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Change in Maternal Mental Health Trends Among Lactating Women during the

COVID-19 Pandemic

A Thesis submitted in partial satisfaction of the requirements for the Master's degree

in

Public Health

by

Samantha Powell

Committee in Charge:

Professor Gretchen Bandoli, Chair
Professor Christina Chambers
Professor Richard Garfein

2021

The Thesis of Samantha Powell is Approved, and it is acceptable in quality and form for publication on microfilm and electronically:

University of California, San Diego

DEDICATION

This thesis is dedicated to Samuel Zorich, who started my passion for learning. I am

honored to carry on your name, and I will aspire to continuously make you proud.

RIP 4.28.2021

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LIST OF ABBREVIATIONS

CBB – Center for Better Beginnings

CDC - Centers for Disease Control and Prevention of the Department of Health and

Human Services, United States

COVID-19 - Coronavirus 19

EPDS - Edinburgh Postnatal Depression Scale

HMB - Human Milk Biorepository

MMWR- Morbidity and Mortality Weekly Report (of the Centers for Disease Control
and Prevention

NIH- National Institutes of Health (United States)

PRAMS – Pregnancy Risk Assessment Monitoring System

PSS -10 Perceived Stress Scale

STAI - The State-Trait Anxiety Inventory

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ACKNOWLEDGEMENTS

ABSTRACT OF THE THESIS

Change in Maternal Mental Health Trends Among Lactating Women during the COVID-

19 Pandemic

by

Samantha Powell

Master's Degree in Public Health

University of California San Diego, 2021

Professor Gretchen Bandoli, Chair

Purpose: To determine if the COVID-19 pandemic was associated with changing trends
in maternal depression, anxiety and stress levels among lactating women compared to
pre-pandemic.

Methods: Data originated from the UC San Diego Mommy's Milk Study of breastfeeding
mothers residing in the U.S or Canada (2016-2021). Participants were interviewed and
completed a self-administered Edinburgh Postnatal Depression Scale (EPDS), Perceived
Stress Scale (PSS-10) and State Trait Anxiety Inventory (STAI) questionnaire after
childbirth during the time they were breastfeeding. Interrupted times-series analyses
using regression models were used to investigate the change in different samples of
women over time in EPDS, STAI and PSS-10 scores following the onset of the Covid-19
pandemic. All time points prior to March 1, 2020 were considered the "pre-COVID19"
time period, and time points from March 1, 2020 and on were considered the

"COVID19" time period. Models were adjusted for seasonality, and in sensitivity analyses, maternal parity and income.

Results: During the 41 months prior to the onset of the COVID-19 pandemic, mean scores on all three measures remained consistent. Following the onset of the COVID-19 pandemic, mean scores on depression (b = 0.432, p = 0.003) and stress inventories (b = 0.731, p = 0.002) increased in a linear fashion in each month. Anxiety scores followed a similar pattern, but it did not reach statistical significance (p = 0.07). Results were essentially unchanged when adjusting for seasonality or maternal covariates.

Conclusion: The increase in maternal depression and stress scores have public health implications and suggest that breastfeeding mothers are at high risk for mental health issues during the COVID-19 pandemic. These findings show the need for increased screening for postpartum women during the COVID-19 pandemic, and increased availability of mental health resources for postpartum women during the COVID-19 pandemic. Research has shown other catastrophic events affect maternal mental health in similar ways. (Harville, 2009) Therefore, beyond the COVID-19 pandemic, the findings of this study can be used for economic downfalls, other viral or bacteria outbreaks, and even natural disaster response strategies.

Keywords: Anxiety, Coronavirus, COVID-19, Depression, Postpartum psychological distress, Psychological distress, Stress

CHAPTER 1. INTRODUCTION

As the coronavirus disease of 2019 (COVID-19) pandemic placed strict public health measures that included "stay-at-home orders", physical isolation and social distancing, individuals may experience negative psychological effects including stress, confusion and irritation. (Yao, 2020) (Fitzpatrick, 2020) With the extended length of these public health measures, individuals are increasingly apprehensive about financial and economic uncertainties. This consequently may intensify stress and worsen the mental wellbeing of individuals. The needs of more acute issues may have overshadowed caring for mental health during the COVID-19 pandemic, but we can speculate that the psychological burden of this pandemic will be apparent.

Physically recovering from giving birth usually takes between 6-8 weeks, and includes abdominal pain from the uterus returning to normal size, constipation, hormone shifts, and body soreness. On top of the physical pain from childbirth, postpartum women are adapting psychologically as well. Postpartum women may have fears about the baby's health and their own readiness to be a parent, possibly feeling guilt for having negative thoughts about the baby, and fear of the financial toll having a baby can have. They may also be worried about body changes and how that affects their sexuality. Lastly, they could have experienced disappointment regarding the lack of support. Many women who were pregnant during the COVID-19 pandemic are now experiencing motherhood though the pandemic as well. The stress of the COVID-19 pandemic can also extend to lactating women who may worry about offspring exposure to COVID-19 through breast milk or about their caregiving responsibilities should they become infected with the virus.

Mood and anxiety disorders are among the most common mental health conditions for perinatal women. (Kendig, 2017) Studies looking at previous catastrophic events, such as other viral outbreaks, have suggested an association between the events and mental health symptoms in postpartum women. (Caparros-Gonzalez, 2020) (Harville, 2009) (Harville, 2010) (Pariente, 2020) A cohort study that followed women who were postpartum two months after Hurricane Katrina found that 18% of their sample met the criteria for depression during the postpartum period. This shows that it is imperative to shift focus towards lactating and postpartum women during the pandemic because postpartum women are already vulnerable to adverse mental health outcomes. This causes concern that they may be even more vulnerable to pandemic related stressors.

