Prevalence, Stability, and Socio-Demographic Correlates of Depressive Symptoms in Black Mothers During the First 18 Months Postpartum

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Objectives: The goals of this longitudinal study were to evaluate 1) the prevalence and stability of high depressive symptom levels during the first 18 months postpartum in a sample of otherwise healthy Black mothers varying in socio-economic status and 2) the relation of socio-demographic variables and level of socio-demographic risk to maternal depressive symptom levels during this time period. *Methods*: Participants were 163 Black adult mothers of healthy, full-term infants. The level of mothers' depressive symptomatology was assessed at 2, 3, 6, 12, and 18 months postpartum using the Center for Epidemiological Studies-Depression Scale (CES-D). Mothers provided socio-demographic information at each assessment. Univariate and bivariate analyses were used to analyze the data. *Results*: The percentage of mothers with an elevated CES-D score (16 or higher) at single visits ranged from 13.5 to 14.7%, and 35.0% had at least one elevated CES-D score by 18 months postpartum. CES-D total scores were significantly correlated across each pair of visits (mean $r = 0.57$, all p's < 0.0001), and average CES-D scores did not change significantly over time. Single marital status, low-income status, and more negative maternal perceptions of the adequacy of income for meeting familial needs were significantly related to higher maternal CES-D scores at each assessment (all p's < 0.05). Level of socio-demographic risk, as assessed with a composite risk score derived from these variables, was significantly related to higher average CES-D scores (averaged across visits) ($p < 0.0001$) and to a greater frequency of elevated CES-D scores (16 or higher) during the first 18 months postpartum ($p = 0.0002$). *Conclusions*: The prevalence and stability of high levels of maternal depressive symptomatology during the first 18 months postpartum in this sample of Black women are consistent with those reported in prior studies of community samples of mothers unselected for race. Mothers with higher socio-demographic risk profiles had higher levels of maternal depressive symptoms at each assessment point.

KEY WORDS: maternal depression; Center for Epidemiological Studies-Depression Scale (CES-D); African Americans/Blacks; prevalence; stability; socio-demographic risk.

INTRODUCTION

Maternal postpartum depression is a prevalent and serious public health problem. In community samples, the prevalence of new mothers reporting clinically significant levels of depressive symptoms beyond the immediate postpartum period is approximately 8–18% (1–10). For mothers with high socio-demographic risk profiles (e.g., low income, low education, single marital status, and/or young

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maternal age), the prevalence is substantially higher (11–15), with percentages of 35% to 67% reported in some studies (16–19).

High levels of maternal depressive symptoms are of concern to health professionals because they are associated with poor maternal psychosocial adaptation, compromised parenting, and child socio-emotional dysfunction, including insecure attachment, higher rates of behavior problems, aggression, and later psychiatric problems (20–25). Moreover, these associations are stronger when maternal depressive symptom levels are severe or chronic (16, 26–30).

Several investigators have reported that women of color (particularly Black women) have higher levels of depressive symptomatology than White women (28, 31). However, this claim is difficult to evaluate because Black race/ethnicity and low socio-economic status (SES) are often confounded in this literature (32). Mothers from low-SES backgrounds in the U.S., who disproportionately tend to be women of color, typically report higher levels of depressive symptoms than their higher SES counterparts (7, 19, 28, 33–37). This has made it difficult to isolate the effects of depression from the effects of other risk factors and to disentangle the race-SES confounding often found in some prior studies of postpartum women. As a consequence, little is known about the prevalence and stability of high levels of depressive symptomatology in otherwise healthy postpartum Black women that is not confounded by these co-morbid risk factors.

Among studies that have controlled for socio-demographic variables, findings regarding racial differences in level of maternal depressive symptomatology have been inconsistent. In a sample of financially impoverished, urban women (11), no racial differences in risk for depression were found, suggesting that poverty rather than race was the primary factor influencing depression. Similarly, in a nationally representative sample of adolescent mothers from the National Maternal and Infant Survey (38), differences in depressive symptom levels between Black and White teen mothers decreased significantly after statistical control of family income and marital status. However, in a larger sample from the same national survey comprised of both teen and adult mothers (15), Black race continued to be associated with higher maternal depressive symptom levels, even after control of several socio-demographic risk variables. Whether level of socio-demographic risk is related to higher levels of maternal depressive symptomatology within a single cohort of Black women ranging in socio-economic status has not been empirically established.

Moreover, little is known about the course of maternal depressive symptomatology beyond the postpartum period, especially in non-White cohorts of women. In two large, racially diverse, nationally representative samples of women with young children (15, 16, 39), a moderate degree of stability in the level of mothers' depressive symptoms was observed, as indicated by significant cross-time correlations in mothers' scores on the Center for Epidemiological Studies-Depression Scale (CES-D) (40). Similar findings were reported in two smaller prospective studies of mostly White, middle-class women (41–44). It is unclear, however, whether these findings generalize to otherwise healthy adult Black mothers from a range of socio-economic backgrounds.

