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OBSTETRICS

Psychosocial stress during pregnancy

Sarah M. Woods, MD; Jennifer L. Melville, MD, MPH; Yuqing Guo, MSN; Ming-Yu Fan, PhD; Amelia Gavin, PhD, MSW

OBJECTIVE: We sought to identify factors associated with high antenatal psychosocial stress and describe the course of psychosocial stress during pregnancy.

STUDY DESIGN: We performed a cross-sectional analysis of data from an ongoing registry. Study participants were 1522 women receiving prenatal care at a university obstetric clinic from January 2004 through March 2008. Multiple logistic regression identified factors associated with high stress as measured by the Prenatal Psychosocial Profile stress scale.

RESULTS: The majority of participants reported antenatal psychosocial stress (78% low-moderate, 6% high). Depression (odds ratios [OR],

9.6; 95% confidence interval [CI], 5.5–17.0), panic disorder (OR, 6.8; 95% CI, 2.9–16.2), drug use (OR, 3.8; 95% CI, 1.2–12.5), domestic violence (OR, 3.3; 95% CI, 1.4–8.3), and having ≥ 2 medical comorbidities (OR, 3.1; 95% CI, 1.8–5.5) were significantly associated with high psychosocial stress. For women who screened twice during pregnancy, mean stress scores declined during pregnancy (14.8 ± 3.9 vs 14.2 ± 3.8 ; $P < .001$).

CONCLUSION: Antenatal psychosocial stress is common, and high levels are associated with maternal factors known to contribute to poor pregnancy outcomes.

Key words: antenatal screening, pregnancy, psychosocial stress

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Psychosocial stress in pregnancy, defined as “the imbalance that a pregnant woman feels when she cannot cope with demands. . . which is expressed both behaviorally and physiologically,”¹ has not routinely been measured in everyday obstetric practice. It has recently come to the forefront of policy, however, with the American College of Obstetricians and

Gynecologists (ACOG) releasing a 2006 committee opinion stating that psychosocial stress may predict a woman’s “attentiveness to personal health matters, her use of prenatal services, and the health status of her offspring.”² In this committee opinion, ACOG advocated screening all women for psychosocial stress and other psychosocial issues during each trimester of pregnancy and the postpartum period.²

Despite these recommendations the prevalence of antenatal psychosocial stress is unclear³ and its influence on maternal health is likely underestimated. Further, little research exists regarding which factors contribute to or coexist with psychosocial stress during pregnancy. In the few studies conducted to date, associations have been noted between antenatal psychosocial stress and domestic violence,⁴⁻⁸ substance use,^{9,10} depressive symptoms,¹¹⁻¹³ psychiatric diagnoses,¹⁴ poor weight gain,¹⁰ and having a chronic medical disorder.¹⁰ Many of these studies were limited, however, in their sample size, select populations, or assessment of potential covariates (eg, use of nonvalidated measures or medical records only). Some of these identified factors are known to be associated with adverse birth outcomes (eg, preterm delivery,¹⁵⁻¹⁷ low birthweight¹⁶⁻¹⁸), so de-

termining their associations with psychosocial stress is paramount.

Research regarding the factors associated with high psychosocial stress during pregnancy has potential to provide targets for interventions, leading to an increase in maternal well-being and a potential decrease in adverse birth outcomes. The primary aims of this study were to identify factors associated with high antenatal psychosocial stress and describe the course of psychosocial stress during pregnancy.

MATERIALS AND METHODS

Design, sample, setting, and time frame

We studied pregnant women enrolled in a longitudinal study of antenatal care at a single university obstetric clinic. The clinic serves a group of women with diversity in race, socioeconomic status (SES), and medical risk, with a payer mix of 46.5% private insurance, 51.6% Medicaid, and 1.9% self-pay.¹⁹ Clinic providers include attending physicians, fellows, residents, and midwives. As part of a psychosocial screening program, questionnaires measuring stress and mood were introduced in January 2004. Questionnaires were designed to be distributed by clinical staff as part of routine clinical care to all women at least once during pregnancy with the goal of 2 times: first

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during the early second trimester and again in the third trimester. All women receiving ongoing obstetric care and completing at least 1 questionnaire from January 2004 through March 2008 were eligible for inclusion in the study. Exclusion criteria included age <15 years at the time of delivery and inability to complete the clinical questionnaire due to mental incapacitation or language difficulties (ie, no interpreter available). Clinical staff were asked to contact and consent potentially eligible subjects at the time of screen completion. All procedures were approved by the University of Washington's institutional review board.

