Examining the Association Between Racial Bias Exposure and Postpartum Depression Among Women in Wisconsin

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ABSTRACT

Objective: To analyze the association between racial bias and postpartum depression among women in Wisconsin.

Methods: Analyzed the Wisconsin Pregnancy Risk Assessment Monitoring System with a weighted sample of 125,581 women/mothers who delivered a live birth in 2016-2017. The outcome was self-reported postpartum depression. The independent variable was racial bias exposure. Survey-weighted logistic regression analyses were performed adjusting for confounders in 6 models—socioeconomic position, psychosocial factors, health risk behaviors, health care access, stress/obesity, and disease condition. All analyses were completed using STATA accounting for complex survey design and sample weights.

Results: In this sample, 6.6% of women/mothers experienced racial bias and 11.5% had postpartum depression. In unadjusted analysis, the odds of postpartum depression were higher for women who experienced racial bias than those who did not (OR 2.15; 95% CI, 1.35-3.41). Non-Hispanic Black women had higher odds for racial bias exposure than other racial/ethnic groups (OR 6.01; 95% CI, 1.69-21.41). However, the relationship between racial bias and postpartum depression was not significant after adjusting for socioeconomic position (OR 1.17; 95% CI, 0.69-1.97), psychosocial factors (OR 1.07; 95% CI, 0.63-1.81), health risk behaviors (OR 0.90; 95% CI, 0.55-1.49], health care access (OR 1.01; 95% CI, 0.60-1.70), stress/obesity (OR 0.73; 95% CI, 0.41-1.30), and disease/morbidity (OR 0.85; 95% CI, 0.46-1.57).

Discussion/Conclusion: Racial bias was associated with significantly increased risk of postpartum depression. Black women had higher odds for racial bias exposure than other groups. The relationship between racial bias and postpartum depression was not significant after adjusting for confounders, suggesting that social determinants potentially influenced this relationship. These findings should inform screening and health education interventions to minimize racism and poor maternal health outcomes.

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INTRODUCTION

Postpartum depression (PPD) in women is a serious medical condition (different from "baby blues") that is triggered by and occurring after childbirth.[1] PPD involves feelings of extreme sadness and anxiety that result in sleep, energy, and appetite changes.[2] Women who have recently delivered are vulnerable to the entire spectrum of PPD.[3] PPD is significantly associated with adverse maternal and infant outcomes, such as lower breastfeeding initiation and poor maternal and infant bonding.[4]

Postpartum depression is a major public health concern in the United States, and it can affect all women, even if they had a healthy pregnancy and/or a healthy child.[1] According to the Centers for Disease Control and Prevention (CDC), 1 in 10 women in the US reported severe symptoms that suggest they experienced an episode of major PPD. Studies report similar cases in women in the US in the 12 months after delivery.[1] In Wisconsin, 14% of mothers experience PPD every year; however, 12% of these mothers are not screened for PPD after they give birth.[5]

The etiology of PPD is multifaceted. Risk factors include the experience of stressful life events, low social support, being a teenage mother, having a previous history of depression, preterm delivery, and pregnancy complications.[4] PPD is associated with the psychoactive effects of female hormones (low estrogenic levels) and interpersonal and environmental factors.[3]

Significant racial disparities in PPD have been observed. High levels of PPD, lower levels of PPD treatment initiation, and the attendance of postpartum visits have been found in low-income

women, especially non-Hispanic Black women.[6] Even when they attend postpartum visits, 1 in 8 reported not being screened for depression by their health care provider during postpartum visits.[1] Many cases of PPD remain undiagnosed due to time constraints and issues related to social acceptability of screening.[7]

Existing studies have examined the relationship between race/ethnicity as proxy measures for structural racism and maternal and child health outcomes and disparities among diverse racial and ethnic groups.[1,4,6,8,9] Race consistently has been found to be associated with reproductive health outcomes.[9] Today and historically, non-Hispanic Black women experience racial discrimination, even when receiving prenatal care.[10] Cumulatively, these experiences can affect their reproductive health and well-being,[9] as well as their trust in the health care system.[10]

There are several pathways through which racial bias could increase the risk of PPD experienced by non-Hispanic Black women. For example, cumulative maternal stress from multiple exposures to social stressors over the life course could affect the body's allostatic systems.[11] Studies have shown that exposure to different social stressors (social-human interactions, economic conditions, housing and discrimination) over time can cause wear and tear on the body's adaptive systems, leading to adverse maternal health outcomes.[12] Interpersonally mediated racism also has a long and deeply rooted history in the US. Studies have documented the historical experiences[13] of non-Hispanic Black women since slavery to present, revealing a long saga of medical mistreatment and social injustice.[9] In addition, there is a disconnect in patient-centered communication,[14] especially on issues relating to racial bias, which reinforces the problem. This history adds crucial context for understanding maternal health and health disparities. An understanding of this historical context[13] can help in the design of system changes and preventive interventions.