The present study had two primary goals. The first was to evaluate the prevalence and stability of high levels of maternal depressive symptoms during the first 18 months postpartum in a selected community cohort of otherwise healthy Black adult mothers from a range of socio-economic backgrounds. Level of depressive symptomatology was assessed using the CES-D at 2, 3, 6, 12, and 18 months postpartum. A CES-D total score of 16 or higher was considered indicative of elevated depressive symptomatology. Four sets of questions associated with this first goal were addressed, as follows: 1) What percentage of mothers had a high CES-D score at each assessment? 2) Do mothers' average CES-D total scores decrease over the course of the first 18 months postpartum, as reported in other studies (43, 44)? Alternatively, do their symptom levels increase or stay the same during this time period? 3) Of the women with an elevated CES-D score at intake (2 months postpartum), what percentage of women had another elevated CES-D score at later assessments? 4) Are mothers' CES-D total scores at each visit significantly correlated over time (i.e., across each pair of visits)?

The second goal was to evaluate the relation between socio-demographic risk variables and mothers' depressive symptom levels during the first 18 months postpartum. Two questions associated with this second goal were addressed: 1) What is the relation between individual socio-demographic variables (e.g., marital status, family income) and mothers' CES-D scores at each assessment point (2, 3, 6, 12, and 18 months postpartum)? 2) Using a composite risk variable, does increasing levels of socio-demographic risk increase (a) the severity (average level) of maternal depressive symptoms during the first 18 months postpartum or (b) the persistence of high depressive symptom status (number of assessment

periods at which a mother had an elevated CES-D total score)?

METHOD

Subjects

Subjects were participants in a larger, multi-hospital prospective longitudinal study of child development and parenting among Black adult mothers and their healthy, term infants. To be eligible for recruitment, mothers had to self-report as being African American or Black and be willing to provide informed consent. In addition, mother–infant dyads met a set of low-risk inclusion criteria. To be recruited, mothers had to be at least 18 years old and free of drug or alcohol abuse problems, HIV positivity, and other serious chronic medical conditions, as confirmed by medical record review and maternal self-report. Infants had to be healthy, clinically normal at delivery, and full term (gestational weeks $\geq$37) as determined by medical record review and pediatric examination. Infants with obvious major congenital anomalies, a diagnosis of fetal alcohol syndrome, HIV positivity, or other serious health condition, or indication of prenatal drug exposure in the neonatal record were excluded.

Mothers and infants who met these inclusion criteria were recruited regardless of the infant's gender, the mother's marital status, parity, education, socioeconomic status (SES), income, employment status, or family size. Maternal and infant characteristics at intake were obtained from a review of maternal and infant medical records and confirmed by infant physical examination at delivery and a follow-up maternal interview at 2 months postpartum. These inclusion criteria resulted in a medically low-risk yet demographically diverse sample.

Recruitment and Attrition

Recruitment of potential study mothers took place in two phases. Initial contact took place in the maternity wards of three metropolitan Harvard-affiliated teaching hospitals. After screening medical records, a research assistant approached potential study mothers in the maternity ward and described the research protocol to them. Interested mothers completed a brief demographic questionnaire and provided signed informed consent to participate in a telephone interview when their baby was 2 months old.

Recruitment of eligible, consenting mothers into the follow-up phase of the study took place at the time of the 2-month telephone interview. Dyads who were recruited into the follow-up phase of the study were then observed four times during the child's first 18 months: three times in the laboratory at 3, 6, and 18 months, and once in the child's home at 12 months. Study mothers signed an additional informed consent form to participate in the follow-up phase of the study, at the time of the first laboratory visit. All recruitment and follow-up procedures received formal approval by the institutional human subjects review board.

A total of 794 mothers were approached in the maternity ward for potential recruitment. Of these, 679 (85.5%) mother–infant dyads met our inclusion criteria and were considered eligible to participate in the initial 2-month postpartum telephone interview. Two hundred sixty-eight (40%) mothers completed the telephone interview and had their eligibility status confirmed. Of the remaining mothers, 171 (25%) could not be reached, 157 (23%) were contacted at 2 months postpartum but were no longer interested in participating in the larger follow-up phase of the study, and 83 (12%) were contacted but no longer met inclusion criteria. There were no significant differences between the eligible, interested mothers who completed the 2-month telephone interview and those who did not on infant gender, maternal age (years), marital status (single/married), or parity (primiparous/multiparous).

