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Stressors, Resources, and Stress Responses in Pregnant African American Women:

A Mixed-Methods Pilot Study

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Abstract

This research aimed to develop an initial understanding of the stressors, stress responses, and personal resources that impact African American women during pregnancy, potentially leading to preterm birth. Guided by the ecological model, a prospective, mixed-methods, complementarity design was used with 11 pregnant women and 8 of their significant others. Our integrated analysis of quantitative and qualitative data revealed 2 types of stress responses: high stress responses (7 women) and low stress responses (4 women). Patterns of stress responses were seen in psychological stress and cervical remodeling (attenuation or cervical length). All women in the high stress responses group had high depression and/or low psychological well-being and abnormal cervical remodeling at one or both data collection times. All but 1 woman had at least 3 sources of stress (racial, neighborhood, financial, or network). In contrast, 3 of the 4 women in the low stress responses group had only 2 sources of stress (racial, neighborhood, financial, or network) and 1 had none; these women also reported higher perceived support. The findings demonstrate the importance of periodically assessing stress in African American women during pregnancy, particularly related to their support network as well as the positive supports they receive.

Keywords

mixed methods; personal resources; pregnancy experiences; stress

Stress during pregnancy has been linked to adverse birth outcomes, including preterm birth and low-birth-weight infants.^{1,2} Preterm birth and low birth weight are major causes of infant mortality, cerebral palsy, developmental delays, and vision and hearing impairments.³ The cost of preterm birth exceeds 26 billion annually.⁴ In 2010 in the United States, 12% of infants were born prematurely and 8% of infants were born with low birth weight.⁵ African American women had 17% preterm birth rates and 13.5% low-birth-weight infants compared with 11% preterm birth and 7% low-birth-weight infants for non Hispanic white

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women.⁵ These negative birth outcomes influence women's transition to motherhood and mother-infant interaction, which is necessary for and contributes to optimal infant growth and development.⁶⁻⁹

African American women are more likely than white women to experience chronic stressors, such as living in poor neighborhoods^{10,11} and exposure to racial discrimination,^{12,13} which may be one pathway explaining the underlying health disparities in negative birth outcomes.^{2,10-15} Negative aspects of neighborhood environment and experiences of racial discrimination may increase stress in pregnant women.¹⁶⁻¹⁸ Emotional stress responses such as psychological distress, anxiety, and depression have been related to negative birth outcomes.^{12,13,19-23} However, personal resources such as coping and social support may be protective, decreasing the levels of stress experienced by pregnant women.²⁴⁻²⁸ Chronic stressors may also lead to dysregulation of cortisol levels²⁹ and higher levels of proinflammatory cytokines (eg, interleukin [IL]-6).³⁰ During chronic stress, cortisol is less effective at suppressing inflammation.³¹⁻³³ These physiological stress responses may change the structure and function of collagen tissue,³⁴⁻³⁸ which the cervix comprises. Collagen remodeling of the cervix involves local inflammation and makes it possible for the cervix to dilate.^{36,39-42}

While most studies examining the effects of stressors, personal resources, and emotional stress responses on negative birth outcomes used quantitative data, there are limited data on women's perceptions of these factors. A small set of qualitative studies of African American women's pregnancy experiences illuminates the sources of stress, including partner issues, emotional stress, racism, and resources, including intrapersonal resources (ie, inner strength), from female relatives and family members.^{43,44} No researchers used both quantitative and qualitative approaches to obtain an in-depth understanding of African American women's stressors, personal resources, and stress responses that impact their pregnancy. In addition, to date, no investigators have studied the impact of stress on the pregnancy from the perspective of women and their primary support persons. This is a major gap in the literature, in light of the documented importance of social support on pregnancy outcomes.⁴⁵⁻⁴⁷ Thus, the purpose of this pilot study was to develop an initial understanding of the stressors, stress responses, and personal resources that impact African American women during pregnancy.

BACKGROUND

Theoretical framework

This study was guided by the ecological model⁴⁸ adapted by Heitkemper and Shaver.⁴⁹ This model views a person's health as a function of internal person factors and external environmental factors (see Figure 1). For this study, we examined stressors (neighborhood environment, racial discrimination, and other stressors), personal resources (social support, coping, self-esteem), and stress responses (psychological well-being, anxiety, depressive symptoms, cortisol, cytokines, and cervical remodeling) that impact birth outcomes.

Stressors

Negative aspects of neighborhood environment have been reported as triggers of emotional stress responses for pregnant and postpartum women. Living in a low-income neighborhood may increase stress for pregnant women.^{18,50} African American women who reported higher levels of perceived social and physical disorders and perceived crime also reported higher levels of psychological distress.⁵¹ This is especially true for women with low income who report stress related to neighborhood violence.^{44,52,53} Racial discrimination may act as a social stressor influencing the risk for negative birth outcomes.^{2,12,13} African American women are more likely to experience racial discrimination.^{12,13} Qualitative studies also

report that African American women experience discrimination on a daily basis.⁴³ Women who reported more experiences of racial discrimination also had higher levels of psychological distress.⁵¹

