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Social discrimination, stress, and risk of unintended pregnancy among young women

Kelli Stidham Hall,
Research Investigator and "BIRCWH" NIH K-12 Scholar, Department of Obstetrics and Gynecology; Institute for Social Research, Population Studies Center, University of Michigan, L4000 Women's Hospital, 1500 East Medical Center Dr., Ann Arbor, MI 48109, (t) 734-232-1818, (f) 734-647-9727

Yasamin Kusunoki,
Institute for Social Research, Population Studies and Survey, Research Centers, University of Michigan

Heather Gatny, and
Institute for Social Research, Population Studies and Survey, Research Centers, University of Michigan

Jennifer Barber
Department of Sociology; Institute for Social Research, Population Studies and Survey Research Centers, University of Michigan

Kelli Stidham Hall: hkelli@umich.edu

Abstract

Purpose—Prior research linking young women's mental health to family planning outcomes has often failed to consider their social circumstances and the intersecting biosocial mechanisms that shape stress and depression as well as reproductive outcomes during adolescence and young adulthood. We extend our previous work to investigate relationships between social discrimination, stress and depression symptoms, and unintended pregnancy among adolescent and young adult women.

Methods—Data were drawn from 794 women 18–20 years in a longitudinal cohort study. Baseline and weekly surveys assessed psychosocial information including discrimination (EDS), stress (PSS), depression (CES-D), and reproductive outcomes. Multi-level, mixed-effects logistic regression and discrete-time hazard models estimated associations between discrimination, mental health, and pregnancy. Baron and Kenny's method was used to test mediation effects of stress and depression on discrimination and pregnancy.

Correspondence to: Kelli Stidham Hall, hkelli@umich.edu.

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Results—The mean discrimination score was 19/45 points; 20% reported moderate/high discrimination. Discrimination scores were higher among women with stress and depression symptoms versus those without symptoms (21 versus 18 points for both, p's<0.001). Pregnancy rates (14% overall) were higher among women with moderate/high (23%) versus low (11%) discrimination (p<0.001). Discrimination was associated with stress (aRR 2.2, 95%CI 1.4,3.4), depression (aRR 2.4, CI 1.5,3.7), and subsequent pregnancy (aRR 1.8, CI 1.1,3.0). Stress and depression symptoms did not mediate discrimination's effect on pregnancy.

Conclusions—Discrimination was associated with an increased risk of mental health symptoms and unintended pregnancy among these young women. The interactive social and biological influences on reproductive outcomes during adolescence and young adulthood warrant further study.

Keywords

social discrimination; unintended pregnancy; stress; mental health; adolescents; social epidemiology

Unintended pregnancy during adolescence and young adulthood has significant health and social consequences for young women, their families, and society [1–3]. Increased risk of maternal and infant morbidity and mortality, antenatal and postpartum depression, domestic violence, rapid repeat unintended pregnancy, interrupted education, reduced employment opportunities, and substantial health care costs are among the many adverse outcomes for pregnant young women, their offspring, and health systems worldwide [1–3]. In the United States, unintended pregnancy and its sequelae are disproportionately high among poor and minority young women [4,5].

While disparities in unintended pregnancy point to the role of sociodemographic factors such as race/ethnicity and socioeconomic status (SES) [4–7], the mechanisms through which these distal determinants influence reproductive outcomes are not fully clear. Research on the interrelationships between social context and health (i.e. biosocial), including Geronimous' "Weathering Hypothesis," suggests that chronic social stressors differentially experienced by socially disadvantaged women, and specifically discrimination and marginalization, can lead to ongoing psychological (e.g. mental distress) and physiological (e.g., immune/inflammatory dysfunction, higher allostatic load, and accelerated cellular aging) stress burden to influence health outcomes (e.g., depression, chronic disease, and mortality) and shape health disparities [8–12]. Social discrimination and its biosocial processes, however, have been given relatively little attention in reproductive health research [13]. Racial and socioeconomic disparities in adverse perinatal outcomes, such as miscarriage and stillbirth, are believed to at least partially stem from the biological and psychological "wear and tear" that chronic exposure to discrimination triggers [14–18].