Of the 268 eligible mothers who completed the 2-month phone interview, 195 mothers (73%) were recruited into the follow-up phase of the study and participated in at least one follow-up visit. There were no significant differences between this initial follow-up cohort of 195 mothers and the 73 nonparticipants on infant gender, infant birth weight (grams), number of gestational weeks, or mothers' primiparous versus multiparous status, or on total CES-D scores at intake. However, mothers who participated in the follow-up phase of the study were somewhat older, on average, than nonparticipating mothers (mean age of participants = 29.37, SD = 5.5; mean age of non-participants = 27.38, SD = 6.3, $F[1, 266] = 6.34$, $p < 0.05$) and had attained slightly more education (mean years for participants = 14.46, SD = 2.1; mean years for nonparticipants = 13.45, SD = 1.98, $F[1, 259] = 11.49$, $p < 0.001$).

Of the 195 mothers in the initial follow-up cohort, 31 subjects (15.8%) subsequently dropped out of the study (21 moved or could not be reached, and 10 were not interested), and one missed the

12-month study visit. Analyses in the present study were based on data from 163 mothers (83.6%) who finished the study and had complete data. Results of chi square analyses indicated that these 163 mothers did not differ significantly from the 32 mothers who dropped out or had missing data on intake CES-D scores or on socio-demographic variables, although participants were slightly more likely to have an income of less than \$20,000 ($p = 0.093$). Detailed data are available from the first author upon request.

Follow-up Assessments

Dyads were assessed in the laboratory at 3, 6, and 18 months postpartum and in their home at 12 months postpartum. At each follow-up visit, mothers completed the CES-D and other questionnaires and provided socio-demographic information about their employment status, occupation, child-care arrangements, and household composition (number of children and ratio of adults/children at home). At 3 and 18 months, mothers reported on their total yearly family income and their perceptions of the adequacy of their family's total income for meeting familial needs. In addition, at each visit, mother–infant dyads were videotaped during social interaction.

Measurement of Variables

CES-D

The CES-D (40) is a widely used, self-report scale designed to measure level of depressive symptomatology in the general population. Possible scores range from 0 to 60, with higher scores reflecting higher levels of depressive symptoms in the past week. The CES-D has been shown to have excellent psychometric properties in both clinical and epidemiological studies with diverse populations, including postpartum women (2, 40, 45). As is standard for this instrument and traditional in clinical studies of postpartum women (16, 44, 46, 47), a cutoff score of 16 or higher was used in this study as indicative of elevated depressive symptomatology.

Preliminary analyses were conducted to evaluate the internal consistency and concurrent validity of the CES-D in this cohort. Standardized Cronbach alpha coefficients for mothers' CES-D total scores at each visit were all at or above 0.80 (0.82 at 2 months,

0.89 at 3 months, 0.87 at 6 months, 0.88 at 12 months, and 0.86 at 18 months). In support of the concurrent validity of the CES-D, mothers' CES-D scores at each assessment were significantly correlated with their concurrent scores on the Brief Symptom Index (BSI) (48), a widely used, abbreviated measure of maternal psychiatric symptomatology, including scores on its General Symptom Index (GSI) and Depression Subscale (GSI: mean $r[163] = 0.76$, range $= 0.68–0.83$, all p's $< .0001$; Depression subscale: mean $r[163] = 0.72$, range $= 0.69–0.79$, all p's < 0.0001).

Socio-demographic Variables

A comprehensive list of socio-demographic variables was evaluated as possible correlates of maternal CES-D scores, based on findings in the maternal depression literature, as follows: marital status (single/married), total family income (five-level categorical variable), low-income status (yearly income $< \$20,000$, which corresponds approximately to the federal poverty threshold for the majority of families in this sample, mothers' perceptions of the adequacy of total income for meeting familial needs, as assessed using a five-point Likert rating ($1 =$ very inadequate, $5 =$ completely adequate), household composition (the number of children and adults/children ratio in the household), maternal age (years), maternal education (years), infant gender, infant birth weight (grams), infant gestational age (weeks), mothers' country of origin (US-born/not), maternal employment status (employed/not), number of hours per week the mother is employed, the number of hours per week that the infant was in nonparental child care, and SES. SES was assessed using the Hollingshead four-factor index of SES (49), which is based on the parent's or parents' level of education and occupational status and yields both a continuous total score (higher scores reflect higher SES) and a categorical score (lower scores reflect higher SES).

Statistical Analysis

Univariate statistics were used to describe the sample's characteristics. Bivariate statistics were used to evaluate the four questions associated with the first study goal, as follows: Chi square analyses were used to evaluate the percentage of mothers who had a high

CES-D score at each assessment, and to compare the percentage of women with and without an elevated CES-D score at intake (2 months postpartum) who had another elevated CES-D score at later assessments. One-way repeated-measures analysis of variance (ANOVA) was used to evaluate whether the average level of maternal depressive symptomatology (CES-D total score) for the sample as a whole changed over the course of the first 18 months postpartum. Pearson product–moment correlations were used to evaluate whether mothers' CES-D total scores at each visit were significantly correlated over time (i.e., across each pair of visits).

