Perper et al., 2010). While the challenges facing pregnant teens are multiple, one factor that has not been well explored in the literature is their social lives within schools.

There are multiple reasons to expect pregnant teens may face increased social isolation following pregnancy, including stigma, pregnancy and/or parenting related responsibilities, and alternate educational placements. Decreased social engagement is a concern because past work has found friends to be important parts of adolescent development (Hartup, 1996). Social acceptance

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and engagement are also thought to mitigate dropout risk (Gubbels et al., 2019; Marcus & Sanders-Reio, 2001; Rumberger, 2011), a particular concern for pregnant teens who are at greater risk for dropout than their nonpregnant peers (Perper et al., 2010). For pregnant teens, having social support has been associated with increased life satisfaction, parenting quality, and confidence; greater support and network connections have also been found to relate to decreased stress and depression among pregnant adolescents (Letourneau et al., 2004). As such, this study explores the extent to which social networks of pregnant teens (currently or previously pregnant) differ from nonpregnant teens.[1] Specifically, it evaluates differences in self-reported, cross-sectional measures of social acceptance, social isolation, network size, friendship reciprocation, and characteristics of friends (e.g., friends' GPAs/grade point averages).

1. Background

Past work directly examining the friendship networks of pregnant teens has been limited. Much of what is known about pregnant teens' social experience comes from small, qualitative studies, which report friendship loss and increased social isolation following pregnancy (Herrman, 2008; Thompson, 1986). Only one study has attempted to quantify friendship change in this population; however, it did not employ any strategies to account for possible confounding and its sample was limited to one metropolitan area (Lohr & Gillmore, 1991). The present study addresses this gap in the literature by analyzing multiple social network measures of pregnant teens drawn from a large, nationally representative sample, and introduces a new strategy to more robustly account for possible endogeneity between pregnancy and friendships.

1.1 Pregnancy and friendship

Many factors may drive pregnant teens to be socially hindered compared to her peers. Firstly, it is difficult to juggle normal adolescent life with the many responsibilities of pregnancy and/or parenting (DeVito, 2010). Pregnancy takes time (e.g., going to the doctor), energy (e.g., morning sickness, fatigue), and resources (e.g., money, transport to appointments or childcare) (Bermea et al., 2016; Clemmens, 2003; SmithBattle, 2007), all of which hamper a typical adolescent social life. Parenting teens may face additional, time-consuming responsibilities, such as breastfeeding, childcare, birth recovery, and financial obligations. Many girls carrying to term report increased time spent working for pay in order to provide for a future child (Herrman, 2008; SmithBattle, 2007). These demands reduce the opportunities for teens experiencing a pregnancy to spend time with friends; indeed, pregnant teens express difficulty navigating pregnancy-related constraints to social leisure activities (Clark, 2011). Further, friends of pregnant teens may not understand or accept the life changes that come with pregnancy (Sherman & Greenfield, 2013), leaving the friendships of pregnant teens more vulnerable to change.

Pregnancy may also physically displace teens from their usual social environments, which is a concern as proximity and shared context are thought to be an important factor in friendship sustainability (Johnson et al., 2004; Poulin & Chan, 2010; Rose, 1984). Girls may miss school or other social activities because of morning sickness, doctors' appointments, recovery following birth, or child healthcare needs (SmithBattle, 2007). Parenting teens report breastfeeding not being universally accommodated at schools, leading to tardiness and absences (Bermea et al., 2016). Schools are also less likely to offer equivalent leave for teen fathers, leaving parenting girls to shoulder challenges that may keep them from school and friends without paternal support (Bermea et al., 2016). Further, pregnant teens moved to new educational environments face increased physical separation from previous friends. Pregnancy is sufficient justification for placement in alternative educational settings in approximately 28% of school districts nationally (Kleiner et al., 2002). Some teens elect to switch to alternative schools or nontraditional courses (e.g., taking courses early in advance of birth, online courses) because they better accommodate pregnancy challenges

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(SmithBattle, 2007). Placement in new classes or schools introduces pregnant girls to new peers (or no peers, in the case of online courses) while simultaneously limiting their exposure to their previous peers.

Another source of social change is the stigmatization of pregnant teens. Stigma is generally defined as the loss of social standing, exclusion, separation, or discrimination resulting from being differentiated or stereotyped based on a distinguishing characteristic (Link & Phelan, 2001). Approximately 40% of teens interviewed immediately following birth reported experiencing pregnancy-related stigma (Wiemann et al., 2005), with teens reporting stigma from both teachers and peers (Bermea et al., 2016; Cherry et al., 2015). Stigma may alter friendship networks through two mechanisms. Stigma may discourage old friends from continuing a relationship or deter potential new friends for fear of stigmatization by association. Additionally, stigmatized teens may avoid situations where they encounter stigma, such as schools or social settings. Indeed, accounts suggest that some teens contemplate quitting courses in order to avoid the perceived judgment of others in the classroom (Cherry et al., 2015) and dropping out of school has been associated with a reduction in perceived stigma by pregnant teens (Wiemann et al., 2005).

In addition to reducing a pregnant teen's social network, these factors may also alter the types of peers with whom a pregnant girl becomes friends. Teens with certain backgrounds or characteristics may be more accepting or accommodating of a pregnancy and thus more amenable to befriending a pregnant or parenting peer. Theoretically, lower achieving or more delinquent peers may be more accustomed to pregnancy occurrences, or less concerned by the ramifications of pregnancy. Pregnant teens may also seek out more understanding or less judgmental peers; for example, pregnant teens have been found to befriend other pregnant teens following pregnancy (Lohr & Gillmore, 1991). If moved to alternate educational settings, pregnant teens are more likely to be exposed to peers also facing some type of disruption to their education or in need of additional educational accommodations (Lehr et al., 2008), which again may expose them to less academically achieving peers. Further, if stigmatized, pregnant teens may be more likely to connect with other stigmatized peers, another factor that may account for differences in the characteristics of friends between pregnant and nonpregnant girls.

Alternatively, there are other mechanisms that may account for potential differences in pregnant teens' social networks. First, teens report reevaluating their friendships and social activities after becoming pregnant, citing improvements in their expectations of friends and reduced participation in risky social activities (SmithBattle, 1995). Teens report being better able to identify quality friendships, select better friends, and opt for less delinquent activities as a result of pregnancy (Herrman, 2008). In this way, friendship network changes following pregnancy may partially reflect a favoring of quality over quantity by pregnant teens. Second, there is reason to believe that different pregnancy outcomes (e.g., miscarriage, live birth) may have differential effects on adolescent friendships. For example, a parenting teen may not be able to attend school or visit with friends because of lack of childcare whereas a pregnant teen may avoid both because of stigma.