African American women report stressful life events such as losing the job, having many bills to pay, or someone close to the woman having drinking problems.^{54,55} A small body of qualitative research with African American women has identified that these women experience stress due to isolation, feelings of conflict, lack of material and emotional resources, and support from significant others.⁴⁴ Compared with pregnant women in good relationships with the father of the baby, pregnant women in poor relationships with the father of the baby reported higher levels of stress and depressive symptoms.⁵⁶ Women attributed poor pregnancy outcomes to stress from everyday hassles, feeling unsupported, untimely deaths of family members, and economic hardship,⁵⁷ which often lead to depression and anxiety.⁵⁸

Personal resources

Personal resources of social support, coping, and self-esteem ameliorate pregnant women's stress responses.^{24–28,59–63} African American women experienced fewer depressive symptoms when they reported a strong friend- and family-based social network during their pregnancy and help with child care. Pregnant women with higher levels of self-esteem and positive self-attitude and those who used less distancing from problems as a coping strategy were less likely to deliver a preterm infant.^{12,25,64,65} During pregnancy, African American women also tend to draw their support from internal resources: personal attributes.^{44,66} Similar findings concerning the reliance on personal strength have been seen in other research with urban African American mothers,⁶⁷ particularly those dealing with everyday hardships.^{58,68}

Stress responses

Emotional stress responses including psychological distress, anxiety, and depressive symptoms are positively associated with an increased risk for negative birth outcomes.^{12,13,19–23} Compared with pregnant non Latino white women, pregnant African American women have higher rates of depressive symptoms.^{13,69} Higher levels of chronic stressors may also increase physiological stress responses leading to dysregulation of cortisol levels.²⁹ Cortisol downregulates the proinflammatory cytokines (eg, IL-1 β , IL-6),³⁰ limiting inflammation. However, during chronic stress, cortisol is less effective at suppressing inflammation.³¹ These physiological stress responses may also change the structure and function of collagen tissue, which the cervix comprises. During pregnancy, total collagen content of the cervix increases to strengthen the cervix. Before contractions begin, the cervix remodels (cervical ripening) over a period of many weeks through a process of collagen disorganization, increased water content, and decreased collagen concentration.^{70–73} Collagen remodeling of the cervix makes it possible for the cervix to dilate, allowing birth of the fetus and also involves local inflammation.⁷⁴

METHODS

We employed a prospective, mixed-methods, complementarity approach to obtain an in-depth understanding of stress during pregnancy for African American women. This mixed-methods approach was designed to seek a broader and more comprehensive understanding of key phenomena of interest by using methods that examine different facets of the pregnancy experience.⁷⁵ With this design, we combined qualitative interview data with quantitative data for a subsample of women who participated in a pilot study of 114 pregnant women and their significant others. That pilot longitudinal study examined the

nature of women's experiences with stress and resources during pregnancy, using a set of established quantitative instruments. Using strategies for conducting sensitive research,⁷⁶ interviews were conducted 1 time during pregnancy between 24 and 33 weeks with women and significant others.

Sample and recruitment

For a convenience subsample, 11 pregnant women and 8 significant others were recruited from a larger study conducted at 1 urban medical center. Women were enrolled in the larger study if they (a) self-identified as African American; (b) were at least 18 years of age; (c) had a singleton pregnancy; (d) were able to read and write English at a fifth-grade level; and (e) were living in Chicago. We excluded women with medical diagnoses (eg, chronic hypertension) or obstetrical complications (eg, multiple pregnancies). The significant other, regardless of race or gender, was identified by the woman, at least 18 years of age, and able to read and write English.

Institutional review board approval was obtained at the participating site. The principal investigator received institutional review board approval for waiver to access medical records of women receiving prenatal care at the participating site. Potential participants were identified by the healthcare provider or member of the research team via maternal medical records and demographic data. Women who met the inclusion criteria were invited to participate and complete the consent process. This research team member also obtained the name of the significant other and obtained permission from the woman to contact that person.

Data collection measures

Maternal characteristics included sociodemographic characteristics (eg, maternal age, income) and medical and obstetrical history (eg, history of previous preterm birth) and were collected from self-report and medical records. Women completed a packet of instruments for stressors (perceived neighborhood environment, racial discrimination), personal resources (social support, coping, self-esteem), and stress responses (psychological well-being, anxiety, depressive symptoms) as part of the larger study (see Table 1). Women had blood drawn for cortisol and cytokine analyses and transvaginal ultrasound for cervical remodeling. In this study, we examined cervical remodeling by 2 methods, ultrasonic cervical length (cm)⁹¹ and ultrasonic attenuation (dB/cm-MHz) with a 4- to 9-MHz vaginal transducer and z.one (Zonare Medical Systems Inc, Mountainview, California) ultrasound system.⁹² Both cervical measures were evaluated with a transvaginal cervical examination by standard methods.^{91,92} Ultrasonic attenuation is the loss of energy as a sound wave propagates through tissue and is a measure of cervical remodeling.^{73,91–95} The interview guide was developed with separate versions worded appropriately for the woman and significant other. The interview guide contained questions for stressors, personal resources, and stress responses. With this approach, we obtained different measures for the same constructs.