The purpose of this research was to assess group trends among breastfeeding women in mental health screening scores over the course during the pandemic. By observing this trend, this study will help determine the relationship between the COVID-19 pandemic environment and maternal mental health scores, and can help direct future research and public health policy.

CHAPTER 2. LITERATURE REVIEW

2.1 Postpartum Mental Health

2.1.1 Postpartum Stress

The postpartum period is usually thought of as the time from giving birth until around 6 weeks after giving birth, but the postpartum period can last up to 6 months from childbirth. (Romano, 2010) The risk of postpartum stress has been strongly linked to the mother's perceived social support. (De Sousa Machado, 2020) (Hung, 2011) (Hung, 2001) (Hung, 2006) (Mann, 2010) (Razurel, 2013) (Sampson, 2015) (Thorp, 2004) A qualitative study looking at stressful events in the postpartum period found that during the early postpartum period, interaction with caregivers in the hospital was an important source of perceived stress, but once the mother was home their partner was considered the primary source of social support throughout their postpartum period. (Razurel, 2013) Another study that looked at support and maternal stress for one-year postpartum found support from fathers was the most crucial for a mother's stress regardless of education, race, or marital status. (Sampson, 2015) Some research has focused on the quality of the relationship between mother and partner, including one study indicating that communication mediates the association between dissatisfaction with partner support and maternal stress. (Mann, 2010) (Thorp, 2004)

The prenatal experience has been determined to be an important factor when studying postpartum stress, particularly prenatal stress and prenatal social support. (Glazier, 2004) (Sumner, 2011) (Tanner, 2012) (Tissera, 2020) A longitudinal study that focused on factors associated with postpartum health found that women who reported mean scores of perceived stress during pregnancy in the moderate and higher levels were

found to be inversely related to decreased health status, even after controlling for symptoms of post-traumatic stress disorder (PTSD), trauma exposure and social support. (Shrestha,2016) Perceived social support in the prenatal period has been shown to lower stress levels in the postpartum period, and relationship satisfaction has been shown to mediate this association. (Sumner, 2011) (Thorp, 2004)

2.1.2 Postpartum Anxiety

Postpartum women report higher levels of generalized anxiety when compared to the general population of women. (Farr, 2014) (Goodman, 2016) (McLean, 2006) (Wenzel, 2005) (Zappas, 2021) Research on postpartum anxiety disorder is relatively rare, and prevalence estimates vary across studies. A meta-analysis addressing anxiety in postpartum women estimated that 8.5% of women during the postpartum period experienced one or more anxiety disorders, while other studies reported the prevalence of postpartum anxiety disorder to be between 15-20%. (Fairbrother, 2016) (Farr, 2014) (Goodman, 2016)

In a qualitative study where the researchers conducted in-depth interviews with postpartum women about their anxiety, the participants stated that their anxiety stemmed from worrying about their baby, their own physical health, and not being able to control their emotions through the hormonal changes during the first 6 months postpartum period. (Wardrop, 2013) Due to their close overlap in symptomology, postpartum anxiety and depression have been studied together frequently, and have been found to be strongly related. (Lee, 2012) In a prospective longitudinal study of pregnant women followed throughout their prenatal and perinatal period, more than one half (54%) and more than

one third (37.1%) of the women had postpartum anxiety and depressive symptoms, respectively, and anxiety was more prevalent than depression at all stages. (Lee, 2012)

The risk for developing postpartum anxiety depends on certain risk factors such as lack of social support, psychiatric or medical history, and stressors during or throughout the prenatal period. The role of education level has been inconclusive, with one meta-analysis finding having more education increased the risk for postpartum anxiety, while another study found an inverse correlation with postpartum anxiety and education level meaning as the anxiety went up, the education level went down. (Britton, 2008) (Field, 2018)

2.1.3 Postpartum Depression

Studies have shown the prevalence of postpartum depression to be between 12-19%. (O'Hara, 2013) (Zaidi, 2017) This follows the trends from the Center for Disease Control and Prevention's (CDC) Pregnancy Risk Assessment Monitoring System (PRAMS), which shows nationally one out of eight women experience symptoms of postpartum depression. (CDC, 2020)

When asking women about their postpartum depressive symptoms in an in-depth semi-structured interview, they described feeling confused, overwhelmed, and guilty, and that these symptoms caused other problems like relationship strain. (Edhborg, 2005) (Ugarriza, 2002) Cross-sectional studies have shown that lack of adequate perceived social support is associated with increased symptoms of postpartum depression. (Heh, 2004) (O'Hara, 2013) (Reid, 2015) (Webster, 2011) (Xie, 2009) Although these studies showed association, it was not possible based on the study design to determine causality. However, a randomized control trial looking at the impact of partner support and

postpartum depression found similar results in that the group that had partner support displayed a significant decrease in postpartum depressive symptoms when compared to the control group with no support. (Misri, 2000) Unlike the cross-sectional studies, this study was designed to test a causal link, and the results support the protective role of partner support on a woman's postpartum depression.

Having a history of depression prior to childbirth has been found to be associated with developing postpartum depression. (Beck, 2001) (Bowen, 2012) (Dennis, 2004) (Eberhard-Gran, 2002) (Gotlib, 1991) (Molyneaux, 2018) A cross-sectional study found that women who have one or more previous episodes of depression prior to childbirth are at increased risk for developing postpartum depression. (Molyneaux, 2018) Specifically, prenatal depression as a predictor of postnatal depression has been a focus in the literature. A longitudinal study looking at patterns of depression in postpartum women found depression scores decreased from the pregnancy to the postpartum period, and women who were taking psychiatric medication or who were in counseling were more likely to show signs of postpartum depression. (Bowen, 2012) Another longitudinal study on the onset of postpartum depression found that levels of depressive symptoms during pregnancy were predictive of postpartum depression. (Gotlib, 1991)