Lastly, teens who become pregnant are thought to be different from those who never become pregnant, even prior to their pregnancy. Pregnant teens have been found to be more delinquent and sexually risk-taking, with less advantaged families than their nonpregnant counterparts (Woodward et al., 2001). Delinquency and sexual behaviors have also been associated with adolescent friendships and peer reception. Past research suggests that delinquency is associated with both the selection of friends, and that friends' delinquency may influence a teen's own delinquency behaviors (Haynie et al., 2014; Jose et al., 2016). Further, for teen girls, having more sexual partners predicts decreased peer acceptance (Kreager & Staff, 2009), suggesting sexual behaviors may relate to a girl's social standing. As such, there is reason to suspect that unobserved characteristics or experiences could influence both a girl's behaviors leading to a pregnancy and her friendships. If this were the case, observed social network differences could result from selection and not pregnancy.

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1.2 Present study

Prior literature suggests a relationship between adolescent pregnancy and altered social networks. As such, the present study asks to what extent friendship network characteristics (i.e., perceived social acceptance, social isolation, centrality, number of friendships, and friend characteristics) differ between pregnant (currently or previously pregnant) and nonpregnant teens (see Note 1). Facing challenges, separation from friends, and potential stigma, it is hypothesized that pregnant teens likely have fewer and different types of friends (presumably more delinquent and less academically achieving ones) than their nonpregnant counterparts. If pregnant teens are stigmatized, peers may be hesitant to form or continue friendships with them, resulting in pregnant teens being expected to have fewer reciprocated friendships or received friend nominations from others.

Yet, because of potential unobserved confounders that may drive both selection into pregnancy and friendships, attributing social differences to pregnancy proves difficult. Pregnant teens are thought to differ from girls who never experience a teen pregnancy even prior to a pregnancy occurrence, and these differences may also impact their social networks. In order to address such confounding, this study introduces a novel comparison group of girls who have yet to experience a pregnancy, but will become pregnant later in adolescence. These girls, known to become pregnant in the future, are likely more similar to girls who have already experienced a teen pregnancy than teens who never experience a teen pregnancy.

To achieve this comparison, this study uses a longitudinal dataset with pregnancies reported over multiple years and classifies teen girls into one of three pregnancy groups: (1) currently/previously pregnant; (2) future pregnant; or (3) never pregnant (during the longitudinal data collection). These groupings were created by using the data collection time point where friendship network data were collected as a cut point, with girls reporting a pregnancy before the cut point being considered "currently/previously" pregnant, and those experiencing their first pregnancy after the cut point but prior to the end of data collection (and thus not pregnant when friendship data were collected) being classified as "future pregnant." If pregnancy relates to social networks, differences observed between currently/previously pregnant teens and nonpregnant teens are expected to persist even when the comparison is limited to only those "future pregnant" girls who became pregnant soon after the data collection cut point.

2. Data and methods

The Add Health dataset is a nationally representative study that began in the 1994–1995 school year following a cohort of adolescents who were in grades 7–12 during 1994–1995 (approximately 12–18 years old) (Harris et al., 2009). It employs a school-level sample, stratified by region, urbanicity, school size, school sector, and school demographics, with probability of selection proportional to school size. Multiple surveys were administered to students at selected schools over three time points between 1994 and 1996. At the first time point (1994–1995 school year), all seventh to twelfth graders in selected schools were invited to complete a survey, referred to as the In-School survey ($n = 90,118$). The In-School survey is the only time point where every student in the school was surveyed and thus is the only survey that has complete social network data for all schools in the study. Subsequent time points of data collection only included a subsample of students, stratified based on grade and gender. The second data collection occurred roughly 6 months to a year after the In-School survey (1995). This survey is called the Wave 1 survey and was administered to a subsample of 20,745 adolescents and their parents. The third data collection again surveyed this subsample of students approximately a year after the Wave 1 data collection (1996). This survey is referred to as the Wave 2 survey and it included 14,738 participants. Respondents who were seniors at the time of the In-School survey were surveyed during Wave 1 but were not included in the Wave 2 follow-up. For further information on Add Health survey design and implementation, see Harris et al. (2009).

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The In-School survey is the primary source of data for this study. However, it did not include any pregnancy items. Therefore, Wave 1 and/or Wave 2 surveys were used as they included pregnancy data that could be used to calculate participants' pregnancy status at the time of the In-School survey. Thus, the sample for this analysis includes only those female participants who were surveyed in either Wave 1 or Wave 2. Additionally, participants attending schools with less than 50% participation rate in the In-School survey were excluded because social network characteristics in these schools may present inaccurate network structures. This 50% cutoff was used to align with the procedures of the Add Health survey constructed network variables (Carolina Population Center, 2001). Of the 44,482 females completing the In-School survey, 7,882 had either Wave 1 or Wave 2 data available. After restricting to only those in schools with 50% or greater response rates, the final sample is comprised of 7,339 respondents.

Missing data were handled in two steps. Missing values were filled with data from other parts of the dataset where possible. For example, if a participant was missing sex from their In-School survey, their Wave 1 reported sex was used. Any remaining missing data were imputed with multiple imputation by chained equation using the R package mice (30 imputations, 10 iterations per imputation) (van Buuren & Groothuis-Oudshoorn, 2011). There were 2,516 cases that had missing data, with prior GPA as the most frequently missing covariate (11.31% missing).

While the age of the data used in this analysis limits its generalizability, there is not a newer dataset that would be appropriate for the present study. The Add Health data are unique in the scale of its whole school network data collection and its availability of extensive longitudinal data, both necessary for this analysis. The Discussion section presents further details on the age of the data as a limitation of this work.

2.1 Measures

Pregnancy Status. Pregnancy status was determined by participants self-reporting whether they had ever been pregnant prior to completing high school (including current and past pregnancies, regardless of outcome), and in what month and year their pregnancies began in either the Wave 1 or Wave 2 survey. Participants were categorized into one of three pregnancy status groups by using the In-School survey administration date as a cut point to which self-reported pregnancy start dates were compared. Participants were categorized as *currently/previous pregnant* if they experienced a pregnancy that began before completing the In-School survey. Girls were categorized as *future pregnant* if they first became pregnant after the In-School survey but before the Wave 2 survey. Because they were not pregnant at the In-School survey, the future pregnant group's covariates in this study represent their state prior to pregnancy. The time differences between when currently/previously pregnant girls and future pregnant girls experienced pregnancy vary between participants: the earliest reported pregnancies in the currently/previously pregnant group occurred in 1991 or earlier and the latest pregnancies in the future pregnant group occurred in 1996. *Never pregnant* teens reported never experiencing a pregnancy in Wave 1 and/or Wave 2. There were 39 girls who could not be categorized due to missing data.

