

Risk Factors for Serious Psychological Distress among Pregnant Women and Mothers with Children less than One Year of Age: An Evaluation of National Health Interview Survey Data (1997–2016)

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Objective: This study examined individual factors associated with serious psychological distress (SPD) in mothers.

Methods: The study used National Health Interview Survey data (1997-2016), with analysis being restricted to pregnant women and non-pregnant mothers whose youngest child was 12 months old or younger. The Andersen framework, a reliable tool to study health services, was used to examine the effect of individual predisposing, enabling, and need factors.

Results: Of 5,210 women, 13.3% had SPD, as determined by the Kessler-6 scale. Compared to those without SPD, those with SPD were more likely to be 18 to 24 years old (39.0% vs. 31.7%; all *P* values < .001), never have been married (45.5% vs. 33.3%), not have completed high school (34.4% vs. 21.1%), have a family income below 100% of the federal poverty level (52.5% vs. 32.0%), and have public insurance (51.9% vs. 36.3%). Furthermore, women with SPD had a lower proportion of “excellent” health status (17.5% vs. 32.7%). Multivariable regression found that having any formal education was associated with a lower likelihood of perinatal SPD than was not completing high school. For example, the bachelor’s degree odds ratio was 0.48 (95% CI: 0.30, 0.76). A receiver operator curve analysis revealed that individual predisposing factors (e.g. age, marital status, and education), accounted for more explained variation than did enabling or need factors.

Conclusion: There are high levels of poor maternal mental health. Prevention and clinical services should focus on mothers with less than a high school education and those reporting poor physical health. [*P R Health Sci J* 2023;42(1):57-62]

Key words: Perinatal, Pregnancy, Psychological distress, Mothers, Poverty

Overwhelming feelings of sadness, guilt, irritation, resentment, hopelessness, emptiness, and discontent can overcome the joy and infant-bonding that mothers generally experience after birth (1). Depressive symptoms such as these vary from the maternity blues to perinatal depression, both of which affect 50% to 80% of mothers and occur before delivery and in the first few days after (2). About 1 in 7 women suffer from postpartum depression (PPD), making it the most common complication for women who have just had a baby, and 8.5 to 11% of women are affected by depression during pregnancy (3, 4). The prevalence rates of perinatal depression among mothers in the U.S. range from 15% to 20%, making it the most common obstetric complication in that country (5).

The perinatal period generally includes the time during pregnancy and up to 12 months after delivery, with depressive symptoms being more prevalent or more severe after delivery (4, 6). Poor maternal mental health can be severe, and depressive

symptoms may include thoughts of using violence toward oneself (mother) and/or the baby (7). To escape the feeling of being trapped; obsessive thoughts of being a bad mother (7) may prevent sleep among women with PPD. Untreated perinatal depression may lead to suicide attempts or ideation, with suicidal ideation being the primary cause of psychiatric hospital admissions in the postpartum year, and suicide being the leading cause of maternal death (8).

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The poor mental health of some mothers may also affect their children's health, as evidenced by a 13% greater incidence of premature delivery and retarded fetal growth, i.e., a 15% greater incidence of low birth weight (9, 10). Furthermore, depressed mothers are about 1.5 times more likely to engage in less healthy feeding and sleep practices with their infants (11). Caregiving activities, such as well-child visits and vaccinations, may also be compromised with perinatal depression (12). Perinatal depression can also lead to an increased risk of child abuse and neglect, costly increases in health care use, poor family functioning, perinatal obstetric complications, breastfeeding challenges, and delayed infant development (5).

