Original Article

Maternal mental health symptoms are positively related to emotional and restrained eating attitudes in a statewide sample of mothers participating in a supplemental nutrition program for women, infants and young children[1]

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Abstract

Postpartum, low-income mothers are at risk for mental health symptoms and obesity, and disordered eating attitudes may be associated with both mental health and obesity in this vulnerable population. The study objective is to determine whether higher levels of mental health symptoms are associated with increased odds of emotional and restrained eating attitudes in this sample of Special Supplemental Nutrition Program for Women, Infants and Children (WIC) participants. Data on 711 mothers of infants <13 months from a statewide sample of Maryland WIC participants were collected via telephone survey. Maternal mental health symptoms were measured on continuous scales for depression (PRIME-MD), stress (Perceived Stress Scale) and anxiety (Spielberger State-Trait Anxiety Inventory). Emotional and restrained eating attitudes were measured with questions adapted from the Dutch Eating Behavior Questionnaire. Multivariate logistic regression analysis was used. Obesity [body mass index (BMI) ≥ 30] was explored as a moderating variable. Mothers reporting higher levels of depression symptoms [odds ratio (OR) = 3.93, 95%CI: 2.71–5.69], anxiety symptoms (OR = 1.96, 95%CI: 1.47–2.65), stress symptoms (OR = 2.09, 95%CI: 1.67–2.61) and high overall mental health symptomatology (OR = 3.51, 95%CI: 2.43–5.3) had increased odds of emotional eating attitudes. There were significant associations between symptoms of depression (OR = 1.59, 95% CI: 1.12–2.25) and increased odds of restrained eating attitudes. Obesity did not moderate the association. Mothers with mental health symptoms are at risk for disordered eating attitudes, which may increase risk of poor diet. These findings underscore the need for greater focus on addressing maternal mental health status and eating attitudes in the postpartum period.

Keywords: women's health, postpartum, overweight, obesity, attitudes, maternal mental health.

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Introduction

Psychosocial factors, including mental health status, have been linked to unhealthy eating attitudes and adverse health outcomes. Several studies have found symptoms of depression to be related to less healthy diet, and symptoms of both stress and depression were associated with increased consumption of energy-dense foods (Torres & Nowson 2007; Konttinen *et al.* 2010; Hurley *et al.* 2005). Disordered eating attitudes, such as emotional eating, were also associated with increased consumption of energy-dense food, and may be related to mental health symptomatology (Konttinen *et al.* 2010). Stress, anxiety and depressive symptoms are often comorbid, potentially resulting in increased risk for eating attitudes leading to overweight and obesity and other adverse health outcomes (Hirschfeld 2001; Akbaraly *et al.* 2009; Allison *et al.* 2009; Dallman 2010; Singh 2014).

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Two aspects of disordered or unhealthy eating attitudes include emotional and restrained eating, which were derived from psychosomatic theory (van Strien *et al.* 1986a). Emotional eating is characterized by excessive eating in response to negative emotions, such as fear, anger and anxiety (van Strien *et al.* 1986a; Konttinen *et al.* 2010). Restrained eating refers to the practice of restricting food intake to achieve weight loss, but is often characterized by a loss of restrictive control and subsequent excessive intake, particularly during periods of stress (van Strien *et al.* 1986a). One study found that restrained eaters ate more overall in periods of high work stress, and also ate more sweet and fatty foods, compared with non-restrained eaters (Wardle *et al.* 2000). Growing evidence suggests that disordered eating attitudes, including emotional and restrained eating, are associated with increased body mass index (BMI) and obesity (Van Strien *et al.* 2000; Burton *et al.* 2007).