Additionally, maternal stress due to increased exposure to lifetime stressors,[12] such as racial bias may lead to high-risk behaviors as a coping mechanism.[9] Racism can impact maternal and reproductive health by stimulating psychological distress in the form of low self-worth, low self-confidence, and depression, which can negatively affect behavioral decisions such as cigarette smoking and alcohol use.[9] Studies found that cigarette smoking or alcohol abuse significantly increased risk of adverse maternal health outcomes.[15] The interaction of substance abuse with other life-course factors, such as low household income and psychosocial distress, may cause higher virulence with differential impact on maternal health.[16] Hence, Black women can be more susceptible to the interactive effects of smoking and distress and adverse maternal outcomes due to their increased exposure to life-course stressors compared to their White counterparts.[12]

Despite the burden racism places on non-Hispanic Black women,[9] studies have not examined racial bias (the emotional effect of having been treated differently because of race) and PPD in Wisconsin, even though it is ranked as the most segregated state in America.[17] Studies have found that non-Hispanic Black women experience PPD at a disproportionately higher rate than their peers; however, little is known about how racial bias influences PPD outcomes, especially for non-Hispanic Black women in Wisconsin.

To fill this gap in the literature, the association between racial bias and PPD in Wisconsin was analyzed, adjusting for social determinants of health and using a statewide weighted representative sample of women/mothers. Our findings aim to inform policies (including the Wisconsin Public Health Association resolution declaring racism as a public health crisis in Wisconsin[18]), system changes, and clinical interventions to address persistent discrimination linked to poor health outcomes.

METHODS

Data and Population Description

Data were analyzed from the Pregnancy Risk Assessment Monitoring System (PRAMS) for 2016-2017 Wisconsin births. PRAMS is a surveillance system administered by state and territorial health departments that covers about 83% of all US births and is supported by the CDC.[19] It collects state-specific, population-based data in the field of reproductive health, including maternal experiences months before, during, and shortly after pregnancy. State and local governments use PRAMS to inform planning interventions to reduce health problems related to reproductive, maternal, and infant health. The Wisconsin Data Governance Board at the Department of Health Services approved the data request for this study. The inclusion criteria were women who gave birth to a live infant in Wisconsin who responded to the PRAMS questions on racial bias and PPD during the surveillance period (2016-2017). There were 2,609 (unweighted) women who responded to PRAMS and were included in the study, representing 125,581 (weighted) women who delivered a live birth in Wisconsin during 2016-2017.

Key Study Measures and Outcomes

The key independent variable was experiencing racial bias (categorized as no/yes), defined as being emotionally upset (angry, sad, or frustrated) as a result of being treated differently based on race within 12 months before the baby was born. The key dependent variable was PPD indicator, categorized as no/yes. PPD was defined—according to the CDC—as a serious medical condition that is activated by and occurring after child delivery, including having feelings of extreme sadness and anxiety that result in energy, sleep, and appetite changes.

Potential Confounders

This study was conceptualized using a framework on racial and ethnic differences in health.[20] The framework included respondent's socioeconomic status, psychosocial factors, health risk behaviors, health care access, stress/obesity, and disease condition.

Socioeconomic status included maternal age (categorized as ≤19 years, 20-24 years, 25-29, 30-34, and ≥35 years), maternal race/ethnicity (non-Hispanic White, non-Hispanic Black,