Discrimination and its biosocial processes (i.e., mental and physical weathering) may also help explain disparities in *unintended* and *early* pregnancy among socially disadvantaged women, though this has not been widely studied. Our prior research highlighted the influence of young women's mental health on the proximate determinants of unintended pregnancy – sex and contraceptive behaviors [19–21]. Using data from a representative

longitudinal study of nearly 1,000 women aged 18–20, we described the effects of stress and depression symptoms on women's contraceptive nonuse, misuse, less effective method use, increased sexual activity and rates of pregnancy over one year [19–21]. While this work and that of others has identified links between mental health and unintended pregnancy [22–24], young women's adverse social circumstances, and notably experiences with discrimination, have not been considered but may concurrently contribute to negative mental *and* reproductive health outcomes, especially for poor and minority young women [13].

We investigated relationships between social discrimination, mental health, and pregnancy among a population-based cohort of adolescent and young adult women not desiring pregnancy. We hypothesized that women who perceived discrimination would experience higher rates of stress and depression symptoms and pregnancy and that mental health would mediate relationships between discrimination and pregnancy. We further hypothesized that rates of discrimination, mental health symptoms, and pregnancy would be higher among poor and minority women than among their socially advantaged counterparts.

METHODS

Sample and design

Data were drawn from a longitudinal population-based cohort study of women aged 18–20 [19–21]. Young women were sampled from a racial/ethnically and socioeconomically diverse county in the Midwestern U.S. between March 2008 and March 2009. Names and contact information were randomly selected from state driver's license and personal identification card registries to identify eligible women (ages 18–20 and a county resident). Of the women contacted by mail or in-person and asked to participate, 84% enrolled at baseline and 99% of those agreed to participate in the longitudinal study, resulting in a final sample of 992 women. The Institutional Review Board of the University of Michigan approved this study.

Following informed consent, women completed a 60-minute in-person baseline survey interview on sociodemographics, relationship characteristics, reproductive and contraceptive histories, and mental health. Nearly all participants (98%) stated at baseline that they had no intentions but rather strong desires to avoid pregnancy. Women then participated in a 2.5-year study of weekly surveys (online or by phone) that collected information on relationship dynamics, sexual and contraceptive behaviors, and pregnancy outcomes; 75% of the sample completed 18 months or more of surveys. We also administered a series of quarterly surveys assessing additional psychosocial characteristics, including social discrimination.

For our analysis, we included women who were not pregnant, completed more than one weekly survey, and completed at least one quarterly survey with a discrimination scale measurement. The analytic sample includes 794 women who completed 36,809 weekly surveys, including 2,417 quarterly discrimination surveys, over the first 18 months of study.

Measures

Social discrimination—In quarterly surveys, we administered the Everyday Discrimination Scale (EDS), the most commonly used measure of perceived social

discrimination in studies of health and wellbeing [25,26]. On a 5-point Likert response scale (5=almost everyday, 4=at least once a week, 3=a few times a month, 2=a few times a year, or 1=less than once a year), women responded to nine items assessing how often they experienced discrimination in their day-to-day lives: "You are treated with less courtesy than other people;" You are treated with less respect than other people;" "You receive poorer service than other people at restaurants or stores;" "People act as if they think you are not smart;" "People act as if they think you are dishonest;" "You are called names or insulted;" "People act as if they are better than you are;" "You are threatened or harassed;" and "You are followed around in stores." Responses are summed for a total score (range 5–45 points), with higher scores denoting greater perceived discrimination.

On average, women completed 4 quarterly discrimination scales (SD 1.6, range 1–7). We examined time-variant survey-level discrimination scores (intra-class correlation and reliability coefficients 0.7 and 0.9 respectively, suggesting little variance across woman's survey-level scores). We then created a summary indicator, a woman-level average discrimination score.

To assess different "levels" of discrimination (i.e. low, moderate, and high scores), we created sets of bivariate and categorical indicators using score cut-offs based upon the sample distribution. We applied a cut-off of 24.5 points (≥1 SD above the sample mean, the top 20^{th} percentile) to create a bivariate discrimination indicator denoting women with moderate/high versus low discrimination scores. We conducted sensitivity analyses to test different discrimination score cut-offs. All results were the same for a 25.5-point cut-off (15^{th} percentile). Discrimination score means and proportions with moderate/high scores were the same for the survey-level and woman-level discrimination indicators. We present results from the latter.