Most of the research on disordered eating attitudes has focused on female college students, generally of higher socio-economic status (Bushnell *et al.* 1990; Heatherton *et al.* 1995). Few studies have investigated mental health and disordered eating attitudes among low-income populations. One study found that obese female African American adolescents had increased disordered eating attitudes and depressed mood compared with normal-weight adolescents (Witherspoon *et al.* 2013). Less is known about mental health status and disordered eating attitudes among low-income adult women and minority populations, even though low socio-economic status is a risk factor for mental health problems (Regier *et al.* 1993; Muntaner *et al.* 2004; *Ertel et al.* 2011). Additionally, pregnancy and the postpartum period may be a time of increased stress, when women often have concerns over physical changes, the infants' health, relationships with partners and employment/financial concerns (Zajicek &

Wolkind 1978; Arizmendi & Affonso 1987; Affonso *et al.* 1999; DiPietro *et al.* 2004; Astrachan-Fletcher *et al.* 2008). Perinatal stress, combined with the environmental stressors that low-income women face, may put them at high risk of having disordered eating attitudes leading to overeating. Prior research among participants in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) has shown that stressful experiences provoked emotional eating and limited women's ability to practice health behaviors (Chang *et al.* 2008). Combined with pregnancy weight gain and postpartum weight retention, mental health symptoms and disordered eating attitudes may result in increased risk for overweight/obesity in low-income populations. Generating greater understanding of mental health and eating attitudes may have important implications for clinicians and programs such as WIC, as disordered eating attitudes result in adverse health consequences for mothers and are also related to sub-optimal infant feeding practices (Squires *et al.* 2014; Torgersen *et al.* 2015). The objective of this analysis was to determine whether symptoms of depression, anxiety and stress were associated with increased odds of restrained and emotional eating attitudes in a sample of mothers of infants less than 13 months old participating in Maryland WIC. WIC is a nation-wide program that provides supplemental food, nutrition education and breastfeeding support to low-income pregnant and postpartum women and children under 5 years of age (Institute of Medicine 1996). A secondary analysis examined whether obesity was a moderator of the association between mental health symptoms and high emotional and restrained eating attitudes, given that obese mothers may be at risk for both mental health symptoms and disordered eating attitudes. Participants were surveyed as part of the Maryland Infant Feeding Study, a cross-sectional study that investigated patterns

Key messages

- Symptoms of depression, stress and anxiety are associated with emotional eating attitudes, and symptoms of depression are associated with restrained eating attitudes among low-income mothers in Maryland.
- Disordered eating attitudes may increase risk of poor diet and obesity, especially among vulnerable populations.
- Greater focus on maternal mental health and eating attitudes as a component of maternal and child health services may be important for promoting healthy eating behavior and weight status among new mothers.

of mothers' feeding styles and infants' dietary intakes among mother/infant pairs enrolled in WIC (Hurley *et al.* 2008b). We hypothesized that higher levels of symptoms of stress, depression and anxiety would be associated with increased odds of emotional and restrained eating attitudes. For our secondary analysis, we hypothesized that there would be a stronger association between mental health symptoms and disordered eating attitudes for obese participants compared with non-obese participants.

Methods

The Maryland State WIC Program provided contact information for all mothers with infants between 0 and 12 months of age ($n = 33\,804$). A random-number table was used to select a sample ($n = 10\,376$) of participants, stratified by infant age (0–4, 5–8 and 9–12 months); infant race/ethnicity (White, Hispanic and African American); and location of residence (urban/peri-urban and rural). Participants were ineligible if they did not have an infant less than 13 months of age, were less than 18 years of age, or were not the infant's primary caregiver. Contact was attempted for 3285 of the randomly selected potential participants, with a goal of achieving 800 participants. Approximately half ($n = 1705$) of the randomly selected participants were not located, and 371 were ineligible, with Hispanic mothers and mothers of infants in the 0–4 months age group more likely to be located than White or African–American mothers or mothers of older infants. Out of the 1209 potential participants who could be located and were eligible, 65% of participants ($n = 781$) completed interviews, 24% refused and 10% did not keep or complete scheduled appointments. As described elsewhere, no differences were found between those who did and did not participate in geographic residence, infant gender or maternal pre-pregnancy weight (Hurley *et al.*, 2008a).

