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Availability of reproductive healthcare services at schools and subsequent birth outcomes among adolescent mothers

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Abstract

BACKGROUND—Adverse birth outcomes are more common among adolescent versus adult mothers, but little is known about school-based services that may improve birth outcomes in this group.

METHODS—Data from Waves I and IV of the National Longitudinal Study of Adolescent Health were analyzed. Girls and women who gave birth to singleton live infants after Wave I and before age 20, were still in secondary school while pregnant, and had complete data (N=402) were included. Mothers reported infants' birthweight and gestational age. School administrators reported whether family planning counseling, diagnostic screening (including sexually transmitted diseases [STDs]), STD treatment, and prenatal/postpartum healthcare were provided on-site at school at Wave I. Multilevel models adjusted for individual and school characteristics were conducted.

RESULTS—Few schools offered reproductive healthcare services on-site. In multilevel analyses, availability of family planning counseling (Est. $\beta=0.21$, 95% confidence interval [CI] 0.04, 0.38) and prenatal/postpartum healthcare (Est. $\beta=0.21$, 95% CI 0.02, 0.40) were significantly associated with increased infant birthweight. No services examined were significantly associated with increased gestational age.

CONCLUSIONS—Some school-based reproductive health services may improve subsequent birth outcomes among adolescent mothers. Future analyses should examine the mechanisms by which services impact birth outcomes.

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Human Subjects Approval Statement

The present study was deemed exempt from review by the Biomedical Institutional Review Board of Tulane University.

Keywords

birth outcomes; school health services; adolescent pregnancy; multilevel analysis

In 2011, there were 31.3 live births for every 1000 women age 15-19 in the United States (US).¹ Infants born to teen mothers are at increased risk of both low birthweight and preterm birth compared to infants born to adult mothers.² For instance, in 2010, the proportion of infants born with low birthweight was 12.08% among mothers aged less than 15 years, 9.63% among mothers aged 15-19, and 8.15% among all mothers.³ The rate of preterm birth (birth before 37 weeks gestation) was 21.77% among mothers aged less than 15 years, 13.99% among 15-19 year olds, and 11.99% among all women.³

One study found that individual-level factors associated with birthweight and gestational age differed between adolescent (<age 20) and adult (≥ 20) mothers, as well as between black and non-black adolescent mothers.⁴ For example, low birth weight was associated with BMI, race and gravidity among mothers aged 20 or greater, whereas only gravidity was associated with low birthweight among mothers age less than 20. Further, preterm birth was associated with BMI, ethnicity, receiving prenatal care, and timing of prenatal care initiation among adult mothers, while only marital status was associated with preterm birth among mothers aged less than 20 years. Among black adolescent mothers, higher parental education and gravidity were negatively associated with birthweight, and low parental education and using birth control were associated with greater gestational age. In non-black adolescents, being underweight was associated with lower birthweight, whereas being unmarried was associated with lower gestational age. Although initiation of prenatal care in the first trimester was not associated with improved birth outcomes among adolescent mothers in that study, in another study, inadequacy of prenatal care was found to be strongly associated with adverse birth outcomes among teen mothers.⁵ This suggests that it is the pattern of accessing prenatal care throughout pregnancy rather than timing of initiation that may be important for teen mothers. Other factors related to preterm birth and/or low birthweight among teen mothers in other studies include dating violence,⁶ the mother being underweight,⁷ smoking,⁸ living in a remote area,⁸ and neighborhood racial makeup.⁹

The availability of reproductive health services at school may be important in preventing adverse birth outcomes among teenage mothers. On-site reproductive healthcare services may improve the consistency of care a teen mother receives through her pregnancy, which, as noted above, could improve birth outcomes through increasing adequacy of prenatal care. Providing access to testing and treatment for sexually transmitted diseases could improve birth outcomes by improving teen mothers' preconception health. Providing reproductive healthcare services on-site for teens may also be a marker for a school culture that is generally more supportive for teens as they experience pregnancy and parenting. Lastly, care offered in school also may be better suited to teens compared to care offered in a general practice because school-based providers specialize in working with adolescents. In this study, our main research question was: Is the availability of reproductive healthcare services at school associated with improved birth outcomes in subsequent pregnancies among adolescent mothers? Our hypothesis was that young women who attended schools offering

reproductive healthcare services on-site would evidence better birth outcomes in subsequent pregnancies compared to young women who attended schools without those services.