To evaluate the two questions associated with the second study goal, the following analyses were used: One-way ANOVAs (for categorical variables) and Pearson product–moment correlations (for continuous variables) were used to evaluate the relation of individual socio-demographic variables to mothers' CES-D scores at each assessment point. Based on the results of these analyses, a composite risk variable was constructed to reflect individual mothers' level of socio-demographic risk. Univariate statistics were used to calculate the number and percent of mothers at each risk level. Two summary CES-D dependent measures were also constructed, as follows: The arithmetic mean of mothers' CES-D scores at 2, 3, 6, 12, and 18 months was calculated to represent the average level of maternal depressive symptoms during the first 18 months postpartum. To represent the persistence of high depressive symptom levels across the first 18 months postpartum, the number of assessment periods at which individual mothers had a high CES-D score was tallied (possible scores ranged from 0 to 5). Univariate statistics were used to calculate the mean and standard deviation of each summary CES-D dependent variable. Bivariate statistics were then used to calculate the mean and standard deviation (SD) of each dependent variable by level of socio-demographic risk. The significance of the relation between the socio-demographic risk composite variable and the two summary dependent measures was evaluated using one-way ANOVAs, followed by Tukey post-hoc tests. Findings were noted as statistically significant where $p \leq 0.05$.

RESULTS

Sample Characteristics

The sample consisted of 163 Black adult mothers and their healthy, term infants (49.7% male, 44.8%

first-born) from heterogeneous socio-economic backgrounds. At intake, mothers varied in marital status (41.7% were single), household composition (number of children at home ranged from 1 to 5), family income (23% had a total income of less than \$20,000), and employment status (50.6% were employed). Regardless of their employment status, the majority of mothers reported that they were the infant's primary caregiver. Univariate statistics describing the maternal, infant, and socio-demographic characteristics of the sample are provided in Table I (first two columns).

Prevalence and Stability of Maternal Depressive Symptomatology

Descriptive statistics for the number and percentage of mothers with a high CES-D score at each assessment period, and the number of visits at which a mother received an elevated CES-D score, are provided in Table II. The percentage of mothers with a high CES-D score at single visits ranged from 13.5% to 14.7%, and the number of mothers with at least one high CES-D score increased over time. By 18 months postpartum, 35.0% of mothers had at least one high CES-D score.

Descriptive statistics for mothers' mean CES-D total score at each assessment period and mothers' mean CES-D total score, averaged across visits, are provided in Table II. Results of repeated-measures ANOVA indicated that mothers' mean total CES-D score at each visit did not change significantly over time.

In Table III, a breakdown is provided of the percentage of mothers with a high (16+) or a lower (0–15) CES-D score at 2 months postpartum (intake) who had a high CES-D score at later assessment points (i.e., at 3, 6, 12, and 18 months postpartum), along with results of chi square analyses, odds ratios, and 95% confidence intervals (CIs). Results indicated that mothers with a high CES-D score at 2 months postpartum were significantly more likely than their lower-scoring counterparts to have another high CES-D score later during the first 18 months postpartum. Over a third of mothers with a high CES-D score at intake had another elevated CES-D score at each subsequent assessment.

Results of correlational analyses indicated that maternal CES-D scores were significantly and substantially correlated across all visits (mean $r[163] = 0.57$, range $= 0.47$ to 0.66, all

Table I. Sample Characteristics at Intake

Continuous variables	Total sample N = 163		High CES-D score (16 or higher) (n = 23)		Lower CES-D score (0–15) (n = 140)		$F(1,161)$	p value
	Mean	SD[a]	Mean	SD	Mean	SD		
Number of children at home	1.97	1.04	2.30	1.40	1.91	0.097	2.78	0.0972
Ratio adults to children at home	1.45	0.84	1.34	0.89	1.47	0.83	0.44	0.5075
Hollingshead SES[b] index	43.69	11.56	44.46	10.89	43.56	11.70	0.12	0.7328
Perceived adequacy of income for meeting family needs[c]	3.17	1.03	2.64	1.20	3.26	0.98	7.52	0.0068
Hours per week mother is employed[d]	15.85	18.14	22.35	18.92	14.78	17.85	3.49	0.0634
Hours per week infant receives nonparental child care[e]	14.43	19.14	20.65	21.44	13.52	18.63	2.77	0.0979
Maternal age (years)	29.58	5.46	29.14	6.20	29.65	5.35	0.17	0.6793
Maternal education (years)	14.55	2.13	14.43	2.23	14.56	2.12	0.07	0.7881
Infant birth weight (grams)	3463	514	3416.0	558.1	3470.5	508.2	0.22	0.6386
Infant gestational age (weeks)	39.6	1.3	39.78	1.00	39.51	1.32	0.91	0.3413