2.2 COVID-19

Near the end of 2019, a novel coronavirus was detected in Asia. Coronaviruses are a large family of viruses that typically cause mild to moderate upper respiratory tract illnesses. (NIH, 2020) Coronaviruses usually circulate through animals like pigs, camels, bats and cats; but sometimes these viruses spillover into humans. (NIH, 2020) SARS-CoV2 is a novel coronavirus, meaning it has never been detected before in humans, until

December 2019 when it emerged in Wuhan China. SARS-CoV2 causes the coronavirus disease known as COVID-19. COVID-19 is mainly spread through respiratory droplets that can pass person-to-person from close contact. (NIH, 2020)

On March 13, 2020 the United States government declared the COVID-19 outbreak as a national state of emergency. To try to prevent the spread of COVID-19 and stop hospitals from getting overwhelmed with a high volume of patients, public health officials in the United States implemented preventative measures such as stay at home orders, social distancing and mask wearing. According to the CDC from March 1, to May 31, 42 of the 50 states issued mandatory stay-at-home orders, which affected 73% of the United States population.

2.3 Mental health during COVID-19

2.3.1 General Population Mental Health during COVID-19

COVID-19 has been a major disruption in a majority of people's daily lives, and the prevention tools put into place to keep people physically safe likely had negative consequences on the public's mental health. During the COVID-19 pandemic levels of depression, anxiety and stress have increased in the general population. (Dean, 2021) (Jia, 2020) (Kazmi, 2020) (Park, 2020) (Pierce, 2020) A systematic review comparing mental health during the COVID-19 pandemic to pre-pandemic times among the general public found lower psychological well-being and higher scores of anxiety and depression. (Vindegaard, 2020) Self-reported levels of depression among the general population have ranged between 17-48%, anxiety has ranged from 20-50%, and stress has ranged from 21-81% during the COVID-19 pandemic. (Czeisler, 2020) (Kobayashi, 2021) (Rossi, 2020) (Xiong, 2020)

Perceived loneliness during stay-at-home orders and quarantine has been associated with increased depressive symptoms. (Brooks, 2020) (Jia, 2020) (Kobayashi, 2021) (Rossi, 2020) A review published in The Lancet reported that the separation from loved ones, loss of freedom, boredom, and uncertainty can cause a deterioration in an individual's mental health status. (Javed, 2020)

Financial loss and unemployment have also contributed to stress, anxiety and depression during this time. (Bhattacharjee, 2020) (Brooks, 2020) (Kazmi, 2020) (Park, 2020) According to a national survey among the general population in the United States, from the Kaiser Family Foundation, 59% worried that their investments would be negatively impacted by the COVID-19 pandemic for a long time, 52% worried that the economic downturn due to coronavirus would cause them to lose their jobs, and 45% worried that they would lose income due to workplace closure or reduced work hours. (Bhattacharjee, 2020) These findings are similar to a study focused on American's COVID-19 stress that found financial concerns were rated the most stressful aspect of COVID-19. (Park, 2020)

Fear of infection and fear of the unknown is also an important component of individual's mental health. (Bhattacharjee, 2020) (Brooks, 2020) (Khan, 2020) In a cross-sectional study, nationally representative sample of individuals in the United States, fear appeared to be concentrated in regions of the country with the highest reported COVID-19 cases. Respondents averaged a score of seven out of 10 when asked how fearful they were of COVID-19. (Fitzpatrick, 2020) Social media and news outlets may have added to the fear of the public by highlighting COVID-19 as a unique threat, rather than one of many, which has added to panic, stress, and the potential for hysteria. (Jiloha, 2020) An

online survey identifying predictors of fear of COVID-19 found that regular media use and social media use were two of the four main predictors to fear during the pandemic, and a cross-sectional study in China found that high prevalence of mental health problems were associated with the frequency of social media exposure during the COVID-19 outbreak. (Merten, 2020) (Yao, 2020) Fear during the COVID-19 pandemic has also increased stigmatization, primarily among frontline workers, people who have had COVID-19, and those of Asian descent. (Brooks, 2020) (Javed, 2020) (Khan, 2020)

Common risk factors that have been associated with higher levels of mental health symptoms during the COVID-19 pandemic have included being female, younger age, a history of mental or physical health issues, lack of social support, and low socioeconomic status. (Dean, 2021) (Jia, 2020) (Kazmi, 2020) (O'Connor, 2020) (Rossi, 2020) (Vindegaard, 2020) (Xiong, 2020) (Zhou, 2020)

2.3.2 Maternal Mental Health during COVID-19

As discussed in earlier sections, postpartum women are at increased risk for developing symptoms of depression, anxiety and stress. Studies looking at previous catastrophic events, such as hurricanes or other viral outbreaks, have stated that severity of the exposure has been a determining factor in mental health symptoms in postpartum women. (Caparros-Gonzalez, 2020) (Harville, 2009) (Harville, 2010) (Heh, 2004) (Pariente, 2020) Further, two or more severe experiences with the disaster or feeling like one's life was in danger increased risk for depression. (Harville, 2009)

Social distancing, isolation and quarantining have created negative consequences for postpartum women. During the COVID-19 pandemic, postpartum women have expressed concerns about how they will obtain healthcare services and keep up with

perinatal appointments. (Ali, 2020) (Caparros-Gonzalez, 2020) (Farewell, 2020) (Meltzer-Brody, 2018) Some researchers have speculated that the stigma of hospitals due to COVID-19 has led to the underutilization of healthcare services like perinatal care, while others have speculated it is due to restricted movement. (Ali, 2020) (Caparros-Gonzalez, 2020) Other concerns mothers have had during the pandemic include financial difficulties, support from those around them, safety for themselves and their baby, and misinformation or mixed information they were getting from media sources. (Almeida, 2020) (Farewell, 2020) (Nanjundaswamy, 2020) (Ollivier, 2021)