An analysis of data from the U.S. Centers for Disease Control and Prevention Pregnancy Risk Assessment Monitoring System found that depressive symptoms were significantly associated with physical abuse before or during pregnancy, partner-related stress, traumatic stress, financial stress, and the use of tobacco during the last 3 months of pregnancy (5). A number of risk factors have been associated with poor maternal mental health; Leigh and Milgrom discovered young age, low income, and low educational attainment to be predisposing factors for perinatal depression (13). Furthermore, being a single mother, having poor social support, and a past medical history of depression are psychosocial risk factors for perinatal depression (5). Also, a family history of PPD is strongly associated with mothers experiencing depression after their first delivery (5, 14). Thus, the prevalence of perinatal depression is highest among the most socially and economically disadvantaged women, who frequently experience threatening and uncontrollable life events. Conversely, education, regular work, health care services, and supportive family relationships are associated with a lower risk of perinatal depression (14).

Though there have been previous studies looking at the risk factors that have the strongest association with perinatal depression, this study explores a handful of factors possibly associated with poor mental health among pregnant women and mothers with children less than 12 months of age. The Anderson behavioral model framework (15, 16) provides an overview of the feedback loop between contextual (community/population) characteristics, individual characteristics, health behavior, and outcomes used in selecting variables to test for associations with poor maternal mental health during the perinatal period.

Materials and Methods

This study used secondary data (1997 to 2016) from the National Health Interview Survey (NHIS). The survey was conducted by the National Center for Health Statistics, which is part of the CDC. The NHIS is a population-based, cross-sectional household interview survey that uses a multistage area probability sampling design and computer-assisted interviewing and has been conducted continuously every year since 1957 (17). The CDC obtains data from roughly 35,000 households per year, obtaining said data for the family as a whole and then details for a sample

adult and sample child. The unconditional response rates have decreased steadily over time, with the sample adult module rate dropping from roughly 80% in 1997 to 60% in 2014 (18). The mean time spent for the interviews was around 80 minutes for much of the study period, with a minimum of 60 minutes in 2006 and 100 minutes in 2015 (18). The data was obtained from the IPUMS Health Surveys website (19). The data file extracted for this study (20) included 5,210 respondents who indicated that they were "currently pregnant" or had a child that was less than 12 months of age at the time of the survey. We also excluded those who were not asked mental-health screening questions. Loma Linda University's Institutional Review Board determined that this was an exempt, non-human-subjects study (IRB #5180133).

Measures

The survey year and region were conceptualized as contextual predisposing factors guided by the Andersen behavioral model framework. Individual predisposing characteristics included age, race, Hispanic ethnicity, marital status, education, and citizenship. Individual enabling characteristics were poverty status, health insurance, public insurance, and having a usual place to receive care. Self-reported health status, current pregnancy status, and the number of children were conceptualized as individual need characteristics. The primary outcome was perceived mental health status. The secondary outcome was health care utilization. More complete levels of variables are shown in Table 1.

The 6-item Kessler Psychological Distress (K6) Scale was used to assess mental health. The K6 scale is a 6-item screen for the presence of serious mental illness, classified according to the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) (21). The scale was developed for community epidemiological needs-assessment surveys in the U.S. but has subsequently been validated and used in other countries (22). Following the standard categorization of the K6 scale, a score of 13 or higher indicates serious psychological distress (SPD). The K6 scale does not diagnose a specific mental disorder; however, it can identify mental illness that is severe enough to cause functional impairment and require treatment (23). Since depression and anxiety are by far the most common mental diagnoses among pregnant women and (non-pregnant) mothers with young children, it is likely that women identified as having SPD had depression or anxiety. Thus, though we are formally analyzing SPD, we are operating with the assumption that our findings are roughly equivalent to the more commonly studied topic of maternal depression, i.e., SPD as a proxy measure.

Statistical analysis

Using SAS software, version 9.4, we carried out a bivariate comparison of independent variables to summarize those with and without SPD. Statistically significant differences in proportions were evaluated using the chi-square or Fisher's exact

test for categorical variables. Wilcoxon signed-rank tests were used to compare the mean values of highly skewed quantitative variables. Multivariable logistic regression was employed to explore associations with SPD (yes/no). A receiver operating characteristic (ROC) curve analysis (24) was used to observe changes in the area under the curve (AUC) for each component of the Andersen behavioral model framework.