Data collection procedure

As part of the larger study, women completed the packet of questionnaires, had blood drawn for cortisol and cytokine analyses, and underwent transvaginal ultrasound for cervical remodeling twice during pregnancy (16–22 and 26–32 weeks' gestation). Women completed the questionnaires by themselves in a private room. The blood sample was collected in the afternoon to control for circadian rhythm.⁹⁶ Venous blood was collected in sterile tube (10 mL), placed on ice, and transported to the laboratory where the samples were centrifuged, aliquoted, and stored at –80°C. All assays were run according to manufacturer's specifications. Ultrasound data were acquired with a transvaginal ultrasound system by the

method of Iams et al.⁹¹ Women were reimbursed \$45 each time for completing the questionnaires and having blood drawn and transvaginal ultrasound.

After obtaining informed consent, interviews were scheduled and were held in private rooms in the university. Except for 2 cases, interviews were conducted after the second data collection of the quantitative measures. The digitally recorded interviews were conducted by the investigators. If the woman reported depression, we referred her to her healthcare provider or mental health therapist. Strategies to prevent and alleviate distress included limiting the interview to 45 minutes; including information about the potential distress in the informed consent process; and using process consent, whereby consent is renegotiated throughout the interview.⁷⁶ Women and significant others were reimbursed \$50 each for their participation in the interview. A total of 19 individual interviews were conducted.

Data management and analysis

All interviews were transcribed verbatim and each was checked for accuracy and corrected. A summary, which consisted of a descriptive summary of qualitative data for each participant, was completed for each prenatal interview. For the first 3 cases, 2 independent summaries were produced to verify accuracy of the summary process. Then, the remaining summaries were completed by 1 team member under the guidance of an investigator. The main constructs (stressors, personal resources, and stress responses) served as the organizing framework for the summary. Consistent with a complementarity approach, qualitative and quantitative data were integrated during the early phases of data management and analysis for an enriched understanding.⁷⁵ During data analysis, we reviewed data for patterns by an approach called integrated data displays.⁹⁷ This step was accomplished by creating matrices that incorporated qualitative and quantitative data for the major constructs (eg, stressors), allowing for comparison of data within and across cases. For example, each individual in the case was listed on one axis and categories were listed on the other axis. Multiple matrices were developed to allow a review of subsets of data across the different constructs and a comparison within and across each pair (woman and significant other)⁹⁸ to allow for emergence of types of stress responses. Patterns were noted for similarities and differences between cases and with particular attention to those that are related to varying levels of stress responses in the woman. Table 2 is an example of the final matrix where we entered our assessment of the data (eg, high, low) for particular variables. The quality framework for mixed-methods research was followed, which necessitates adhering to rigor through all phases of the study from planning to dissemination.⁹⁸ For example, we used rigorous data management techniques that included a team approach toward analysis and an inductive approach to allow for patterns to emerge from the data.

RESULTS

Description of the sample

The sample included 11 women and 8 significant others. Four of the significant others were the father of the baby, 3 were friends, and 1 was the mother of the participant. Women were 18 to 35 years of age and between 24 and 33 weeks' gestation at the time of the interview. All women were single. One woman had less than a high school education, 5 women completed high school, 3 women had some college education, and 2 women had an associate or bachelor degrees. Of the 6 women who worked outside the home, the hours per week ranged between 20 and 53. All women reported an annual household income below \$30 000 and 5 had incomes below \$10 000. None of the women had low-birth-weight or preterm infants, but 1 woman experienced an intrauterine fetal death at 39 weeks. Women gave birth between 38 and 41 weeks' gestation, and infant birth weight ranged between 2627 and 4026 g.

Quantitative and qualitative data

Two clear patterns of stress responses, high stress responses and low stress responses, emerged quite strikingly and unexpectedly from our integrated analysis of quantitative and qualitative data. These patterns were based on a holistic evaluation of interview data depicting the woman as being impacted negatively by the stress in her life and by unfavorable scores on 2 quantitative measures of mental health, the Center for Epidemiologic Studies–Depression (CES-D) Scale and the Psychological General Well-Being Index.^{100,101} The CES-D scale has established clinically meaningful threshold scores that require psychiatric referral for further evaluation. All women whose qualitative interviews indicated high stress responses also had CES-D scale or Psychological General Well-Being Index scores that required referral at either the first or second quantitative data collection. The patterns of specific stressors and personal resources associated with the stress responses are summarized in Table 2. Specific information on the stressors from the qualitative data is shown in Table 3. The names of the participants were changed to protect their privacy. We first present the results according to the major constructs in the model: stressors, personal resources, and stress responses. Then, we present 2 cases to illustrate the 2 types of stress responses, followed by a summary of a comparison between the 2 groups.

Stressors

The sources of stress were racial discrimination, neighborhood, job or financial, and the woman's network (family members, friends). Racial discrimination that was experienced personally or by a close relative or friend was reported by all but 2 of the women, both in the low stress responses group. Often these discriminatory experiences involved negative encounters with the criminal justice system. One woman in the high stress responses group described an encounter that involved her mother. “The officer came and pushed my momma on the ground So she like broke her rib. Somebody told them . . . , she was raised in the zoo like a monkey. Like whoa, where did that come from?”