Hispanic, and non-Hispanic Other), maternal education (college and above and high school or less), marital status/married (no/yes), Federal Poverty Levels (FPL) for the year of the birth (2016-2017) (not poor ≥200% FPL and low income [poor/near poor ≤199% FPL]), and feeling unsafe in neighborhood (no/yes). Psychosocial factors (all coded as no/yes) were being exposed to intimate partner violence, such as physical abuse, 12 months before and during pregnancy, sexual abuse during pregnancy, and psychological aggression (feeling unsafe, controlled, and threatened) during pregnancy. Health risk behaviors (all coded as no/yes) were comprised of cigarette smoking 12 months before and during pregnancy, alcohol use/drinking 3 months before pregnancy, and poor diet (financial food insecurity, yes/no) 12 months before the infant was born. Health care access included insurance during pregnancy (private/self-pay/other: uninsured and Medicaid) and prenatal care visits grouped according to the Kessner index[21] (8 or less [inadequate] and 9+ visits [adequate]). Stress/obesity variables contained stressful events (divorce, homeless, family member ill/hospitalized, could not pay the bills, did not want pregnancy, someone closer had a problem with drinks/drugs, someone closer to me died, husband/partner/mother went to jail) grouped as no stressors, 1 to 2 stressors, and 3 or more stressors; depression 12 months before pregnancy (no/yes); and maternal weight gain in pounds (categorized as body mass index [BMI] in pounds categories: underweight [BMI <19.8], normal [BMI 19.8-26], and overweight/obese [BMI >26]). Stress and obesity were considered as 2 broad physiological conditions that partly mediate the effects of behavior and psychosocial factors on health and disease conditions. Stress is an important consequence of the experience of racial bias and discrimination, and the complications in the effects of stress comprise not only its reciprocal relationship with overall health, but also nonlinearities in its effects.[20] It can be treated as a separate factor, potentially mediating the effects on health not only of racial bias, but also of other social and behavioral factors. Disease conditions were high blood pressure before pregnancy, birth weight (normal weight ≥2500g or ~ ≥5.5lbs), and low birth weight (<2500g or ~ <5.5lbs).

Statistical Analysis

First, the characteristics of the weighted study population of women/mothers were described. Second, an unadjusted analysis between racial bias and PPD was performed. Third, an unadjusted analysis between race/ethnicity and racial bias was conducted. Finally, survey-weighted multiple logistic regression analyses were performed to test the independent association of racial bias and PPD while controlling for potential confounders in 6 models—socioeconomic position, psychosocial factors, health risk behaviors, health care access, stress/obesity, and disease condition. All analyses were performed using STATA/SE v.15.1, accounting for complex survey design and sample weights. *P* values <0.05 were considered statistically significant. The reported percentages, odds ratios, and their 95% confidence intervals in the results section are estimates for the population (weighted).

RESULTS

2016-2017 Population Characteristics

There were 2,609 women included in the study, representing a weighted population size of 125,581 women/mothers in Wisconsin during 2016-2017. Of this weighted population, 6.6% experienced racial bias and postpartum depression (11.5%). Of the women under 19 years of age, 33.2% reported experiencing PPD compared to 19.2% of women aged 20-24 years, 9.3% 25-29 years, 9.1% 30-34 years, and 8.7% 35 years of age or greater (*P* <.01). Of the non-Hispanic Black women, 21.2% had PPD compared to 16.7% non-Hispanic Other, 15.8% Hispanic, and 9.0% of non-Hispanic White (*P* <.01). See Table 1 for summary of population characteristics.

Association Between Racial Bias and PPD Among Women, 2016-2017

In the unadjusted weighted analysis (Table 2), the odds of experiencing PPD were 2.2 times more likely among women who reported experiencing racial bias, compared to those who did not (OR 2.15; 95% CI, 1.35-3.41). Among the women who reported experiencing PPD (Table 3), the odds of experiencing racial bias were 6 times higher for non-Hispanic Black women than other racial/ethnic groups (OR 6.01; 95% CI, 1.69-21.41).

In the adjusted weighted analysis (Table 4), the relationship between racial bias and PPD was no longer statistically significant after adjusting for potential confounders (including social determinants of health), such as socioeconomic position (OR 1.17; 95% CI, 0.69-1.97), psychosocial factors (OR 1.07; 95% CI, 0.63-1.81), health risk behavior (OR 0.90; 95% CI, 0.55-1.49), health care access (OR 1.01; 95% CI, 0.60-1.70), stress/obesity (OR 0.73; 95% CI, 0.41-1.30), and disease/morbidity (OR 0.85; 95% CI, 0.46-1.57).

DISCUSSION

This study analyzed the association between racial bias exposure and PPD using a statewide weighted sample of women who gave birth in Wisconsin during 2016-2017. In the unadjusted analysis, we found that the odds of PPD were higher for women who experienced racial bias than those who did not, and non-Hispanic Black women had higher odds for racial bias exposure than other racial/ethnic groups. The relationship between racial bias and PPD was no longer statistically significant after adjusting for confounders, suggesting that social determinants of health factors potentially influenced this relationship. These findings help to inform screening and health education interventions to minimize racism and poor maternal health outcomes.