Results

Sample characteristics

As seen in Table 1, the sample population consisted of 5,210 female respondents, of whom 2,152 were pregnant at the time of the survey and 3,149 had a child 12 months of age or younger. Most of the respondents self-identified as non-Hispanic white and had health insurance and a usual place for medical care, with roughly half being 25 to 34 years old. Out of the 5,210 respondents, 4,516 scored less than 13 using the K6 Scale, while 694 scored greater than or equal to 13, i.e., 13.3% had SPD. Those with SPD were more likely to be 18 to 24 years of age (39.0% vs. 31.7%; $P < .0005$), to never have been married (45.5% vs. 33.3%; $P < .001$), to have not completed high school (34.4% vs. 21.1%; $P < .001$), to have a family income of less than 100% of the federal poverty level (FPL) (52.5% vs. 32.0%; $P < .001$), to have public insurance (51.9% vs. 36.3%; $P < .001$), and to have 3 or more children (31.4% vs. 23.3%; $P < .0001$). They also were modestly more likely to not have a usual source of medical care (15.2% vs. 12.1%; $P = .0442$) and less likely to have self-reported excellent health (17.5% vs. 32.7%; $P < .001$).

Table 2 presents the results from the multivariable regression model. The likelihood of perinatal SPD decreased as women obtained more education. Compared to respondents who had never attended high school or had attended for some period of time from kindergarten through 12th grade, the odds ratio (OR) for having a high school

Table 1. Characteristics of pregnant women and (non-pregnant) mothers with children less than one year old in the United States, 1997–2016, (n = 5210).

	No SPD (n, %)	SPD (n, %)	P value
<i>Region of residence</i>			.7885
Northeast	678 (15.0)	100 (14.4)	
North Central/Midwest	1064 (23.6)	162 (23.3)	
South	1599 (35.4)	259 (37.3)	
West	1175 (26.0)	173 (24.9)	
<i>Age</i>			.0005
18–24	1435 (31.7)	271 (39.0)	
25–34	2423 (53.6)	341 (49.1)	
35–49	658 (14.6)	82 (11.8)	
<i>Race</i>			.0619
White	3263 (72.3)	475 (68.4)	
Black/African American	890 (19.7)	161 (23.2)	
Aleut, Alaskan Native, or American Indian	65 (1.4)	12 (1.7)	
Asian	153 (3.4)	17 (2.4)	
Other race/multiple races	140 (3.1)	29 (4.2)	
<i>Hispanic ethnicity</i>			.1717
Not Hispanic	3398 (75.2)	492 (70.9)	
Hispanic	1118 (24.8)	202 (29.1)	
<i>Marital status</i>			< .0001
Never married	1502 (33.3)	316 (45.5)	
Married	1500 (33.3)	142 (20.5)	
Widowed	1044 (23.2)	132 (19.0)	
Separated/divorced	460 (10.2)	104 (15.0)	
<i>Education</i>			< .0001
Never attended/kindergarten through less than 12 th grade	951 (21.1)	237 (34.4)	
High school/GED or equivalent	2152 (47.7)	347 (50.4)	
Associate degree	454 (10.1)	51 (7.4)	
Bachelor's degree	623 (13.8)	37 (5.4)	
Master's/professional/doctoral degree	329 (7.3)	17 (2.5)	
<i>U.S. citizenship</i>			1.000
Not U.S. citizen	561 (13.2)	3682 (13.2)	
U.S. citizen	83 (86.8)	546 (86.8)	
<i>Ratio of family income to poverty threshold</i>			< .0001
Ratio less than 1.00	1306 (32.0)	323 (52.5)	
Ratio 1.00 – 1.99	949 (23.3)	147 (23.9)	
Ratio 2.00 and over	1821 (44.7)	145 (23.6)	
<i>Has any health insurance</i>			.0129
Yes	3850 (85.5)	562 (81.0)	
No	652 (14.4)	130 (18.7)	
Unknown	14 (0.3)	2 (0.3)	
<i>Has any public insurance (Medicaid/other public assistance/State sponsored plan or CHIP)</i>			< .0001
No	2868 (63.7)	333 (48.1)	
Yes	1634 (36.3)	359 (51.9)	
<i>Has usual place for medical care</i>			.0442
No	547 (12.1)	105 (15.2)	
Yes, one usual place	3916 (86.9)	577 (83.6)	
Yes, more than one place	43 (1.0)	8 (1.2)	
<i>Health status</i>			< .0001
Excellent	1475 (32.7)	121 (17.5)	
Very good	1554 (34.4)	176 (25.4)	
Good	1158 (25.7)	242 (34.9)	
Fair	299 (6.6)	117 (16.9)	
Poor	27 (0.6)	37 (5.3)	
<i>Currently pregnant</i>			< .0001
No	2616 (58.1)	427 (61.8)	
Yes	1888 (41.9)	264 (38.2)	
<i>Age of youngest own child</i>			< .0001
0–12 months	2702 (59.8)	447 (64.4)	
>12 months	1814 (49.2)	247 (35.6)	
<i>Number of children</i>			< .0001
0	673 (14.9)	95 (13.7)	
1	1529 (33.9)	184 (26.5)	
2	1263 (28.0)	197 (28.4)	
3+	1051 (23.3)	218 (31.4)	
<i>Kessler Scale, Median (Range)</i>	7.30 (1 – 12)	14.13 (13 – 24)	< .0001