Categorical variables	Number	Percent	Number	Percent	Number	Percent	χ^2	df	p value
Infant gender									
Male	81	49.7	13	56.5	68	48.6	0.50	1	0.4797
Female	82	50.3	10	43.5	72	51.4			
Parity									
Primiparous	90	65.2	9	39.1	64	45.7	0.35	1	0.5562
Multiparous	73	44.8	14	60.9	76	54.3			
Mother is US born									
No	32	19.6	3	13.0	29	20.7	0.74	1	0.3907
Yes	131	80.4	20	86.9	111	79.3			
Marital status									
Single	68	41.7	15	65.2	53	37.9	6.08	1	0.0137
Married	95	58.3	8	34.8	87	62.1			
Mother is infant's primary caretaker									
No	30	18.9	5	21.7	25	18.4	0.14	1	0.7035
Yes	129	81.1	18	78.3	111	81.6			
Mother is employed									
No	79	49.4	9	39.1	70	51.1	1.13	1	0.2882
Yes	81	50.6	14	60.9	67	48.9			
Yearly total income									
> $100,000	8	4.9	1	4.4	7	5.0	6.91	6	0.3295
$75–100,000	27	16.6	3	13.0	24	17.1			
$50–75,000	29	17.8	3	13.0	26	18.6			
$30–50,000	38	23.3	4	17.4	34	24.3			
$20–30,000	23	14.1	4	13.4	19	13.6			
$10–20,000	23	14.1	7	30.4	16	11.4			
<$10,000	15	9.2	1	4.4	14	10.0			
Low-income status[f]									
No	125	79.7	15	65.2	110	78.6	1.97	1	0.1604
Yes	38	23.3	8	34.8	30	21.4			

[a]SD = standard deviation.
[b]SES = socio-economic status.
[c]Five-point Likert scale, higher scores reflect greater adequacy.
[d]Includes unemployed mothers, who received a score of 0. Among employed mothers, the mean number of work hours was 34.4 ± 8.4.
[e]Includes infants not receiving nonparental childcare, who received a score of 0. Among infants receiving nonparental childcare, the mean number of child care hours was 34.3 ± 13.5.
[f]Yearly income <$20,000.

Table II. Descriptive Statistics for CES-D Variables at Each Assessment Period

Assessment period	High[a] CES-D score		Average CES-D score	
	Number	Percent	Mean	SD[b]
2 months postpartum	23	14.1	8.06	6.95
3 months postpartum	24	14.7	8.84	8.14
6 months postpartum	22	13.5	8.14	7.43
12 months postpartum	23	14.1	7.99	7.36
18 months postpartum	24	14.7	8.94	7.01
Summary variables				
Mean CES-D total score[c]			8.40	6.02
Mean number of high CES-D scores across all visits			0.71	1.20
Any high[a] CES-D score by 12 months	52	31.9		
Any high[a] CES-D score by 18 months	57	35.0		

Note. Results of a one-way repeated measures ANOVA revealed no significant change in average CES-D scores by time of assessment ($F[4, 159] = 1.59$, $p = .1786$).
[a]High CES-D score refers to a score of 16 or higher.
[b]SD = standard deviation.
[c]Mean of CES-D total scores at 2, 3, 6, 12, 18 months postpartum.

p's < 0.0001). Specific results are provided in Table IV.

Relation of Socio-demographic Variables to CES-D Scores at 2, 3, 6, 12, and 18 Months Postpartum

In the six right-hand columns of Table I, a breakdown of the sample's socio-demographic characteristics by mothers' high (16+) versus lower (0–15) CES-D total scores at 2 months postpartum (intake) is presented. Results of bivariate analyses indicated that two of the 18 socio-demographic variables (single marital status and negative maternal perceptions of the adequacy of income for meeting familial needs) were significantly related to high versus lower maternal depressive symptom status at intake. Four additional socio-demographic variables were marginally related ($p < 0.10$) to high maternal depressive symptom status at intake: number of children at home ($p = 0.097$), the ratio of the number of adults to the

number of children at home ($p = 0.058$), a greater number of hours per week the mother was working ($p = 0.063$), and a greater number of hours per week that the infant was in non-parental care ($p = 0.098$).

Additional bivariate analyses were conducted to evaluate the relation of these 18 socio-demographic variables to maternal CES-D total scores at each assessment period. Results indicated that three of the 18 socio-demographic variables (single marital status, low-income status, and negative perceptions of the adequacy of income for meeting familial needs) were significantly related to maternal CES-D total scores at each assessment period.

