Behavioral and Psychosocial Health of New Mothers and Associations With Contextual Factors and Perceived Health

Lorraine O. Walker, Bo Xie, Sherry G. Hendrickson, and Bobbie S. Sterling

ABSTRACT

Objective: To test the association of behavioral and psychosocial health domains with contextual variables and perceived health in ethnically and economically diverse postpartum women.

Design: Mail survey of a stratified random sample.

Setting: Southwestern community in Texas.

Participants: Non-Hispanic White, African American, and Hispanic women (N = 168).

Methods: A questionnaire was sent to a sample of 600 women. The adjusted response rate was 32.8%. The questionnaire covered behavioral (diet, physical activity, smoking, and alcohol use) and psychosocial (depression symptoms and body image) health, contextual variables (race/ethnicity, income, perceived stress, and social support), and perceived health. Hypotheses were tested using linear and logistic regression.

Results: Body image, dietary behaviors, physical activity behaviors, and depression symptoms were all significantly correlated (Spearman ρ = 0.15 to 0.47). Higher income was associated with increased odds of higher alcohol use (more than 1 drink on 1 to 4 days in a 14-day period). African American ethnicity was correlated with less healthy dietary behaviors and Hispanic ethnicity with less physical activity. In multivariable regressions, perceived stress was associated with less healthy dietary behaviors, increased odds of depression, and decreased odds of higher alcohol use, whereas social support was associated with less body image dissatisfaction, more physical activity, and decreased odds of depression. All behavioral and psychosocial domains were significantly correlated with perceived health, with higher alcohol use related to more favorable perceived health. In regressions analyses, perceived stress was a significant contextual predictor of perceived health.

Conclusion: Stress and social support had more consistent relationships to behavioral and psychosocial variables than race/ethnicity and income level.

JOGNN, 45, 3–16; 2016. http://dx.doi.org/10.1016/j.jogn.2015.10.012

Accepted October 2015

Although giving birth and motherhood are normal events, some mothers in the United States find they are unprepared for and uninformed about the realities of the postpartum period (Howell, Mora, Chassin, & Leventhal, 2010; Kanotra et al., 2007; Martin, Horowitz, Balbierz, & Howell, 2014). The postpartum period may be an important health transition for some women, especially with regard to their behavioral and psychosocial health (Walker & Wilging, 2000). In a recent study, for example, nearly half of low-income postpartum women had multiple domains in which their behavioral and psychosocial health was classified as unfavorable, including areas such as diet and exercise, alcohol use and smoking, and depression symptoms (Walker, Sterling, Guy, Mahometa, 2013). When optimal, these domains contribute to the health and well-being of postpartum women, but when unfavorable, many may become risk factors for later chronic disease (Centers for Disease Control and Prevention [CDC], 2012) and mortality (Whitley, Batty, Hunt, Popham, & Benzeval, 2014). In this study, we extended prior research by studying behavioral and psychosocial health domains in relation to overall perceived health and the contextual factors of income level, race/ethnicity, stress, and social support in an economically diverse sample of postpartum women.
Only rarely has the spectrum of postpartum health, including diet, physical activity, smoking and alcohol use, depression symptoms, and body image been studied simultaneously.

**Background**

Behavioral and Psychosocial Aspects of Women's Postpartum Health

The behavioral (e.g., smoking) and psychosocial (e.g., depression) health aspects of postpartum women are often viewed in terms of their effects on parenting and on infants’ health and development (American Academy of Pediatrics, 2012; Balbierz, Bodnar-Deren, Wang, & Howell, 2015; Cook & Strachan, 1999; Field, 2010; Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012; Kahn, Zuckerman, Bauchner, Homer, & Wise, 2002; McLearn, Minkovitz, Strobino, Marks, & Hou, 2006). It is equally important, however, to view the period after giving birth from a larger women’s health perspective (Institute of Medicine, 2010). The extended postpartum period (first postpartum year), sometimes seen by mothers as a new beginning (Sterling et al., 2009), is an opportune time in the life course to promote the health of women and prevent risk factors for chronic disease development.

Even for mothers experiencing normal pregnancies and births, the demands associated with infant care and postpartum changes in lifestyle and family may often prove stressful (Jevitt, Groer, Crist, Gonzalez, & Wagner, 2012; McConachle et al., 2008). Stress associated with a new infant in the family can lead to behavioral or lifestyle adaptations in which physical activity is low and diets are high in calories, various fats, and sugars (Berge, Larson, Bauer, & Neumark-Sztainer, 2011; Hull et al., 2010; Nasuti, et al., 2014). Stress can also play a role in smoking (Ansell, Gu, Tuit, & Sinha, 2012), postpartum smoking relapse (Correa, Simmons, Sutton, Meltzer, & Brandon, 2015; Park et al., 2009), and alcohol use (Hamilton, Ansell, Reynolds, Potenza, & Sinha, 2013). With regard to psychosocial health, postpartum stress may be a precursor of depression or depression symptoms (Beck, 2001), which are more likely to occur among mothers who have low social support (Beck, 2001; Corrigan, Kwasky, & Groh, 2015). Finally, unfavorable changes in women’s feeling about their bodies (such as body image dissatisfaction) may occur postpartum, especially in women who have increasing body weight (Gjerdingen et al., 2009; Walker, 1998).