METHODS

Participants

Data from Waves I and IV of the National Longitudinal Study of Adolescent Health (Add Health) contractual dataset were utilized.¹⁰ Add Health is a prospective cohort study of a nationally-representative sample of youth enrolled in grades 7-12 in the 1994-95 school year (Wave I).¹¹ Follow-up interviews were conducted in 1996 (Wave II), 2001 (Wave III), and 2007-08 (Wave IV). A multistage probability clustered sampling design was used to obtain its Wave I sample. The first stage was a stratified, random sample of all public and private high schools in the US. A feeder school was also recruited from each participating community. In-school surveys were attempted with all students attending participating schools; a total of 90,118 were completed. In the second Wave I sampling stage, a sample of adolescents was drawn for in-depth in-home interviews; a total of 20,745 interviews were conducted at this stage. At Waves IV, all respondents to the Wave I in-home interview were eligible for re-interview. A total of 15,701 interviews were conducted at Wave IV (80.3% response rate). Sampling weights adjusted for both unequal probabilities of selection and loss to follow-up.

We applied a number of sample inclusion criteria. First, we limited to girls and women who participated in Wave IV, as that was the wave when all respondents had complete teen pregnancy data. Second, we limited to participants with valid sampling weights. Third, we limited to women whose first pregnancies occurred after Wave I and before age 20 and ended with a singleton live birth to ensure the temporal ordering of predictors and outcomes (N = 978). Because of our interest in school services, we further limited to those who had information indicating they were still in high school while pregnant (N = 487). Among them, 402 had complete data. There were some differences between excluded versus included girls and women: age (15.98 vs. 15.53 years respectively, $p < .01$); school size attended (eg, 54.12% of excluded girls attending large schools vs. 34.58% of those included, $p < .001$); and availability of diagnostic screening services at school (18.29% in excluded vs. 6.22% in included, $p < .05$).

Instrumentation

Outcomes—At Wave IV women were asked about previous pregnancies and their outcomes. If they indicated they had given birth, they were asked: “How much did the baby weigh at birth?” Responses were given in pounds and ounces, which we converted to kilograms. Respondents were also asked “Was [baby's name] born before or after [his/her] due date?” and then “How many weeks or days early/late was [baby's name] born?” This was subtracted from 40 weeks to calculate gestational age (in weeks).

Predictors—At Wave I, school administrators were asked if their school provided on-site or referred out to a list of health and supportive services. We included 4 reproductive healthcare services, coded as 1= provided on site, 0=not provided on-site: diagnostic

screening (including but not limited to STDs), treatment for sexually transmitted diseases (STD), family planning counseling, and prenatal/postpartum healthcare.

Controls, individual-level—Potential individual-level confounders were identified through previous analyses of teen birth outcomes in the Add Health data set:⁴ race, age at pregnancy, age at Wave I, body mass index (BMI) category and parental education. Race, self-reported at Wave I, was categorized as black vs. non-black based on prior analyses suggesting black mothers' infants to have significantly lower birthweight compared to mothers of other races/ethnicities.⁴ BMI was constructed based on self-reported height and weight at Wave I, and categorized into underweight, normal weight, overweight or obese. Parental education was measured as the higher of either co-residential mother or father: less than high school diploma, high school diploma/GED or higher.

Controls, school level—A number of school-level variables were included. First, a *school disadvantage score* was created by conducting a polychoric principal component analysis of 5 individual-level variables at Wave I: family structure, parent education, public assistance receipt, difficulty paying bills, and parent unemployment.¹² Factor loadings on the first principal component were used as item weights in generating an individual disadvantage score, and then this score was averaged across students in each school to create a school-level disadvantage score. We standardized the score across schools (higher scores indicate greater disadvantage). *School enrollment options after pregnancy*, reported by school administrators, was coded as a three-category variable: continue in regular school only, enrolled in a separate school only, or both. School administrators also reported the *number of students who became pregnant* at their school in the prior year. *Type of school* (public vs. private) and *size of school* (small [1-400 students] vs. medium [401-1000 students] vs. large [1001-4000 students]) were also included.

Data Analysis

All analyses were performed in SAS (SAS Institute, Cary, North Carolina) and Stata version 9 (StataCorp LP, College Station, Texas). Individual-level analyses included corrections for complex survey design and population weights. Multilevel random intercept linear regression analyses were conducted including weights for individuals and schools.^{13,14}

Analyses began by examining univariate distributions and bivariate relationships. Proportions and means of individual-level and school-level characteristics were calculated. Bivariate associations between each covariate and birth outcomes were assessed with a series of bivariate random intercept linear regression models. We then entered all variables into a multilevel model simultaneously (one model for each outcome).