Mental health symptoms—The larger study contained standard measures for stress and depression in the baseline interview, including The Center for Epidemiologic Studies – Depression Scale (CES-D) and The Perceived Stress Scale (PSS), which we have described in more detail elsewhere [19–21]. Briefly, the abbreviated CES-D uses a 4-point Likert scale to assess how often over the previous week women experienced five depressive symptoms, including feeling: "depressed," "sad," "life was not worth living," "like you could not shake off the blues," and "happy" [27]. The PSS assesses the degree to which one appraises her life situation as stressful, unpredictable, uncontrollable, and overloading over the previous month via four items on a 5-point Likert scale [28]. Stress symptoms assessed by the PSS included: "unable to control important things in life," confident about ability to handle personal problems," "things were going your way," and "difficulties were piling up so high that you could not overcome them." For both scales, positively worded items are reverse coded and responses are summed for total scores, with higher scores indicating greater symptoms. We used standard score cut-offs on each instrument to denote moderate/severe stress symptoms (≥9 points on the PSS-4) and depression symptoms (≥4 points on the CES-D-5).

Unintended pregnancy—Each woman was asked each week whether it was possible she was pregnant and whether a pregnancy test had indicated so. We operationalized a

pregnancy as a newly reported positive pregnancy test. Given that 98% of women explicitly stated at baseline that they had no intentions to become pregnant but rather strong desires to avoid pregnancy, we refer to pregnancy here as "unintended."

Background characteristics—Sociodemographic, relationship, and reproductive characteristics were assessed at baseline and across the study period and included: age, race/ethnicity, educational attainment, employment status, public assistance recipient, childhood household/family structure, mother's age at first birth, frequency of religious service attendance, relationship status, cohabitation with marital or non-marital partner, sexual intercourse experience, age at coitarche, lifetime number of sexual partners, and histories of pregnancy, contraceptive use and unprotected sex. In our analysis, we examined both baseline and time-varying characteristics and their effects were similar, so we present the former. We examined race/ethnicity as a categorical variable (Black, White, Hispanic, Other), as well as a binary variable (Black and Non-Black) which consistent with our ongoing work on Black-White differences in contraceptive use and pregnancy outcomes. All results were the same as so we present the latter.

Statistical analysis

We described women's background characteristics, discrimination scores, and rates of moderate/high discrimination and pregnancy using means with standard deviations (SD) and frequencies with percentages (%). We conducted unadjusted bivariate analysis (t-tests, X^2, ANOVA, and nonparametric equivalents) to identify differences in discrimination scores and proportions with moderate/high discrimination by: 1) background characteristics, 2) stress and depression symptoms, and 3) pregnancy.

We examined relationships between background characteristics, discrimination, mental health symptoms, and pregnancy using multi-level, mixed effects logistic regression models (when discrimination and mental health symptom were modeled as outcomes) and discrete-time proportional hazard models (for the pregnancy outcome models). We controlled for covariate fixed effects, random and cluster effects where appropriate, and the numbers of weekly surveys completed, discrimination scales completed, pregnancy months, and pregnancy months squared. Person-weeks of exposure are the unit of analysis. A woman was considered to be at risk of pregnancy during all weeks that she reported not being already pregnant. We estimated associations between discrimination and pregnancy in full models first, then in reduced models controlling only for significant covariates. We also tested a series of interaction terms for discrimination by mental health symptoms and discrimination by covariates (e.g. race); none were significant and are not presented.

Finally, we used Baron and Kenny's formal mediation criteria to test whether stress and depression symptoms mediate the effects of discrimination on pregnancy [29]. The method requires the following criteria:

1. Independent variable affects the mediator (Path A, discrimination is related to mental health). We tested these models with depression and stress regressed on discrimination. Given that mental health was only measured at baseline and discrimination was measured quarterly intervals and because we hypothesized that

bidirectional relationships between mental health and discrimination may exist, we also tested models with discrimination regressed on depression and stress.

2. Mediator affects the outcome (Path B, mental health is related to pregnancy). This step replicates our prior work on the relationships between depression and stress and pregnancy rates [19], here using 18 months of data among this smaller sub-sample of women.