Data collection took place between July 2004 and July 2005. Potential participants were mailed a brief description of the study prior to data collection. Data were collected via telephone, using a survey written in English and Spanish. The survey was translated to Spanish and then back-translated to ensure equivalency, and was pilot tested in both languages. Six trained telephone interviewers (three bilingual) collected data; participants were given the option of completing the interview in English or in Spanish. Each interview lasted about 45 min. Participants were informed that the study was voluntary and were assured confidentiality of their data collected. Verbal consent from each participant was obtained, and participants received a $10 gift certificate to a local store and a list of health and social services for mothers and infants.

Data were excluded from 63 participants who did not complete the mental health and eating attitudes sections of the survey, and 7 who did not complete the restrained eating questions only, resulting in a final analysis sample of 711 participants. Out of the 711 participants, 82 were missing data on height and weight; therefore they were not included in the analyses examining obesity as a potential moderator of the association between mental health symptoms and eating attitudes. No differences in race/ethnicity, maternal age, education, parity, marriage, infant age, gender or birth weight were found between participants with and without complete data. The Maryland Department of Health and Mental Hygiene Institutional Review Board, the University of Maryland Institutional Review Board, and the Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved all data collection instruments and procedures.

Independent variables

Maternal stress was measured by the 4-item version of the Perceived Stress Scale (PSS), which measures perceived stress associated with daily life situations, using a 4-point Likert scale (Cohen *et al.* 1983). Mean PSS scores were used for analysis, with higher scores indicating a higher level of symptoms. Within-subject mean substitution was used if one of the PSS item responses was missing ($n = 10$). The internal consistency reliability coefficient of this scale was 0.70 (Rodriguez & Maeda 2006; Hurley *et al.* 2008b).

Maternal anxiety was measured by the 6-item short-form of the Spielberger State-Trait Anxiety Inventory (STAI), which evaluates current feelings of apprehension, tension, nervousness and worry using a 4-point Likert scale (van Knippenberg *et al.* 1990; Marteau & Bekker 1992). Each participant's mean STAI score

was used for this analysis. Participants missing one of the STAI scale item responses ($n = 4$) were assigned the mean score of the available items. The internal consistency reliability coefficient of this scale was 0.79 (Rodriguez & Maeda 2006; Hurley *et al.* 2008b).

Maternal depression was measured using 7 items from the 10-item self-report version of the PRIME-MD Patient Health Questionnaire (PHQ), and each participant's mean PHQ score was used for this analysis (Spitzer *et al.* 1999). Items related to suicidal ideation and the impact of endorsed items on functioning were removed. Participants missing one of the PHQ scale item responses ($n = 7$) were assigned the mean score of the available items. The internal consistency reliability coefficient of this scale was 0.75 (Rodriguez & Maeda 2006; Hurley *et al.* 2008b).

Cumulative mental health symptomology was assessed by the construction of a dichotomous variable identifying mothers who scored in the top quartile on ≥2 of the mental health measures (PSS, STAI, PRIME-MD).

Covariates

Covariates assessed included both maternal and infant characteristics. Maternal characteristics were maternal age in years, employment status (full-time, part-time, unemployed and student), marital status (married or single/divorced/widowed), education level (never completed high school, finished high school and some college/finished college/graduate school) and self-reported health status (excellent, very good, good, fair and poor). Infant characteristics included infant age in months, infant race (White, African American and Hispanic), infant breastfeeding status and parity (infant is first child or not).

Obesity was examined as a potential moderator of the relations between eating attitudes and mental health symptomatology. BMI was calculated using participants' self-reported height and weight. Participants were classified as obese if their BMI was $30 \, \text{kg/m}^2$ or greater. Interaction terms were generated for obesity and each of the mental health variables.

Dependent variables

Emotional Eating was measured with the Dutch Eating Attitude Questionnaire (DEBQ), using four questions that assessed frequency of emotional eating on a 5-point Likert scale (van Strien *et al.* 1986a). The scale reliability coefficient was 0.84 (Rodriguez & Maeda 2006). Participants' mean scores were calculated and then recoded into a binary variable for 'high' emotional eating (scores in the upper quartile) compared with 'low' emotional eating (scores below the upper quartile with a cut-off score of 2.5).