RESULTS

Individual-level sample characteristics are presented in Table 1. The mean birthweight of babies born to in-school adolescent mothers was 3.28 kilograms (kg), and the mean gestational age was 39.46 weeks. Seven percent of births were classified as low birthweight, and 4.8% were born premature. The mean baseline age was 15.3 years, with births occurring 2 years later on average. Nearly 26% of teen mothers were black, 19.7% were either

overweight or obese at baseline, and 19.7% had a highest parent education of less than high school.

School characteristics are presented in Table 2. By definition, school disadvantage had a mean of zero. The average number of past-year pregnancies was 11.13. Most included schools were public (94%), and nearly half were medium-sized (47%). The majority of schools permitted pregnant adolescents to continue in her regular classes (66%) or allowed her to choose whether to enroll in a separate school or stay in the same classes (26%). Few schools reported having on-site reproductive healthcare services: diagnostic screening (8%), STD treatment (3%), family planning counseling (9%), and prenatal/postpartum healthcare (4%).

Crude relationships between analysis variables and birth outcomes are presented in Table 3. Race was the only individual-level variable significantly associated with birth outcomes: black mothers' babies weighed significantly less at birth compared to other babies. Of the school control variables, having a greater number of pregnancies in the school was associated with higher gestational age. Also, small and large school size were associated with increased birthweight (relative to medium school size), although only large school size was associated with increased gestational age. On-site family planning counseling was significantly associated with increased birthweight ($\hat{\beta}=0.20$, 95% CI 0.06, 0.35) and borderline associated with increased gestational age ($\hat{\beta}=0.50$, 95% CI -0.002, 1.00). Prenatal/postpartum healthcare ($\hat{\beta}=0.29$, 95% CI 0.18, 0.39) was also associated with increased birthweight.

Associations between school-based reproductive health and supportive services and adolescent mothers' subsequent birth outcomes after controlling for all individual- and school-level variables are presented in Table 4. School availability of family planning counseling ($\hat{\beta}=0.21$, 95% CI 0.04, 0.38), and prenatal/postpartum healthcare ($\hat{\beta}=0.21$, 95% CI 0.02, 0.40) were significantly positively associated with the birthweight of infants born to teen mothers. The only school service marginally associated with infants' gestational age was family planning counseling ($\hat{\beta}=0.65$, 95% CI -0.08, 1.37).

Sensitivity Analyses

We ran a number of additional analyses to test the sensitivity of our results. First, we tried limiting our school-level predictors to those with potential biologic (as opposed to social) connections to subsequent birth outcomes – namely, STD treatment and prenatal/postpartum healthcare. In those models, connections between birthweight and prenatal/postpartum healthcare became stronger ($\hat{\beta}=0.34$, 95% CI 0.18, 0.50), and STD treatment remained unassociated with this outcome. Second, we limited our sample to youth who were in grades 9 and above at Wave I, and thus, who most likely to be in a school that offered such services on-site (N=279 students, N = 89 schools). In these analyses, estimated associations between prenatal/postpartum healthcare and birthweight were roughly the same as in the larger sample ($\hat{\beta}=0.30$, 95% CI 0.13, 0.47), and STD treatment remained unassociated with

examined outcomes. Across both analyses gestational age remained unassociated with school services.

DISCUSSION

Preterm birth and low birthweight are leading causes of morbidity and mortality among infants and children,¹⁵ and these negative outcomes are more common among infants born to adolescent compared to adult mothers.² Some previous studies have suggested that inadequacy of prenatal care was strongly associated with worse birth outcomes among this group.⁵ The goal of this study was to examine whether reproductive health services offered at the school level were associated with subsequent birth outcomes in this group.

Our first finding was that the on-site availability of reproductive health services for pregnant and parenting teens was low overall. The service most commonly offered on school site was family planning counseling (8.7% of schools). Despite a trend toward increasing availability of school-based health centers over time,¹⁶ the services associated with improving subsequent birth outcomes in our analysis remain relatively scarcely offered. For example, according to a report by the US Centers for Disease Control and Prevention, only 3.4% of surveyed school districts in 2012 required schools to provide contraceptive services, and 6.1% required schools to either provide prenatal care on-site or refer out to other services.¹⁷ Many schools districts prohibit the provision of some reproductive health services on school grounds.¹⁸ Thus, although our data come from the mid-1990s, the school services environment specifically related to reproductive health services has not improved much.