As further detailed in the Analytic Strategy section, the currently/previously pregnant group is the sample group of interest for this study. Note that term "all nonpregnant girls" used throughout the paper refers to both never pregnant and future pregnant girls. While pregnancy data are also available in the Wave 4 survey of Add Health, the Wave 1 and 2 data were selected because only Wave 1 and 2 asked about pregnancy start dates. Start dates are needed as pregnancy-related challenges and social stigma may begin early in a pregnancy. Further, there is a much smaller recall period between possible adolescent pregnancies and Wave 1/2 than Wave 4, which was collected approximately 13–14 years after the first In-School survey.

There is reason to suspect that different pregnancy outcomes (e.g., miscarriage, live birth, parenting) may have differential effects on adolescents and their friendships. This study focuses on any instance of pregnancy instead of live births because: (1) becoming pregnant can be a life

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turning point that brings about mental and physical changes, regardless of how the pregnancy ends (Diaz & Fiel, 2016); (2) stigmatization of pregnant adolescents likely begins prior to a live birth; (3) only using live births often skews the sample since it excludes teens that abort, who are more likely to come from more advantaged families than those who miscarry or give birth (Ashcraft et al., 2013); and (4) the available Add Health survey data do not allow for the differentiation of possible pregnancy outcomes for all pregnant girls as a result of an error in the administration of the Wave 1 survey.

Add Health used audio computer-assisted self-interviewing for sensitive topics including pregnancy (Harris, 2013), which has been found to increase reporting of sensitive behaviors in adolescents (Turner et al., 1998). Nevertheless, it is possible that girls did not report pregnancies. It stands to reason that those girls who felt most vulnerable, fearful, or stigmatized by their pregnancies would be more likely to underreport. If this were the case, the results of this analysis may underestimate the relationship between pregnancy and friendship networks.

Friendship Networks and Perceived Social Acceptance. Cross-sectional social network measures were taken from the In-School survey, as that is the only time point with whole school social network data. Measures of friendships networks were constructed using participant-reported school-based friendships (up to 10 friends total) using rosters of all students within their school. The following network variables were probed: social acceptance, isolation (having no friends and no reciprocated friendships), centrality, number of friendships, number of reciprocated friendships, and friend characteristics (GPA and delinquency). Note that these variables represent the currently/previously pregnant group's friendships after pregnancy, whereas they represent the future pregnant group's friendships prior to pregnancy. Analyzing change in networks across time was not possible due to data limitations.

The following measures were used to gauge subjective view of one's social acceptance, feeling: (1) socially accepted, (2) close to people at their school, and (3) a part of their school (1 = strongly agree, 3 = neither agree nor disagree, 5 = strongly disagree). Factor analysis with principal axis factoring methods was used; all three items had factor loadings above 0.4 and were averaged to create the composite measure. Looking at both subjective measure of social acceptance (i.e., perceived closeness to others) and objective measures of social standing (i.e., number of peers reporting a friendship with a participant) allows for the detection of differences in how an individual thinks she is socially received by peers versus how she is actually received.

In addition, indicators for having no friends or no reciprocated friendships were used as proxies of social isolation. The number of friends a participant reports having (*out-nominations*) serves an indicator of a participant's view of her social group and the number of peers who report the participant in their friend (*in-nominations*) as an indicator of social acceptance of others. Friendship reciprocation is also probed as a measure of friendship quality and mutual acceptance of friends. Centrality, a measure of how well connected a participant is to other well-connected members of the network served as an indicator of overall connectedness to the greater school social network.

Differences in friends' delinquency and GPAs were considered, as the characteristics of one's friends are also important features of one's social world. Friend characteristics were considered for friendships reported by participants, and peers who reported being friends with the participant. GPA was the average GPA of friends in the grading period immediately prior to In-School survey data collection. Delinquency was a composite measure, confirmed by factor analysis, of the regularity in which participants partake in the following activities: (1) smoking cigarettes, (2) drinking beer, wine, or liquor, (3) getting drunk, (4) doing dangerous actions because of a dare, (5) lying to parents or guardians, or (6) skipping school without an excuse (where 0 = never, 3 = 2 − 3 days a month, and 6 = nearly everyday). For friendship characteristic measures, the analytic sample includes only those with at least one friendship.

Covariates. The following covariates were included in the analysis: age, race, academic achievement, parents' education, family poverty, lack of parental figure, and average delinquency.

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Adjusting for age is necessary because teens who have already experienced a pregnancy are generally older than nulligravida girls. Additionally, friendship preferences are also likely to change with age. Race variables were dummy coded for white, black, and other race (indicating anyone identifying as Asian or Pacific Islander, American Indian or Native American, multiple races or other race).

Academic behaviors and average delinquency were adjusted for because these factors may be associated with both friendships and selection into pregnancy (Haynie et al., 2014; Jose et al., 2016, Woodward et al., 2001). While sexual activity would ideally be adjusted for as sexual behaviors may relate to both friendships and pregnancy risk, sexual behavior data were not collected in the In-School survey. Because family disadvantage and family structure have also been associated with pregnancy risk (Maness & Buhi, 2016; Manlove et al., 2009), family characteristics were adjusted for using indicators of at least one parent completing college, family use of public assistance, and lack of parental figures in the household.

The environmental context of a relationship also impacts friendship formation and influence (Small, 2009); as such, school environment is an important consideration when evaluating friendship within adolescence. The following school-level covariates were used in the analysis: district-provided childcare, possible alternate class or school placement following pregnancy, and school urbanicity (urban serves as the reference category). Childcare is an indicator of a school that may provide childcare at the school or district level. Possible alternate placement for pregnant teens is an indicator of a school that may place pregnant teens in different classes, home tutoring, or separate schools. Given data limitations, it is not possible to discern whether individual participants were alternatively placed or whether teens availed themselves of childcare options. These measures were reported by a school administrator for each school during Wave 1 data collection and are assumed to be constant from the In-School to Wave 2 data collections.

2.2 Analytic strategy

Multilevel random intercept models without survey weights were used to account for the nested data structure. The following outcomes were modeled: perceived social acceptance, having no friendships and having no reciprocated friendships, centrality, number of out-, in-, and reciprocated friendship nominations, and out- and in-nomination friendship groups' average delinquency and GPA. Number of out-, in-, and reciprocated friendships models were run as both continuous variables and with Poisson regressions; similar results were obtained and the continuous variable models are reported for ease of interpretation. "Having no friends" and "no reciprocated friendships" were run with multilevel logits. As a robustness test, simple regression models were run with and without survey weights; similar coefficients were found and standard errors were somewhat smaller standard errors in the unweighted models (Solon et al., 2015). As such, all models reported here are non-weighted.