Current literature looking at postpartum mental health during the COVID-19 pandemic found prevalence rates of depression, stress, and anxiety all elevated when compared to pre-pandemic rates. (Chrzan-Dętkoś, 2021) (Davenport, 2020) (Farewell, 2020) (Hessami, 2020) (Perzow, 2021) (Yan, 2020) (Zanardo, 2020) A cross-sectional study of postpartum mothers using social media platforms in North America during April and May 2020 found that self-identified depression scores pre-pandemic were prevalent in 15% of their participants, and during the COVID-19 pandemic self-identified depression sores were prevalent in 40% of their participants. (Davenport, 2020) In the same cross-sectional study of postpartum mothers in North America, self-reported anxiety scores increased from 29% pre-pandemic to 72% during the pandemic. (Davenport, 2020) A common factor that has been linked to negative mental health outcomes in postpartum women during COVID-19 has been self-reported rates of loneliness. (Farewell, 2020) (Perzow, 2021)

A limitation within the current literature of maternal mental health during COVID-19 is the study designs mainly assessed post pandemic difference in scores at a

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single time point, with limited longitudinal knowledge. From these designs, it is not possible to tell whether there was a shift in overall psychological health during the pandemic, and whether any changes in psychological health have persisted or worsened over time. Therefore, the objective of this research was to determine whether there was an association between the onset and continuation of the COVID-19 pandemic and maternal psychological health scores by using cross-sectional data collected at many time points before and during the pandemic.

CHAPTER 3. METHODS

3.1 Data Source

3.1.1 Background

The Center for Better Beginnings (CBB) in the Department of Pediatrics at University of California San Diego conducts observational studies among pregnant and breastfeeding women. Within the CBB, the Mommy's Milk Study was established in 2014 to help understand the benefits of human milk at the molecular level and to use those findings to improve the health and development of children. The goal of the Mommy's Milk Study is to build a research database and specimen repository for human milk that will allow scientists to evaluate and better understand full immunologic, developmental and nutritional benefits of breast milk.

3.1.2 Study Design & Data Collection

The Mommy's Milk Study is comprised of consented women who are currently breastfeeding, have sufficient milk supply to feed their infant and still have excess breast milk (typically a sample of 50ml) that can be donated to the biorespository. Breast feeding women across the United States and Canada are recruited to participate in the Mommy's Milk Study in several ways, including referrals from medical professionals or through social media platforms.

Trained study staff explain the study to potential participants using a video consent. Women who meet the study eligibility criteria and who provide verbal consent are mailed a FedEx package including medical record release forms, a written consent form and a milk collection kit and a return FedEx package. After the package is received, a scheduled interview is conducted by telephone, and includes demographic information,

medical histories, pregnancy history, breast-feeding patterns, and exposures within the last 14 days prior to sample collection. Participants are also asked to take part in online mental health questionnaires, described in Section 3.2.3, sent via email after completion of the telephone exposure interview. Participants complete the interview and online questionnaires during the time that they are breastfeeding each child. Participants could enroll and complete questionnaires at any time during lactation (e.g. one mother could enroll three weeks after giving birth and another mother could enroll five months after giving birth). If a participant has more than one child, and enrolled in study multiple times, they went through the same process as the first time, but questions were answered for the most recent perinatal period.

For the purpose of this analysis, we examined data from women who enrolled in the Mommy's Milk Study between April 2016 to January 2021 and completed the EDPS, PSS-10 and STAI online questionnaires. (n= 1,582)

The Human Milk Biorepository (Mommy's Milk study) received approval through the University of California, San Diego Institutional Review Board.

3.2 Measures

3.2.1 Exposure

Our exposure variable in this analysis is the onset of the COVID-19 pandemic. We defined the start of the COVID-19 pandemic as March 2020 when the United States government declared the COVID-19 outbreak as a national state of emergency. All data points prior to March 1st, 2020 were considered the "pre-COVID19" time period, and all points from March 1st 2020 and on were considered the "COVID19" time period.

3.2.2 Outcomes

3.2.2.1 Edinburgh Postnatal Depression Scale

Postpartum depression was captured with the EPDS. (Cox, 1987) The EPDS is one of the most widely used instruments for assessing symptoms of perinatal depression and anxiety. Previous studies looking at maternal mental health during the COVID-19 pandemic used EPDS to compare rates of depression during the perinatal period after the start of the pandemic versus rates prior to the pandemic. (Davenport, 2020) (Pariente, 2020) (Perzow, 2021) (Zanardo, 2020) (Hessami, 2020) The EPDS is a 10-question scale (range 0- 30) used to identify patients at risk for perinatal depression. (Levis, 2020) The EPDS assesses the emotional experience of the participant over the last 7 days prior to completing questionnaire. Mothers who score above 13 are likely to be suffering from a depressive illness with varying sensitivity, but possible depression is considered 10 or greater. (Levis, 2020) (Shrestha, 2016) Among a systematic review of 36 semi structured studies using EPDS, sensitivity and specificity were 0.85and 0.84 for a cut-off value of 10 or higher, 0.81 and 0.88 for a cut-off value of 11 or higher, and 0.66 and 0.95 for a cut-off value of 13 or higher. (Levis, 2020) Due to the relatively small sample of women enrolling and completing the EPDS within each month (5-20), we analyzed the EPDS as a continuous score.

3.2.2.2 Perceived Stress Score

Stress was measured using the PSS-10, which is the most widely used psychological instrument for measuring the perception of stress. (Cohen, 1983) PSS is a self-administered questionnaire that was designed to measure the degree to which the individual appraises situations in their lives as stressful. (Lee, 2012)

PSS-10 is a 10-question likert scale instrument, where participants were asked about their feelings and thoughts during the last month prior to filling out the questionnaire. Participants are given statements, each question can range from 0-4 points, and the range is based on agreement with the statement (never, almost never, sometimes, fairly often, and very often). Of the 10 questions, scores for numbers 4,5,7,8 are reversed, and the sum of all the answers is the score. According to a guideline from the New Hampshire Department of Administrative Services, scores 0-13 are considered low stress, 14-26 moderate stress, and scores 27-40 are high perceived stress.[61] The PSS-10 possesses adequate internal consistency with Cronbach's alpha coefficients ranging from 0.67 to 0.91, moderate convergent validity with stressful life events, and good concurrent validity with mental health problems such as depression and anxiety. (Baik, 2019) (Lee, 2012) (Liu, 2020) Due to the relatively small sample within each month (n=5-20), we analyzed the PSS as a continuous score.