Some of the domains of behavioral and psychosocial health have been extensively studied, in particular postpartum depression (Beck, 2001; Gavin et al., 2005; O’Hara & McCabe, 2013). By contrast, only rarely has the spectrum of postpartum behavioral and psychosocial health domains, including diet, physical activity, smoking and alcohol use, depression symptoms, and body image, been studied simultaneously. In one study of this spectrum, investigators found that among low-income postpartum women who had healthy pregnancies, 45% had poor behavioral or psychosocial health in two or more domains, whereas only 25% had no domains of poor health (Walker et al., 2013). In addition, Hispanic women were less likely than White or African American women to have accumulated multiple domains of poor health. Limitations of that study were inclusion of only low-income women and no direct measurement of women’s stress or social support. Inclusion of women with low and high incomes and measurement of their stress and social support, as was done in the current study, advances understanding of the interplay between stress and behavioral and psychosocial health domains in postpartum women and supports a more holistic approach to their health.

**A Framework for Women's Postpartum Health**

As a framework of studying women’s postpartum behavioral and psychosocial health, we drew on principles related to social determinants of health and life-course theory. Social determinants, such as low socioeconomic status, highlight the vulnerability of women’s health to the adverse impact of living with chronic disadvantage (Turrell, Lynch, Leite, Raghunathan, & Kaplan, 2007; U.S. Department of Health and Human Services, 2013). The life-course perspective further provides a means of explicating potential mechanisms whereby that vulnerability may be set in place and accumulate early and throughout women’s lives (Ben-Shlomo & Kuh, 2002; Lu & Halfon, 2003; Whitley et al., 2014). Early life experience is one aspect of the life-course perspective. More relevant for postpartum women is the aspect of stress during critical life stages, such as motherhood, especially if resources such as social support are limited. The cumulative effects of stress on the body (known as allostatic load) and its adaptive processes explain, in part, how stress and low protective factors, such as low social support, increase vulnerability to poor health (Gruenewald et al., 2012; Lu & Halfon, 2003).
Chronic disadvantage, such as low income or ethnic minority status, or life-stage stresses also may favor development of unhealthy lifestyle behaviors (Correa et al., 2015; Crespo, Smith, Andersen, Carter-Pokras, & Ainsworth, 2000) and depression (Katon, Russo, & Gavin, 2014; Pratt & Brody, 2008), which are early and modifiable risk factors for chronic disease. As a result, postpartum behavioral and psychosocial health domains overlap with many of the common risk factors for chronic disease development: poor diet, low physical activity, smoking, high alcohol use, and depression (CDC, 2012; Ferketich, Schwartzbaum, Frid, & Moeschberger, 2000; Kivimaki et al., 2013; Pan et al., 2011). Body image is another critical postpartum domain central to the postpartum experience (Gjerdingen et al., 2009) that has implications for depression and health behaviors such as smoking (Levine, Marcus, Kalarchian, Houck, & Cheng, 2010; Walker, Timmerman, Kim, & Sterling, 2002). Assessment of such risk factors is an opportunity for early detection of risk and prevention (Stampfer, Hu, Manson, Rimm, & Willett, 2000). Furthermore, perceived health status, a well-established health indicator (Idler & Benyamini, 1997), offers a means to gauge the potential importance of postpartum behavioral and psychosocial health domains. Thus, factors related to behavioral and psychosocial health need to be studied to facilitate health promotion and prevention of risks for chronic disease in women’s life courses. The postpartum period offers such a life-course opportunity.

Purpose
The purpose of this study was to examine the interrelationships between behavioral and psychosocial domains of postpartum health, their potential common determinants such as stress, and their relationship to overall perceived health. Based on our framework and prior research, our first aim was to test the following hypotheses:

1. The domains of postpartum behavioral (diet, physical activity, smoking, and alcohol use) and psychosocial (depression symptoms and body image) health are related.
2. The contextual factors of income level and race/ethnicity are associated with the domains of postpartum behavioral and psychosocial health.
3. Current contextual factors of stress and social support are associated with the domains of postpartum behavioral and psychosocial health, after adjusting for income level and race/ethnicity.
4. The domains of postpartum behavioral and psychosocial health are related to postpartum women’s overall perceived health, after controlling for income level, race/ethnicity, stress, and social support.

Our second aim was to identify risk groups by addressing the following research question:

What demographic (maternal age, number of children, education, marital status, and employment status) and health-related (breastfeeding and body mass index) variables are associated with postpartum behavioral and psychosocial health domains?