Three women described stress from living in a bad neighborhood, which was consistent with their quantitative measures of neighborhood. One woman in the high stress responses group said, “It was kind of a rough neighborhood from where we moved from. So I don't go outside as much Last night I saw like somebody was shooting, like it was right outside the window.” Two additional women had moved within the year because of the crime in their neighborhoods. However, some women did not describe their neighborhood as bad despite living in an area with relatively high crime and/or social disorder ratings.

Stress from employment in the high stress responses group was common. Six women and 3 of the fathers of the baby reported being employed; it is noteworthy that most of the women who were employed were in the high stress responses group. One woman in the high stress group described the stress from her employment situation.

And if you are late or anything, you get easily fired. And now I'm on a d-day [decision-day], so, because I was late a couple of times And then I have my own apartment and it's like I can, I'm at risk of losing everything.

Finally, the woman's network was a source of stress for all of the 7 women in the high stress responses group and 2 of the women in the low stress responses group. Stressors included conflict between the woman and a close person in her network, feelings of not being understood or supported, and stressors such as substance use in the lives of persons the woman felt close to. One woman in the high stress responses group described her stress. “My father doesn't live with me. Um, his relationship is kind of rocky because, uh, he's suffering from substance abuse.” Because the quantitative social support measure included

only positive perceived support, these stressors within the woman's support network were apparent only from the interview data.

Personal resources

The woman's personal resources included perceived network support, use of community agencies, self-esteem, and personal coping styles that included avoidance, positive interpretation of events, and prayer. All women identified at least one of their own relatives as an important source of support, and the father of the baby was an important source of support for all but 2 women who were both in the high stress responses group. Friends and family members of the father of the baby were less often mentioned. However, most women named multiple individuals who gave them support. All women reported receiving extensive tangible support, such as help with daily activities including transportation, financial help, cooking, and housecleaning. For example, a mother in the low stress responses group described the many ways that the father of the baby provided support. She said, "Every support I could possibly think of Financially, moral, physical, emotional, all kind of support. He (father of baby), he's ... I won't say perfect because no one's perfect But he, he is the ideal father." Despite their descriptions of tangible support received, 4 women, all in the high stress response group, explained that they had to "do it all" alone and did not feel supported.

The perceived social support quantitative scores were congruent with the interview descriptions of support received. Seven women, all but 1 woman in the high stress responses group, had low total perceived support scores at one or both quantitative data collection times. All but one of the women in the low stress responses group had high perceived support scores, but it is important to note that several of the women in the high stress responses group also had high perceived support scores. Three of the 11 women had the maximum score at both time points, suggesting that there may be a ceiling effect for this measure. We also asked women to discuss any community agencies that provided support. Most women did not use community agencies; besides being in WIC (Special Supplemental Nutrition for Women, Infants, and Children), only 2 women used community agencies for child programs and 2 additional women used an agency's services for themselves.

Self-esteem scores were similar between the 2 groups (20 for all but 1 woman in the high stress responses group), but coping styles varied for women. Three of the 4 women in the low stress responses group had a score of 7 or less for avoidance, and all but 1 woman in the high stress responses group had a score of 7 or more at both times. For 2 of these women, avoidance as a coping style was described in the interviews. Scores for the use of positive interpretation were higher for the women in the low stress responses group than in the high stress responses group. During the interviews, for 4 women, either the woman or significant other described communicating as a way of coping. For 3 women in the high stress responses group, crying as a coping mechanism was described in the interviews. One woman in the low stress responses group reported exercising. All women scored high with prayer as a coping strategy when measured quantitatively. However, only 1 woman described praying as a way of coping in the interview and only 2 women, both in the low stress responses group, reported that they attended church at least monthly.

Stress responses

Patterns of stress responses were seen in cervical remodeling and psychological stress. Abnormal measures of ultrasonic cervical attenuation or cervical length were seen in 7 women at both times of data collection, with all but 1 woman in the high stress responses group. There were no differences in cortisol and inflammatory markers between women with high stress responses and women with low stress responses. Women with higher levels

of cytokines of IL-1 β , IL-8, and IL-10 at the first data collection point also had higher levels of these inflammatory markers at the second data collection point. Cortisol was not related to inflammation for these women. In addition, anxiety scores did not reveal any patterns; scores were between 20 and 40 for the majority of women, with 3 women having scores between 40 and 54.

Seven of 11 women had high depressive symptoms scores and/or low psychological well-being scores at one or both time points requiring follow-up. Three women had high depressive symptoms at both times, and 2 of these were low for psychological well-being at both times (the third was missing these data). For 6 of the women in high stress responses group, the woman and/or significant other reported that the woman was irritable, sad, and/or stressed, and the ones who were sad reported crying to cope. Suicidal thoughts were mentioned during the interview by one woman and by another's significant other.

Cheryl: A case of low stress responses

Cheryl was a 20-year-old, unemployed single primigravida who was a high school graduate with a household annual income of \$21 000 to \$30 000. She reported not smoking and being a recipient of WIC and Public Aid. Cheryl completed the questionnaires and had blood drawn at 20½ and 29 weeks' gestation and was interviewed at 31 weeks' gestation. She delivered at 39 weeks' gestation, and her baby had a birth weight of 3592 g.