Three additional variables (low SES, more than four children at home, and infant gestational age) were significantly associated with maternal total CES-D scores, but only at one assessment point. At 6 months postpartum, mothers with a low SES score or four or more children at home had a higher CES-D score than their lower-risk counterparts. For mothers

Table III. Number and Percent of Mothers With a High[a] CES-D Score at Intake (2 Months Postpartum) Who Also Had a High[a] CES-D Score at Later Assessments

2 month CES-D score	Number and percent of mothers with a high[a] CES-D score							
	3 months		6 months		12 months		18 months	
	N	%	N	%	N	%	N	%
High (16+), N = 23	11	47.8	10	43.5	8	34.8	8	34.8
Lower (0-15), N = 140	13	9.3	12	8.6	15	10.7	16	11.4
χ^2 (df = 1)	23.37, $p < .0001$		20.62, $p < .0001$		9.44, $p = .0021$		8.58, $p = .0034$	
Odds ratio (95% CI[b])	8.96 (3.3, 24.3)		8.21 (3.0, 22.6)		4.44 (1.6, 12.2)		4.13 (1.5, 11.3)	

[a]High CES-D score refers to a score of 16 or higher.
[b]CI = confidence interval.

Table IV. Correlations of CES-D Scores Over Time

	Assessment period[a]			
	2 months	3 months	6 months	12 months
3 months	0.62			
6 months	0.52	0.66		
12 months	0.48	0.60	0.65	
18 months	0.47	0.59	0.61	0.56

Note. N = 163. All correlations are significant, $p < .0001$.
[a]Number of months postpartum.

with low SES, the mean CES-D score was 11.53 (SD = 10.22), compared to a mean CES-D of 7.69 (SD = 6.90) for mothers without low-income status, $F(1, 161) = 4.57$, $p = 0.034$. For mothers with four or more children at home, the mean CES-D score was 12.71 (SD = 11.93), compared to a mean CES-D score of 7.71 (SD = 6.76), for mothers with fewer than four children at home, $F(1, 161) = 5.99$, $p = 0.0155$. At the 12-month assessment period, higher infant gestational age (weeks) was significantly, positively correlated with maternal CES-D scores ($r[163] = 0.15$, $p < 0.05$). All other socio-demographic variables were not significantly related to maternal CES-D total scores at any assessment period.

In Table V, descriptive statistics and results of one-way ANOVAs are presented for the three

risk variables that were significantly related to mother's total CES-D scores at each visit. The socio-demographic variables in this table were collected at the 2-month intake point. However, results were virtually identical whether these risk variables were derived at the 2-month intake point or at later assessments. Complete data on all risk variables are available upon request from the first author.

Composite Socio-demographic Risk Variable

Based on these findings, a composite risk variable was constructed to assess individual mothers' level of socio-demographic risk. One risk point was assigned for each of the following: single marital status, low-income status (total family income < $20,000), and negative maternal perceptions of the adequacy of total family income for meeting familial needs (rating of 1 or 2 on the five-point Likert scale). Risk points were then summed for each subject (possible scores ranged from 0 to 3). Eighty mothers (49.08%) had 0 risk points, 46 (28.2%) had 1 risk point, 25 (15.34%) had 2 risk points, and 12 (7.36%) had 3 risk points.

Table V. The Association of Selected Socio-demographic Risk Variables[a] With Mothers' Mean CES-D Total Scores at Each Assessment Period

			Maternal CES-D total score									
			2 months		3 months		6 months		12 months		18 months	
		N	Mean	SD[b]	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Single marital status	No	95	6.77	6.55	7.22	6.96	7.00	7.77	6.11	5.87	7.79	7.06
	Yes	68	9.87	7.14	11.11	9.12	9.74	6.65	10.62	8.39	10.56	6.65
	$F(1, 161) =$		8.22, $p = 0.0047$		9.57, $p = 0.0023$		5.53, $p = 0.0199$		16.3, $p < 0.0001$		6.40, $p = 0.0124$	
Low-income status[c]	No	125	7.47	6.78	7.61	6.82	7.41	7.52	6.86	6.90	7.89	6.80
	Yes	38	10.00	7.26	12.88	10.60	10.55	6.66	11.68	7.68	12.42	6.61
	$F(1, 161) =$		3.92, $p = 0.0494$		13.1, $p = 0.0004$		5.37, $p = 0.0218$		13.5, $p = 0.0003$		13.1, $p = 0.0004$	
Negative maternal perceptions of the adequacy of total income for meeting familial needs[d]	No	137	6.85	5.97	7.07	5.67	7.29	6.93	6.70	6.63	8.27	6.71
	Yes	26	14.42	8.33	18.17	12.11	12.62	8.45	14.77	7.40	12.50	7.57
	$F(1, 161) =$		30.6, $p < 0.0001$		54.0, $p < 0.0001$		12.0, $p = 0.0007$		31.2, $p < 0.0001$		8.33, $p = 0.0044$	

Note. Results of one-way ANOVAs comparing the CES-D scores of mothers with and without each risk variable were significant at all assessment periods.
[a]These variables were significantly associated with mothers' CES-D total scores at each assessment period.
[b]SD = standard deviation.
[c]Yearly income <$20,000.
[d]Score of 1 or 2 on a five-point Likert rating.