Attending schools that provided on-site reproductive health services was related to better subsequent birth outcomes in subsequent pregnancies among this nationally-representative sample of adolescents. In particular, availability of family planning counseling and on-site prenatal/postpartum care were related to increased birthweight, and availability of family planning counseling was borderline associated with increased gestational age. This borderline association with gestational age may be due to the study being under-powered. Such associations held even after controlling for some factors that may be implicated in the selective placement of these services – namely characteristics of the student body (including socioeconomic disadvantage) and the number of previous-year teen pregnancies in a school. Offering services on-site at school is obviously related to increased access for pregnant and parenting teens. This would be consistent with past research that connects availability of school-based health centers with adolescents' increase utilization of health services.^{19,20} The availability of family planning counseling may be a proxy for the availability of general health counseling services, or may signal to pregnant adolescents an open environment in which they can more freely discuss their sexual and reproductive health with school-based providers. Having such services in-school likely would have other positive health consequences, such as decreasing teenage pregnancy through increasing contraceptive use.²¹ Such services may impact adolescents' subsequent birth outcomes by decreasing the stress and/or stigma associated with their adolescent pregnancy and increasing the social support felt by pregnant and parenting teens. Unfortunately, because we do not have data on adolescents' specific feelings and practices *during* pregnancy, we are unable to test these mechanisms. Future analyses examining such mediators are warranted.

Limitations

Although this study has strengths, including the use of nationally-representative, prospective data, its results should be interpreted in light of its limitations. The school services we examined are likely not randomly allocated across schools, and thus, unmeasured factors related to both services' placement and subsequent birth outcomes could distort the current findings. We have included relevant variables at the individual and school level, but cannot rule out unmeasured confounding factors. The data we present are from teen pregnancies that happened between the mid-1990s to the early 2000s; thus, it is possible that historical changes could impact the relevance of our findings to current conditions. Repeating such analyses in more recent cohorts could test the historical generalizability of results. We were unable to assess whether the pregnant teens actually used the services offered at school; thus, we are unable to test direct effects of these services through clinical care. We also were unable to test for differences between race groups in the relevance of school-based services for subsequent birth outcomes, despite past studies that found differences in predictors of birth outcomes between black and non-black adolescents.⁴ Multilevel models become less stable with smaller sample size per cluster, which would have been exacerbated by stratified analyses. If other datasets become available with a larger number of teenage mothers, it would be worth exploring potential racial differences. We were unable to isolate the specific association between prenatal care and subsequent birth outcomes because the questionnaire used a single question assessing whether prenatal and/or postpartum healthcare were offered by each school. Although we believe it is likely schools who offer one service also offer the other, we cannot rule out possible dampening of estimated effects of prenatal care due to its combined reporting with postpartum healthcare. The sample is limited to adolescents with complete data on all covariates; thus, sample selection biases could affect our results. Finally, young mothers self-reported infants' birthweight and gestational age; thus, outcomes may be subject to recall biases. Although mothers' reports of these outcomes are generally reliable,²² and studies have found that maternal age does not affect accuracy of reporting,²² ethnicity and socioeconomic status have been found to predict errors.²³

Conclusions

On-site provision of family planning counseling and prenatal care were positively related to the birthweight and gestational age of infants born to adolescent mothers. Future analyses should pinpoint the mechanisms by which these services improve subsequent birth outcomes, including tracking individuals to determine if services offered are actually used, and if used, services actually achieve positive birth outcomes. Also, future work should explore whether offering referrals to such services off-site also improve teen mothers' birth outcomes. Finally, future studies should examine contingencies for these services' effects on birth outcomes, for example, whether on-site services are more strongly related to positive outcomes among certain subgroups of adolescents, such as those who have less access to transportation or poorer students.

IMPLICATIONS FOR SCHOOL HEALTH

School boards or administrators may consider adding some of these services – especially family planning counseling and prenatal care – to the menu of health services offered on-site

at school. However, offering prenatal care may only be cost-effective in schools with a larger number of teen births; other schools should consider providing referrals to adolescent-friendly providers of such services.

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Table 1

Descriptive Statistics: Individual Characteristics (N = 402)

	<u>Mean (se)</u>
Birthweight	3.28 (0.04)
Gestational age	39.46 (0.14)
Baseline age	15.30 (0.17)
Age at pregnancy	17.22 (0.12)
	<u>N (weighted %)</u>
Low birthweight	
No	371 (92.69)
Yes	31 (7.31)
Preterm birth	
No	376 (95.18)
Yes	26 (4.82)
Race	
non-Black	257 (74.25)
Black	145 (25.75)
Baseline BMI category	
Underweight	59 (16.11)
Normal weight	262 (64.23)
Over weight	64 (15.32)
Obese	17 (4.34)
Parental education	
HS	313 (80.33)
less than HS	89 (19.67)