For each outcome, three models were run (equations detailed below). The first two base models compare currently/previously pregnant girls (the group of interest in this study) to all nonpregnant girls (including both future pregnant and never pregnant girls), while the third model limits the comparison of currently/previously pregnant teens to only future pregnant girls (removing never pregnant teens from the sample). Again, the future pregnant groups' friendship networks represent their nonpregnant friendships, as they were reported prior to their first pregnancies.

Models 1 and 2, which include never pregnant teens, rest on the strong assumption that pregnancy risk and friend selection are independent of each other, when likely there is confounding present. Limiting the comparison to only future pregnant teens in Model 3 provides a control group that is presumably more similar to currently/previously pregnant teens than teens who never experience an adolescent pregnancy. This provides stronger evidence for pregnancy (and not background characteristics) as a potential driver of any observed network differences because future pregnant girls likely possess similar drivers toward pregnancy selection as those who have

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already experience a pregnancy. Juxtaposing Models 1 and 2 with Model 3 also allows for an analysis of the extent to which findings differ depending on the comparison group used.

Model 1 is a base model that includes no adjustments for covariates and is represented by the following equation:

$$Y_{ij} = \beta_{0j} + \beta_1 X_{ij} + e_{ij} + u_{0j} \quad (1)$$

In Equation (1), (X_{ij}) represents being currently or previously pregnant and Y_{ij} represents the network outcomes of student i, in school j. β_{0j} represents the intercept, with the random school-level component indicated by $u_{0j.}$ Individuals' error terms are indicated by e_{ij}. The second base model, Model 2, then added covariates, where W_{ij} are individual covariates of student i, in school j, and all nonpregnant girls (never pregnant and future pregnant girls) remained the reference category:

$$Y_{ij} = \beta_{0j} + \beta_1 X_{ij} + \beta_2 W_{ij} + e_{ij} + u_{0j} \quad (2)$$

The third model, Model 3, reruns the second model, but the sample was restricted to only currently/previously pregnant ($n = 292$) and future pregnant ($n = 347$) girls, with future pregnant acting as the reference category.

To test the assumption that currently/previously pregnant and future pregnant teen are comparable, mean differences and standardized biases of covariates were calculated. All covariates except age (an expected difference given older girls increased opportunity for pregnancy) had biases less than 0.25, indicating sufficient resemblance between groups (Stuart, 2010). As such, further matching with additional covariates was not conducted. While both groups are known to become sexually active during adolescence, this strategy does not account for differences in sexual activity between the groups at the time of the In-School survey.

One concern with this modeling strategy is that there is a large difference in sample size between the first and second models with all girls ($n = 7,339$) and the third model restricted to only currently/previously pregnant and future pregnant girls ($n = 639$). Differences between models may reflect loss of statistical power. As a robustness check, an additional set of test models were run with both currently/previously pregnant and future pregnant indicators on the sample of all girls (currently/previously pregnant and all nonpregnant girls). These coefficients were then tested to see if they were significantly different from each other using the linear hypothesis test function in the R package "car" (Fox & Weisberg, 2011). In all cases except friendship group delinquency (discussed more in the Results section), the robustness checks matched the comparison across the models, suggesting that most observed difference between the models reflects change in significance and not an artifact of change in statistical power.

3. Results

3.1 Descriptive statistics

Background Characteristics. Table 1 provides descriptive statistics for all girls in the sample, and girls in each pregnancy category. It also reports mean difference comparisons between the currently/previously pregnant group and the other pregnancy groups as a robustness test of the assumption that the currently/previously pregnant to future pregnant comparison better adjusts for potential confounders. While the currently/previously pregnant and never pregnant groups differed significantly across most of the covariates, the currently/previously pregnant and future pregnant girls only differ significantly by age, currently/previously pregnant girls being roughly 6 months older on average. The currently/previously pregnant group and the future pregnant group were older, less white, more delinquent, and had lower prior GPAs than the sample generally. The families of currently/previously pregnant and future pregnant girls were also less educated, with more use of public assistance than the sample in general.

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Table 1. Descriptive statistics by pregnancy group, with mean difference comparison to the currently/previously pregnant group

	Currently/previously pregnant		Future pregnant		Never pregnant		All girls	
	m	*SD*	*m*	*SD*	*m*	*SD*	*m*	*SD*
Network variables								
Nominated friends	3.52	2.72	3.83	2.81	4.62**	2.91	4.54	2.91
Nominations received	3.08	2.44	4.05**	3.07	4.65**	3.63	4.55	3.57
Reciprocated friendships	1.25	1.30	1.68**	1.56	1.98**	1.78	1.94	1.76
Social acceptance	2.81	0.90	2.69	1.00	2.40**	0.89	2.43	0.90
No friends	0.10	0.29	0.09	0.29	0.07	0.26	0.08	0.27
No reciprocated friends	0.37	0.48	0.28*	0.45	0.26**	0.44	0.26	0.44
Centrality	0.58	0.50	0.65	0.56	0.86**	0.63	0.83	0.63
Friend characteristics								
Delinquency (out-nom.)	1.76	0.93	1.63	0.77	1.33**	0.68	1.36	0.71
GPA (out-nom.)	2.54	0.52	2.62	0.52	2.86**	0.54	2.83	0.54
Delinquency (in-nom.)	1.79	0.80	1.64*	0.87	1.35**	0.75	1.38	0.76
GPA (in-nom.)	2.58	0.57	2.57	0.56	2.85**	0.55	2.82	0.56
Covariates†								
Age	16.21	1.21	15.66**	1.42	14.86**	1.70	14.96	1.70
White‡	0.33	0.47	0.40	0.49	0.50**	0.50	0.49	0.50
Black	0.36	0.48	0.29	0.46	0.20**	0.40	0.21	0.41
Other race	0.22	0.41	0.21	0.41	0.23	0.42	0.23	0.42
Prior GPA	2.46	0.70	2.55	0.73	2.90**	0.77	2.87	0.78
Parent education	0.21	0.41	0.17	0.37	0.31**	0.46	0.29	0.46
Public asst.	0.15	0.36	0.17	0.38	0.09*	0.28	0.09	0.29
No parent	0.09	0.29	0.07	0.26	0.03**	0.17	0.04	0.19
Delinquency	1.45	1.13	1.64	1.21	0.94**	0.98	1.00	1.01
Childcare	0.17	0.38	0.16	0.36	0.15	0.35	0.15	0.35
Alt. placement	0.27	0.45	0.27	0.45	0.29	0.46	0.29	0.45
Urban	0.24	0.43	0.26	0.44	0.28	0.45	0.28	0.45
Rural	0.14	0.34	0.19	0.39	0.17	0.38	0.17	0.38
Suburban	0.62	0.49	0.55	0.50	0.55*	0.50	0.55	0.50
n	292		347		6655		7339	

**$p < 0.01$, *$p < 0.05$, mean difference compared to currently/previously pregnant group.
† Categorical variables reported as proportions.
‡ A small number of participants responded "no" to every race option.