Measures

Data were collected from self-report questionnaires and from automated medical records. The questionnaire included inquiry regarding demographic characteristics, social history, medication use, general health history, past obstetric complications, as well as validated measures assessing psychosocial stress,^{20,21} depression and panic disorder,^{14,22} tobacco use,²³ alcohol use,²⁴ drug use,²⁵ and domestic violence.²⁶ Maternal age and parity were obtained from the automated medical record.

Psychosocial stress was measured using the Prenatal Psychosocial Profile stress scale, which has been validated for use in pregnant populations.^{20,21} It is an 11-question survey using a Likert response scale with possible scores ranging between 11 and 44 (Appendix). The scale's validity and reliability have been supported among ethnically diverse rural and urban pregnant women.²⁰ Several recent studies have used this instrument to measure psychosocial stress.^{4,5,8,9,11,27-29} In these studies, mean stress scores ranged from 17-23.^{4,5,9,11,21,29} The recommended cutoff for high stress depends on the population studied and the patient characteristics; there are no recommendations for differentiating low to moderate stress. In the 2 studies that have established cutoffs for high stress, one used scores above the mean plus 2SD (score >26)⁵ whereas another chose a set percentile of 25% (score \geq 23).²⁸ Both of these studies had predominantly low SES participants. In our heterogeneous SES popula-

tion, we chose a cutoff of scores above the mean plus 2SD, corresponding to a score of \geq 23 for our sample.

Depression and panic disorder were assessed using the Patient Health Questionnaire short form (15 items), which yields diagnoses for major depression, minor depression, and panic disorder. In a study of 3000 obstetric-gynecologic patients, high sensitivity (73%) and specificity (98%) for the depression items were demonstrated for a diagnosis of major depression based on the Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*.^{14,22} This was also true for diagnostic items related to panic disorder (sensitivity 81%, specificity 99%).²² In our study, women meeting *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria for major or minor depression on the Patient Health Questionnaire-9 were classified as experiencing current depression. The criteria for major depression require the subject to have, for at least 2 weeks, \geq 5 depressive symptoms present for more than half the days, with at least 1 of these symptoms being depressed mood or anhedonia.¹⁴ The criteria for minor depression require the subject to have, for at least 2 weeks, 2-4 depressive symptoms present for more than half the days, with at least 1 of these symptoms being depressed mood or anhedonia.¹⁴ Women were classified as having current panic disorder if they answered "yes" to 5 diagnostic criteria for panic disorder.

Tobacco, alcohol, and drug use were assessed using the Smoke-Free Families Prenatal Screen,²³ the Alcohol T-ACE ('Tolerance': How many drinks does it take to make you feel high? Have people 'annoyed' you by criticizing your drinking? Have you ever felt you ought to 'cut down' on your drinking? 'Eye-opener': Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?),²⁴ and the Drug CAGE (Have you ever felt you should 'cut down' on your drinking? Have people 'annoyed' you by criticizing your drinking? Have you ever felt bad or 'guilty' about your drinking? 'Eye opener': Have you ever had a drink first thing in the morning to steady your nerves or to

get rid of a hangover?).²⁵ The Smoke-Free Families Prenatal Screen was specifically developed to maximize disclosure of smoking status during pregnancy and any current smoking is classified as tobacco use.²³ Both the T-ACE and the Drug CAGE assess substance use during the current pregnancy as well as in the 12 months prior to pregnancy to identify all women at risk for use. The T-ACE was developed to identify at-risk drinkers, has been validated in a pregnant population, and has increased sensitivity compared to the Alcohol CAGE.²⁴ Sensitivity and specificity of identifying at-risk drinkers are 69% and 89% when a score of \geq 2 on the T-ACE is used.²⁴ The Drug CAGE, developed from the original CAGE to identify problem illicit drug use, has been validated in pregnant women with a cutoff score of \geq 3 identifying problem drug use.²⁵ In this study, women were considered as at-risk drinkers or problem drug users if they met criteria for risk drinking or problem drug use during pregnancy and/or in the 12 months prior to pregnancy.