Method
Design, Sample, and Procedures
This is the first report of a mail survey of mothers who were identified through state birth records as having live births during a 6-month period in a metropolitan county in Texas. The survey, which was approved by the institutional review boards at the authors’ university and a state health agency, was conducted between late January 2014 and mid-April 2014. A total of 600 women were selected to receive the survey questionnaire. Inclusion criteria were that mothers had a term, singleton birth and were at least 18 years of age. In an effort to obtain representation of new mothers balanced for race/ethnicity and income level, six subgroups of 100 mothers each were selected at random by computer based on these two factors: race/ethnicity (non-Hispanic White, non-Hispanic African American, or Hispanic) and income (lower income defined as coverage by Medicaid for delivery, higher income as private insurance coverage).

The first letter sent to selected women introduced the survey and explained that they would be receiving a questionnaire in approximately one week. After that initial questionnaire was sent, a reminder postcard was sent in about two weeks to women who had not yet responded. Thereafter, this process was repeated at least once more at 2-week intervals. As an incentive to participate, women who returned completed questionnaires were sent a gift card worth $5 at a pharmacy chain that offered a wide range of products. Because response to the survey was slower than we expected based on prior experience, midway...
through the survey we added a drawing for a mini tablet computer as an additional incentive. The questionnaire and all correspondence sent to mothers was in English for non-Hispanic White and African American women, and in English and Spanish for Hispanic women. (At the end of the questionnaire, we included a list of health resources suitable for new mothers who might need assistance with behavioral [e.g., smoking cessation resources] or psychosocial [e.g., resources for postpartum depression] concerns.) A total of 168 women returned usable questionnaires, and 88 questionnaire packets were returned as undeliverable. The adjusted response rate was 32.8%.

Variables Measured and Questionnaire Items
Rationale for measures used. The use of state birth records allowed us to select a stratified random sample of new mothers, but it also constrained mothers’ contact information to mailing addresses and limited us to use of a mail survey. Because research shows that response rates in mail surveys improve when shorter rather than longer questionnaires are used (Edwards et al., 2002), we included brief measures of variables of interest in this study. If available, we used existing brief measures, or selected key items from existing scales. For one variable, we developed an item specifically for this study.

Stress and social support. The four-item version of the Perceived Stress Scale (PSS) (Cohen & Williamson, 1988) was used to measure mothers’ current psychosocial stress. For example, one item pertains to difficulties piling up (0 = never, 4 = very often). Validity of the four-item PSS is supported by a correlation of .28 with life-event stress, and in principal components analysis it was shown to represent only one factor that comprised 46% of variance (Cohen & Williamson, 1988). In a perinatal sample the four-item PSS was significantly correlated with depression symptoms ($r = .76$), supporting the validity of the PSS (Karam et al., 2012). In this current study, Cronbach’s alpha for the four-item PSS was .80. Higher scores indicated higher perceived stress.

Mothers’ emotional social support was measured by one key item from an established postpartum social support scale (Walker, 1997). This item asked, “How much can you count on your family (including partner) to listen when you want to talk about your feelings?” Response options ranged from 0 (not at all) to 4 (completely). For test–retest reliability, this item showed a Spearman correlation of .52 between 3 and 6 months postpartum (Walker, L., Austin New Mothers Study, unpublished data, 2015) and was validated by correlation ($r = .87$) with the entire social support scale in an independent sample. In past research, the full postpartum social support scale showed expected shared variance with postpartum lifestyle and depression symptoms across ethnically diverse samples (Walker & Sterling, 2007).

Diet, physical activity, smoking, and alcohol-use habits. The behavioral health measures included in this current study were based on a multistage process in a previous study (Walker et al., 2013) in which we identified brief sets of items to measure the four common behavioral causes of chronic disease (CDC, 2012): diet, physical activity, smoking, and alcohol use. In that previous study involving an independent sample, subscales for diet/exercise (12 items) and substance abuse (six items, including alcohol use and smoking) were developed. These two subscales were derived from a 42-item omnibus health behavior inventory that included the 40-item Self-Care Inventory (described in Wiebe & McCallum, 1986) supplemented with two alcohol-use items from the National Health Interview Survey (Drury & Shannon, 1987). Items selected for the diet/exercise and substance abuse subscales were ones on which an expert panel had 100% agreement about each item’s content validity to its subscale (Walker et al., 2013). Next, to further shorten the subscales to the most salient items, we identified the eight items most highly correlated ($r$ range, .46–.32) with being in the least healthy tertile (i.e., the lowest third) on the diet/exercise subscale; similarly, we identified the four items most highly correlated ($r$ range, .77–.41) with being in the least healthy tertile on the substance abuse subscale (Walker et al., 2013).