Restrained Eating was measured also with the DEBQ, using ten questions that assessed frequency of restrained eating on a 5-point Likert scale. The scale reliability coefficient was 0.90 (Rodriguez & Maeda 2006). Participants' mean scores were calculated and then recoded into a binary variable for 'high' restrained eating (scores in the upper quartile) compared with 'low' restrained eating (score below the upper quartile with a cut-off of score of 2.9).

Statistical analysis

Data were analyzed using Stata statistical software version 13 (StataCorp 2013). Descriptive data analysis included examining frequencies, means and standard deviations for study variables. Bivariate associations between demographic characteristics and emotional and restrained eating attitudes were examined with logistic regression. Multivariate logistic regression was used to estimate the odds of disordered eating attitudes with increases in maternal mental health symptom scores, adjusting for marital status and infant race/ethnicity, which were the only background characteristics and demographic factors related to the eating attitude variables. Models were evaluated for each mental health variable and each eating attitude variable separately. The Hosmer–Lemeshow test for logistic regression was used to assess goodness-of-fit for each model. The association between obesity and eating attitudes was explored using logistic regression, and interaction terms for obesity and each mental health variable were tested to evaluate whether obesity moderated the relations between mental health and eating attitudes.

Results

Background characteristics and demographic information for the 711 pairs of mothers and infants are

reported in Table 1. The mean age of the participants was 26.9 years, and approximately half of infants were white, 37% were African American and 15% were Hispanic. Approximately half of the participants were unemployed, and 60% of the participants were single. Forty-five per cent of participants had finished at least some college or vocational school, and 41% were first-time mothers. Mean depression, stress, anxiety, emotional eating and restrained eating scores are reported in Table 1.

Table 1. Background characteristics of Maryland Infant Feeding Study Participants ($n = 711$)

	Mean ± SD or n(%)
Mother age (y)	26.9 ± 6.3
Infant age (mo)	6.6 ± 3.3
Infant currently breastfed	176 (24.8)
Infant ever breastfed	455 (64.1)
Infant is first child	291 (41.2)
Education category	
Less than high school	144 (20.3)
High school	243 (34.2)
Some college	323 (45.5)
Employment status	
Full-time	152 (21.6)
Part-time	128 (18.1)
Unemployed	378 (53.6)
Student	47 (6.7)
Infant race/ethnicity	
African American	260 (36.6)
Hispanic	103 (14.5)
White	348 (48.9)
Married	279 (39.5)
Self-reported health status	
Poor	7 (1)
Fair	52 (7.3)
Good	219 (30.8)
Very good	229 (32.2)
Excellent	204 (28.7)
Obese[†]	176 (28)
Depression (1–4)[‡]	1.3 ± 0.46
Stress (1–5)[‡]	2.0 ± 0.79
Anxiety (1–4)[‡]	1.5 ± 0.56
Emotional Eating (1–5)[§]	1.8 ± 0.96
Restrained Eating (1–5)[§]	2.1 ± 0.98

[†]BMI ≥ 30 kg/m^2. Data on height and weight were available for 629 of the 711 participants. [‡]Mental health scales with the range of scale scores provided in parentheses and higher scores indicating greater severity of symptoms. [§]Eating attitude scales with the range of scale scores provided in parentheses and higher scores indicating greater number of symptoms.

Associations between maternal and infant background characteristics and maternal symptoms of depression, stress and anxiety are reported in Table 2. African American race/ethnicity was significantly associated with increased symptoms of stress compared with White race/ethnicity. Participants with 'excellent' self-reported health status had significantly fewer symptoms of depression and stress compared with those with self-reported 'poor' health status.

Associations between maternal and infant background characteristics and maternal eating attitudes are also reported in Table 2. Marital status was significantly associated with eating attitudes, with married participants having significantly higher odds of emotional eating compared with non-married/single participants. Infant African American race/ethnicity was associated with significantly lower odds of emotional eating compared with White race/ethnicity. Marital status and obese BMI were the only maternal background characteristic significantly associated with odds of high restrained eating. No other infant characteristics were significantly associated with maternal mental health or eating attitude variables. Based on their significant associations with the dependent variables, marital status and infant race/ethnicity were adjusted for in the analyses.