The 3-question Abuse Assessment Screen²⁶ assesses physical and sexual violence during the past year and during pregnancy. This screen has been used both as a clinical screening tool with established validity and test-retest reliability, and for research purposes as a dichotomous measure of abuse.^{4,5,8,18,30} Consistent with previous research studies, we classified women as positive for domestic violence if they answered "yes" to any of the 3 abuse questions.

Women were considered as having high medical comorbidity if they self-reported \geq 2 chronic medical problems outside of pregnancy (eg, asthma, hypertension, diabetes, or cardiovascular problems). A history of pregnancy complications was recorded for patients who self-reported \geq 1 significant pregnancy complications (eg, gestational diabetes, preeclampsia, eclampsia, preterm delivery, or placental abruption) in a prior pregnancy. Other demographics including employment, education, and marital status were dichotomized as shown in Table 1.

TABLE 1
Maternal demographic, behavioral, and clinical characteristics by psychosocial stress category

| Characteristic | Total (n = 1522) | High stress | | Test statistic (t or χ^2) | P value |
|-------------------------------------------|---------------------|-------------------|-------------------|------------------------------------|---------|
| | | Yes (n = 91) | No (n = 1421) | | |
| Age, y | 30.4 (\pm 6.3) | 28.0 (\pm 6.6) | 30.6 (\pm 6.3) | 3.676 | < .001 |
| Gestational age, wk ^a | 23.5 (\pm 7.3) | 25.0 (\pm 7.5) | 23.4 (\pm 7.3) | 1.917 | .058 |
| Education | | | | 36.433 | < .001 |
| \leq High school | 19.3% (n = 293) | 42.9% (n = 39) | 17.9% (n = 254) | | |
| >High school | 73.5% (n = 1118) | 48.4% (n = 44) | 75.1% (n = 1067) | | |
| Employment | | | | 39.171 | < .001 |
| Unemployed | 11.1% (n = 169) | 30.8% (n = 28) | 9.9% (n = 141) | | |
| Other ^b | 81.5% (n = 1241) | 60.4% (n = 55) | 83.0% (n = 1179) | | |
| Marital status | | | | 43.522 | < .001 |
| Married/partnered | 81.1% (n = 1234) | 58.2% (n = 53) | 82.6% (n = 1174) | | |
| Other ^c | 11.8% (n = 179) | 33.0% (n = 30) | 10.5% (n = 149) | | |
| Race | | | | 26.075 | < .001 |
| White | 66.9% (n = 1018) | 56.0% (n = 51) | 67.6% (n = 961) | | |
| Black | 7.6% (n = 116) | 14.3% (n = 13) | 7.2% (n = 102) | | |
| American Indian or Native Alaskan | 2.2% (n = 34) | 4.4% (n = 4) | 2.1% (n = 30) | | |
| Asian | 10.9% (n = 166) | 6.6% (n = 6) | 11.2% (n = 159) | | |
| Native Hawaiian or other Pacific Islander | 1.2% (n = 18) | 1.1% (n = 1) | 1.1% (n = 16) | | |
| Mixed | 5.5% (n = 83) | 14.3% (n = 13) | 4.9% (n = 69) | | |
| Undeclared | 5.7% (n = 87) | 3.3% (n = 3) | 5.9% (n = 84) | | |
| Ethnicity | | | | 2.302 | .316 |
| Hispanic | 9.0% (n = 137) | 8.8% (n = 8) | 9.1% (n = 129) | | |
| Non-Hispanic | 81.1% (n = 1234) | 76.9% (n = 70) | 81.5% (n = 1158) | | |
| Undeclared | 9.9% (n = 151) | 14.3% (n = 13) | 9.4% (n = 134) | | |
| Parity | | | | 0.756 | .385 |
| Primiparous | 53.7% (n = 818) | 58.2% (n = 53) | 53.6% (n = 761) | | |
| Multiparous | 46.3% (n = 704) | 41.8% (n = 38) | 46.4% (n = 660) | | |
| Current cigarette smoking | | | | 75.808 | < .001 |
| No | 88.8% (n = 1352) | 67.0% (n = 61) | 90.6% (n = 1288) | | |
| Yes | 7.4% (n = 112) | 30.8% (n = 28) | 5.9% (n = 84) | | |
| Alcohol use | | | | 1.147 | .284 |
| No | 80.7% (n = 1228) | 80.2% (n = 73) | 85.0% (n = 1208) | | |
| Yes | 14.9% (n = 212) | 17.6% (n = 16) | 13.7% (n = 195) | | |
| Drug use | | | | 45.139 | < .001 |
| No | 95.9% (n = 1460) | 87.9% (n = 80) | 96.6% (n = 1372) | | |
| Yes | 1.6% (n = 23) | 9.9% (n = 9) | 1.0% (n = 14) | | |
| Domestic violence | | | | 73.017 | < .001 |
| No | 95.4% (n = 1452) | 80.2% (n = 73) | 96.6% (n = 1372) | | |
| Yes | 3.5% (n = 54) | 19.8% (n = 18) | 2.5% (n = 36) | | |