3. When Paths A and B are simultaneously controlled, a previously present effect of the independent variable on the outcome (Path C, discrimination is related to pregnancy) becomes insignificant or reduced. We tested separate mediation models with pregnancy regressed on discrimination, controlling for depression and stress.

We present results with discrimination modeled as the bivariate woman-level summary indicator of the proportion with moderate/high discrimination (24.5 point cutoff). Covariate selection was based upon our previous work and variables were considered for inclusion in regression models if their p-value in bivariate models was 0.25 or less [19–21]. We examined time-varying sociodemographic characteristics and their effects were similar to baseline characteristics, so we present baseline models. We present exponentiated coefficients from regression models as adjusted relative risk ratios (aRR) and 95% confidence intervals (CI), with two-tailed alphas of $P<0.05$*, $P<0.01$**, and $P<0.001$*** considered significant. We analyzed data with Stata 12.0 (StataCorp LP, College Station, TX).

RESULTS

Sample characteristics

Sociodemographic, reproductive, and mental health characteristics of the sample are presented in Table 1. One third of women identified as Black (32%) race/ethnicity, with the majority of non-Black women identifying as White (58%). Over half of women were enrolled in a 2- or 4-year college (59%). A quarter of women were receiving public assistance (24%) and 51% were unemployed. Most women were in a relationship (71%); 16% were cohabiting. Three-quarters of women had a history of sexual intercourse (75%), with 51% experiencing coitarche at 16 years or younger; 20% had a history of pregnancy. Mental health symptoms were moderate/severe for quarter of women (24% for depression and 23% for stress).

Social discrimination

The mean response on the EDS was 2 out of 5 (SD 1), translating to perceived social discrimination “a few times a year.” The mean discrimination score (both survey-level and woman-level) was 19 (SD 6) out of 45 points (range 9 to 40.5). Twenty percent of women (n=155) scored 1 SD above the mean or higher, denoting moderate/high discrimination.

Discrimination scores differed by nearly all of women’s background characteristics (Table 1). Compared to their counterparts, mean discrimination scores and proportions of moderate/high discrimination were higher among women with low educational attainment, women who were unemployed or receiving public assistance, women with a childhood family

structure of other than 2 parents present or with a mother who had given birth as a teen, women with infrequent or no religious service attendance, women who were engaged or cohabitating, and women with histories of more sexual partners, early coitarche, unprotected sex, and prior pregnancy.

In multivariable models of social discrimination (Table 1), women with a pregnancy history had a higher risk of perceiving moderate/high levels of discrimination than those without a prior pregnancy (aRR 1.7, CI 1.0, 2.8, P =0.03). Women who were employed (aRR 0.6, CI 0.4, 1.0, P =0.04) or enrolled in a 2-year (aRR 0.6, CI 0.3, 1.0, P =0.04) or 4-year (aRR 0.3, CI 0.2, 0.5, P <0.001) college had lower risks of moderate/high discrimination, compared to their counterparts (Table 1).

Mental health and discrimination

Discrimination scores were three points higher for women with depression and stress symptoms compared to those without symptoms (21 versus 18 points, P-values<0.001 for both) (Table 1). Proportions with moderate/high discrimination were also higher among women with depression and stress than those without symptoms (31% versus 16% and 34% versus 15%, respectively, P's<0.001).

In multivariable models, relationships between social discrimination and mental health symptoms were similarly significant when we treated depression and stress as predictors of discrimination (Table 1) and vice versa (Mediation Path A); women with moderate/high levels of discrimination had over twice the risk of having both depression (aRR 2.4, CI 1.5, 3.7, P <0.001) and stress (aRR 2.2, CI 1.4, 3.4, P =0.001) symptoms compared to women with low discrimination.

Unintended pregnancy, mental health, and discrimination

The pregnancy rate during the 18-month study period was 14%. Pregnancy rates were higher among women with depression and stress symptoms than among those without depression (18% versus 12%, P =0.01) and stress (17% versus 12%, P =0.05). In adjusted models of pregnancy regressed on mental health symptoms (Mediation Path B, not shown in tables), stress was marginally associated with pregnancy (aRR 1.5, CI 1.0, 2.4, P =0.09). The similar point estimate for depression was non-significant (aRR 1.3, CI 0.8, 2.0, P =0.33).