School characteristics were similar between the sample and the pregnancy groups in terms of urbanicity, provided childcare and alternate placement of pregnant teens.

Network Characteristics. Girls in the sample nominated an average of 4.54 ($SD = 2.91$) friends and received 4.55 ($SD = 3.57$) friend nominations in return. In comparison, both currently/previously pregnant and future pregnant teens reported having fewer friends (out-nominations), with currently/previously pregnant teens having 3.52 ($SD = 2.72$) friends and future pregnant teens

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having 3.83 ($SD = 2.81$), a nonsignificant difference. Conversely, currently/previously pregnant teens differed significantly from future pregnant teens, never pregnant teens, and the sample generally in terms of the number of friend nominations received (in-nominations), with currently/previously pregnant teens receiving 3.08 ($SD = 2.44$) nominations compared to the 4.05 ($SD = 3.07$) nominations of future pregnant teens, a nearly 25% reduction. Similarly, currently/previously pregnant teens also differed in the number of reciprocated friendships, 1.25 ($SD = 1.3$) compared to 1.68 ($SD = 1.56$) for future pregnant teens, and 1.98 ($SD = 1.78$) for the never pregnant sample. Both currently/previously pregnant and future pregnant teens reported slightly higher levels of disagreements with items probing perceived social acceptance (currently/previously pregnant $m = 2.81$, $SD = 0.80$; future pregnant $m = 2.69$, $SD = 1.00$) compared to never pregnant teens (never pregnant $m = 2.40$, $SD = 0.89$; 2 indicates "agree" and 3 indicates "neither agree nor disagree"). Lastly, never pregnant girls' friends (both in- and out-nomination friends) reported lower levels of delinquency and higher GPAs than friends of currently/previously pregnant girls.

3.2 Regression results

Social Acceptance, Isolation, and Centrality. Regression models were used to determine if these mean differences remain after adjusting for covariates. To gain a better understanding of whether currently/previously pregnant teens are more socially isolated, models were run on perceived levels of social acceptance, having no reported friendships, having no reciprocated friendships, and centrality, with results presented in Table 2. Having no friends was found to be insignificant when compared to both all nonpregnant girls and only future pregnant girls. Being currently/previously pregnant predicted differences in perceived social acceptance ($\beta = 0.16$, $SE = 0.06$), having no reciprocated friendships ($\beta = 0.28$, $SE = 0.13$), and centrality ($\beta = -0.14$, $SE = 0.04$) compared to all nonpregnant girls. However, these differences did not remain significant after reducing the comparison to only future pregnant teens.

Number of Friendships. Table 3 presents models with network size variables as outcomes. A current/previous pregnancy predicts reporting fewer friends (out-nominations) compared to all nonpregnant girls ($\beta = -0.43$, $SE = 0.17$, $p = 0.01$). However, no difference in number of reported friends was found after the sample was limited to only future pregnant and currently/previously pregnant teens ($\beta = -0.09$, $SE = 0.21$, $p = 0.68$). This suggests that currently/previously pregnant teens are as likely to report friendships as their similar nonpregnant peers.

While currently/previously pregnant teens do not differ in reporting friendships, being currently/previously pregnant is associated with receiving fewer friendship nominations from others (in-nominations). Being currently/previously pregnant predicts receiving 0.90 ($SE = 0.21$, $p < 0.01$) fewer friend nominations than all nonpregnant girls. This difference persists even after limiting the comparison to future pregnant teens. Currently/previously pregnant girls are predicted to receive 0.68 ($SE = 0.22$, $p < 0.01$) fewer friend nominations compared to future pregnant girls. For context, 0.68 friend nominations correspond to approximately 15% of the average number of received nominations for all girls, a sizable reduction considering the average is roughly over 4 friends.

Being currently/previously pregnant also predicts having fewer reciprocated friendships, even after comparing to only future pregnant teens. Currently/previously pregnant girls were predicted to have 0.32 ($SE = 0.11$, $p < 0.01$) fewer reciprocated friendships compared to future pregnant girls. This difference between currently/previously pregnant and future pregnant teens is roughly 16% of the average number of reciprocated friendships for all girls.

Friend Characteristics. Current/previous pregnancy status was found to predict reporting more delinquent friends compared to all nonpregnant teens ($\beta = 0.23$, $SE = 0.04$, $p < 0.01$) (Table 4). When limited to only currently/previously pregnant and future pregnant teens, this predictor was no longer significant ($\beta = 0.13$, $SE = 0.07$, $p = 0.08$). Robustness tests were run to assess whether

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Table 2. Coefficients of random intercept models of social acceptance, no reciprocated friendships, no friendships and centrality, with Models 1 and 2 including all nonpregnant girls and Model 3 including only future pregnant girls as the comparison groups