Relation of Level of Socio-Demographic Risk to Summary CES-D Variables

In Table II, univariate descriptive statistics are provided for the two summary CES-D variables used in these analyses: mothers' mean CES-D score (averaged across visits) and the number of visits at which a mother had a high CES-D score. In Table VI, descriptive statistics for these two summary variables are presented, as broken down by the four-level composite risk variable.

Results of one-way ANOVAs indicated that the composite risk variable was significantly associated with mothers' averaged CES-D score ($F[3, 159] = 14.56$, $p < 0.0001$). Results of Tukey post hoc tests indicated that mothers with 3 risk points had a significantly higher averaged CES-D score than mothers with either 2, 1, or 0 risk points. In turn, mothers with 1 risk point had a significantly higher averaged CES-D score than mothers with 0 risk points.

A similar pattern of results was obtained for the persistence variable ($F[3, 159] = 7.02$, $p = 0.0002$). Results of Tukey post hoc tests indicated that mothers with 3 risk points had a significantly greater number of high CES-D scores during the first 18 months postpartum than mothers with either 2, 1, or 0 risk points. Similarly, mothers with 2 risk points had a significantly greater number of high CES-D scores than mothers with 0 risk points.

DISCUSSION

This longitudinal study is among the first to evaluate the prevalence and stability of high depressive symptom levels during the first 18 months postpartum in a selected community sample of otherwise healthy Black adult mothers of term infants. Mothers in this sample varied in socio-demographic characteristics, which made it possible for us to evaluate the relation between varying levels of socio-demographic risk and the severity and chronicity of mothers' depressive symptomatology during this time period.

Prevalence and Stability of Maternal Depressive Symptoms

Findings regarding the prevalence of high maternal depressive symptomatology in this medically low-risk sample were largely consistent with those reported for mothers in low-risk community samples unselected for race (43, 44). In the present study, the prevalence of mothers with an elevated CES-D score (16 or higher) at single visits during the first 18 months postpartum ranged from 13.5% to 14.7%. By 18 months postpartum, over a third (35.0%) of mothers in the present study had at least one elevated CES-D score. The single-visit prevalence values fall within the range of 8-18% reported in the maternal depression literature (1–10). These values are somewhat lower than those reported for mothers of toddlers and preschoolers in a more racially, economically, and medically diverse, national sample (15), in which 23.7% of mothers had a high CES-D score at 17 months postpartum, and 16.6% of mothers had a high CES-D score at 35 months postpartum. Notably, the percentage of mothers with at least one elevated CES-D score over the course of the national study (31.9%) was very similar to that observed in the present study (35%), although the specific time periods evaluated and the number of assessments included in each study differed. In contrast, the prevalence of high levels of maternal depressive symptoms in the present study was significantly lower than that reported for mothers in uniformly high-risk samples, such as low-income or teen cohorts (11–15, 19, 38).

Results from this study also provide evidence for a substantial degree of stability in level of maternal depressive symptomatology over the course of the first 18 months postpartum. Over a third of mothers who had a high CES-D score at 2 months postpartum had another high CES-D score at each subsequent assessment. Moreover, mothers' CES-D scores were strongly correlated across each pair of assessment periods, suggesting that individual mothers retain their initial rank-ordering in level of depressive symptomatology over time. These results replicate

Table VI. Relation Between Level of Socio-demographic Risk and Summary CES-D Variables

Risk score	N	Averaged CES-D total score[a]		Number of visits that a mother had a high[b] CES-D score	
		Mean	SD[c]	Mean	SD
0	80	6.09[d]	4.95	0.40[d]	.092
1	46	9.48[e]	5.96	0.74[de]	1.24
2	25	10.09[ef]	4.49	1.12[e]	1.33
3	12	16.09[g]	7.11	1.83[f]	1.53
		$F(3, 159) = 14.56$, $p < 0.0001$		$F(3, 159) = 7.02$, $p = 0.0002$	

Note. Means with different superscripts in each column were significantly different in Tukey post hoc analyses.

[a] Arithmetic mean of mothers' CES-D total scores at 2, 3, 6, 12, and 18 months postpartum.

[b] High CES-D score refers to a score of 16 or more.

[c] SD = standard deviation.

and extend findings from prior research that evaluated the course of maternal depressive symptomatology during the first year postpartum in a low-risk cohort of mostly White mothers (44). In that study, as in the present study, approximately a third of mothers with a high CES-D score at 2 months postpartum had another high CES-D score at 3, 6, and 12 months postpartum, and mothers' CES-D scores were correlated across time. Similar findings were also reported in studies of racially and economically diverse cohorts of mothers of toddlers and preschoolers (15, 39).