3.2.2.3 State Trait Anxiety Inventory

The STAI is a 40-item total self-report instrument, including 20 items for assessing trait (STAI-T) anxiety and 20 items for state (STAI-S) anxiety. (Spielberger, 1983) State anxiety reflects reactions directly related to adverse situations in a specific moment, whereas trait anxiety reflects individual differences like personalities. A cut point of 39–40 has been suggested to detect clinically significant symptoms for the state-anxiety scale. (Julian, 2011) The STAI has appeared in over 3,000 studies and has been translated into over 30 languages. (Grös, 2007) The STAI was found to have good discriminating ability for both high- and low-scoring anxiety situations. Item remainder correlation coefficients for both scales have consistently been above .90. (Tluczek, 2009)

We wanted to look at the reactions directly related to adverse situations in this specific moment of the Covid-19 pandemic, so we only used the scores from the 20-Item State anxiety inventory in our analysis. Some of these items include statements such as: "I am tense", "I am calm", "I feel secure", "I am worried". All items were scored on a 4-point likert scale (range 20-80), and higher scores are an indication of greater distress. Due to the relatively small sample within each month (n=5-20), we analyzed the STAI-S as a continuous score.

3.3 Covariates

During the baseline interview, participants reported their age, race, ethnicity (Hispanic/Latina or not), education level, employment status, pre-tax household income, smoking status, and parity. Average age of participants were calculated in years for each time period. Similarly, average age of child were calculated in months for each time period. Race choices included Asian, African American, Caucasian, Native American, Pacific Islander, or other. Education level was categorized as partial high school, high school graduate or GED, some college, college graduate, or post graduate. Employment status was classified by full-time, part-time, or unemployed. Pre-tax household income was categorized into above or below 60,000 United States dollars (USD). Current smoking status was a yes or no response. Parity was categorized into primiparous and multiparous.

3.4 Interrupted Time Series Analysis

An interrupted time series analysis (ITSA) is a quasi-experimental analysis with which to evaluate the longitudinal effects of an intervention through regression modeling. This method makes use of longitudinal observations and accounts for pre-intervention

trends. This design is useful for 'natural experiments' with a measurable or delineated onset. (Kontopantelis, 2015) In this ecologic analysis, data are aggregated to a level of time (e.g.- weeks, months). There is less concern for traditional confounding in these models, as the exposure is often an event impacting all, although models can be adjusted for systematic shifts in the population that differ by intervention status.

3.5 Statistical Analysis

Demographic characteristics of the participants were summarized and stratified by time period. To identify any differences between individual-level demographics of the pre-COVID19 and COVID19 time periods, a chi-squared analysis was conducted on each demographic variable, and p-values were included in Table 1.

To examine trends over the entire study period, we created mean monthly scores for all three outcome variables, EPDS, STAIS, and PSS-10, which were then plotted by month. The scatter plots were used to identify any trends, patterns or outliers. Segmented regression models were then used for an interrupted time-series analysis for each outcome variable (in a continuous form) to estimate the association of the change in scores (intercept) at the start of the pandemic, and a change in scores with a time unit increase (slope). In March 2020, the United States federal government declared the COVID-19 pandemic as a national emergency. Thus, for the interrupted time-series analysis study time was divided into two time periods. The period before the federal government declared COVID-19 an emergency (pre-COVID19) includes 41 months from April 2016 to February 2020. The second period (COVID19) includes 11 months from March 2020 to January 2021. Original models were adjusted for seasonality. A sensitivity analysis was conducted, further adjusting for the underlying distribution of primiparity

and low income, which were found to differ in univariate analyses. For the sensitivity

analysis, primiparity and low income were added to the statistical model. All analyses

were conducted using the statistical packages R version 4.0.5

CHAPTER 4. RESULTS

Trends in average EPDS, PSS-10 and STAI score prior to the onset of the COVID-19 pandemic were flat and somewhat decreasing. In the month defined as the pandemic start (March 2021) we saw a sharp decrease in EPDS and PSS-10 scores. This estimated decrease is unstable due to low number of sample enrolled in that month (n=6). Following the onset of the pandemic we saw a sharp increase in all three measures.

Table 1 shows summary data of the cohort demographics, stratified by COVID-19 pandemic status (Pre-COVID19 and COVID19). At the time of completion of the online questionnaires, participants were 18-48 years old (mean=33). The majority of participants were of Non-Hispanic Caucasian descent, income of >$60,000, non-smoker, college graduate or higher education level. More than half of the participants worked full time outside of the home. Our chi-squared analysis showed a significant difference in income level and parity from our Pre-COVID19 participant sample when compared to the Covid-19 participant sample. Enrollment during the COVID-19 time period showed higher income women and higher levels of multiparous.

Figure 1 depicts monthly trends of EPDS scores with a predictive regression line. Prior to COVID-19, EPDS scores average 5.81. There was no change in the intercept for EPDS scores (b=-1.525, p=0.071). We observed a significant increase of 0.43 in mean EPDS scores every month during the COVID-19 time period (p=0.0003). Similarly, in Figure 2, PSS-10 scores prior to COVID-19 were around 14.