Fixed effects	Perceived social acceptance			No reciprocated friendships			No friendships			Centrality		
	1	2	3	1	2	3	1	2	3	1	2	3
Intercept	2.40*	1.67*	1.81*	−1.20*	−1.27*	−2.36	−2.70*	−3.37*	−2.67	0.85*	1.42*	1.51*
	(0.02)	(0.12)	(0.54)	(0.07)	(0.35)	(1.27)	(0.08)	(0.52)	(1.92)	(0.10)	(0.09)	(0.29)
Current/prev. preg	0.34*	0.16*	0.11	0.45*	0.28	0.32	0.17*	−0.01	−0.04	−0.26*	−0.14*	−0.04
	(0.06)	(0.06)	(0.08)	(0.13)	(0.13)	(0.19)	(0.21)	(0.21)	(0.29)	(0.04)	(0.04)	(0.04)
Age		0.06*	0.06*		0.05*	0.14		0.07*	0.11		−0.05*	−0.06*
		(0.01)	(0.03)		(0.02)	(0.07)		(0.03)	(0.11)		(0.01)	(0.02)
Black		0.15*	0.04		0.41*	0.66*		0.47*	0.40		−0.17*	−0.18*
		(0.03)	(0.10)		(0.08)	(0.23)		(0.13)	(0.35)		(0.02)	(0.05)
Other race		0.10*	0.22*		0.35*	0.76*		0.46*	0.75*		−0.11*	−0.21*
		(0.03)	(0.11)		(0.07)	(0.25)		(0.11)	(0.37)		(0.02)	(0.06)
GPA		−0.09*	−0.10		−0.24*	−0.24		−0.17*	−0.36		0.08*	0.06*
		(0.02)	(0.06)		(0.04)	(0.14)		(0.07)	(0.23)		(0.01)	(0.03)
Delinq.		0.13*	0.10*		−0.02	−0.11		−0.02	−0.18		−0.03*	−0.03
		(0.01)	(0.04)		(0.03)	(0.09)		(0.05)	(0.15)		(0.01)	(0.02)
Parent ed.		−0.09*	−0.11		−0.13*	−0.24		0.08	−0.44		0.05*	0.05
		(0.02)	(0.10)		(0.07)	(0.24)		(0.10)	(0.40)		(0.02)	(0.06)
Public asst.		0.09*	−0.04		0.29*	0.30		−0.01	−0.10		−0.11*	−0.03
		(0.04)	(0.12)		(0.11)	(0.28)		(0.17)	(0.47)		(0.03)	(0.06)
No parent		0.09	0.18		0.57*	−0.11		0.69*	0.43		−0.11*	−0.05
		(0.06)	(0.14)		(0.14)	(0.34)		(0.18)	(0.45)		(0.04)	(0.08)
Alt. placement		−0.01	0.04		0.26*	0.40		0.27	−0.03		−0.02	0.05
		(0.03)	(0.11)		(0.12)	(0.24)		(0.14)	(0.32)		(0.03)	(0.06)
Childcare		0.04	−0.16		0.18	0.02		0.14	−0.47		0.02	−0.02
		(0.04)	(0.13)		(0.15)	(0.29)		(0.18)	(0.47)		(0.03)	(0.07)
Suburban		0.02	−0.06		−0.25	−0.74*		−0.18	−0.31		−0.02	0.09
		(0.03)	(0.12)		(0.13)	(0.26)		(0.15)	(0.33)		(0.03)	(0.06)
Rural		−0.03	0.00		−0.58	−1.15*		−0.63*	−1.84*		0.00	0.14
		(0.04)	(0.16)		(0.18)	(0.36)		(0.23)	(0.77)		(0.04)	(0.08)
Random effects												
Var. in school means	0.02	0.003	0.06	0.38	0.23	0.13	0.35	0.19	0.002	0.003	0.01	0.01
n	7339	7339	639	7339	7339	639	7339	7339	639	7339	7339	639

Note: Standard errors are reported in parentheses, $^*p < 0.05$.

the change in significance between the two models may be an artifact of statistical power change due to sample size. In the case of out-nomination friendship delinquency, the currently/previously and future pregnant coefficients were found to differ significantly in the linear hypothesis robustness test even though the model of only currently/previously and future pregnant girls did not find this difference; this result suggests that the model may be underpowered to detect a significant association between out-nomination friendship group delinquency and pregnancy status.

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Table 3. Coefficients of random intercept model of network structure characteristics, with Models 1 and 2 including all nonpregnant girls and Model 3 Including only future pregnant girls as the comparison groups

Fixed effects	Nominated friends (out-nominations)			Received nominations (in-nominations)			Reciprocated nominations		
	1	2	3	1	2	3	1	2	3
Intercept	4.70*	7.46*	7.29*	4.76*	5.70*	9.60*	2.01*	1.69*	2.57*
	(0.09)	(0.42)	(1.45)	(0.11)	(0.50)	(1.47)	(0.06)	(0.25)	(0.76)
Current/prev. preg	−0.84*	−0.43*	−0.09	−1.28*	−0.90*	−0.68*	−0.58*	−0.42*	−0.32*
	(0.17)	(0.17)	(0.21)	(0.21)	(0.21)	(0.22)	(0.10)	(0.10)	(0.11)
Age		−0.23*	−0.27*		−0.18*	−0.41*		−0.03	−0.09*
		(0.02)	(0.08)		(0.03)	(0.08)		(0.01)	(0.04)
Black		−0.65*	−0.80*		−0.65*	−0.45		−0.43*	−0.45*
		(0.10)	(0.27)		(0.12)	(0.27)		(0.06)	(0.14)
Other race		−0.51*	−1.20*		−0.53*	−0.21		−0.37*	−0.47*
		(0.09)	(0.29)		(0.11)	(0.29)		(0.05)	(0.15)
GPA		0.27*	0.30		0.53*	0.39*		0.28*	0.20*
		(0.05)	(0.16)		(0.06)	(0.16)		(0.03)	(0.08)
Delinq.		−0.10*	−0.03		0.17*	−0.01		0.04	0.04
		(0.03)	(0.10)		(0.04)	(0.10)		(0.02)	(0.05)
Parent ed.		0.11	0.23		0.31*	0.33		0.12*	0.02
		(0.07)	(0.27)		(0.09)	(0.28)		(0.05)	(0.14)
Public asst.		−0.45*	−0.04		−0.75*	−0.88*		−0.33*	−0.28
		(0.12)	(0.32)		(0.14)	(0.31)		(0.08)	(0.16)
No parent		−0.51*	−0.49		−0.83*	−0.74		−0.49*	−0.25
		(0.17)	(0.38)		(0.21)	(0.39)		(0.10)	(0.20)
Alt. placement		−0.69*	−0.70*		−0.60*	−0.69*		−0.31*	−0.42*
		(0.17)	(0.31)		(0.19)	(0.30)		(0.10)	(0.16)
Childcare		−0.20	−0.25		−0.09	−0.29		−0.15	0.06
		(0.21)	(0.36)		(0.24)	(0.35)		(0.13)	(0.19)
Suburban		0.42*	0.92*		0.34	0.45		0.20	0.44*
		(0.18)	(0.33)		(0.20)	(0.32)		(0.11)	(0.17)
Rural		0.91*	1.46*		1.09*	1.24*		0.48*	0.75*
		(0.25)	(0.43)		(0.27)	(0.41)		(0.15)	(0.22)
Random effects									
Var. in school means	0.85	0.52	0.47	1.05	0.58	0.31	0.33	0.19	0.12
n	7339	7339	639	7339	7339	639	7339	7339	639

Note: Standard errors are reported in parentheses, * $p < 0.05$.

This type of robustness testing was run for each outcome variable but only out-nomination friendship delinquency differed from the estimated models, suggesting that the other outcome variables were robust to changes in sample size.