These shortened subscales were used in this current study; however, to provide greater clarity to each behavioral domain we separated the items on the diet/physical activity subscale into diet (six items) and physical activity (two items) measures. Similarly, the four items from the substance use subscale were separated into smoking (one item) and alcohol use (three items) measures. The dietary measure included items on dietary habits (e.g., eating regular meals, snacking, eating junk foods). The physical activity measure included items on leisure time physical activity and vigorous activity. Cronbach’s alpha...
values for the diet and physical activity measures in the current study were .69 and .64, respectively. Higher scores indicate healthier behaviors.

Smoking was captured by one item asking about the number of cigarettes smoked per day (none to more than one and a half packs). Test–retest reliability was supported by a significant Spearman correlation of .82 between 3 and 6 months postpartum in an independent sample of postpartum women (Walker, L., Austin New Mothers Study, unpublished data, 2015). Alcohol use was assessed by items about the frequency of drinking more than two drinks in one day, the usual amount of drinks on a day in which alcohol use occurred, and the frequency of days of alcohol use. The Cronbach's alpha for alcohol use items in the current study was .84. Because of a skewed distribution, the alcohol-use scale was dichotomized for regression analyses into lower and higher alcohol use (lower use equivalent to no more than one drink on 1 to 4 days in a 14-day period, and higher use exceeding this level).

Depression symptoms and body image. Five items on the Center for Epidemiologic Studies—Depression scale (CES-D; Radloff, 1977) were used to measure depression symptoms during the past week in this survey: feeling sad, lonely, depressed, blue, and life a failure (0 = never, 1 = rarely [less than 1 day], 3 = most or all of the time [5–7 days]). These five CES-D items were shown in an earlier study in an independent sample to be those most highly correlated (r range, .72–.61) with being in the least healthy tertile (i.e., the highest third) of the distribution of the full CES-D (Walker et al., 2013). In addition, a two-item depression screener, the Patient Health Questionnaire—2 (Kroenke, Spitzer, & Williams, 2003; Whooley, Avins, Miranda, & Browner, 1997), was included to assess validity of the abbreviated CES-D items. Cronbach’s alpha values for the five-item CES-D and the Patient Health Questionnaire—2 in the current study were .86 and .81, respectively. Their Spearman correlation was .67 (p < .001). To adjust for a skewed distribution of the five-item CES-D scores and to provide a reference point for risk of depression, we estimated the cutoff (<4 = not at risk of depression, ≥4 = at risk of depression) comparable to a score of 16 on the full CES-D in an independent sample of postpartum women (Walker, L., Austin New Mothers Study, unpublished data, 2015). Body image was assessed by one item developed for this study that asked, “How has your body size and shape after pregnancy changed your feelings about yourself?” (response option range, 1 = got much better to 5 = got much worse). Although we did not have reliability data on this new item, in its entirety it is at the 7.5-grade reading level. In support of validity of this item, it was correlated (Spearman ρ = .45, p < .001) with change in body weight from before pregnancy to the time of the postpartum survey.

Overall perceived health and demographic and other health-related items. A well-established single item was used to assess overall perceived health status (Idler & Benyamini, 1997): “In general, would you say your health is” (response options: 1 = excellent, 2 = very good, 3 = good, 4 = fair, or 5 = poor). The perceived health status item has high predictive validity for a number of health outcomes (Bowling, 2005). Demographic items on the survey questionnaire included maternal age, time since giving birth, number of children, education, marital status, and work status. Health-related variables included individual items drawn from the authors’ past research on weight and height for computing body mass index (BMI) and on breastfeeding (Walker, Im, & Vaughan, 2012). Other items in the questionnaire dealt with technology use and health experiences that are not part of this report. Race/ethnicity and income level (based on funding source for delivery) were extracted from birth records.

Data Analysis and Variable Coding
After examining distributions of variables, several skewed continuous variables (depression symptoms and alcohol use) were dichotomized for analyses that required normally distributed variables or were recoded to avoid small numbers of cases in cells of categoric variables. Recoded variables were transformed as follows: number of children into a trichotomous variable (one, two, or three or more children), education levels into a dichotomous variable (high school education or less or at least some college education), marriage or partner status into a dichotomous variable (living with spouse/infant’s father or not living with spouse/infant’s father), employment status into a dichotomous variable (employed or not employed), and BMI into a dichotomous variable (overweight/obese [BMI ≥ 25] or not overweight/obese). For the variable of perceived health status, the scores for fair and poor health were combined because only one woman reported poor health. For several variables with missing data for only one or two participants, means (continuous variables) or predominant responses (categoric variables) were substituted. For two
other variables with five or six participants with missing data (breastfeeding [several mothers had already weaned their infants] and BMI group), analyses were run on available participants. Finally, only six women reported smoking, so there were insufficient smokers to include this variable in analyses.