Maternal mental health symptoms were significantly related to both eating attitude variables in both unadjusted and adjusted models, which are reported in Table 3. After adjusting for race/ethnicity and marital status, depression score (OR = 3.93, 95% CI: 2.71–5.69, $P < 0.05$), anxiety score (OR = 1.97, 95% CI: 1.47–2.65, $P < 0.05$), stress score (OR = 2.09, 95% CI: 1.67–2.61, $P < 0.05$), as well as cumulative high mental health symptoms (OR = 3.51, 95% CI: 2.38–5.16, $P < 0.05$) were significantly associated with high emotional eating. After adjusting for race/ethnicity and marital status, depression score was significantly associated with high restrained eating (OR = 1.59, 95% CI 1.12–2.25, $P < 0.05$). Adjusting for race/ethnicity and marital status had minimal effects on the relations between mental health variables and eating attitudes.

A Hosmer–Lemeshow goodness-of-fit test was applied to each of the models, with non-significant results for the model evaluating the association between depression score and emotional eating ($P = 0.076$), anxiety and emotional eating ($P = 0.052$), stress and

Table 2. Association between background characteristics, mental health symptoms and eating attitudes of Maryland WIC mothers and infants (n = 711)

| | Maternal mental health symptoms | | | | | | Maternal eating attitudes | | | |
| | Depression | | Stress | | Anxiety | | High emotional eating | | High restrained eating | |
	β	P-value	β	P-value	β	P-value	OR	P-value	OR	P-value
Age (y)	<0.001	0.97	0.003	0.58	0.002	0.47	1.001	0.50	0.996	0.76
Education (< high school is reference)										
High school	−0.06	0.19	−0.1	0.22	−0.05	0.40	1.02	0.93	0.97	0.90
Some college	−0.07	0.16	−0.12	0.12	−0.03	0.56	1.15	0.55	1.1	0.68
Obese	0.05	0.20	0.02	0.80	−0.06	0.182	1.36	0.12	2.02	<0.001
Employment (Full-time is reference)										
Part-time	0.002	0.97	−0.06	0.50	−0.03	0.16	0.88	0.65	1.27	0.38
Unemployed	0.02	0.74	−0.01	0.90	0.02	0.66	1.15	0.52	1.05	0.83
Student	−0.008	0.91	−0.02	0.87	−0.005	0.96	0.62	0.26	1.03	0.94
Race/Ethnicity (White is reference)										
African American	0.05	0.23	0.17	0.008	−0.02	0.72	0.59	0.008	0.95	0.79
Hispanic	0.06	0.25	0.10	0.27	0.12	0.09	0.85	0.51	0.97	0.92
Married	0.02	0.68	−0.03	0.61	0.02	0.63	1.52	0.02	1.58	0.008
Health status (poor is reference)										
Fair	−0.05	0.76	−.003	0.93	0.002	0.99	0.92	0.93	0.75	0.75
Good	−0.21	0.22	−0.32	0.28	−0.12	0.58	0.9	0.9	0.76	0.75
Very good	−0.38	0.03	−0.50	0.10	−0.27	0.19	0.87	0.87	0.97	0.97
Excellent	−0.4	0.02	−0.61	0.04	−0.39	0.07	0.79	0.78	0.99	0.99
Infant is first child	−0.03	0.37	0.04	0.55	−0.03	0.44	0.84	0.32	0.87	0.41
Infant age (mo)	<0.001	0.93	0.01	0.53	−0.004	0.54	1.04	0.16	0.98	0.59
Ever breastfed	0.02	0.66	0.08	0.21	0.04	0.32	0.89	0.52	1.36	0.08
Currently breastfed	−0.05	0.26	0.0002	0.10	0.03	0.53	0.88	0.54	0.88	0.52

Table 3. Association between mental health symptoms and eating attitudes Maryland WIC participants ($n = 711$)