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(continued)

TABLE 1

Maternal demographic, behavioral, and clinical characteristics by psychosocial stress category (continued)

| Characteristic | Total (n = 1522) | High stress | | Test statistic (t or χ^2) | P value |
|-------------------------------------|---------------------|-----------------|------------------|------------------------------------|---------|
| | | Yes (n = 91) | No (n = 1421) | | |
| Current depression (major or minor) | | | | 221.765 | < .001 |
| No | 90.7% (n = 1381) | 47.3% (n = 43) | 93.5% (n = 1329) | | |
| Yes | 9.1% (n = 138) | 52.7% (n = 48) | 6.3% (n = 90) | | |
| Panic disorder | | | | 101.189 | < .001 |
| No | 96.6% (n = 1470) | 79.1% (n = 72) | 97.7% (n = 1389) | | |
| Yes | 3.1% (n = 47) | 20.9% (n = 19) | 2.0% (n = 28) | | |
| ≥ 2 chronic health problems | | | | 51.307 | < .001 |
| No | 74.8% (n = 1139) | 45.1% (n = 41) | 76.8% (n = 1091) | | |
| Yes | 18.9% (n = 287) | 46.2% (n = 42) | 17.0% (n = 242) | | |
| History of pregnancy complications | | | | 2.727 | .099 |
| No | 64.7% (n = 984) | 56.0% (n = 51) | 65.2% (n = 927) | | |
| Yes | 32.3% (n = 492) | 39.6% (n = 36) | 31.8% (n = 452) | | |

^a Gestational age at first screening; ^b Other includes employed, homemaker, retired, or student; ^c Other includes single and not living with partner, separated or divorced, widowed.

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Analysis

Univariate analysis was performed for the sample characteristics by stress level (high stress vs other, χ^2 test for categorical variables and *t* test for continuous variables, significance at $P < .05$). Significant variables from the univariate analysis and variables established a priori were entered into a multiple logistic regression model to determine associations with high psychosocial stress. Variables were added to the model one by one and were excluded from the final model if they did not improve the overall model fit. For women who completed screening at 2 time points, their mean stress scores were compared using a paired *t* test.

Questionnaire data for each subject were entered and stored using Filemaker Pro (Version 9 for Windows; FileMaker Inc, Santa Clara, CA). Data were analyzed using software (SPSS for Windows, Rel. 15.0.1; SPSS Inc, Chicago, IL).

RESULTS

During the study period 2046 women completed at least 1 psychosocial screen as part of their routine antenatal care. All women completing a screen were eligible for the study. Staff were present in clinic

to contact around 80% ($n = 1639$). Of 1639 women who staff were able to contact for involvement in the study, 92.9% ($n = 1522$) consented for participation whereas 7.1% ($n = 117$) declined.

Among the 1522 study participants, mean age was 30.4 ± 6.3 years, with a range of 15–51 years. Racial identification was 66.9% white, 10.9% Asian, 7.6% black, 2.2% American Indian or Alaska Native, 1.2% Pacific Islander, 5.5% mixed race, and 5.7% undeclared. Ethnicity was 9% Hispanic. The index pregnancy was the first pregnancy for 53.7% ($n = 818$). The majority of women reported living with a spouse or partner (87.3%, $n = 1234$) and had achieved education beyond high school (79.2%, $n = 1118$). In all, 12% ($n = 169$) reported that they were unemployed. All other maternal demographic, behavioral, and clinical characteristics are reported in Table 1.