Because several continuous variables had skewed distributions, hypothesis 1 was evaluated by use of Spearman correlations among variables; recoded versions of depression symptoms and alcohol-use behaviors, which were used subsequently in regression analyses, were also evaluated with Spearman correlations for comparative purposes. Hypotheses 2, 3, and 4 were evaluated using linear or logistic regression analyses for continuous or dichotomous dependent variables, respectively. Hierarchical entry of variables was used to reflect hypotheses. In these analyses, race/ethnicity and income were coded as dummy variables. Because we found in preliminary analyses that racial/ethnic groups did not differ within income levels (strata) on psychosocial or behavioral variables or on perceived health, interactions between race/ethnicity and income level were not included in regressions. The research question, which dealt with associations between behavioral and psychosocial domains and demographic and health-related variables, was evaluated using Spearman, Cramér’s V, or phi correlations.

Results

Sample Characteristics

Characteristics of respondents by income group are presented in Table 1. Women in the lower income group differed from those of higher income on four demographic variables: age, education, number of children living at home, and employment status. As expected from our sampling design, race/ethnicity did not differ significantly by income level (Table 1).

Hypothesis Tests

Regarding hypothesis 1, correlations among psychosocial and behavioral domains are presented in Table 2. As hypothesized, body image, dietary behaviors, physical activity behaviors, and depression symptoms were all significantly related. Contrary to our hypothesis, alcohol use behaviors were only significantly related to dietary behaviors, with higher alcohol use related to healthier dietary behaviors. The dichotomized versions of the depressive symptom (at risk of being depressed, n = 39; not at risk of being depressed, n = 129) and alcohol-use scales (lower alcohol use, n = 126; higher use, n = 42) were each significantly related to their continuous parent scale.

There was only limited support for hypothesis 2. Income level was a significant predictor of only alcohol use, with higher income associated with increased odds of higher alcohol use. African American ethnicity was associated with less healthy dietary behaviors, whereas Hispanic ethnicity was associated with less physical activity (Table 3).

In testing hypothesis 3 we first examined Spearman correlations among perceived stress and social support and behavioral and psychosocial domains (Table 4). As expected, perceived stress and social support were associated with body image, dietary behaviors, physical activity, and depression symptoms. Perceived stress was inversely related to alcohol intake (dichotomous scoring). In multivariable regressions controlling for income level and race/ethnicity, higher perceived stress was associated with less healthy dietary behaviors, increased odds of depression, and decreased odds of higher alcohol use. Higher social support was associated with lower body image dissatisfaction, higher physical activity, and decreased odds of depression after adjustment for income level and race/ethnicity (Table 3).

In testing hypothesis 4, we first examined Spearman correlations between maternal perceived health and behavioral and psychosocial domains (Table 4). Perceived health was significantly related to all behavioral and psychosocial domains, but contrary to our expectation higher alcohol use was related to more favorable perceived health. Furthermore, in multivariable regression analyses, the contextual variables (income level, race/ethnicity, stress and social support) explained 23% of the variance in perceived health at the first step of the hierarchical analyses ($F = 9.57, p < .001$), but perceived stress was the only predictor variable that was statistically significant ($b = .097, SE = .022, ß = .345, t = 4.49, p < .001$). At the second step, when behavioral and psychosocial variables were added to separate regression analyses, only dietary behaviors ($b = −.081, SE = .022, ß = −.270, t = −3.70, p < .001$) and physical activity ($b = −.102, SE = .035, ß = −.210, t = −2.91, p < .01$) were significant.
predictors of perceived health. Perceived stress remained a significant predictor of perceived health in these later regression analyses.

**Exploration of Groups Associated With Lower and Higher Risk**

Eight correlations between demographic and health-related variables and behavioral and psychosocial domains were significant (Table 5), although half of these correlations were quite low. Maternal age was related to healthier dietary behaviors and less physical activity. Younger women tended to have lower alcohol use, whereas those with more education had higher alcohol use. Living with a spouse (or the infant’s father, if unmarried) was related to healthier dietary behaviors and less risk of being depressed. Being overweight or obese was related to less physical activity, and breastfeeding was related to healthier dietary behaviors.

**Discussion**

In our sample designed to include White, African American, and Hispanic postpartum women of lower and higher incomes, race/ethnicity was not associated with income level. The sampling strategy we used allowed us to minimize a confounding of income level with race/ethnicity so that associations with race/ethnicity and income level could be examined somewhat independently of each other. Other key demographic variables such as education attainment and employment, however, were associated with income level and thus support our use of Medicaid coverage as a broad indicator of socioeconomic status.
### Table 2: Spearman Correlation Among Psychosocial and Behavioral Variables