Differences in the types of peers who report being friends with currently/previously pregnant teens (in-nominations) were also evaluated. Having a current/previous pregnancy is again associated with being considered a friend by more delinquent peers ($\beta = 0.24$, $SE = 0.05$, $p < 0.01$) compared to all nonpregnant girls. When compared to only future pregnant girls, this relationship

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Table 4. Coefficients of random intercept models of friends' characteristics, with Models 1 and 2 including all nonpregnant girls and Models 3 including only future pregnant girls as the comparison groups.

Fixed effects	Out−nom friends' delinq.			Out−nom friends' GPA			In−nom friends' delinq.			In−nom friends' GPA		
	1	2	3	1	2	3	1	2	3	1	2	3
Intercept	1.33*	0.83*	0.46	2.88*	2.15*	1.98*	1.34*	0.93*	0.16	2.86*	2.25*	2.26*
	(0.02)	(0.10)	(0.51)	(0.02)	(0.08)	(0.31)	(0.02)	(0.10)	(0.48)	(0.02)	(0.08)	(0.32)
Current/prev. preg	0.39*	0.23*	0.13	−0.22*	−0.11*	−0.07	0.39*	0.24*	0.15*	−0.17*	−0.06	0.03
	(0.05)	(0.04)	(0.07)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.07)	(0.03)	(0.03)	(0.05)
Age		0.05*	0.07*		0.01*	0.03		0.04*	0.08*		0.00	0.00
		(0.01)	(0.03)		(0.00)	(0.02)		(0.01)	(0.03)		(0.00)	(0.02)
Black		−0.06*	−0.12		−0.17*	−0.17*		−0.03	−0.05		−0.14*	−0.14*
		(0.03)	(0.09)		(0.02)	(0.06)		(0.03)	(0.09)		(0.02)	(0.06)
Other race		−0.04	−0.08		−0.02	0.00		−0.05*	−0.06		−0.03	−0.02
		(0.02)	(0.10)		(0.02)	(0.06)		(0.02)	(0.09)		(0.02)	(0.06)
GPA		−0.10	−0.09		0.22*	0.15*		−0.10*	−0.06		0.22*	0.19*
		(0.01)	(0.05)		(0.01)	(0.03)		(0.01)	(0.05)		(0.01)	(0.03)
Delinquency		0.20	0.17*		−0.06	−0.06*		0.17*	0.20*		−0.05*	−0.04
		(0.01)	(0.03)		(0.01)	(0.02)		(0.01)	(0.03)		(0.01)	(0.02)
Parent educ.		−0.04*	−0.03		0.08*	0.05		−0.02	−0.01		0.09*	0.07
		(0.02)	(0.10)		(0.01)	(0.06)		(0.02)	(0.09)		(0.01)	(0.06)
Public asst.		0.06	0.03		−0.05	0.04		0.11*	0.07		−0.09*	0.00
		(0.03)	(0.12)		(0.02)	(0.06)		(0.04)	(0.11)		(0.03)	(0.07)
No parent		−0.09*	−0.15		0.04	0.08		0.04	−0.01		0.03	0.19*
		(0.05)	(0.13)		(0.02)	(0.08)		(0.05)	(0.12)		(0.03)	(0.08)
Alt. placement		0.01*	−0.16		−0.02*	−0.08		0.01	−0.09		−0.01	−0.07
		(0.03)	(0.10)		(0.04)	(0.08)		(0.03)	(0.09)		(0.04)	(0.07)
Childcare		0.04*	0.10		−0.06*	0.09		0.08*	0.02		−0.06	0.05
		(0.04)	(0.12)		(0.05)	(0.08)		(0.04)	(0.11)		(0.05)	(0.08)
Suburban		−0.04*	0.11		0.00*	0.02		−0.02	0.08		−0.02	−0.05
		(0.04)	(0.10)		(0.04)	(0.08)		(0.03)	(0.10)		(0.04)	(0.07)
Rural		−0.08*	−0.06		0.00*	0.09		−0.06	0.00		−0.02	−0.02
		(0.05)	(0.14)		(0.06)	(0.10)		(0.04)	(0.12)		(0.05)	(0.09)
Random effects												
Var. in school means	0.04	0.01	0.03	0.06	0.03	0.03	0.03	0.01	0.03	0.05	0.03	0.02
n	6419	6419	527	6419	6419	527	6795	6795	577	6795	6795	577

Note: Standard errors are reported in parentheses, * $p < 0.05$.

between pregnancy and nominating friends' delinquency remains significant ($\beta = 0.15$, $SE = 0.07$, $p < 0.05$). It is also substantively similar to the predicted delinquency of out-nomination friends.

Friend group GPA was also evaluated. While current/previous pregnancies appear to relate to having lower achieving out-nomination friends compared to all nonpregnant girls ($\beta = -0.10$, $SE = 0.03$, $p < 0.01$), the significant relationship between pregnancy and reported friends' GPA does not persist after limiting the comparison group to future pregnant teens ($\beta = -0.04$, $SE = 0.05$, $p = 0.39$). Lastly, being currently/previously pregnant is not significantly associated

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with differences in in-nomination friends' GPAs in any of the models. These results suggest that there is not a meaningful relationship between a current/previous pregnancy and friends' GPAs.

Summary. Overall, comparing currently/previously pregnant girls to all nonpregnant girls (including never pregnant girls) would have indicated relationships between experiencing a pregnancy and the following social network characteristics: perceived social acceptance, having no reciprocated friends, centrality, number of reported friendships, and friends' GPA. However, these differences were no longer found once currently/previously pregnant girls were compared to the presumably more similar future pregnant group. The associations between pregnancy and receiving fewer friend nominations (in-nominations), reciprocated friendship, and friendship group delinquency did persist even when currently/previously pregnant girls were compared to their future pregnant peers.

4. Discussion

Past research has found pregnant teens to qualitatively report social difficulties following pregnancy. Taking advantage of Add Health's whole school network data, this study explored both perceived friendships of adolescents who experience a pregnancy prior to the In-School survey data collection and the received friendship nominations from others within school, an arguably more objective measure of one's social standing among peers. While it was expected that currently/previously pregnant teens would report having fewer friends because of having already experienced pregnancy demands, this analysis finds that currently/previously pregnant teens did not differ from future pregnant teens in the number of friends they report having, network centrality, nor in the GPAs of their friends. They also do not appear to feel socially isolated, reporting similar levels of agreement to items probing social acceptance as their future pregnant counterparts.