In all, 6% ($n = 91$) of women reported high stress, 78% ($n = 1190$) reported low/moderate stress, and 16% ($n = 241$) reported no stress. The mean gestational age at first screening was 23.5 ± 7.3 weeks and mean stress score was 15.0 ± 4.0 . In all, 43% ($n = 658$) of the enrolled women completed screening at 2 time

points during pregnancy. For this subset, mean gestational age at first screening was 22.1 ± 6.0 weeks with mean stress score of 14.8 ± 3.9 ; and mean gestational age at second screening was 36.3 ± 1.8 weeks with mean stress score 14.2 ± 3.8 . A statistically significant difference in mean stress scores from first to second screening was found ($P < .001$).

Adjusted odds ratios from the logistic regression examining the relationship between maternal characteristics and high psychosocial stress are shown in Table 2. Five maternal characteristics were significantly associated with high psychosocial stress. Domestic violence, drug use, and having ≥ 2 medical problems increased the odds of high psychosocial stress during pregnancy by 3- to 4-fold, whereas current depression and panic disorder increased the odds by 7- to 10-fold. Conversely, marital status, employment, education, race, age, and history of pregnancy complication were not significantly associated with high psychosocial stress in the final model.

COMMENT

In a population of ethnically and economically diverse pregnant women attending a university-based prenatal

clinic, antenatal psychosocial stress was common, with slightly higher mean levels earlier in pregnancy. High levels of antenatal psychosocial stress were significantly associated with depression, panic disorder, drug use, domestic violence, and having ≥ 2 medical comorbidities. Our study adds significantly to a small body of literature regarding factors associated with antenatal stress.⁴⁻¹⁴ It firmly establishes an independent association between current psychiatric mood disorders (major/minor depression, panic disorder) and high antenatal psychosocial stress. It improves on prior studies showing a relationship between depressive symptoms or psychiatric disorders and increased stress during pregnancy,¹¹⁻¹⁴ by using diagnostic criteria and assessing for multiple potential confounders. For substance use, we found psychosocial stress to be associated with risky drug use, but not alcohol use. Two previous studies have linked substance use with high psychosocial stress,^{9,10} but these studies were limited in that one combined alcohol and drug use in a single variable and the other used medical records to determine substance use during pregnancy. Our results are distinctive in that we measured alcohol use and drug use individually with separate, validated measures. The strong independent association between domestic violence and antenatal stress found in our study strengthens the conclusion of prior studies.⁴⁻⁸ We further found that chronic medical problems are independently associated with high antenatal psychosocial stress. Our findings did not show a significant independent association between antenatal psychosocial stress and several maternal characteristics seen in prior studies (ie, race,^{7,31,32} marital status,³¹ age,⁷ education,⁷ poverty,^{7,32} and cigarette smoking³³⁻³⁵).

Levels of psychosocial stress likely change throughout the course of pregnancy, although few studies have measured psychosocial stress at different antenatal time points.^{3,21,36-38} Our study found a significant decrease in mean stress scores from first to second screening, consistent with the findings of several prior studies.^{20,21,36,37} Although statistically significant, the decrease in the

TABLE 2

Adjusted odds of high psychosocial stress during pregnancy

| Maternal characteristic | Adjusted OR | 95% CI |
|--------------------------------------|-------------|-----------|
| Current depression ^a | 9.6 | 5.5–17.0 |
| Panic disorder | 6.8 | 2.9–16.2 |
| Drug use | 3.8 | 1.2–12.5 |
| Chronic health problems (≥ 2) | 3.1 | 1.8–5.5 |
| Domestic violence | 3.3 | 1.4–8.3 |
| Not married/partnered | 1.6 | 0.8–3.2 |
| Unemployed | 1.7 | 0.9–3.3 |
| \leq High school | 1.1 | 0.6–2.2 |
| Race | | |
| White | 1.0 | Reference |
| Black | 1.3 | 0.5–3.1 |
| Asian | 1.1 | 0.4–2.9 |
| Other ^b | 1.1 | 0.6–2.3 |
| History of pregnancy complications | 1.2 | 0.7–2.1 |
| Maternal age | 1.0 | 1.0–1.0 |

CI, confidence interval; OR, odds ratio.