Maternal mental health symptoms	High emotional eating				High restrained eating			
	Crude[†]		Adjusted[‡]		Crude[†]		Adjusted[‡]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Depression	3.79*	2.63–5.45	3.93*	2.71–5.69	1.59*	1.13–2.26	1.59*	1.12–2.25
Anxiety	1.96*	1.58–2.42	1.97*	1.47–2.65	1.25	0.93–1.68	1.25	0.93–1.67
Stress	1.99*	1.49–2.66	2.09*	1.67–2.61	1.18	0.96–1.45	1.18	0.96–1.45
Cumulative high mental health	3.32*	2.28–4.84	3.51*	2.38–5.16	1.34	0.91–21.97	1.37	0.93–2.02

[†]Univariate logistic regression. [‡]Multivariate logistic regression, adjusted for race/ethnicity and marital status. *$P < 0.05$.

emotional eating ($P = 0.729$), cumulative high mental health symptoms and emotional eating ($P = 0.127$), and depression and restrained eating ($P = 0.43$), providing evidence of adequate fit.

Height and weight data were available from 629 of the 711 participants; 28% were obese. Obesity was significantly related to restrained eating attitudes (OR = 2.02, 95% CI: 1.37–2.97, $P < 0.001$), but was not related to emotional eating attitudes, after controlling for race/ethnicity and marital status. The inclusion of the obese variable in the analyses did not result in substantial differences in the magnitude or significance of the relations between the mental health variables and eating attitudes from the previous analyses. Interaction terms for obesity and the mental health variables were also included in the analyses and were non-significant, suggesting that obesity does not moderate the relations between mental health symptomatology and eating attitudes.

Discussion

The findings support our hypothesis that mental health symptoms are significantly associated with emotional and restrained eating attitudes. Symptoms of depression, stress, anxiety and cumulative high mental health symptomatology were associated with increased odds for high emotional eating attitudes, and symptoms of depression were associated with increased odds of high restrained eating attitudes, even after adjusting for race/ethnicity and marital status. Although depression was the only mental health variable significantly related to both eating attitudes, symptoms of depression, stress and anxiety are highly interrelated in this and other studies (Hirschfeld 2001; Moffitt *et al.* 2007; Hurley *et al.* 2008b). Thus the findings suggest that symptoms of depression and multiple mental health symptoms are related to increased risk of both high emotional and restrained eating attitudes. Obesity is significantly related to restrained eating, although it does not modify the relations between mental health symptoms and eating attitudes.

This analysis is consistent with previous findings showing that psychosocial factors, including symptoms of mental health problems and negative life events, are related to disordered eating attitudes (van Strien *et al.* 1986b; Geliebter & Aversa 2003; van Strien *et al.* 2013; Schrepf *et al.* 2014). Affect regulation theories postulate that people eat more when feeling depressed in an attempt to regulate negative feelings (Ouwens *et al.* 2009). Depression is associated with alexithymia, a difficulty in identifying feelings, which may play a role in emotional eating (Van Strien *et al.* 2000; Larsen *et al.* 2006). The biological response to stress is generally considered to be decreased eating, but for depressed individuals, increased eating in times of stress may be related to alexithymia (Schachter *et al.* 1968; Ouwens *et al.* 2009). Moreover, both increased and decreased dietary intakes have been linked to stress, and dietary intake may in turn influence psychological state (Polivy & Herman 2005; Dallman, 2010).

Few studies have explored the association between mental health and eating attitudes in the postpartum period, a time when many women are concerned with

returning to pre-pregnancy weight, and normal eating patterns in a family may be disrupted (Stein & Fairburn 1996; Carter *et al.* 2000). This sample of low-income WIC participants who have given birth in the last 13 months represents a population that is at high risk for overweight and obesity, as well as increased stress and mental health symptomatology (Regier *et al.* 1993; Mokdad *et al.* 2003; Hedley *et al.* 2004; Muntaner *et al.*, 2004). There is evidence for increased risk of eating disorder pathologies in the postpartum period, and one study following women from pregnancy to 6 months postpartum showed that dietary restraint peaks at 3 months postpartum (Stein & Fairburn 1996). Nuss *et al.* (2006) found a significant association between obesity and emotional eating attitudes in a similar population of low-income postpartum women. Carter *et al.* (2000) found that at 14 months postpartum, measures of depression and anxiety symptoms were associated with eating attitudes, relations that were not present during pregnancy. BMI was also associated with depression and anxiety symptoms at both 4 and 14 months postpartum (Nuss *et al.* 2006).