Stressors

Cheryl experienced racial discrimination when she was young and felt left out because she was black. However, Cheryl did not report perceived racial discrimination on the quantitative measure and the father of the baby did not report any racial discrimination since the 2 years they had been together. Cheryl experienced stress related to her father's drinking and her brother's intermittent incarceration for the past 15 years and felt that both situations had affected her pregnancy. She explained that her relationship with her father is “emotionally draining.” She limited her contact with her father to once a month because her father caused her stress. However, she added that her father was nicer to her since the pregnancy, especially when he was sober. Cheryl was unemployed and supported financially by her mother. She reported disagreements with her mother on how to raise her baby and her financial status.

Personal resources

Cheryl had been living for 7 years in a “real nice quiet neighborhood” and said that it is “a lot more relaxed” than her previous neighborhood. According to Cheryl and the father of the baby, her family, his family, and community members support her. According to the father of the baby, Cheryl attended church for counseling and talked frequently to his mother and to her mother, which kept her “grounded.” Cheryl indicated that the father of the baby provided the most support, offering advice on how to reduce stress.

Stress responses

Cheryl and the father of the baby reported that Cheryl had difficulty sleeping and had mood swings. According to Cheryl, her mood swings lead to a decrease in the amount of support she received from her mother and the father of the baby. Her father was tense around her because of her mood swings. Her quantitative scores on the psychological distress and depression measures indicated no psychological distress or depression. She had no signs of abnormal cervical remodeling.

Shaneeeka: A case of high stress responses

Shaneeeka was a 34-year-old woman, unemployed, and had less than a high school education, with a household income of less than \$10 000. She was expecting her sixth child. Her 5 children, ranging in age from 17 to 3 years, were from a previous relationship. Her current partner was the father of this baby, and this baby would be his first. Shaneeeka was also a recipient of WIC. She had a medical history of asthma. Shaneeeka completed the questionnaires and had blood drawn at 20.5 and 26.5 weeks. She was interviewed at 27 weeks' gestation. Shaneeeka delivered at 38 weeks, although she had an episode of preterm labor. Her baby weighed 2627 g, the lowest birth weight for women in our study.

Stressors

Shaneeeka experienced an early pregnancy loss in her last pregnancy and worried about this pregnancy. Her fiancé was employed; however, his hours had been reduced and he experienced problems with his employer. She did not work, but she received disability financial support. She estimated their income was less than \$10 000 and reported difficulties paying bills. Both her fiancé and her 2 sons have been arrested and then later released; their perception was that the police accused them unjustly on the basis of their race. She moved a year ago from a very bad neighborhood to a better one, and she began establishing relationships with neighbors. She stated that the only person she can rely on was her partner. She was very close to her father, but he died recently, just a few months before she became pregnant. According to Shaneeeka, her mother and sisters do not support her current pregnancy. She is worried about her children because of incidences of bullying of her daughters and because her son had health problems. Her partner is concerned about her 2 older sons who have physically threatened her. He expressed doubts about how long he could tolerate the situation and reported that his mother disapproved of the relationship. Shaneeeka did not mention these issues.

Personal resources

Although Shaneeeka reported that her partner supported her, including cooking, helping with the kids, and providing emotional support, she also reported she did everything and felt that she could only depend on herself. These qualitative responses were congruent with her low quantitative social support scores. Her partner felt strongly attached to Shaneeeka and talked about how she was a strong support for him when he lost his job earlier.

Stress response

Shaneeeka's main response to stress was to avoid thinking about things and to pray. She also avoided getting close to people and felt she could not trust any other women. Her perceived overall well-being was low, and her depressive symptoms were very high at both data collection points. Shaneeeka had signs of early cervical ripening and experienced contractions midpregnancy, although she delivered at term.

Summary of across-groups comparison

Seven of the 11 women had stress responses that placed them in the high stress responses group. All but one of these women had at least 3 sources of stress (racial, neighborhood, financial, or network), and the remaining woman in this group had 2 sources of stress. All women in this group experienced racial discrimination and had a stressor related to their support network. One woman in this group experienced an intrauterine fetal death at 39 weeks. In contrast, 3 of the 4 women in the low stress responses group had only 2 sources of stress (racial, neighborhood, financial, or network) and 1 had none. The women in the low stress responses group all reported an overall feeling of support, which was congruent with their total perceived support scores.

Three of these 7 women (Shaneeka, Shannon, and Nia) were particularly high in their stress responses, as evidenced in their interviews and abnormal measures at both times of data collection for the CES-D scale and/or the Psychological General Well-Being Index. These women also reported stress from their employment situation, their perception that they did not feel supported, which was consistent with their scores at both times on the perceived support scale, and all 3 had abnormal cervical remodeling. Coping measures for this subgroup of highly stressed women indicated high avoidance and low positive interpretation of events.

DISCUSSION

This is the first study to examine pregnant African American women's stressors, personal resources, and stress responses, using a mixed-methods complementary approach. Seven of the 11 women were in the high stress responses group. These women reported numerous types of stressors in their lives, such as negative aspects of the neighborhood, experiences of racial discrimination, financial, and network stressors. These women used social support from friends and family members as personal resources to cope with their stress. Finally, the stressors in their lives increased their emotional stress responses and subsequently might have contributed to abnormal attenuation and cervical length measures.