Previous studies[6,8] have examined racial and ethnic disparities in maternal, infant, and child health outcomes. One study using PRAMS data (2004-2012) found that the experiences of emo-

Table 1. Population Characteristics, 2016-2017

Variables/Measures		Unweighted		Weighted	Postpartum Depression[a] Weighted		*P* value
Total/Overall		**2,609**		**125,581**	**88.46%**	**11.54%**	
		n	**%**	**%**	**No**	**Yes**	
Socioeconomic position							
Maternal age	≤19 years	178	6.82	3.44	66.79	33.21	<0.01
	20-24 years	586	22.46	16.64	80.81	19.19	
	25-29 years	760	29.13	31.68	90.66	9.34	
	30-34 years	729	27.94	34.27	90.86	9.14	
	≥35 years	356	13.65	13.96	91.33	8.67	
Maternal race/ethnicity	Non-Hispanic White	666	25.53	71.07	90.97	9.03	<0.01
	Non-Hispanic Black	1,291	49.48	11.56	78.81	21.19	
	Hispanic	348	13.34	9.69	84.19	15.81	
	Non-Hispanic other	304	11.65	7.68	83.27	16.73	
Maternal education[a]	College and above	1,442	55.65	63.97	91.57	8.43	<0.01
	High school or less	1,149	44.35	36.03	82.99	17.01	
Marital status (married)	No	1,408	53.97	35.16	81.62	18.38	<0.01
	Yes	1,201	46.03	64.84	91.98	8.02	
Federal poverty levels[a]	Not poor (≥200% FPL)	746	32.13	49.92	93.62	6.38	<0.01
	Low income (≤199% FPL)	1,576	67.87	50.08	84.01	15.99	
Feeling unsafe in neighborhood[a]	No	1,819	72.70	76.98	90.52	9.48	<0.01
	Yes	683	27.30	76.98	81.68	18.32	
Psychosocial factors							
Experienced racial bias[a]	No	2,139	85.59	93.37	89.15	10.85	<0.01
	Yes	360	14.41	6.63	79.25	20.75	
Exposed to intimate partner violence–all forms[a]	No	2,257	89.74	93.26	89.79	10.21	<0.01
	Yes	258	10.26	6.74	70.29	29.71	
Health risk behavior							
Cigarette smoking[a]	No	2,248	86.69	86.13	89.85	10.15	<0.01
	Yes	345	13.31	13.87	79.42	20.58	
Alcohol use/drinking[a]	No	1,045	41.62	30.30	87.90	12.10	0.70
	Yes	1,466	58.38	69.70	88.70	11.30	
Poor diet (Eat less/no money/food unsecured)[a]	No	2,196	89.34	91.74	90.90	9.10	<0.01
	Yes	262	10.66	8.26	65.53	34.47	
Health care access							
Insurance during pregnancy[a]	Private/self pay/other	1,154	44.59	64.89	92.94	7.06	<0.01
	Medicaid	1,434	55.41	35.11	79.41	20.59	
Prenatal care visits grouped as Kessner index[a]	8 or less: inadequate	2,090	83.47	87.30	89.65	10.35	<0.01
	9+ visits: adequate	414	16.53	12.70	80.61	19.39	
Stress/Obesity							
Stressful events	No stressors	1,366	52.36	60.06	91.36	8.64	<0.01
	1-2 Stressors	954	36.57	33.26	87.89	12.11	
	3 or more Stressors	289	11.08	6.68	65.91	34.09	
Diagnosed depression before pregnancy[a]	No	2,125	82.94	83.78	91.46	8.54	<0.01
	Yes	437	17.06	16.22	72.91	27.09	
Maternal weight gain during during pregnancy (BMI)[a]	Underweight (<19.8 lbs)	407	16.15	14.56	89.34	10.66	0.04
	Normal (19.8-26 lbs)	803	31.87	26.45	84.69	15.31	
	Overweight/obese (>26 lbs)	1,310	51.98	58.99	89.99	10.01	
Disease/Morbidity							
High blood pressure[a]	No	2,373	92.73	94.53	89.08	10.92	0.06
	Yes	186	7.27	5.47	81.93	18.07	
Birth weight	Normal weight (≥2500 g / ≥5.5 lbs)	2,360	90.46	93.86	89.25	10.75	<0.01
	Low birth weight (<2500 g /~<5.5 lbs)	249	9.54	6.14	75.95	24.05	

[a] Variables with ≤12% of missing values were included in the analysis.
Variables with >12% of missing values were excluded.
Abbreviations: BMI, body mass index

Table 2. Association Between Racial Bias and Postpartum Depression Among Women in Wisconsin, 2016-2017

	Odds Ratio	*P* value	95% CI
Racial bias			
No	Ref.		
Yes	2.15	<0.01	1.35-3.41

Table 3. Association Between Race/Ethnicity and Racial Bias in Women With Postpartum Depression in Wisconsin, 2016-2017