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There was no change in the intercept for PSS (b=-2.396, p=0.086), but scores

significantly increasing by 0.73 each month in the months during the COVID-19 time

period (p=0.0002). Figure 3 shows STAIS monthly trends with a predictive

regression line. Prior to COVID-19, STAIS scores were around 33. There was no

change in the intercept for STAIS score (b=0.553, p=0.775). We observed a slight

increase in mean STAIS scores after the onset of the COVID-19 pandemic (b=0.48),

but not enough to reach statistical significance (p=0.070). All models were adjusted

for seasonality (winter vs. non-winter month of enrollment). A sensitivity analysis

adjusting for the underlying distribution of primiparity and low income was

performed, and the results were essentially unchanged.

CHAPTER 5. DISCUSSION

5.1 Summary of findings

        Because of the consequences of social isolation in the general population during the COVID-19 pandemic, this study aimed to observe if the COVID-19 pandemic was associated with trends in self-reported psychological health scores among breastfeeding mothers by using a cohort of women enrolled at varying times before and after the onset of the pandemic. In our analysis of breastfeeding mothers across the United States and Canada before and during the COVID-19 pandemic, we found average self-reported depression and stress scores increased with time during the period of COVID-19 when compared to the trends of scores prior to the pandemic. We found a similar trend with anxiety scores, but this was not statistically significant. Interestingly,]the average scores in the pre-pandemic time period were stable with no major changes, and the increasing trends were only seen pot-pandemic onset.

5.2. Interpretation of Results

        The average EPDS score prior to COVID-19 was 5.81, and our findings show that during the COVID-19 time period the average scores on the EPDS increased by 0.43 each month. Although at first glace these numbers are low, they still have clinical implications. If each month maternal depression scores go up almost half a point, it would only take 10 months to reach an average score of 10 from the pre-pandemic means. This is significant because EPDS scores of 10 or greater can be considered possible depression. (Levis, 2020) (Shrestha, 2016) Additionally, this shift is at the mean of study sample for each outcome, signifying some women are likely having greater increase in scores and more likely to move into the range of suspected depression.

Further, each question on the EPDS describes a personal struggle, and any additional endorsement of struggles in the postnatal period should be viewed with concern. Similar to the EPDS, the PSS-10 score trends prior to the pandemic on average indicated low stress at around 13.7. During the time period of COVID19, PSS-10 scores increased by 0.73 each month. This increase does not seem like a large jump, but it does put the average score into the moderate stress level and also has the potential to reach a high-perceived stress level in a short time period. Like the increase in depression, stress not only affects the mother, but also can have long-term effects on the offspring.

Other studies have also shown an increase in maternal depression and stress during the COVID-19 pandemic when compared to a time period prior to the onset of the pandemic. (Chrzan-Dętkoś, 2021) (Davenport, 2020) (Farewell, 2020) (Hessami, 2020) (Perzow, 2021) (Yan, 2020) (Zanardo, 2020) The results of this study are congruent with the findings of other research articles looking at maternal mental health during the COVID-19 pandemic. Although our findings show us the trends, they do not give us any context for the increase.

Our average scores for EPDS and PSS-10 were relatively low prior to the COVID-19 pandemic, and this could be due to our study sample including a majority of high-income educated women. Due to this specific study sample, these results are not generalizable to the general population. One would expect our sample to have coping resources that other samples, including those representing minorities or low-income mothers, may not. For example, a more affluent white woman might not feel as stressed or anxious about the pandemic because they have access to healthcare and a secure income. Whereas someone who is less secure, may have more psychological distress

during the pandemic. Thus, our findings should alert clinicians and public health practitioners that screening for postpartum psychological distress should be prioritized during the pandemic.

Quarantine, isolation and stay-at-home orders have been a huge part of the COVID-19 pandemic. Previous researchers stated loneliness and the lack of social and emotional support were impacted by these public health interventions. (Perzow, 2021) (Farewell, 2020) These interventions could also hinder people's structure and daily routines, especially mothers with newborn babies who have set feeding times, routine appointments, and other activities on a set schedule. Additionally, for mothers with multiple children, the pandemic could have reduced access to childcare. Restrictions on movement also have the potential to decrease physical activity levels, hours outdoors, and time spent on self-care. This could lead to increased weight gain or more difficulty returning to one's pre-pregnancy weight, and could create more stress and anxiety.

The uncertainty of what is going to happen next throughout the whole COVID-19 pandemic has severely impacted new mothers. Breastfeeding mothers during the pandemic have the added stress of worrying if they are exposing their children through the milk or worry about getting the virus from their asymptomatic child. Many mothers have also stated that they feel there is a stigma about going to the hospital and if it is actually safe to be there. (Ali, 2020) This could lead to underutilization of perinatal healthcare services, which could have negative consequences for the mother and the baby. There has been inconsistent messaging through media outlets on the facts of the COVID-19 pandemic and what the proper precautions are, which could add to new mothers' anxiety and stress. Lastly, with the inconsistent job market throughout the

pandemic, added financial anxiety could potentially affect maternal mental health. If a new mother was to lose her job or her spouse lost their income, this could create a lot of extra stress and mental strain on a family with a newborn that already has a lot of additional costs.

5.3 Strengths

The use of the ITS analysis was a strength in this study because it has allowed us to evaluate the potential health impacts of an unplanned event like the COVID-19 pandemic. The findings from this study could be informative regarding maternal psychological health score trends as the COVID-19 pandemic continues. Rigorous design of the Mommy's Milk Study and consistent data collection across the study period enabled us to isolate the effect of the pandemic. Additionally, due to the computer-based questionnaires in this cohort, the participants may have felt more comfortable providing authentic responses.

5.4 Limitations

Limitations must be considered when interpreting these findings. Recruitment methods for this cohort could lend themselves to selection bias. Because some women were recruited through medical professionals or through social media advertisements, volunteer bias could potentially skew the sample away from generalizability. Women who are in the medical field or trust the medical field, have more free time, or have had issues or complications with breastfeeding may be more willing to volunteer for this cohort.