Some women in our study reported high neighborhood social disorder and crime. Three women described stress from living in a bad neighborhood. Similarly, other researchers have found that pregnant African American are more likely to live in poor neighborhoods,^{10,11} which may increase stress for these women.^{18,50} African American women who reported higher levels of perceived crime also reported higher levels of psychological distress.⁵¹ Therefore, negative aspects of the neighborhood environment may increase stress for pregnant African American women.

Experiences of racial discrimination were common, not only among the participants but also among their close relatives and friends, subsequently affecting their levels of stress. Seven of the women reported 1 to 4 experiences of racial discrimination, and 1 woman reported 7 experiences of racial discrimination. Racial discrimination experienced personally or by a close relative or friend was also reported during the interviews by all but 2 of the women and negatively impacted the mother. Many African American women experience discrimination on a daily basis.⁴³ Researchers have found that experiences of racial discrimination increase stress for pregnant women.^{16,17,102} Similarly, we found all but one of the women who reported experiences of racial discrimination in the high stress responses group. Racial discrimination is a stressor for most of these African American women and adds to their total burden of stress. The unique US heritage of slavery and continuing exposure to racial discrimination becomes a daily threat for African Americans.¹⁰³

African American women rely heavily on family support during their pregnancy, and the degree of support decreases their stress level. All but 1 woman in the high stress responses group reported low levels of social support at both times of data collection. Conversely, all but one of the women in the low stress responses group reported high perceived support scores. All women identified at least one of their relatives as an important source of support, and the father of the baby was also an important source of support for all but 2 women. The women in the low stress responses group all reported feeling supported, which was congruent with their total perceived support scores. Social support may ameliorate the emotional stress responses experienced by pregnant women.

African American women's experiences of discrimination and limited social support and resources may force them to take on multiple roles, including mother, nurturer, and

breadwinner out of necessity. A feeling of reliance on only oneself may contribute to the “superwoman schema.” African American women feel they must produce a self-reliant persona to the world, contributing to increased strain in interpersonal relationships, increased stress related behaviors, and embodiment of stress.⁶⁷ Posttraumatic slave syndrome, a disorder experienced by African Americans, is closely related to racial discrimination. It is due to the dominant culture's infliction of slavery historically and continuous oppression and institutionalized racism upon African Americans. These historical and current experiences have denied African American the full access to the privileges freely given to members of the dominant society, resulting in reduced psychological well-being, economic achievement, and continuous coping with blocked goals.¹⁰³ Healing includes the recognition of one's and one's group's worth within a society that devalue African Americans.¹⁰³ Healthcare providers can assist by advocating against racial discrimination in all environmental settings including social, educational, recreation, and health environments.

A large number of women in this small pilot study were experiencing high emotional stress responses during pregnancy. Women reported stressors in their lives such as negative aspects of the neighborhood and experiences of racial discrimination. High stress responses during pregnancy can have negative effects on the woman's and infant's long-term health through the increased production of cortisol.¹⁰⁴

This study found that pregnant African American women experience significant depressive symptoms. Similarly, research suggests that pregnant African American women have higher rates of depressive symptoms.^{13,69} Of the 7 women with high levels of depressive symptoms, 3 women had high levels of depressive symptoms both at 16 to 22 and 26 to 32 weeks' gestation. However, 4 women with low levels of depressive symptoms at 16 to 22 weeks' gestation reported high levels of depressive symptoms at 26 to 32 weeks' gestation. Therefore, the incidence of depressive symptoms may be higher in women as they approach the end of their pregnancy. This may be related to the impending stress of the arrival of the infant and the potential for significant role change after delivery.

A high level of chronic experienced stress, racism, high-risk behaviors, and low resources in African American women have been implicated as important factors in preterm birth.^{34,55,69,105} Experienced stress is independently associated with preterm birth in African American women.^{17,34,35} Links between physiological and psychological chronic stress responses with changes in the structure and function of the cervical collagen leading to premature cervical remodeling have not been studied. However, physiological stress responses involve alterations in the hypothalamic-pituitary-adrenal axis and immune functions in pregnancy (cortisol and cytokines) that place women at risk for preterm birth.³⁶ Collagen remodeling of the cervix is an essential function of parturition, making it possible for the cervix to dilate and allow passage of the fetus. Thus, the role of chronic stress and cervical remodeling warrants further investigation.

Limitations

There are limitations of this study that should be considered. Qualitative prenatal interviews of the women were conducted only once during pregnancy after the quantitative measures were collected. There were several cases where the father of the baby or other support person was not available to be interviewed. Quantitative scores for racial discrimination were somewhat less informative than open-ended interviews. The MOS (Medical Outcomes Study) Social Support survey inquires about positive sources of social support (eg, someone you can count on to listen to you when you need to talk). Because the quantitative social support measure included only positive perceived support, stressors within the woman's support network were apparent only from the interview data. Three women had the

maximum score for social support at both time points, suggesting that there may be a ceiling effect for this measure. Another limitation of this study was the measure of cortisol at only 2 times during pregnancy.