	Odds Ratio	*P* value	95% CI
Race/ethnicity			
Non-Hispanic White	Ref.		
Non-Hispanic Black	6.01	0.01	1.69-21.41
Hispanic	5.68	0.02	1.37-23.58
Non-Hispanic Other	1.56	0.62	0.27-8.97

tional upset due to racial discrimination contributed to the risk of preterm birth in non-Hispanic Black women.[8] Another report using PRAMS data (2004-2007) found significant disparities in self-reported PPD among Asian, Hawaiian, and Pacific Islander women.[22] Our study was consistent with previous results indicating that women—particularly women of color—experience both racial discrimination and PPD at higher rates than their White peers. However, our analysis suggests that while social determinants of health factors potentially influenced the relationship between racial bias and PPD, higher maternal age was protective against PPD. Our findings also suggest that concentration of socioeconomic disadvantage due to racial bias/discrimination in non-Hispanic Black women was evidently a significant driver of PPD. To our knowledge, this is the first weighted analysis to examine the influence of experiencing racial bias on PPD among women in Wisconsin, adjusting for social determinants of health, which are known to influence maternal health outcomes.

Study Strengths and Limitations

This study has several strengths. A weighted analysis that can be applied to all women who delivered a live birth in Wisconsin during the study period was provided. Novel social determinants of health variables were used in our statistical adjustment. The racial bias measure was based not only on the race of the respondent, but also their experience with racial bias or racism. However, findings should be interpreted in light of the following limitations. First, PRAMS data did not use clinician diagnoses of depression to define women who suffered postpartum depression. This means that depressive symptoms reported by respondents could have been due to other mental health conditions (eg, schizophrenia or bipolar disorder) or may not be indicative of clinical depression. Second, findings are limited to women who delivered a live birth in Wisconsin and cannot be generalized to all women at the national level. Finally, the relationship between racial bias and PPD was an association and cannot be interpreted as causal. Future research that prospectively establishes the temporal relationship between racial discrimination and PPD could better assess causality.

Study Implications

This study contributes to the scientific literature by examining the impact of racial bias on PPD and the influence of social determinants of health. Implications for research include the need for larger and longitudinal analysis of women at the county and national levels to examine the prevalence and pervasiveness of the association.

Our findings underscore several implications and help to inform policies, system changes, and clinical practices to address the impact of racial bias on poor maternal mental health outcomes, especially for a historically marginalized population. One in 8 women does not report a health care professional asking about depression during postpartum visits.[1] Hence, health care professional universal screening of non-Hispanic Black women in the perinatal period is recommended to increase the identification of women at risk and promote provision of medical care or referral.[1] There is a need to promote health education, prevention, and treatment of perinatal mental health issues such as PPD affecting all mothers, especially those in higher need and greater vulnerability.

Racism causes persistent discrimination and is linked to poor health outcomes;[23] therefore, racial health disparities cannot be addressed without addressing racism itself. However, racism is generally acknowledged and addressed through the lens of being an acute interpersonal issue instead of a chronic systemic epidemic. Although racism is deeply integrated into the physical, social, psychological, and institutional constructs of American culture,[24] it is often viewed as individual events or isolated moments in the lives of African Americans.[25] To address this issue holistically, policymakers and health care professionals should not only recognize racism as historical or event-based, but as pervasive, systematic, and widespread across all sectors of society. Any policy or intervention must take these factors into account to be effective in addressing racism.

In light of these findings, exposure to racial bias and discrimination of Black Americans have adverse effects on maternal mental health among Black American women in the general population. Programs should be designed and implemented to decrease the frequency of racial prejudices and discrimination and to mitigate adverse maternal mental health effects within communities when such racial prejudices occur. Interventions should employ a holistic approach in addressing the lack of fairness, inferior beliefs about one's own worth or lower social status, activation of prior traumas, and freedom from differential legal or social treatment based on one's race or skin color.[26,27] There is the need to invest in culturally sensitive interventions in the form of social support that could promote positive coping methods to deal with racial bias. The use of support systems and racial identity development[28] may be an uplifting coping mechanism to reinforce positive psychological self-image, especially in African American women experiencing PPD.