<table>
<thead>
<tr>
<th>Psychosocial and Behavioral Variables</th>
<th>Body Image Dissatisfaction</th>
<th>Dietary Behaviors</th>
<th>Physical Activity Behaviors</th>
<th>Depression Symptoms</th>
<th>Depression—Dichotomized</th>
<th>Alcohol-Use Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body image dissatisfaction</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Dietary behaviors</td>
<td>-.17*</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Physical activity behaviors</td>
<td>-.20*</td>
<td>.47***</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Depression symptoms</td>
<td>.26**</td>
<td>-.20*</td>
<td>-.15*</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Depression—dichotomized</td>
<td>.26**</td>
<td>-.11</td>
<td>-.12</td>
<td>.77***</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alcohol-use behaviors</td>
<td>.14</td>
<td>.23**</td>
<td>.03</td>
<td>.02</td>
<td>.10</td>
<td>—</td>
</tr>
<tr>
<td>Alcohol use—dichotomized</td>
<td>.04</td>
<td>.27***</td>
<td>.08</td>
<td>-.09</td>
<td>-.02</td>
<td>.82***</td>
</tr>
<tr>
<td>Mean</td>
<td>3.22</td>
<td>13.15</td>
<td>3.12</td>
<td>2.04</td>
<td>—</td>
<td>1.43</td>
</tr>
<tr>
<td>Median</td>
<td>3.00</td>
<td>13.00</td>
<td>3.00</td>
<td>1.00</td>
<td>—</td>
<td>0.00</td>
</tr>
<tr>
<td>SD</td>
<td>0.94</td>
<td>2.82</td>
<td>1.75</td>
<td>2.78</td>
<td>—</td>
<td>1.86</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001.

### Table 3: Association of Contextual Variables With Postpartum Psychosocial and Behavioral Health Domains

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Outcome Variables in Linear Regressions</th>
<th>Outcome Variables in Logistic Regressions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Body Image Dissatisfaction</td>
<td>Diet</td>
</tr>
<tr>
<td>Regression Analyses: Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income level</td>
<td>.113</td>
<td>.073</td>
</tr>
<tr>
<td>African American</td>
<td>.001</td>
<td>-.265***</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-.082</td>
<td>-.101</td>
</tr>
<tr>
<td>Step 1 statistic</td>
<td>R² = .021</td>
<td>R² = .065*</td>
</tr>
<tr>
<td>Regression Analyses: Step 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived stress</td>
<td>.158</td>
<td>-.236***</td>
</tr>
<tr>
<td>Social support</td>
<td>-.242***</td>
<td>.150</td>
</tr>
<tr>
<td>Step 2 change statistic</td>
<td>R² = .112***</td>
<td>R² = .106***</td>
</tr>
</tbody>
</table>

Note. AOR = adjusted odds ratio; CI = confidence interval.

*In logistic regression analysis, the referent for the categorically coded variable of income was low income.

**In logistic regression analysis, the referent for the categorically coded variable of African American was non–African American.

***In logistic regression analysis, the referent for the categorically coded variable of Hispanic was non-Hispanic.

p < .05, **p < .01, ***p < .001.
Behavioral and Psychosocial Health Domains

With the exception of alcohol use, the behavioral and psychosocial health domains were interrelated as hypothesized on continuously scaled measures. Because few participants were smokers in this sample, relationships to this domain were not examined. Overall, the interrelations that were found supported a view of behavioral and psychosocial health as an interrelated network of domains during the postpartum transition. The findings were consistent with the relationships previously reported among depression symptoms, body image, and dietary and physical activity behaviors for low-income postpartum women (Walker et al., 2013). Contrary to expectations, higher alcohol use (in both continuous and dichotomous format) was related to healthier dietary behaviors but not to other domains. In addition, when exploring risk groups (Table 5), higher alcohol use was more common among older and more educated women. These findings are in partial agreement with patterns reported by Laborde and Mair (2012), who found

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Table 4: Spearman Correlations of Psychosocial and Behavioral Variables With Perceived Stress, Social Support, and Perceived Health

<table>
<thead>
<tr>
<th>Psychosocial and Behavioral Variables</th>
<th>Perceived Stress</th>
<th>Social Support</th>
<th>Perceived Health^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body image dissatisfaction</td>
<td>.23**</td>
<td>-.27***</td>
<td>.18*</td>
</tr>
<tr>
<td>Dietary behaviors</td>
<td>-.28***</td>
<td>.27***</td>
<td>-.41***</td>
</tr>
<tr>
<td>Physical activity behaviors</td>
<td>-.19*</td>
<td>.27***</td>
<td>-.30***</td>
</tr>
<tr>
<td>Depression symptoms</td>
<td>.64***</td>
<td>-.41***</td>
<td>.28***</td>
</tr>
<tr>
<td>Depression—dichotomized</td>
<td>.53***</td>
<td>-.40***</td>
<td>.16*</td>
</tr>
<tr>
<td>Alcohol-use behaviors</td>
<td>-.09</td>
<td>.03</td>
<td>-.19*</td>
</tr>
<tr>
<td>Alcohol use—dichotomized</td>
<td>-.17*</td>
<td>.05</td>
<td>-.23*</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>4.81 (3.03)</td>
<td>2.87 (1.11)</td>
<td>1.93 (0.85)</td>
</tr>
<tr>
<td>Median</td>
<td>5.00</td>
<td>3.00</td>
<td>2.00</td>
</tr>
</tbody>
</table>

^aA higher score for perceived health indicates worse perceived health.
^p < .05. **p < .01. ***p < .001.