Pregnancy rates were also higher among women with moderate/high discrimination levels compared to those with low discrimination (23% versus 11%, P <0.001). In hazard models controlling for significant covariates (Table 2), the risk of pregnancy was 80% higher among women who perceived moderate/high discrimination compared to those who did not (aRR 1.8, CI 1.1, 3.0, P =0.01) (Mediation Path C).

Point estimates for discrimination remained stable and significant across all models testing the mediation effects of depression and stress on the relationship between discrimination and pregnancy, providing no evidence of mediation (Table 2).

DISCUSSION

Perceived social discrimination was not uncommon among young women in our study, with discrimination experienced “a few times a year,” on average. The strongest predictor of moderate/high discrimination was a history of adolescent pregnancy. A few studies have pointed to the social stigmatization of adolescent pregnancy and childbearing in the U.S. and abroad [30–32]. Young women, especially adolescents, who become pregnant may suffer marginalization and discrimination, which may be further exacerbated by the pregnancy resolution – that is, abortion and childbearing are uniquely stigmatizing experiences. Adolescents who carry their pregnancy to term are at risk for more severe long-term social and health consequences, including lost employment and educational opportunities, parental and intimate partner violence, and mental health morbidity, all which may be further stigmatizing [30–33]. A dearth of research exists on stigma and family planning among young women, and we did not have explicit measures of stigma here. Our ongoing research focuses on the role of stigma in women’s reproductive and mental health outcomes across adolescence and young adulthood, in domestic and global contexts.

These young women not desiring pregnancy who perceived moderate/high social discrimination had nearly two-fold risk of *subsequent* pregnancy over 18 months compared to women with low discrimination. They also experienced two-fold higher risk of depression and stress symptoms, though mental health symptoms did not appear to fully mediate relationships between discrimination and pregnancy. These results, coupled with our previous work, contribute to emerging biosocial research on the biological and psychological consequences of social stressors and their impact on reproductive outcomes. Most studies on discrimination and “weathering” in reproductive health have focused on maternal-infant outcomes in the perinatal and postpartum period [14–18]. Our findings offer new insights into adverse social circumstances and mental health in shaping risk of unintended pregnancy, accounting for different dimensions of women’s health, wellbeing and social disadvantage that are understudied in family planning. Building upon Bird and Bogart’s research [34–36], future studies can elucidate mechanisms by which discrimination influences unintended pregnancy, especially contraceptive access and family planning service utilization.

Relationships between discrimination and pregnancy risk appeared to be similar for socially advantaged and disadvantaged women, with non-significant interaction terms by race and SES. Race and SES were also not predictive of discrimination. In other words, the effects of discrimination on pregnancy risk did not have a greater impact on the groups of women we would have hypothesized would be more “vulnerable” to experiencing discrimination as well as unintended pregnancy. Perhaps discrimination does not contribute to pregnancy risk above and beyond the contributions of other adverse life events for socially disadvantaged women. It may also be that disadvantaged women are “better equipped” to manage the effects of discrimination due to adaptive coping, social support, and resiliency, which may help buffer “weathering” [8,14,37,38].

Other social class indicators, including college enrollment and employment, were protective against discrimination (though not associated with pregnancy). Researchers have

documented the positive effects of upward mobility (i.e. opportunities and activities that compete with childbearing during adolescence and young adulthood) in improving the health and wellbeing of disadvantaged young women, including the protective effects of educational attainment and employment on reproductive outcomes [6,7]. Ultimately, factors associated with discrimination require further study to better understand links between discrimination, mental health, and unintended pregnancy.