While American women recognize the negative health out-

Table 4: Adjusted Weighted Analysis. Outcome: Post-Partum Depression; Primary Independent Variable: Racial Bias

	Model 1: Socioeconomic Position		Model 2: Psychosocial Factors		Model 3: Health Risk Behavior		Model 4: Health Care Access		Model 5: Stress/Obesity		Model 6 (All): Disease/Morbidity	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Racial bias												
No	Ref		Ref		Ref		Ref		Ref		Ref	
Yes	1.17	0.69-1.97	1.07	0.63-1.81	0.90	0.55-1.49	1.01	0.60-1.70	0.73	0.41-1.30	0.85	0.46-1.57
Race/ethnicity												
Non-Hispanic White	Ref		Ref		Ref		Ref		Ref		Ref	
Non-Hispanic Black	1.52	0.96-2.39	1.54	0.98-2.43	1.81[a]	1.11-2.95	1.43	0.85-2.41	1.44	0.85-2.44	1.37	0.78-2.41
Hispanic	1.12	0.66-1.90	1.13	0.67-1.92	1.45	0.83-2.54	1.30	0.71-2.37	1.26	0.68-2.35	1.36	0.70-2.62
Non-Hispanic other	1.53	0.92-2.53	1.61	0.97-2.66	1.87[a]	1.09-3.22	1.63	0.92-2.90	1.62	0.89-2.95	1.74	0.93-3.25
Maternal age												
≤19 years	Ref		Ref		Ref		Ref		Ref		Ref	
20-24 years	0.70	0.30-1.62	0.69	0.29-1.62	0.57	0.22-1.45	0.57	0.21-1.52	0.58	0.21-1.58	0.58	0.21-1.60
25-29 years	0.40[a]	0.17-0.93	0.39[a]	0.16-0.92	0.33[a]	0.13-0.84	0.31[a]	0.12-0.81	0.34[a]	0.13-0.92	0.31[a]	0.11-0.87
30-34 years	0.50	0.21-1.18	0.48	0.20-1.16	0.37[a]	0.14-0.94	0.33[a]	0.12-0.89	0.37	0.14-1.00	0.35[a]	0.13-0.97
≥35 years	0.46	0.18-1.19	0.45	0.17-1.17	0.37	0.13-1.05	0.29	0.10-0.85	0.32[a]	0.11-0.95	0.29[a]	0.10-0.88
Maternal education												
College and above	Ref		Ref		Ref		Ref		Ref		Ref	
High school or less	1.29	0.82-2.03	1.27	0.81-2.01	1.13	0.70-1.84	1.01	0.62-1.65	1.01	0.61-1.68	0.99	0.57-1.73
Marital status (married)												
No	Ref		Ref		Ref		Ref		Ref		Ref	
Yes	0.80	0.48-1.34	0.86	0.51-1.45	0.92	0.52-1.63	1.02	0.55-1.87	1.02	0.55-1.90	1.02	0.56-1.87
Federal Poverty Level												
Not poor	Ref		Ref		Ref		Ref		Ref		Ref	
Low income	1.54	0.87-2.73	1.47	0.82-2.62	1.29	0.70-2.35	1.07	0.55-2.09	1.11	0.56-2.20	1.08	0.54-2.14
Feeling unsafe in neighborhood												
No	Ref		Ref		Ref		Ref		Ref		Ref	
Yes	1.69[a]	1.13-2.55	1.58[a]	1.05-2.37	1.40	0.90-2.16	1.28	0.82-1.98	1.19	0.74-1.89	1.11	0.70-1.76
Exposed to IPV all forms												
No			Ref		Ref		Ref		Ref		Ref	
Yes			2.11[a]	1.25-3.57	1.65	0.95-2.89	1.55	0.85-2.84	1.21	0.60-2.45	1.17	0.58-2.37
Cigarette smoking												
No					Ref		Ref		Ref		Ref	
Yes					1.10	0.60-2.00	1.02	0.57-1.84	0.91	0.49-1.69	0.76	0.41-1.41
Alcohol use/drinking												
No					Ref		Ref		Ref		Ref	
Yes					1.37	0.90-2.07	1.52	0.98-2.36	1.55	1.00-2.39	1.48	0.93-2.36
Eat less/no money/food insure												
No					Ref		Ref		Ref		Ref	
Yes					3.09[a]	1.72-5.57	2.84[a]	1.55-5.19	2.53[a]	1.34-4.77	2.03[a]	1.05-3.91
Insurance during pregnancy							Ref		Ref		Ref	
Private/self pay/other												
Medicaid							1.88[a]	1.05-3.36	1.78	0.99-3.21	1.95[a]	1.05-3.63
Prenatal care visits grouped												
8 or less: inadequate							Ref		Ref		Ref	
9+ visits: adequate							1.72	0.98-3.01	1.64	0.92-2.92	1.39	0.77-2.49
Stressful events												
No stressors									Ref		Ref	
1-2 stressors									1.05	0.66-1.67	0.94	0.59-1.49
3 or more stressors									2.34[a]	1.10-4.97	1.74	0.83-3.69
Diagnosed depression												
No									Ref		Ref	
Yes									1.23	0.65-2.31	1.09	0.58-2.05
Maternal weight gain (BMI)												
Normal									Ref		Ref	
Underweight									1.2	0.65- 2.31	1.09	0.58-2.05
Overweight/obese									1.06	0 .59- 1.92	1.03	0.56-1.86
High blood pressure												
No											Ref	
Yes											1.07	0.49-2.32
Birth weight												
Normal weight											Ref	
Low birth weight											2.34[a]	1.11-4.95