^a Major or minor depression; ^b Other category includes American Indian, Pacific Islander, mixed, undeclared.

Woods. Psychosocial stress during pregnancy. *Am J Obstet Gynecol* 2010.

actual score was small and whether this is clinically significant merits further investigation. In contrast to this observed decline in antenatal stress shown in ours and other studies, higher rates of low birthweight and preterm delivery have been noted in studies where levels of antenatal stress increased during pregnancy.^{3,36,37} Thus, not only the level of stress but the time point in pregnancy during which high maternal stress is experienced may be influential in regard to risk of adverse outcomes.

Our study has a number of strengths, including use of a routine screening protocol with high level of subject participation, large sample size, use of accurate measurement of multiple covariates, and adjustment for biomedical, demographic, psychosocial, and behavioral factors in our models. Among prior studies, our study is unique in accurately assessing a large number of potential confounders to establish a more complete model for antenatal psychosocial stress. We are limited, however, by the use of cross-sectional data, allowing assessment of associations but not causal-ity or temporal sequence between spe-

cific factors and high psychosocial stress. In addition, only a subset of the sample completed 2 screens during pregnancy, limiting the amount of information obtained regarding the change in stress during pregnancy. Last, the majority of the data were self-reported, which may lead to underreporting of sensitive behaviors.

Depression,¹⁷ panic disorder,¹⁷ domestic violence,^{15,18} drug use,¹⁶ and having medical comorbidities^{39,40} are all known to be individually associated with poor obstetric outcomes. Antenatal psychosocial stress contributes to maternal distress and may also be associated with adverse pregnancy outcomes (eg, low birthweight,^{3,10,41-44} preterm delivery^{3,28,37,41,45,46}). The relationship of the above maternal factors with psychosocial stress and the way in which they lead to adverse outcomes is unknown, but may occur via indirect behavioral and direct physiologic pathways.^{47,48} Behavioral responses to stress may include alterations in nutrition, sleep, exercise, substance use, tobacco use, and/or use of prenatal services.^{10,47} Physiologic responses to psychosocial stress may in-

clude both neuroendocrine and immune responses.^{47,49}

Identification of pregnant women experiencing significant psychosocial stress presents health care providers an opportunity to further assess the nature of the stress and alerts them to assess for associated risk factors. Decreasing high antenatal psychosocial stress in itself will improve maternal well-being. Although many of the factors associated with stress are difficult to overcome (eg, poverty, racism, lifetime exposure to violence),²⁷ success may be found in specific health behavior interventions designed to reduce stress (eg, nutritional counseling, physical and mental relaxation, education, and social support).⁵⁰ Poor health behaviors and stress often coexist and predate pregnancy, so it can be argued that interventions should be introduced across a woman's reproductive lifespan (preconception, perinatal, and internatal).^{47,50,51} Decreasing high stress and/or addressing associated risk factors may also decrease the risk of adverse pregnancy outcomes. The screening protocol applied in this study is a model for screening in a prenatal clinic,¹⁹ identifying not only women experiencing stress, but also those with depression, panic disorder, substance use, and domestic violence. With identification of these other factors, health care providers are provided additional specific foci for intervention.

In conclusion, antenatal psychosocial stress during pregnancy is common, and high stress is associated with multiple maternal factors that are known to contribute to poor pregnancy outcomes. Our findings lend support to recent ACOG recommendations to screen for psychosocial stress during pregnancy.² Future investigations are planned to further investigate relationships between antenatal psychosocial stress and pregnancy outcomes. ■

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APPENDIX

Prenatal Psychosocial Profile: Stress Scale

To what extent are the following currently a stress or hassle for you?

- a. Financial worries like food, shelter, healthcare, transportation
- b. Other money worries like bills
- c. Problems related to family
- d. Having to move, either recently or in the future
- e. Recent loss of a loved one
- f. Current Pregnancy
- g. Current abuse, sexual, emotional, or physical
- h. Problems with alcohol and/or drugs
- i. Work problems such as being laid off
- j. Problems related to friends
- k. Feeling generally "overloaded"

| No Stress | Some Stress | Moderate Stress | Severe Stress |
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