Recommendations for research

Future studies need to collect the qualitative and quantitative data at the same time to better evaluate congruence between the measures. The interviews should be conducted at least twice during pregnancy in case the woman's situation changes. Greater flexibility regarding time and place of the interview might enable more support persons to take part in studies. Finally, multiple collections over multiple days may be a better measure of cortisol for future studies.¹⁰⁶

Implications

More than half of the women in our study had clinically significant depressive symptoms. Suicidal thoughts were mentioned during the interview by 1 woman. Pregnant women need to be assessed for depressive symptoms and be provided referrals for psychiatrist for potential management with antidepressant treatment and psychotherapy when warranted. Women should be assessed for depression not only at entry into prenatal care but also at each trimester of pregnancy. Some advanced practice nurses who serve a predominantly low-income population of women have begun to assess for depression at each trimester in their agency, based on trends they have noticed in their population (Mary Bauer, oral communication, October 4, 2012).

We did not observe any differences in cortisol and inflammation between women with low stress responses and women with high stress responses. However, women with higher levels of inflammation earlier in pregnancy continued to have higher levels of inflammation later in pregnancy. Inflammation during pregnancy has been related to higher risk for preterm birth.^{107,108} Clinically, there are no current recommendations for measuring cortisol and cytokines as biomarkers to predict preterm birth. However, clinicians need to be aware that emotional stress responses can increase the levels of inflammation and potentially lead to preterm birth.

Ultrasonic attenuation can provide quantitative information about the microstructure of cervical tissue (collagen) before macrostructure changes such as cervical dilation and effacement.^{92,95,109,110} This technology has the potential to determine microstructural tissue changes in relation to clinical conditions and treatments.

The benefits of social support for physical and mental health are widely recognized, and nearly all of these pregnant African American women reported robust social networks and high levels of tangible and emotional support. In evaluating social support for childbearing women, it is important to not only assess for the presence of support but also whether anyone in the woman's support network is a source of stress for her. Racial discrimination and living in an unsafe neighborhood were also sources of stress for many women in the study. Clinicians should be aware of these sources of stress so that recommended health-promoting behaviors, such as exercise in the community, are realistic, given concerns about safety. Clinicians should also demonstrate cultural humility. This approach would include making sure that all individuals who interact with women and their families receive formal preparation to respectfully interact with women and their families so that the clinic setting is free of racial bias.

CONCLUSION

The results from this study support the ecological conceptual framework, indicating that negative perceptions of the neighborhood and perceived racial discrimination increase negative emotional stress responses in pregnant African Americans. However, increased social support from family members and the father of the baby are significant moderators, decreasing the stress responses. The mixed-methods approach for this pilot enabled us to have a beginning understanding of the sources of stress, types of resources, and identification of a pattern of stress responses. A larger study for a more complete uncovering of the varying levels of stress responses is needed.

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Figure 1.
Pregnancy stress experience mixed methods study.

Table 1

Variables and instruments

Construct	Variables	Instruments
Stressors	Perceived neighborhood environment Perceived physical disorder Perceived social disorder Perceived crime Perceived racial discrimination	Adapted Physical Environmental Stressor Scale ⁷⁷⁻⁷⁹ (6 items, eg, housing conditions, vacant lots/houses, and vandalism; range 6–30, Cronbach $\alpha = 0.78$) ^a Adapted Perceived Neighborhood Scale ^{80,81} (6 items, eg, drug use/dealing, homeless people, gangs; range 6–18, Cronbach $\alpha = 0.90$). Scores >6 were considered high levels of social disorder for this study. Adapted Perceived Crime subscale of Perceived Neighborhood Scale ^{81,82} (6 items, eg, fear of being robbed, fear of being mugged, fear of being raped; range 6–30, Cronbach $\alpha = 0.90$). Scores >12 were considered high levels of perceived crime for this study. Experiences of discrimination ⁸³⁻⁸⁵ (9 situations, eg, at school, at work, range 0–9; 9 frequencies, range 0–45, Cronbach $\alpha = 0.83$)
Personal resources	Perceived social support Coping Self-esteem	MOS Social Support Survey ⁸⁶ (first item social network, 19 items, range 19–95, Cronbach $\alpha = 0.98$). Scores below 76 were considered low social support for this study. Prenatal Coping Inventory ⁸⁷ (22 items, 4 coping strategies: preparation for motherhood, avoidance, positive interpretation, and prayer; Cronbach $\alpha = 0.69-0.85$) Rosenberg Self-Esteem Scale ⁸⁸ (10 items, range 0–40, Cronbach $\alpha = 0.87$)
Stress responses	Psychological General Well-Being Anxiety Depressive symptoms Cortisol Cytokines Cervical remodeling	Psychological General Well-Being Index (22 items, range 0–110, Cronbach $\alpha = 0.95$). Scores >72 represent psychological distress and were considered low for this study. ¹⁰⁰ State-Trait Anxiety Inventory ^{89,90} (20 items, range 20–80, Cronbach $\alpha = 0.92$). Center for Epidemiologic Studies–Depression scale (20 items, range 0–60, Cronbach $\alpha = 0.87$). Scores >16 represent signs of clinical depressive symptoms and were considered high for this study. ¹⁰¹ Enzyme immunoassay (minimal detection limit, 56 pg/mL) Cytokines Multiplex Bead Immunoassays (minimal detection limit, 3–15 pg/mL; interassay coefficient of variation, 7%–11.8%) Ultrasonic cervical length (cm; range: 0–5 cm); ultrasonic attenuation (dB/cm-MHz; range: 0–3)

Abbreviation: MOS, Medical Outcomes Study.