It is noteworthy that, in the present study, mothers' average CES-D scores at each assessment point did not diminish significantly during the first 18 months postpartum, in contrast to the significant remission reported in some other longitudinal studies of medically low-risk postpartum women. In one set of studies (42, 43), only 13% of mothers who met diagnostic criteria for major or minor depression at 2 months postpartum continued to meet diagnostic criteria at 24 months postpartum. Nevertheless, approximately a third of these women continued to report high levels of depressive symptoms by 24 months postpartum. Similarly, in other longitudinal research (44), mothers' average CES-D score decreased significantly from 2 to 3 months postpartum but did not change from 3 to 12 months postpartum.

Socio-Demographic Risk

The findings in the present study do not support suggestions made in some prior reports that Black women living in the U.S. may universally have higher levels of depressive symptomatology than White women (28, 31). Rather, the mothers in the present study exhibited variability in the level of their depressive symptomatology during the first 18 months postpartum, which was associated with their socio-demographic risk status. In this sample, three specific socio-demographic risk variables (single marital status, low-income status, and negative maternal perceptions of the adequacy of income for meeting familial needs) were associated with higher mean maternal CES-D scores at each assessment period. These findings are consistent with a large literature documenting that single mothers and low-income mothers tend to experience higher levels of depressive symptoms than their lower-risk counterparts (19, 36). Moreover, as the number of these risk factors increased, mothers had increasingly higher levels of depressive symptomatology overall as well as a greater number of elevated CES-D scores during the first 18 months

postpartum. These results provide some general support for a cumulative risk hypothesis (50, 51).

In much of the maternal depression literature, Black race has been confounded with low SES. This is not surprising since Black families in the U.S. are disproportionately more likely than White families to live in poverty (33). However, a sizable number of Black families in the U.S. have higher socio-economic status. The results from this study suggest that further attention be given to this understudied group in future research.

Limitations

Several limitations of this study should be noted. Due to the study's low-risk inclusion criteria, the findings of this study likely pertain only to healthy, adult Black mothers who are parenting healthy, full-term infants. Findings may not generalize to higher-risk groups of Black mothers, such as chronically ill mothers, teen mothers, mothers of sick or prematurely born infants, or mothers living in severe poverty. Moreover, the relatively small sample size ($N = 163$) may have limited statistical power needed to identify additional socio-demographic correlates of depression.

Another limitation is that the CES-D was the sole measure of maternal depressive symptomatology used in this study. Although the CES-D has sound psychometric properties and higher CES-D scores have been linked to a clinical diagnosis of depression in studies of postpartum women (44), and to poorer adaptive functioning, both in the general population (52–54) and among postpartum women (22, 47), the CES-D measures depressive symptom levels rather than depression per se. Thus, mothers with an elevated CES-D score do not necessarily have clinically significant depression.

For mother–infant dyads, higher levels of maternal depressed mood and affect may be especially problematic, particularly if chronic (42), because they may create a negative "affective climate" for caregiving that is likely to compromise the mother–infant relationship and ultimately the child's functioning. For this reason, the substantial degree of stability in depressive symptom levels reported in this and other studies is clinically important and warrants further attention from public health professionals and health care practitioners. This is especially important because primary care providers do not often recognize or treat maternal depression (55–57). Another obstacle to receiving care is that women with high levels

of depressive symptoms (particularly if they are from low-SES backgrounds) may not always seek out professional help or discuss their symptoms with a health care professional (55). Because early identification of postnatally depressed mothers and early adequate treatment have been associated with a shorter duration of postpartum depressive symptomatology (58), programs should be put into place in which health care providers routinely screen new mothers (regardless of race) for depressive symptomatology early in the postpartum period, using the CES-D or similar screening instrument. This could take place at the infant's pediatric visits or mothers' visits to their own primary care provider. Mothers reporting high levels of depressive symptoms should be monitored or referred for further evaluation.

CONCLUSION

In conclusion, the results of this study indicate that the prevalence of high depressive symptom levels during the first 18 months postpartum among healthy, adult Black mothers varying in social class is largely consistent with that reported for mothers in community samples unselected for race. In the present study, mothers with higher socio-demographic risk profiles had significantly higher mean CES-D scores and a greater number of high CES-D scores during the first 18 months postpartum than their lower-risk counterparts. Evidence for a substantial amount of stability in maternal depressive symptom levels over the course of the first 18 months postpartum was also found. Over a third of mothers with a high CES-D score at 2 months postpartum had another high CES-D score at subsequent assessments. Moreover, mothers' CES-D scores were significantly correlated over time. These findings suggest that the high depressive symptom levels reported by some mothers early in the first postpartum year are not transient. Given that chronic depression can exert deleterious effects on maternal and child functioning (21, 47, 59), these findings suggest that further attention be given by public health professionals and primary care providers to the design and implementation of depression screening programs for postpartum women, regardless of race.

ACKNOWLEDGMENTS

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