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Table 5: Correlations Between Psychosocial and Behavioral Health Domains and Demographic and Health-Related Variables

<table>
<thead>
<tr>
<th>Demographic and Health-Related Variables</th>
<th>Body Image Dissatisfaction</th>
<th>Physical Activity</th>
<th>Depression—Dichotomized</th>
<th>Alcohol Use—Dichotomized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (in years)</td>
<td>.08</td>
<td>-.18</td>
<td>.03</td>
<td>.28*</td>
</tr>
<tr>
<td>Number of children in home (in no.)</td>
<td>.12</td>
<td>-.13</td>
<td>.00</td>
<td>.13</td>
</tr>
<tr>
<td>Education (two levels)</td>
<td>.12</td>
<td>.08</td>
<td>-.05</td>
<td>.26**</td>
</tr>
<tr>
<td>Employment outside home (in no.)</td>
<td>.07</td>
<td>-.11</td>
<td>-.11</td>
<td>.02</td>
</tr>
<tr>
<td>Living with spouse/infant’s father or not</td>
<td>.02</td>
<td>.20**</td>
<td>-.17*</td>
<td>.02</td>
</tr>
<tr>
<td>Overweight/obese or not</td>
<td>.11</td>
<td>-.13</td>
<td>-.16*</td>
<td>.06</td>
</tr>
<tr>
<td>Breastfeeding (full or partial) or not</td>
<td>.05</td>
<td>.22**</td>
<td>-.03</td>
<td>.10</td>
</tr>
</tbody>
</table>

^aFor Spearman correlation, age is treated as a continuous variable; for Cramér’s V, age is treated as younger than 30 years, 30 to 34 years, and 35 years or older.
^bNumber of children is grouped as zero/one child (one child was temporarily out of the home), two children, and three or more children.
^cSix participants had missing data related to body mass index.
^dFive participants had missing data related to infant feeding.
^p < .05. **p < .01. ***p < .001.
that higher education and income were associated with more frequent alcohol use among adult women in California.

Contextual and Perceived Health Associations With Domains

Although income level and race/ethnicity were hypothesized to affect psychosocial and behavioral health domains, only three of 15 associations were significant. In contrast, bivariate analyses showed that both perceived stress and social support were significantly correlated with body image, dietary behaviors, physical activity, and depression symptoms. Moreover, in 6 of 10 multivariable tests, perceived stress and/or social support were significantly associated with specific health domains. Perceived stress was associated with unhealthier diet, increased risk of depression, and lower alcohol use. Social support was associated with less body image dissatisfaction, more physical activity, and decreased risk of depression. Although our design does not permit us to make causal interpretations, the findings indicate that the contextual variables of social support and perceived stress are indeed interrelated with psychosocial and behavioral health during the postpartum transition, a finding supported by previous research on postpartum depression (Beck, 2001; Corrigan et al., 2015). Our finding that lower alcohol use was associated with more stress is in partial agreement with findings that non- or infrequent drinkers have higher reported symptoms of distress (Rodgers, Parslow, & Degenhardt, 2007).

Furthermore, each behavioral or psychosocial health domain was significantly related to perceived health in bivariate analyses. In regressions controlling for contextual variables, both dietary behaviors and physical activity remained significantly associated with maternal perceived health. It is also noteworthy that contextual factors initially explained 23% of the variance in perceived health, with perceived stress the major contributing factor (β = .35). As has been argued by others, stress may have a pervasive effect on maternal health, especially when social supports are low (Lu & Halfon, 2003).

Based on these findings, the demographic variables of income and race/ethnicity were not major determinants of the domains of behavioral or psychosocial health or perceived health status in our sample. Our modest sample size, however, may have led to underestimation of the significance of income and race/ethnicity in women’s postpartum health. In contrast, perceived stress and social support appear to be particularly salient to the context of motherhood, especially with regard to behavioral and psychosocial health domains. These domains may affect the immediate and long-term health of women, and as noted in the introduction, many also may have an impact on infants (Cook & Strachan, 1999; Field, 2010; Gress-Smith et al., 2012; Kahn et al., 2002). Although this is a single study of hypotheses about contextual influences on behavioral and psychosocial domains, our findings support further research about the role of stress and social support on postpartum maternal health. Including more extensive measures of stress and social support than was possible in our survey would be advisable.

A few significant associations were found among behavioral and psychosocial domains and other variables (Table 5) such as maternal age, breastfeeding, or overweight/obese status. On the whole, however, these variables were not associated with domains (such as number of children living at home or employment) or associations were significant but small. Although not unimportant, they may weigh less heavily as risk and protective factors for postpartum women's health than the contextual factors of perceived stress and social support.