[a] Significant at $P < 0.05$; Abbreviations: IPV, intimate partner violence; BMI, body mass index.

comes of mental illness, studies have shown that the use of prayer and counseling are essential coping mechanisms for mental illness in African American women.[29] In addition to internal coping strategies, such as relying on faith, prayer, and spirituality, other more external resistance coping strategies that Black women use to generally manage the stress of racism include leaning on the shoulders of and drawing strength from African American ancestors to sustain a positive self-image, relying on social support mechanisms, avoiding contact with certain situations, and directly challenging the source of the problem using pacific or de-escalation means.[30] Culturally responsive interventions should also address factors that influence treatment-seeking barriers, including stigmatization, inadequate access to mental health care, and lack of awareness of mental illness.[29]

CONCLUSION

Racial bias was associated with significantly increased risk of postpartum depression. Black women had higher odds for racial bias exposure than other groups. The relationship between racial bias and postpartum depression was not significant after adjusting for confounders, suggesting that social determinants potentially influenced this relationship. These findings should inform screening and health education interventions to minimize racism and poor maternal health outcomes.

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REFERENCES

1. Bauman BL, Ko JY, Cox S, et al. Vital signs: postpartum depressive symptoms and provider discussions about perinatal depression - United States, 2018. *MMWR Morb Mortal Wkly Rep*. 2020;69(19):575-581. doi:10.15585/mmwr.mm6919a2

2. Del Barrio V. Diagnostic and statistical manual of mental disorders. In: Stein J, Bennett D, Coen C, et al., eds. *The Curated Reference Collection in Neuroscience and Biobehavioral Psychology.* Elsevier; 2016.

3. Mauri M, Borri C, Cargioli C, Miniati M, Banti S. Postpartum depression. In: Uguz F, ed. *Psychiatric Disorders during the Postpartum Period in Light of Current Advances.* Nova Science Publishers; 2016.

4. Ko JY, Rockhill KM, Tong VT, Morrow B, Farr SL. Trends in postpartum depressive symptoms - 27 states, 2004, 2008, and 2012. *MMWR Morb Mortal Wkly Rep.* 2017;66(6):153-158. doi:10.15585/mmwr.mm6606a1

5. Wisconsin Department of Health Services. Wisconsin PRAMS: Pregnancy Risk Assessment Monitoring System: Perinatal depression. April 2019. Accessed October 4, 2020. https://www.dhs.wisconsin.gov/publications/p0/p00242.pdf

6. Thiel de Bocanegra H, Braughton M, Bradsberry M, Howell M, Logan J, Schwarz EB. Racial and ethnic disparities in postpartum care and contraception in California's Medicaid program. *Am J Obstet Gynecol*. 2017;217(1):47.e1-47.e7. doi:10.1016/j.ajog.2017.02.040

7. Messinger-Rapport BJ, Thomas DR, Gammack JK, Morley JE. Clinical update on nursing home medicine: 2009. *J Am Med Dir Assoc*. 2009;10(8):530-553. doi:10.1016/j.jamda.2009.08.001

8. Bower KM, Geller RJ, Perrin NA, Alhusen J. Experiences of racism and preterm birth: findings from a pregnancy risk assessment monitoring system, 2004 through 2012. *Womens Health Issues.* 2018;28(6):495-501. doi:10.1016/j.whi.2018.06.002

9. Prather C, Fuller TR, Marshall KJ, Jeffries WL 4th. The impact of racism on the sexual and reproductive health of African American women. *J Womens Health (Larchmt).* 2016;25(7):664-671. doi:10.1089/jwh.2015.5637

10. Benkert R, Peters RM, Clark R, Keves-Foster K. Effects of perceived racism, cultural mistrust and trust in providers on satisfaction with care. *J Natl Med Assoc.* 2006;98(9):1532-1540. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2569718/

11. Oliver M, Shapiro T. *Black wealth/white wealth: A new perspective on racial inequality.* Taylor & Francis; 2006.

12. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J.* 2003;7(1):13-30. doi:10.1023/a:1022537516969