Several limitations are noteworthy. The larger study only measured stress and depression symptoms at baseline and discrimination quarterly, so we were unable to investigate the effects of changing mental health and discrimination status or account for temporal ordering effects. While in our related prior work we cite evidence that mental health symptoms may remain stable across relatively short periods of time, including during adolescence [20], our failure to capture even nuanced changes in stress symptoms or perceived discrimination limited our ability to test causal pathways linking discrimination and mental health to pregnancy. Also, the data did not include biological health indicators, which precluded our ability to model the interactive biosocial trajectories health and unintended pregnancy [10,11]. We did not account for microdynamic pregnancy intentions here and so our conclusions regarding findings on “unintended pregnancy” should be interpreted with caution. Nor did we examine measures of social support, coping and resilience, or thoroughly consider religiosity or relationship microdynamics and violence, all of which likely have an impact on mental health and social wellbeing [30–32,37–40]. Finally, in considering differentially effects of discrimination and pregnancy risk by race/ethnicity, we focused on Black versus non-Black women (who were largely White). While the demographics of our analytic sample were consistent with the larger study and greater population in the Midwestern U.S. from which the sample was drawn, small sub-samples of Hispanic, Asian and other race/ethnicities precluded an adequate examination of these groups. Overall, this limited treatment of an important, established predictor of discrimination may help partially explain our null findings on race differences, and our results may not be generalizable to other more diverse samples of young women in the U.S.

Beyond these limitations, findings from this study beg further consideration of traditional conceptualizations of discrimination and the diversity of experiences that contribute to social wellbeing and mental and reproductive health during adolescence and young adulthood.

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Abbreviations

CES-D	Center for Epidemiologic Studies – Depression Scale
CI	Confidence interval
PSS	Perceived Stress Scale

RR	Relative risk ratio
SES	Socioeconomic status
SD	Standard deviation

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Implications and Contributions

Social discrimination was associated with stress, depression, and unintended pregnancy among these young women. Findings offer insight into the roles of social context in the pathways leading to unintended pregnancy, accounting for different dimensions of health, wellbeing, and social disadvantage that have been understudied in adolescent reproductive health research.

Research Highlights

- Social discrimination was not uncommon among our adolescent and young adult women.
- The strongest predictor of social discrimination was prior adolescent pregnancy.
- Discrimination was related to increased risk of subsequent unintended pregnancy.
- Discrimination was also associated with moderate/severe stress and depression symptoms.

Table 1

Social Discrimination, by Mean Scores, Proportions with Moderate/High Scores, and Adjusted Odds, According to Women's Background Characteristics and Mental Health Symptoms

	Mean discrimination scores				Proportion with moderate/high discrimination[c]		Adjusted odds of moderate/high discrimination[e]			
							Model 1 (Full)		Model 2 (Reduced)	
	%	M	SD	*p*[b]	%	*p*[b]	aRR	CI	aRR	CI
Total sample (N=794)[a]	100	19	6		20					
Background characteristics										
Age				0.14		0.69				
18 years	42	19	6		19		1			
19 years	50	19	6		21		1.4	0.9,2.2		
20 years	8	18	7		16		0.8	0.3,1.8		
Race/ethnicity										
Black	32	19	6	0.60	21	0.54	1.1	0.6,1.9		
Non-Black	68	19	6		19		1			
Educational enrollment				<0.001		<0.001				
Not enrolled (graduated HS)	19	20	7		27		1		1	
Enrolled in high school	13	20	6		24		0.8	0.4,1.6	0.8	0.4,1.4
Enrolled in 2 year college	29	19	6		18		0.6^	0.3,1.0	0.6*	0.3,1.0
Enrolled in 4 year college	30	17	6		10		0.3***	0.1,0.6	0.3***	0.1,0.5
High school drop-out	8	21	7		33		0.7	0.3,1.7	0.9	0.4,2.1
Employment status				0.01		0.001				
Employed	49	19	6		15		0.6*	0.4,1.0	0.7*	0.4,1.0
Unemployed	51	20	7		24		1		1	
Receiving public assistance				0.004		0.002				
Yes	24	20	7		27		1.0	0.6,1.8		
No	76	19	6		17		1			
Childhood family structure				0.02		0.09				
2 parents (biological/step)	54	18	6		17		1			
1 parent only	38	20	6		23		1.0	0.6,1.6		