Strengths and Limitations

This is one of the few studies to examine a wide spectrum of postpartum behavioral and psychosocial health domains in the context of income, race/ethnicity, stress, and social support. The sample was selected using a stratified random sampling method. Still, the study was limited in several ways. Our sample response rate was modest despite the use of incentives, although this reflects an increasing national trend of nonresponse in survey research (Brick & Williams, 2013; Massey & Tourangeau, 2013). As noted by Groves (2006), however, nonresponse does not automatically increase bias. This survey was cross-sectional, so causality cannot be determined. The data were self-reported and thus may reflect biases in reporting, which are of concern in areas such as health behaviors. The
Cronbach’s alpha values for diet and physical activity behaviors were lower than for other scales in this study. Test–retest reliability may be more relevant for these types of scales, however, because such behaviors do not reflect a psychological construct but rather risk factors linked to health outcomes. The cutpoint for depression on the five-item CES-D scale was estimated from the full CES-D but warrants further validation. Although single items were used for social support (from an established scale) and body image (designed for this study), these two variables showed interesting and expected relationships. Finally, few women reported smoking, so analysis of data regarding this health behavior was not done.

Implications

Behavioral and psychosocial domains at the critical life stage of the extended postpartum period provide a broad conceptual umbrella under which to view health, whether women are having a first or additional child. Applying the science and the evidence for factors influencing maternal behavioral and psychosocial health to clinical practice, public health programs, and policies could change the life course of both mother and child. Furthermore, although the postpartum period traditionally refers to the first 6 weeks after birth (Lowdermilk, Perry, & Cashion, 2010), there is increasing emphasis on the importance of monitoring the mother’s health for a much longer time (Song, Chae, & Kim, 2014).

Frequently the only health care episodes for the mother during the extended postpartum period (Romano, Cacciatore, Giudano, & La Rosa, 2010) involve family planning or contraceptive care, unless there is an ongoing medical issue or pre-existent chronic illness. By contrast, pediatricians, pediatric nurse practitioners, and providers in well-child and immunization clinics may be the only health care providers to have repeated interactions with mothers during the extended postpartum period. As a result, adopting a family-centered emphasis in these pediatric point-of-care situations to assess mothers’ health perceptions would enable providers to identify women who may be experiencing absent or reduced social support, increased stress, or changes in perceived health. Including the assessment questions for mothers that we found significant in this research, “How much can you count on your family (including partner) to listen when you want to talk about your feelings?” and “In general, would you say your health is...[include 1 to 5 response options]” as a part of the child’s or family’s continuing medical database provides the opportunity for early identification of psychosocial or behavioral changes and referral to appropriate resources for mothers. With the increasing use of electronic health records, assessments and interventions can be tracked between providers caring for the mother or the child to facilitate family-centered health care during the extended postpartum period.

From a broader public health perspective, understanding changes in the mother’s perceived behavioral or psychosocial health during the extended postpartum period may set the stage for prevention of early development of life-long chronic diseases that have their beginnings in the early to middle childbearing years. New mothers are unlikely to consider how their current health behaviors are contributing to the evolution of these lifelong diseases, yet seven of ten deaths among Americans each year are the result of largely preventable chronic illnesses, which consume about 86% of health care dollars (CDC, 2015). The interrelationships among the identified behavioral and psychosocial domains support the need for a concerted effort to implement policies and programs that address maternal health care as a critical component in women’s life courses and as a viable strategy for preventing development of chronic illnesses later in life.

Policies need to be created at multiple levels to assess maternal needs and develop interventions to improve new mothers’ health by identifying and addressing stress, diet, physical activity, and depression symptoms during the extended postpartum period. Mechanisms for sustained contact with nurses in public health home visitation or in women’s health or pediatric health services may be avenues for improved maternal and child health. With inclusion of home visitation for maternal and child health as part of the Patient Protection and Affordable Care Act of 2010 (Thompson, Clark, Howland, & Mueller, 2011), we recommend that nurses who have any contact with new mothers or children be aware of the need to assess for behavioral and psychosocial changes in women during the extended postpartum period.
postpartum period. Gaps in postpartum women’s health care may also be addressed through provision of services under the community benefit requirement of community hospitals (Yoder, Walden, & Verklan, 2010). Such opportunities for focused postpartum assessments will enable nurses to make relevant referrals to ensure that women are knowledgeable and have access to continuing health care that can delay development of risk factors for chronic illness and promote their health and well-being.

In conclusion, stress and social support demonstrated more consistent relationships to behavioral and psychosocial health domains than race/ethnicity and income level. Both dietary behaviors and physical activity were significantly associated with maternal perceived health even after contextual variables were controlled. Further attention to maternal behavioral and psychosocial domains in research and practice is recommended.

Acknowledgment

Supported in part by the Luci B. Johnson Centennial Professorship and a grant from the St. David’s Center for Health Promotion and Disease Prevention Research in Underserved Populations, School of Nursing, The University of Texas at Austin.

REFERENCES