Secondly, the sample of women differed from the general population of breastfeeding mothers in the United States and Canada by proportions of race, ethnicity,

socioeconomic status and education. The women in this study were highly educated and had a majority of incomes over 60,000 USD. These results do not represent lower-income less educated women, therefore, these results may not be generalizable to all breastfeeding mothers.

These findings are not clinical evaluations, but rather self-reported screening instruments. These findings do not establish causality, and can only observe associations. The women in this study are different in each time period, and the participants in the Mommy's Milk Study during the pandemic months potentially could be systematically different than the women who enrolled prior to the pandemic. Although we did a sensitivity analysis with certain potential confounding demographics, taking into consideration additional factors like history of mental health conditions, social support, and the prenatal experience would give more content to the results from this study.

5.5 Conclusion

Among the women in the Mommy's Milk Study cohort, trends in depression and stress scores have changed and significantly increased with each month of the COVID-19 pandemic. However, trends in anxiety scores among this cohort have only slightly increased since the start of the COVID-19 pandemic when compared to Pre-COVID19 time period. The findings from this study suggest that breastfeeding mothers could be a high-risk population for increased psychological health issues during the COVID-19 pandemic, and the need for increased screening and availability of mental health resources for postpartum women during the COVID-19 pandemic.

Outside the COVID-19 pandemic, the findings of this study can be used for a variety of events that are likely to cause psychological distress to lactating and

postpartum women like economic downfalls, future viral or bacterial outbreaks, and natural disasters. Although this study added to the current knowledge of maternal mental health and the COVID-19 pandemic, future non-ecological studies that have a greater ability to identify causal relationships between events like the COVID-19 pandemic and mental health among postpartum and lactating women is still needed.

TABLES AND FIGURES

Table 1. Maternal Characteristics stratified by Pre-COVID19 time period (N=1,300) and COVID19 time period (N=282) of women enrolled in Mommy's Milk Study between April 2016 to January 2021

	Pre- COVID19 April 2016- Feb 2020		COVID19 March 2020 - Jan 2021		
	Proportion	Count	Proportion	Count	P-Value
Age (mean years)	33.3	N= 1300	33.7	N=282	0.2253
Child Age (mean months)	9.14	N=1300	9.74	N=282	0.5856
Ethnicity					0.1912
Hispanic	11.85%	154	8.87%	25	
Non-Hispanic	88.15%	1146	91.13%	257	
Race					0.4534
Asian	8.23%	107	7.80%	22	
African American	2.62%	34	2.13%	6	
Caucasian	85.77%	1115	87.59%	247	
Native American	2.85%	37	1.42%	4	
Pacific Islander	0.38%	5	1.06%	3	
Other	0.15%	2	0%	0	
Education Level					0.06746
Less than College	3.30%	43	1.06%	3	
College +	96.70%	1,257	98.94%	279	
Employment Status					0.832
Full Time	60.46%	786	61.70%	174	
Part Time	21.69%	282	21.99%	62	
Unemployed	17.85%	232	16.31%	46	
Pre-Tax Household Income					0.006052
<60,000 USD	20.93%	272	13.48%	38	
>60,000 USD	79.07%	1028	86.52%	244	
Current Smoker					0.5546
Yes	3.00%	39	2.13%	6	
No	97.00%	1261	97.87%	276	
Parity					8.21E-05
Primiparous	49.85%	648	36.52%	103	
Multiparous	50.15%	652	63.48%	179	

Table 2. Descriptive Statistics of Outcomes: Univariate Analysis of EPDS, PSS-10 and STAI Scores for the Mommy's Milk Study Cohort between April 2016 – January 2021. N indicates each number of months included in study analysis.

Outcome	N	Minimum	Maximum	Median	Mean	Std. Deviation
EPDS	52	1.833	8.095	5.281	5.374	1.22
PSS-10	52	8.571	18	13.209	13.321	2.07
STAI	52	28	39	33.02	3.02	2.70

Table 3. Counts of EPDS, PSS-10 and STAI questionnaires for each month for the Mommy's Milk Study Cohort between April 2016 – January 2021, and the proportions of scores that met clinical criteria for each outcome every month (EPDS, PSS-10, STAI)

Month	EPDS	A. Clinical Criteria	PSS-10	B. Clinical Criteria	STAI	C. Clinical Criteria
1	24	13%	22	9%	24	25%
2	33	15%	34	0%	31	23%
3	17	24%	17	6%	18	23%
4	23	9%	23	4%	40	23%
5	31	9%	30	3%	31	10%
6	42	12%	42	2%	21	18%
7	39	18%	38	5%	38	24%
8	45	16%	45	2%	46	32%
9	43	14%	44	2%	41	26%
10	34	15%	34	3%	35	17%
11	43	12%	43	5%	42	30%
12	24	21%	24	0%	23	32%
13	35	9%	34	3%	34	22%
14	57	4%	57	5%	54	32%
15	41	27%	43	2%	41	35%
16	38	21%	38	3%	40	30%
17	35	11%	35	3%	33	27%
18	45	27%	45	2%	48	10%
19	41	22%	43	2%	42	20%
20	55	9%	57	7%	56	9%

Table 3. Counts of EPDS, PSS-10 and STAI questionnaires for each month for the

Mommy's Milk Study Cohort between April 2016 – January 2021, and the proportions of

scores that met clinical criteria for each outcome every month (EPDS, PSS-10, STAI)