13. Trawalter S, Bart-Plange DJ, Hoffman KM. A socioecological psychology of racism: making structures and history more visible. *Curr Opin Psychol.* 2020;32:47-51. doi:10.1016/j.copsyc.2019.06.029

14. Cooper LA, Roter DL, Johnson RL, Ford DE, Steinwachs DM, Powe NR. Patient-centered communication, ratings of care, and concordance of patient and physician race. *Ann Intern Med*. 2003;139(11):907-915. doi:10.7326/0003-4819-139-11-200312020-00009

15. Nykjaer C, Alwan NA, Greenwood DC, et al. Maternal alcohol intake prior to and during pregnancy and risk of adverse birth outcomes: evidence from a British cohort. *J Epidemiol Community Health*. 2014;68(6):542-549. doi:10.1136/jech-2013-202934

16. Knopik VS, Maccani MA, Francazio S, McGeary JE. The epigenetics of maternal cigarette smoking during pregnancy and effects on child development. *Dev Psychopathol*. 2012;24(4):1377-1390. doi:10.1017/S0954579412000776

17. Lorey C. Wisconsin is the most segregated state in America, according to new report. *Channel 3000.* January 16, 2019. Updated January 7, 2020. Accessed August 24, 2020. https://www.channel3000.com/wisconsin-is-the-most-segregated-state-in-america-according-to-new-report/

18. Wisconsin Public Health Association. 2018 Resolution: Racism is a public health crisis. Published May 2018. Accessed October 2, 2020. https://cdn.ymaws.com/www.wpha.org/resource/resmgr/2018_folder/WPHA_Racial_Equity_Resolutio.pdf

19. Shulman HB, D'Angelo DV, Harrison L, Smith RA, Warner L. The Pregnancy Risk Assessment Monitoring System (PRAMS): overview of design and methodology. *Am J Public Health*. 2018;108(10):1305-1313. doi:10.2105/AJPH.2018.304563

20. Bulatao RA, Anderson NB, eds. *Understanding Racial and Ethnic Differences in Health in Late Life: A Research Agenda.* National Academies Press; 2004.

21. Kotelchuck M. An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index. *Am J Public Health*. 1994;84(9):1414-1420. doi:10.2105/AJPH.84.9.1414

22. Hayes DK, Ta VM, Hurwitz EL, Mitchell-Box KM, Fuddy LJ. Disparities in self-reported postpartum depression among Asian, Hawaiian, and Pacific Islander Women in Hawaii: Pregnancy Risk Assessment Monitoring System (PRAMS), 2004-2007. *Matern Child Health J.* 2010;14(5):765-773. doi:10.1007/s10995-009-0504-z

23. Wisconsin Public Health Association. Racism declaration: racism is a public health crisis. May 2018. Updated May 2020. Accessed August 23, 2020. https://www.wpha.org/page/RacismDeclaration

24. Baratz S, Baratz J. Early childhood intervention: the social science base of institutional racism. *Harv Educ Rev. 1*970;40(1):29-50. doi:10.17763/haer.40.1.m243170whqq36766

25. Paradies Y, Ben J, Denson N, et al. Racism as a determinant of health: a systematic review and meta-analysis. *PLoS One*. 2015;10(9):e0138511. doi:10.1371/journal.pone.0138511

26. Lewis TT, Cogburn CD, Williams DR. Self-reported experiences of discrimination and health: scientific advances, ongoing controversies, and emerging issues. *Annu Rev Clin Psychol.* 2015;11:407-440. doi:10.1146/annurev-clinpsy-032814-112728

27. Bor J, Venkataramani AS, Williams DR, Tsai AC. Police killings and their spillover effects on the mental health of black Americans: a population-based, quasi-experimental study. *Lancet*. 2018;392(10144):302-310. doi:10.1016/S0140-6736(18)31130-9

28. Brondolo E, Brady Ver Halen N, Pencille M, Beatty D, Contrada RJ. Coping with racism: a selective review of the literature and a theoretical and methodological critique. *J Behav Med.* 2009;32(1):64-88. doi:10.1007/s10865-008-9193-0

29. Ward EC, Clark le O, Heidrich S. African American women's beliefs, coping behaviors, and barriers to seeking mental health services. *Qual Health Res.* 2009;19(11):1589-1601. doi:10.1177/1049732309350686

30. Shorter-Gooden K. Multiple resistance strategies: How African American women cope with racism and sexism. *J Black Psychol.* 2004;30(3):406-425. doi:10.1177/0095798404266050

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