CHIP: Children's Health Insurance Program; GED: General Educational Development; SPD: serious psychological distress

Table 2. Logistic regression for presence of maternal serious psychological distress.

Variable	OR (95% CI)*	P value
<i>Region</i>		
Northeast	1.00 (referent)	
Northeast Central/Midwest	1.10 (0.78, 1.54)	.241
South	1.19 (0.88, 1.63)	.141
West	1.03 (0.75, 1.44)	.282
<i>Age</i>		
18–24	1.00 (referent)	
25–34	0.96 (0.76, 1.21)	.669
35–49	0.89 (0.63, 1.25)	.458
<i>Race</i>		
White	1.00 (referent)	
Black/African American	0.94 (0.72, 1.21)	.747
Aleut, Alaskan Native, or American Indian	1.12 (0.54, 2.13)	.578
Asian	1.01 (0.54, 1.97)	.806
Other race/multiple races	1.40 (0.83, 2.31)	.294
<i>Hispanic ethnicity</i>		
Not Hispanic	1.00 (referent)	
Hispanic	0.92 (0.70, 1.19)	.538
<i>Marital status</i>		
Married	1.00 (referent)	
Never married	1.31 (0.99, 1.74)	.094
Divorced/separated	1.17 (0.79, 1.74)	.306
Widowed	1.32 (0.94, 1.86)	.163
<i>Education</i>		
Never attended/kindergarten through less than 12 th grade	1.00 (referent)	
High school/GED or equivalent	0.73 (0.58, 0.92)	.026
Associate degree	0.62 (0.42, 0.91)	.088
Bachelor’s degree	0.48 (0.30, 0.76)	.018
Master’s/professional/doctoral degree	0.49 (0.26, 0.87)	.038
<i>Citizen</i>		
Not U.S. citizen	1.00 (referent)	
U.S. citizen	1.20 (0.85, 1.69)	.324
<i>Ratio of family income to poverty threshold</i>		
Ratio = less than 1.00	1.00 (referent)	
Ratio = 1.00 – 1.99	0.86 (0.67, 1.11)	.168
Ratio = 2.00 and over	0.71 (0.51, 0.99)	.052
<i>Has any health insurance</i>		
No	1.00 (referent)	
Yes	1.32 (0.95, 1.84)	.196
<i>Has any public health insurance</i>		
No	1.00 (referent)	
Yes	1.25 (0.94, 1.66)	.176
<i>Health status</i>		
Poor	1.00 (referent)	
Excellent	0.08 (0.04, 0.16)	<.0001
Very good	0.10 (0.05, 0.19)	<.0001
Good	0.17 (0.09, 0.31)	<.0001
Fair	0.26 (0.14, 0.50)	0.004
<i>Currently pregnant</i>		
No	1.00 (referent)	
Yes	0.85 (0.67, 1.10)	.63
<i>Number of children</i>		
0	1.00 (referent)	
1	0.71 (0.50, 1.00)	.045
2	0.79 (0.55, 1.14)	.212
3+	0.98 (0.66, 1.46)	.912

