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Research paper

Modeling trait depression amplifies the effect of childbearing on postpartum depression

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ABSTRACT

Background: The literature on the relative risk for depression in the postpartum period has largely focused on state (or episodic) depression, and has not addressed trait depression (a woman's general tendency to experience depressed mood). The present study evaluates the association between childbirth and depression in the postpartum period, taking into account the role of stable differences in women's vulnerability for depression across a 10-year span.

Methods: Data from the National Longitudinal Survey of Youth 1997 Cohort (N = 4385) were used. The recency of childbirth was used as a predictor of state depression in two models: one that modeled stable depressive symptoms over time (a multi-state single-trait model; LST), and one that did not (an autoregressive cross-lagged model; ARM).

Results: Modeling trait depression, in addition to state depression, improved model fit and had the effect of increasing the magnitude of the association between childbirth and state depression in the postpartum period.

Limitations: The secondary nature of the data limited the complexity of analyses (e.g., models with multivariate predictors were not possible), as the data were not collected with the present study in mind.

Conclusions: These findings may reflect the fact that some of the covariance between childbirth and episodic depression is obscured by the effect of trait depression, and it is not until trait depression is explicitly modeled that the magnitude of the relationship between childbirth and depression becomes clear.

1. Introduction

There is a developing consensus that depression is more common in the postpartum period than at other times in a woman's life (O'Hara and McCabe, 2013). It has been long established that severe depressive and bipolar episodes requiring hospitalization peak in the early postpartum period (Kendell et al., 1987). In addition to severe episodes, mild mood disturbances, often called the "postpartum blues," arise in the postpartum period and are very common (O'Hara et al., 1991). However, whether risk for depression increases in the postpartum period is still debated given the limited number of longitudinal studies examining symptoms across a woman's childbearing years. For example, in their prospective study Cooper et al., (1988) found that postpartum women did not have a greater rate of depression than a comparable sample of women from the community. Similarly, O'Hara et al. (1990), in comparing postpartum women and matched controls, did not find evidence of a greater risk for major or minor depression diagnoses.

More recent and much larger studies have found significantly higher rates of depression or psychiatric hospitalization for postpartum women than for control groups of non-postpartum women. Using data from a large nationally representative survey and controlling for numerous potential confounders, Vesga-López et al. (2008) found that the twelve month prevalence of depression was significantly higher in postpartum women than non-pregnant/postpartum women (AOR = 1.52; 95% CI 1.07–2.15). Eberhard-Gran et al. (2002) similarly found that, when controlling for the risk factors of depression, the odds ratio for depression was increased in the postpartum period (AOR = 1.6; 95% CI 1.0–2.6) compared to non-postpartum women. Findings from a register-based cohort also highlighted an increased risk of hospital admission with any mental disorder through the first 3 months after childbirth for both primiparous (RR = 7.31; 95% CI 5.44–9.81) and multiparous women (RR = 2.67; 95% CI 1.99–3.59), with the highest risk period being 10–19 days postpartum (Munk-Olsen et al., 2006). Davé et al. (2010) followed mother, father, and baby triads from birth of the child to age 12 years, and reported that mother's depression episode incidence rates were 13.93 per 100 person-years in the first year after childbirth, and reduced to 6.07 per 100 person-years across the remaining 11 years of follow-up. These studies, though varied in

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methodology and reliant on secondary data, suggest that depression is more common in the postpartum period than at other times.

Findings from past and more recent studies have all examined women in the context of a single pregnancy, which limits the conclusions that can be drawn. This feature of studies is a significant limitation because there is no way to rule out that a subset of women would have been depressed at the time of assessment regardless of pregnancy status. The present study addressed these methodological limitations by utilizing data from a longitudinal, large scale study of women in which depression and childbirth were assessed repeatedly over a 10-year period, which allows for the estimation of both trait (stable) and state (episodic) depression.

1.1. Trait depression

Depression is typically measured as a labile state variable, whether by self-report (e.g., the Edinburgh Postnatal Depression Scale, Beck Depression Inventory) or interview (e.g., Hamilton Rating Scale for Depression) in studies of postpartum depression. Time frames for reporting symptom severity typically range from one to two weeks, reflecting the "state" nature of the assessment. A relatively new measure, the Maryland Trait and State Depression-Trait Scale (Chiappelli et al., 2014), asks respondents to report on how they have felt across their adult life, thus capturing stable symptoms. In addition, personality inventories such as the NEO PI-3 (McCrae et al., 2005) and the PID-5 (Krueger et al., 2012) measure depression as an enduring trait, usually as a facet of neuroticism. Another way to measure trait depression is to model it through the use of repeated assessments of depression over time so as to create a latent variable reflecting trait depression (Steyer et al., 1999). This type of measurement may be more reliable because it is less affected by recall bias. Variance in depressive symptoms that is stable across measurement occasions reflects trait depression, and the residual episodic variance reflects state depression. This study takes the latter approach, using longitudinal data to estimate differences between women's symptoms that are consistent over time.