	Mean discrimination scores				Proportion with moderate/high discrimination[c]		Adjusted odds of moderate/high discrimination[e]			
							Model 1 (Full)		Model 2 (Reduced)	
	%	M	SD	*p*[b]	%	*p*[b]	aRR	CI	aRR	CI
Other	8	20	7		24		0.8	0.4,1.9		
Mother's age at first birth				0.02		0.10				
<20 years old	34	20	7		23		0.9	0.6,1.5		
≥20 years old	66	19	6		18		1			
Religious service attendance				0.01		0.57				
Never	22	20	7		22		1			
< weekly	52	19	6		20		0.9	0.5,1.5		
≥ weekly	26	18	6		18		0.9	0.5,1.8		
Relationship status				<0.001		0.003				
Married	1	18	9		20		1			
Engaged	7	22	7		39		5.4	0.8,36.4		
Romantic relationship	47	19	6		19		2.0	0.3,11.4		
Physical/emotional	16	19	6		19		2.5	0.4,15.1		
None	29	18	6		16		2.1	0.4,12.3		
Cohabitation status				0.001		0.006				
Cohabiting	16	21	7		28		1.1	0.6,2.1		
Not cohabiting	84	19	6		18		1			
Lifetime # sexual partners				<0.001		0.01				
0	25	18	6		15					
1	17	18	5		15					
2	13	19	6		18					
≥3	44	20	6		25					
Age at coitarche				<0.001		<0.001				
≤ 16 years	51	20	6		25		1.2	0.7,2.0		
> 16 years	49	18	6		15		1			
Ever had sex without using birth control				<0.001		<0.001				
Yes	44	20	7		26		1.4	0.8,2.4		
No	56	18	6		15		1			

	Mean discrimination scores				Proportion with moderate/high discrimination[c]		Adjusted odds of moderate/high discrimination[e]			
							Model 1 (Full)		Model 2 (Reduced)	
	%	M	SD	*p*[b]	%	*p*[b]	aRR	CI	aRR	CI
History of pregnancy				<0.001		<0.001				
Yes	20	21	7		30		1.4	0.8,2.6	1.8*	1.0,3.0
No	80	19	6		17		1		1	
Number of pregnancies				<0.001		<0.001				
0	80	18	6		17					
1	13	20	6		24					
≥2	6	23	7		44					
Mental health symptoms										
Moderate/severe depression[c]				<0.001		<0.001				
Yes (≥4pts CESD)	24	21	7		31		2.4***	1.5,3.7	2.5***	1.6,3.9
No (<4pts CESD)	76	18	6		16		1		1	
Moderate/severe stress[d]				<0.001		<0.001				
Yes (≥9pts PSS-4)	23	21	6		34		2.1***	1.3,3.4	2.2***	1.4,3.5
No (<9pts PSS-4)	77	18	6		15		1		1	

Abbreviations: Adjusted relative risk ratios (aRR); Center for Epidemiologic Studies – Depression Scale (CES-D-5); confidence intervals (CI); Mean (M); Perceived Stress Scale - 4 (PSS-4); *P*-values (*P)*; Standard deviation (SD)

[a] N=794 women (36,809 total weekly journals, 2,417 quarterly discrimination scores).

[b] Bivariate results presented as discrimination score means with standard deviations and proportions (%) of women meeting criteria for moderate/high discrimination scores on the Everyday Discrimination Scale using cut-off of 24.5 points. *P*-values are from unadjusted bivariate tests (student's t, anova or Chi-square where appropriate) comparing score means or proportions across sociodemographic and reproductive characteristics. *P* -values significant for two-tailed alpha at <0.05*, <0.01**, and <0.001***; ^ marginally significant at *P* <0.10.

[c] Center for Epidemiologic Studies – Depression Scale (CES-D-5) – 4 point cut-off for moderate/severe depression symptoms.

[d] Perceived Stress Scale - 4 (PSS-4) - 9-point cut-off for moderate/severe stress symptoms.

[e] Multivariable results are aRR and 95% CIs from full multi-level, mixed-effects logistic regression models with a cluster effect for the woman and controlling for number of discrimination scores and number of journals completed. Depression and stress variables entered separately in individual models with point estimates of other covariates stable across models; those shown from stress models.