*Odds ratio (OR) with 95% confidence interval (CI); GED: General Educational Development Survey year included in model but not shown.

Table 3. Receiver operator curve analysis of maternal serious psychological distress logistic regression models.

	Area under the curve	Gain in AUC
No measures	0.5000	
Region and survey year	0.5705	0.0705
Adding age, marital status, education, race, Hispanic status, citizenship	0.6559	0.0854
Adding poverty, health insurance, public insurance, usual place	0.6836	0.0277
Adding health status and currently pregnant, number of children, age of youngest child	0.7206	0.037

AUC: area under the curve

diploma/General Educational Development certificate was 0.73 (95% CI: 0.58, 0.92) and for having a bachelor’s degree was 0.48 (95% CI: 0.30, 0.76). Any health status greater than “poor” was much less likely to be associated with SPD. For example, those reporting having “excellent” health had an OR of 0.08 (95% CI: 0.04, 0.16). A family income greater than 200% FPL was marginally associated with SPD (OR: 0.71; 95% CI: 0.51, 0.99). In the multivariable analysis, there was not a significant difference in risk of SPD between those who were pregnant and those caring for infants.

Table 3 summarizes the ROC curve analysis of the staged logistic regression models. The AUC quantifies how well the model can distinguish those with SPD versus those without SPD. The largest group of predictors is that composed of individual predisposing factors such as age, marital status, education, race, and Hispanic status, which accounted for an AUC gain of 0.0854 or 38.7% of explained variation (0.0854/(0.7206-0.5000)). Note that random guessing for a bivariate outcome would ultimately be correct half of the time, so we only care about AUC greater than 0.5. Context, measured by Census region and survey year, had a surprisingly significant effect – 32% of the explained variation. However, we were more interested in personal characteristics, not temporal trends or large national regions for this analysis. Need factors, such as perceived health status, pregnancy status, number of children, and the age of the youngest child, accounted for 16.8% of explained variation. Enabling factors such as poverty, health insurance, and having a usual place for medical care accounted for 12.6% of explained variation.

Discussion

As a result of pooling 19 years of an extensive community-based survey, we were able to identify 5,210 women who were pregnant or caring for a child less than 12 months of age at the time of the survey. Of these, 13.3% were determined to have SPD. In contrast, most community-based studies and U.S. national estimates place SPD prevalence at 3 to 5% within the general population (25). Within this national sample, factors such as the region of residence, race, Hispanic ethnicity, citizenship

status, and the age of the youngest child were all not significantly associated with SPD. In contrast, the univariate analysis found that maternal age, marital status, level of education, poverty, having any kind of health insurance (particularly, having public insurance), having a usual place for medical care, physical health status, pregnancy vs. caring for an infant, and the number of children were all found to be significantly associated with SPD. Multivariable regression suggested that education and physical health had the strongest direct association.

Following the Andersen behavioral model framework, the analysis indicated that individual predisposing factors, particularly education, were the ones most strongly associated with SPD. The next strongest individual factors were in the category of need, mainly self-reported health status. Finally, individual enabling factors, particularly family poverty level, had the least association with perinatal SPD.