1.2. The present study

The present study examined the relative risk for depression during the postpartum period and included "trait depression" (as a latent factor) in this longitudinal childbirth-depression analysis. The analyses used archival data from a large nationally representative survey, the National Longitudinal Survey of Youth 1997 Cohort (NLSY97). This dataset comprises repeated measures of childbirth and symptoms of depression, which allowed for the estimation of a latent depression variable.

The present study is novel in investigating the impact of stable symptoms of depression on episodes of postpartum depression. It was hypothesized that taking into account a woman's tendency to experience depressed mood would mitigate the effect of childbearing on depression. In other words, it was predicted that the relationship between childbirth and depression would decrease once controlling for trait depression

2. Methods

2.1. Sample

Data were from the National Longitudinal Survey of Youth 1997 Cohort (female N = 4383; United States Department of Labor, Bureau of Labor Statistics). A total of 26.6% of female participants were Black, 21.1% were Hispanic, 1.0% were Mixed Race (Non-Hispanic), and 51.4% were Non-Black/Non-Hispanic. Data from the years 2000, 2002, 2004, 2006, 2008, and 2010 (the six time points at which depression was assessed) were used. The average age of female participants in 2000 was 18.48 years (SD = 1.44 years; range = 15.33–21.33 years). The average age of female participants at the last time point (2010) was 28.39 (SD = 1.43 years, range = 25.83–31.42 years). Rates of childbirth for the years 2000, 2002, 2004, 2006, 2008, and 2010 were 5.86, 8.58, 10.07, 10.64, 10.51, and 9.18%, respectively. For a complete description of the NLSY97 cohort and data collection procedures, see the NLSY97 Technical Sampling Report and the NLSY97 webpage (Moore et al., 2000; United States Department of Labor, Bureau of Labor Statistics, 2016).

2.2. Procedures

Data regarding depression and childbirth were obtained during each interview. At each assessment subjects were asked to date any childbirth occurring since the previous interview. Responses to the Mental Health Inventory (the depression measure) were collected at each assessment (using the past month as the time frame). Demographic data were obtained from the baseline assessment.

2.3. Measures

Because there is no consensus regarding peak time for onset of depression in the postpartum period (Howard et al., 2014), postpartum status was represented as the recency of childbirth (calculated as 12 minus the number of months since giving birth at the time of interview). For women who were interviewed but had not given birth in the past year, recency was coded as zero.

The five-item version of the Mental Health Inventory was used as a measure of depression (Berwick et al., 1991). The Mental Health Inventory has good sensitivity and specificity to depression relative to a criterion diagnosis of Major Depression via structured clinical interview using the Diagnostic Interview Schedule (AUC = 0.89; Robins et al., 1981). The five items ask respondents to rate how often in the previous month they experienced anxiety, depression, and positive affect. The two items assessing positive affect were recoded, so that higher scores reflected greater levels of depression for all items. Reliability (Cronbach's coefficient alpha) ranged from 0.77 to 0.80 across the six time points.

2.4. Missing data

Of the 4383 female respondents, 2168 (49%) had missing data on one or more variables. 2288 women had complete data from all six time points, 434 had data from five time points, 408 from four time points, 770 from three time points, 480 from two time points, and three from one time point.

To test whether data were missing completely at random, we evaluated homoscedasticity between groups with shared patterns of missingness. Since structural equation models are a function of covariance matrices, tests of homoscedasticity are more relevant than tests of means (such as Little's test for missing completely at random; Little, 1988). We used the methods developed by Jamshidian and Jalal (2010) to test whether data was missing at random. This method tests whether groups defined by a shared pattern of missingness have a covariance matrix of observed data that differs significantly from the other groups. Jamshidian and Jalal's (2010) methods are relatively robust to non-normality, large numbers of missing data patterns, and small groups. Tests were performed using the R package 'MissMech' (Jamshidian et al., 2014).

Chi-squared comparisons of the covariance matrices were rejected, suggesting that the data were not missing completely at random. We therefore investigated whether missingness was predicted by other variables in the NLSY97 dataset, including respondent's age, race, education, employment, and marital status (all measured at the first time point). Race/ethnicity and age significantly predicted missingness. We therefore covaried structural models on both age and race, and used full-information maximum likelihood to estimate structural models based on the data from all 4383 respondents. Full-information