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Table 2

Relationships Between Social Discrimination and the Hazard of Pregnancy[a]

	Model 1 (Sociodemographics)		Model 2 (Reduced)		Model 3 Depression mediation (Reduced)		Model 4 Stress mediation (Reduced)	
	aRR	**CI**	**aRR**	**CI**	**aRR**	**CI**	**aRR**	**CI**
Social discrimination[b]								
<Moderate/high discrimination	1		1		1		1	
Moderate/high discrimination	1.5^	1.0,2.5	1.8*	1.1,3.0	2.0**	1.2,3.3	1.9*	1.2,3.1
Depression symptoms[c]								
No (<4pts CESD)					1			
Yes (≥4pts CESD)					0.9	0.5,1.5		
Stress symptoms[d]								
No (<9pts PSS)							1	
Yes (≥9pts PSS)							1.0	0.6,1.7
Age								
18 years	1		1		1		1	
19 years	0.9	0.6,1.5	0.8	0.5,1.3	0.8	0.5,1.3	0.8	0.5,1.3
20 years	0.2*	0.1,0.9	0.2*	0.1,0.7	0.2*	0.1,0.7	0.2*	0.1,0.7
Race/ethnicity								
Non-Black	1							
Black	1.3	0.7,2.3						
Educational enrollment								
Not enrolled	1							
High school	1.0	0.5,2.1						
2 year college	0.7	0.4,1.3						
4 year college	0.8	0.4,1.5						
High school drop-out	0.5	0.2,1.2						
Employment status								
Unemployed	1							
Employed	0.8	0.5,1.3						
Receiving public assistance								

	Model 1 (Sociodemographics)		Model 2 (Reduced)		Model 3 Depression mediation (Reduced)		Model 4 Stress mediation (Reduced)	
	aRR	**CI**	**aRR**	**CI**	**aRR**	**CI**	**aRR**	**CI**
No	1							
Yes	1.3	0.7,2.1						
Childhood family structure								
2 parents (biological/step)	1							
1 parent only	1.3	0.8,2.2						
Other	1.1	0.5,2.4						
Mother's age at first birth								
≥20 years old	1							
<20 years old	1.4	0.8,2.1						
Religious service attendance								
Never	1							
< weekly	1.4	0.7,2.6						
≥ weekly	1.4	0.6,3.0						
Relationship status								
Married	1							
Engaged	3.5	0.4,35.1						
Romantic relationship	1.8	0.2,16.9						
Physical/emotional	1.5	0.2,14.9						
None	1.0	0.1,10.2						
Cohabitation status								
Not cohabitating	1		1					
Cohabitating	1.3	0.7,2.3	1.7^	1.0,2.8				
Age at coitarche								
> 16 years	1		1		1		1	
≤ 16 years	2.4**	1.3,4.4	3.3***	1.9,5.7	3.7***	2.1,6.6	3.5***	2.0,6.1
History of pregnancy								
No	1		1		1		1	
Yes	1.8*	1.0,3.1	2.3**	1.4,3.8	2.3**	1.4,3.8	2.4**	1.5,4.0
Ever had unprotected sex								

	Model 1 (Sociodemographics)		Model 2 (Reduced)		Model 3 Depression mediation (Reduced)		Model 4 Stress mediation (Reduced)	
	aRR	**CI**	**aRR**	**CI**	**aRR**	**CI**	**aRR**	**CI**
No	1							
Yes	1.2	0.7,2.0						

Abbreviations: Adjusted relative risk ratios (aRR); Center for Epidemiologic Studies – Depression Scale (CES-D-5); confidence intervals (CI); Mean (M); Perceived Stress Scale - 4 (PSS-4); *P*-values (*P)*; Socioeconomic status (SES); Standard deviation (SD)

[a]Results are aRR and 95% CI from full and reduced multi-level, mixed-effects, discrete-time, proportional hazard models using multivariable logistic regression with a random effect for the woman and controlling for number of pregnancy months, pregnancy months squared, number of discrimination scores and number of journals completed. *P*-values (*P*) significant for two-tailed alpha at <0.05*, <0.01**, and <0.001***.

[b]Discrimination is bivariate indicator using cut-off of 24.5 points (top 20% percentile, 1SD above mean). Interaction terms for stress, depression, race, SES, and previous pregnancy not significant (not shown).

[c]Center for Epidemiologic Studies – Depression Scale (CES-D-5) – 4 point cut-off for moderate/severe depression symptoms.

[d]Perceived Stress Scale - 4 (PSS-4) - 9-point cut-off for moderate/severe stress symptoms.