Chambers et al. (26) found that women at the highest risk for perinatal depression fell in the age bracket of 25 to 34 years, though our study suggested that women 18 to 24 years of age may have a greater risk. Other studies have emphasized socioeconomic status, specific to the lack of education, low income, and being unmarried, as risk factors for perinatal depression (2, 27). Lower education levels played a role in the increase of perinatal depression, and women who identified with low income were more likely to experience perinatal depression than were those with higher incomes (28). Notably, women that identified as having a negative health status were more likely to have perinatal depression than were those with a positive health status (29). Women who had never been married or were separated/divorced were more likely to experience perinatal depression due to the lack of a social support system (30). This study found similar trends, in that the majority of the women with perinatal SPD had never been married, had a high school diploma or equivalent, and had a poverty ratio of less than 1.00.

This study demonstrated that pregnant women and mothers caring for infants had high levels of SPD compared to the general community. These findings emphasize the need to consider factors most associated with poor mental health among pregnant women and (non-pregnant) mothers of children less than 12 months old, particularly—in both cases—women having low levels of education, poor health status, and multiple children. Preventive strategies should focus on access to education and health care services and on mental health screening during perinatal care.

Limitations of the Study

Though the NHIS collects a wide variety of socio-demographic data, said data do not include all the factors that might influence maternal mental health, such as genetics, diet, and childhood experiences. The self-reported data are subject to several potential biases, such as recall bias. There are no clinical data, nor is there any verification of the respondents' self-reports. The K6 scale was used to identify women who had SPD. With the data given, we could not say for sure how many of the women

with SPD actually had depression, though based on numerous studies, it is safe to assume that depression was the most common mental illness among those screened as having SPD. Indeed, the SPD findings were generally consistent with similar findings in the existing perinatal depression literature. Finally, with cross-sectional data, we could not evaluate cause-and-effect among the many independent variables. For example, it is possible that variables not significant in our regression model, such as race and citizenship, might influence SPD through other means, such as maternal age, the number of children, and physical health. As for study strengths, even though we have modest sample size, results are nationally representative due to the survey's multistage random sampling design. The NHIS is a well-established national survey that has been done annually, for decades, and continues to be done, today. The K6 scale has been validated and used in a handful of large population-based surveys.

Resumen

Objetivo: Este estudio examinó los factores individuales asociados con la angustia psicológica grave (SPD, por sus siglas en inglés) en las madres. **Métodos:** El estudio utilizó datos de la Encuesta Nacional de Entrevistas de Salud (1997-2016), restringido a mujeres embarazadas y madres no embarazadas cuyo hijo menor tenía 12 meses de edad o menos. El marco de Andersen se utilizó para examinar el efecto de los factores individuales de predisposición, habilitación y necesidad. **Resultados:** De 5.210 mujeres, el 13,3% tenía SPD, según lo determinado por la escala Kessler-6. En comparación con los que no tenían SPD, era más probable que los que tenían SPD tuvieran entre 18 y 24 años (39,0 % frente a 31,7 %; todos los valores de $p < 0,001$), no estuvieran casados (45,5% frente a 33,3%), no terminaran la escuela secundaria (34,4% frente a 21,1%), tienen un ingreso familiar por debajo del 100% del nivel federal de pobreza (52,5% frente a 32,0%), tienen seguro público (51,9% frente a 36,3%) y tienen menos probabilidades de tener una salud "excelente" estado (17,5% vs. 32,7%). La regresión multivariable encontró que tener cualquier educación formal se asoció con una menor probabilidad de SPD perinatal que no completar la escuela secundaria. Por ejemplo, la razón de probabilidad de la licenciatura fue de 0,48 (IC del 95%: 0,30, 0,76). Un análisis de la curva del operador del receptor reveló que los factores predisponentes individuales (p. ej., edad, estado civil y educación) representaban una variación más explicada que los factores habilitadores o necesarios. **Conclusión:** Existen altos niveles de mala salud mental materna. Los servicios clínicos y de prevención deben centrarse en las madres con menos de educación secundaria y aquellas que reportan mala salud física.

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