While pregnancy does not appear to play a role in one's view of her social connections and acceptance, the results of this study suggest it does play a negative role in peers' view of currently/previously pregnant teens as potential friend candidates, compared to future pregnant teens. Differences were found in the number of peers who consider currently/previously pregnant teens as friends. This measure, calculated based on others' surveys and not known to the participants, serves as an indicator of how attractive they are as a friend to their peers. Currently/previously pregnant teens were also predicted to have 0.32 fewer reciprocated friendships, a roughly one-sixth reduction compared to the reciprocated friendships of girls overall. This finding, paired with the null findings for differences in currently/previously pregnant teens' perceived friendship network and social acceptance, suggests that pregnant teens may be unaware of their hindered social reception among school peers. In addition, pregnant teens' friends appear to be more delinquent than the friends of comparable peers. Substantively, being pregnant predicted having friends who reported roughly 13% (out-nomination friend group) and 15% (in-nomination friend group) more delinquency behaviors than the average delinquency reported by all girls. This difference in delinquency may result from more delinquent teens being more accepting of an adolescent pregnancy than those abstaining from delinquency behaviors. Alternatively, pregnant teens may seek out peers who are less likely to judge teen sexual behaviors or pregnancy.

Reduced social networks remain a concern given friends' role in shaping adolescent development (Hartup, 1996), and providing social support, sense of belonging (Baumeister & Leary, 1995), resources (Bourdieu, 1999; Burt, 2000; Lin, 1999), and social expectations to teens (Coleman, 1988). More generally, being socially connected has been associated with improved mental health, physical health, and longevity outcomes, while low connectedness and isolation are considered risk factors for mortality and reduced well-being (Baumeister & Leary, 1995; Holt-Lunstad et al., 2010; House et al., 1988). Reciprocated friendships, in particular, are often considered to be greater reservoirs of social support and connection; adolescents with reciprocated

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friendships have been found to have higher levels of self-esteem (Bishop & Inderbitzen, 1995), sense of school belonging, and academic performance (Vaquera & Kao, 2008) than those without reciprocated friendships. Having reciprocated friendships has also been found to mitigate dropout risk, even after accounting for parent and teacher support and academic motivation (Ricard & Pelletier, 2016). These deeper, reciprocated friendships may be of particular import to pregnant teens, as they are often in more vulnerable situations and in greater need of support than they were prior to pregnancy. Indeed, pregnant teens are found to rely more on social support than older (non-teenaged) mothers, and have been found to have less stress and depression, and more life satisfaction and confidence when they have broad social support networks (Letourneau et al., 2004). For example, with potentially dubious educational paths before them, pregnant teens may benefit more from peers' academic supports and social engagement at school as a means to encourage academic persistence (Rumberger, 2011). Future work is needed to better understand how these friendship differences may be related to the life trajectories of pregnant teens.

Previous work has highlighted the importance of accounting for potential confounders when studying outcomes following adolescent pregnancy (Hoffman, 2015). When comparing pregnant teens to the general population, it is difficult to disentangle effects of pregnancy from background characteristics that may drive both pregnancy risk and an outcome of interest. Indeed, the findings of this study substantiate these concerns. Different results were found when comparing currently/previously pregnant teens to all other nonpregnant girls than when comparing them to future pregnant teens, who become pregnant later in adolescence. A comparison to girls generally would have suggested that pregnant teens have decreased networks both in terms of reported friendships, centrality, friends' academic behaviors, social isolation, and subjective levels of social acceptance. Leveraging a future pregnant comparison group revealed instead a story of potential stigmatization, with similarly reported friend groups but fewer received nominations and reciprocated friendships for currently/previously pregnant teens. This work provides an example of using a cutoff where those pregnant before a data collection point are compared to those who become pregnant soon after; this strategy should be considered as an addition to other comparison groups already used in the adolescent pregnancy literature, such as miscarriages (e.g., Hotz et al., 2005) and sibling pairs (e.g., Hoffman et al., 1993; Holmlund, 2005).

While the comparison of currently/previously pregnant girls to future pregnant girls adds to the robustness of these results, threats to drawing causal conclusions remain. A main limitation of this work is the age of the data, as adolescent social environments and reception of adolescent pregnancy have likely changed since the 1990s. Friendship networks have evolved with the advent of social media and socially disadvantaged teens may now find social outlets online. Still, the majority of adolescents continue to attend brick and mortar schools, where their in-school friendships and social difficulties contribute to their school climates. Even if pregnant teens are able to connect in online spheres, isolation or stigmatization at school may still negatively affect their schooling experience. Indeed, recent studies suggest that social difficulties and stigmatization are a continued issue for pregnant girls today (Bermea et al., 2016; Cherry et al., 2015). Additionally, a major contribution of this study is the methodological implications of introducing a novel comparison group for work on adolescent pregnancy, which is not dependent on data age.

Further, currently/previously pregnant and future pregnant teens may still differ on unobserved characteristics not accounted for in this study. For example, having a sexual partner or relationship is a possible difference that could drive both pregnancy and friendship network changes. The currently/previously pregnant sample may also suffer from selection bias as some pregnant girls may have dropped out prior to the survey. As social integration is thought to relate dropout risk (Rumberger, 2011), girls who dropped out before the survey may have been more socially isolated and thus, the results presented here may underestimate differences in social networks for pregnant teens. Conceivably, differences may exist between live birth and non-live birth pregnancy outcomes that are not disentangled in these findings. In addition, parenting teens may face different relationship stressors, such as childcare and financial demands, than teens whose

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pregnancies do not result in parenting. This study also does not account for either quality of friends or whether network differences would be experienced negatively or positively for pregnant girls. Further, friendship groups prior to pregnancy are not accounted for, which may have lasting impacts on friendship formation. Additional insights on pregnancy-related network changes could be drawn from mapping the evolution of a teen's social network before and after a pregnancy occurrence.

Overall, this study suggests that social reception of peers may be an additional challenge facing pregnant teens. Given the stresses of adolescent pregnancy, social supports and social engagement may be particularly valuable to this population. This study is the first step in understanding the role that social connections play in the lives of pregnant teens. It highlights the need for future work to assess how these network differences may relate to future life trajectories. This body of research brings to light possible value in school-level initiatives to promote social engagement of pregnant teens, and to limit the social disruption of policies such as alternative educational placements. Efforts to reduce stigma toward pregnant students, especially from adults in schools that serve as models of acceptable behavior, may also be practical way to target the marginalization of pregnant adolescence.

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Conflict of interest. The author has nothing to disclose.

Note

1 Currently and previously pregnant teens were grouped together due to a data collection error in one time point in the Add Health survey. Pregnancy end dates and outcomes were not collected for approximately 90% of pregnant respondents, so it is not possible to definitively identify currently pregnant teens.

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