^a Cronbach α values are reported for the larger study ($N = 114$).

Table 2

Patterns of stress response in pregnant African American women: Selected quantitative and qualitative data

Participant	Stressors												Stress Responses							
	Racial Discrimination			Neighborhood Condition						Personal Resources			Well-being			Depressive Symptoms			Cervical Remodeling	
				Overall			Crime													
	QUAIM			QUAN			QUAN			QUAN			QUAN							
	(Range: 0-9)			(High or Low; See Table 1)						(High or Low)			(High or Low)			(Nor or Abn)				
	QUAL (present)	T1 ^a	T2	QUAL (present)	T1	T2	T1	T2	T1	T2	Perceived Support	QUAL	T1	T2	T1	T2	T1	T2		
High stress responses																				
Shaneecka	Yes	0	3	No	Low	Low	High	High	High	Yes	Yes	No	Low	Low	Low	High	High	Nor	Abn	
Naketa	Yes	2	1	No	Low	High	High	High	High	Yes	Yes	No	Low	Low	High	High	High	Nor	Nor	
Shannon	Yes	7	6	Yes	High	Low	High	High	High	Yes	Yes	No	Low	Low	Low	High	High	Nor	Abn	
Tomeka	Yes	1	1	No	Low	High	High	High	High	Yes	Yes	Yes	High	High	Low	Low	High	Nor	Abn	
Nia	Yes	-	2	No	High	Low	High	High	High	Yes	Yes	No	Low	Low	-	High	High	Abn	Nor	
Trina	Yes	3	1	No	Low	Low	Low	Low	High	Yes	Yes	Yes	High	Low	Low	Low	High	Abn	Abn	
Tawana	Yes	2	2	Yes	High	High	High	High	High	Yes	Yes	Yes	High	Low	Low	Low	High	Nor	Abn	
Low stress responses																				
Kianna	No	0	0	Yes	Low	High	High	High	High	Yes	Yes	Yes	Low	High	High	High	Low	Nor	Nor	
Donnetta	Yes	3	4	No	Low	Low	Low	Low	Low	Yes	No	Yes	High	High	High	High	Low	Nor	Nor	
Asia	No	0	0	No	High	Low	High	High	High	No	No	Yes	High	High	High	High	Low	Nor	Abn	
Cheryl	Yes	0	0	No	Low	Low	Low	Low	Low	Yes	Yes	Yes	High	High	High	High	Low	Nor	Nor	

Abbreviations: Abn, abnormal; Nor, normal; QUAL, qualitative; QUAN, quantitative.

^aT1: *M* = 20 weeks, *SD* = 2.6 weeks; range, 16-22 weeks. T2: *M* = 28 weeks, *SD* = 3 weeks; range, 26-36 weeks.

Table 3

Participant descriptions of stressors

Participant	Racial Discrimination	Neighborhood Condition	Job or Financial	Network
High stress responses				
Shaneeeka	Disrespected by the police, father of the baby and her son locked up for suspected crime	Prior neighborhood was "terrible"; moved 1 y prior; current is quite and clean	On disability; father of the baby had his hours cut	Her mother and her family are unsupportive; teen sons abusive and jailed
Naketa	Comments at work, hours cut.	No stress reported	Hours cut	Her family is somewhat unsupportive
Shannon	Decreased work hours; not allowed in desired school; family followed in stores	Lived in a "bad" neighborhood her entire life	Works against MD advice; father of the baby unemployed	Her family is unsupportive
Toneka	Police knocked her mother down and broke her rib.	No stress reported	Mandatory overtime; father of the baby unemployed	Father of the baby "gets on her nerves"
Nia	Coworker makes negative racial slurs	No stress reported	Risk of losing job due to tardiness	Father of the baby was abusive and unfaithful, now separated
Trina	Her family in the south experienced discrimination in healthcare	No stress reported	No stress reported; good job, father of the baby works occasionally	Her mother has mental illness and father has substance abuse
Tawana	At school; healthcare provider made negative comments about becoming pregnant	Was in a good neighborhood, but now lives in a "bad neighborhood" that is stressing the mother	No stress reported; not employed, supported by her mother	Abandoned by the father of the baby who denies paternity
Low stress responses				
Kianna	None reported	Former neighborhood was "bad"; moved few weeks prior	No stress reported; father of baby works 2 jobs	Most of her family members jailed intermittently
Donnetta	Called names by the police; job application denied, coworkers make remarks	No stress reported	Good job, father of the baby recently lost his job	No stress reported
Asia	None reported	No stress reported	No stress reported; not employed, supported by her mother	No stress reported
Cheryl	As a child felt left out of the group, father of the baby experienced at an amusement park	No stress reported	No stress reported; not employed, supported by her parents, father of the baby in college	Her father has substance abuse; brother in jail