NOTES: BMI = Body Mass Index; HS= high school

Table 2

Descriptive Statistics: School Characteristics (N = 104)

	<u>Mean (se)</u>	
School disadvantage score (standardized)	0.00 (1.00)	
Number of pregnancies	11.13 (21.27)	
		<u>N (%)</u>
Type of school		
Public		98 (94.23)
Private		6 (5.77)
School size		
Small		25 (24.04)
Medium		49 (47.12)
Large		30 (28.85)
School enrollment after pregnancy		
Continue in regular school (ie, in her regular class or taught in separate class)		69 (66.35)
Enrolled in a separate school		8 (7.69)
Both		27 (25.96)
On-site reproductive healthcare services		
Diagnostic screening (including STDs)		8 (7.69)
Treatment for STD		3 (2.88)
Family planning counseling		9 (8.65)
Prenatal/postpartum healthcare		4 (3.85)

NOTES: STD = sexually transmitted disease

Bivariate Analysis: Individual and School Correlates of Subsequent Birth Outcomes among Adolescent Mothers (N = 402)

Table 3

	Birthweight (kg)		Gestational Age (weeks)	
	Est. β	(95% CI)	Est. β	(95% CI)
Individual level variables				
Baseline age	-0.04	(-0.09,0.001)	-0.05	(-0.24,0.14)
Age at pregnancy	-0.02	(-0.08,0.05)	-0.16	(-0.39,0.08)
Baseline BMI category				
	Underweight	-0.03 (-0.19,0.14)	0.04 (-0.65,0.74)	Referent
	Normal weight			
	Over weight	0.12 (-0.17,0.42)	-0.03 (-1.01,0.95)	
Parent education	Obese	0.12 (-0.15,0.40)	0.56 (-0.23,1.35)	
	HS	Referent	Referent	
	Less than HS	-0.01 (-0.23,0.21)	-0.51 (-1.26,0.25)	
Race	Non-black	Referent	Referent	
	Black	-0.19 (-0.33,-0.05)**	-0.23 (-0.87,0.42)	
School Characteristics				
School disadvantage	-0.02	(-0.09,0.05)	-0.03	(-0.25,0.18)
Number of pregnancies	0.0001	(-0.003,0.003)	0.01	(0.01,0.02)***
School type				
	Public	Referent	Referent	
	Private	-0.35 (-0.96,0.25)	-2.02 (-5.54,1.50)	
School size	Small	0.18 (0.02,0.33)*	0.04 (-0.58,0.67)	
	Medium	Referent	Referent	
	Large	0.15 (0.001,0.30)*	0.70 (0.11,1.28)*	
School enrollment after pregnancy				
Continue in regular school (ie, in her regular class or taught in separate class)	Referent		Referent	

	Birthweight (kg) Est. β (95% CI)	Gestational Age (weeks) Est. β (95% CI)
Enrolled in a separate school	-0.04 (-0.42,0.34)	0.77 (-0.07,1.61)
Both	0.05 (-0.15,0.25)	0.12 (-0.52,0.75)
On-site Reproductive Healthcare Services		
Diagnostic screening	-0.07 (-0.28,0.14)	0.22 (-0.36,0.81)
Treatment for STD	0.09 (-0.07,0.25)	0.12 (-0.58,0.81)
Family planning counseling	0.20 (0.06,0.35)**	0.50 (-0.002,1.00) ⁺
Prenatal/postpartum healthcare	0.29 (0.18,0.39)***	0.14 (-0.47,0.75)

NOTES: BMI = Body Mass Index; HS= high school; STD = sexually transmitted disease

⁺ p < .10

* p < .05

** p < .01

*** p < .001

Multivariable Analysis: Reproductive Healthcare Services and Subsequent Birth Outcomes among Adolescent Mothers (N = 402)^a

Table 4

	Birthweight (kg)		Gestational Age (Weeks)	
	Est. β	(95% CI)	Est. β	(95% CI)
On-site Reproductive Healthcare Services				
Diagnostic screening	-0.14	(-0.35, 0.08)	0.10	(-0.59, 0.79)
Treatment for STD	0.04	(-0.20, 0.28)	-0.18	(-1.07, 0.71)
Family planning counseling	0.21	(0.04, 0.38) [*]	0.65	(-0.08, 1.37) ⁺
Prenatal/postpartum healthcare	0.21	(0.02, 0.40) [*]	-0.61	(-1.46, 0.23)

NOTES: STD = sexually transmitted disease

⁺ p < .10

^{*} p < .05

^a Analyses controlled for all individual- and school-level variables included in Table 3.