This analysis confirms existing theories and prior studies on associations between mental health symptomology and eating attitudes. This is important for understanding determinants of dietary intake and the design of appropriate interventions to promote healthy eating. There has been little research on relations between mental health and eating attitudes among low-income women, as most prior studies have evaluated mental health problems in relation to eating disorders among college-age women and adolescents (Ackard *et al.* 2002; Ackard *et al.* 2011). Symptoms of depression were strongly related to both emotional and restrained eating, and these findings provide support for addressing mental health symptoms and eating attitudes in interventions to improve dietary intakes and health among low-income, postpartum women. With increasing prevalence of overweight and obesity among women of reproductive age, which carry risks for poor maternal, fetal and child outcomes, it is increasingly important to address psychosocial factors among high risk populations (Gaillard *et al.* 2013). Maternal depression has long been recognized as having adverse affects on child development, and is associated with increased family stress and social and behavioral problems among children (Wachs *et al.* 2009). Additionally, there are links between familial dietary patterns and children's dietary intake; therefore, disordered eating attitudes leading to increased energy intake among mothers may also adversely affect children's eating behaviors, energy intake and BMI (Birch & Fisher 1998). Thus addressing maternal mental health and disordered eating attitudes has important implications for long-term child health and development.

Methodological considerations

The study was based on a large and diverse population-based sample; there are several methodological considerations. The data were self-reported via telephone interview, and variables of interest may be subject to shared method variance and reporting bias. One limitation of this analysis is that the data were collected 10 years ago, which may affect the generalizability of the results. Additionally, this study was cross sectional; therefore we cannot establish causal relations between mental health status and eating attitudes. There is no score on the Dutch Eating Behavior Questionnaire that serves as a cut-off point for classification of high emotional and restrained eating attitudes; this analysis used the upper quartile of the sample to classify participants as having high emotional and restrained eating attitudes. Maternal dietary data were not collected; thus we are unable to assess how mental health and disordered eating attitudes are related to maternal diet in this sample. Although the questionnaire response rate was 65%, few background and demographic characteristics differed between participants and non-participants. The sample was limited to women, and income was not measured as all participants were low-income based on their participation in WIC. This analysis controlled for a wide range of potential confounding variables. Parity was controlled for using a dichotomous variable for whether the infant was the mother's first child or not; however total number of children was not measured and therefore not considered as a potential confounding variable.

Conclusion

This analysis confirms the association between maternal mental health symptoms and disordered eating

attitudes. Maternal mental health symptoms and disordered eating attitudes may increase risk of poor diet for mothers and potentially for their infants (Carter *et al.* 2000; Dallman 2010; Konttinen *et al.* 2010). Additional research is needed to further understand how both eating attitudes and mental health status affect maternal and infant dietary intake and infant feeding practices. Obesity is associated with a wide range of adverse maternal and child outcomes, and mental health and eating attitudes are related to dietary intake. Low-income postpartum mothers are at increased risk of experiencing mental health problems as well as obesity. Addressing mental health symptoms and eating attitudes among low-income, postpartum women is important for improving the health of both mothers and children, regardless of maternal body size. Screening procedures for maternal mental health problems and disordered eating attitudes, coupled with referrals for treatment and counseling, could be implemented as an integral component of maternal and child health services.

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Conflicts of interest

The authors declare that they have no conflict of interest.

Contributions

JAE performed the analyses and led the drafting of the manuscript. MMB, KMH and LEC designed the original study and participated in the analysis and interpretation of findings. All authors read and approved the final version of the manuscript.

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