Month	EPDS	A. Clinical Criteria	PSS-10	B. Clinical Criteria	STAI	C. Clinical Criteria
21	51	20%	51	6%	52	12%
22	44	23%	45	4%	44	36%
23	32	44%	30	0%	32	22%
24	22	18%	23	4%	20	20%
25	21	24%	20	15%	21	33%
26	21	38%	21	5%	21	24%
27	9	11%	7	0%	7	0%
28	9	22%	9	22%	10	30%
29	16	19%	16	6%	16	19%
30	7	14%	5	0%	6	33%
31	11	18%	11	0%	11	36%
32	4	0%	4	25%	4	25%
33	6	33%	6	0%	7	43%
34	9	11%	11	9%	11	0%
35	8	13%	8	0%	8	25%
36	2	50%	2	0%	2	50%
37	6	0%	6	0%	6	17%
38	16	13%	15	0%	15	20%
39	3	0%	3	0%	3	0%
40	10	0%	10	0%	9	44%
41	15	6%	15	0%	15	20%
42	6	0%	6	0%	6	17%
43	36	17%	33	6%	35	29%
44	40	10%	43	0%	42	31%
45	27	11%	25	0%	26	31%
46	25	24%	24	4%	28	39%
47	21	33%	22	14%	21	33%
48	20	20%	19	11%	20	25%
49	38	13%	39	8%	38	24%
50	31	32%	32	9%	32	34%
51	28	14%	26	4%	27	41%
52	8	25%	8	13%	8	25%

1

A. A cut off point of ≥13 was used for EPDS. B. A cut off point of ≥27 was used for PSS-10. C. A cut off point of ≥40 was used for STAI.
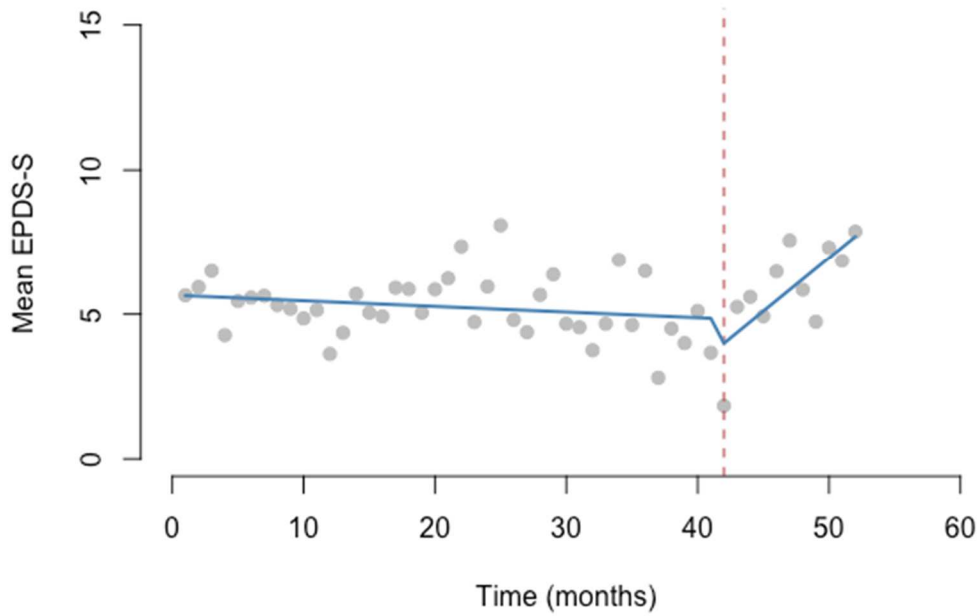
Figure 1. Interrupted time-series analysis of the trends of average depression (Edinburgh Postnatal Depression Scale) scores in the Mommy's Milk Study Cohort from April 2016 to January 2021
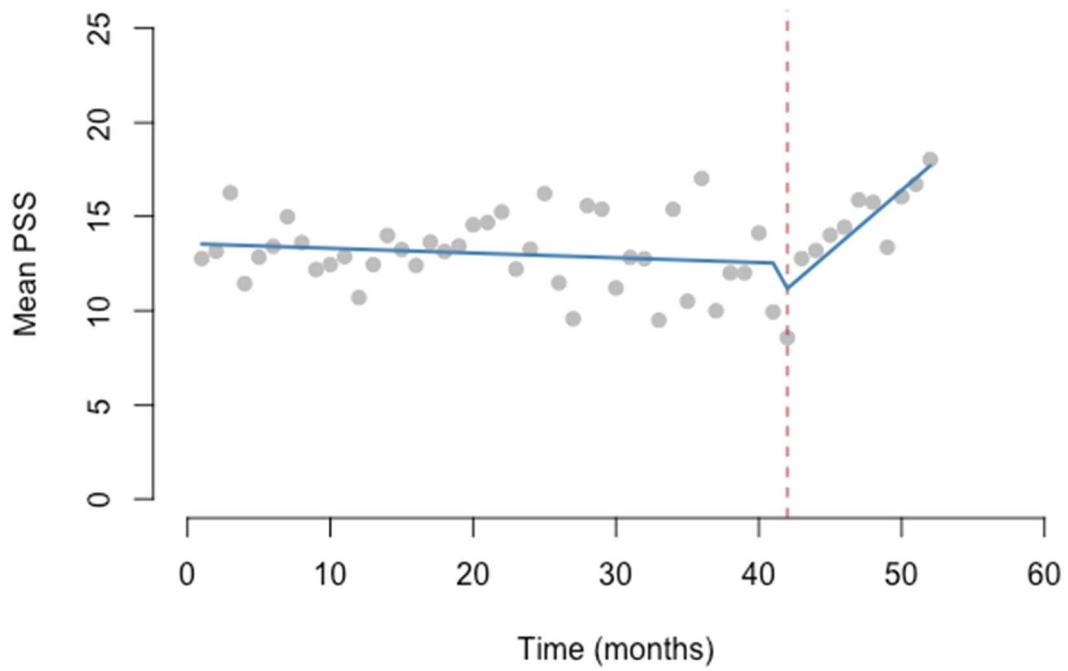
Figure 2. Interrupted time-series analysis of the trends of average stress (Perceived Stress Scale) scores in the Mommy's Milk Study Cohort from April 2016 to January 2021
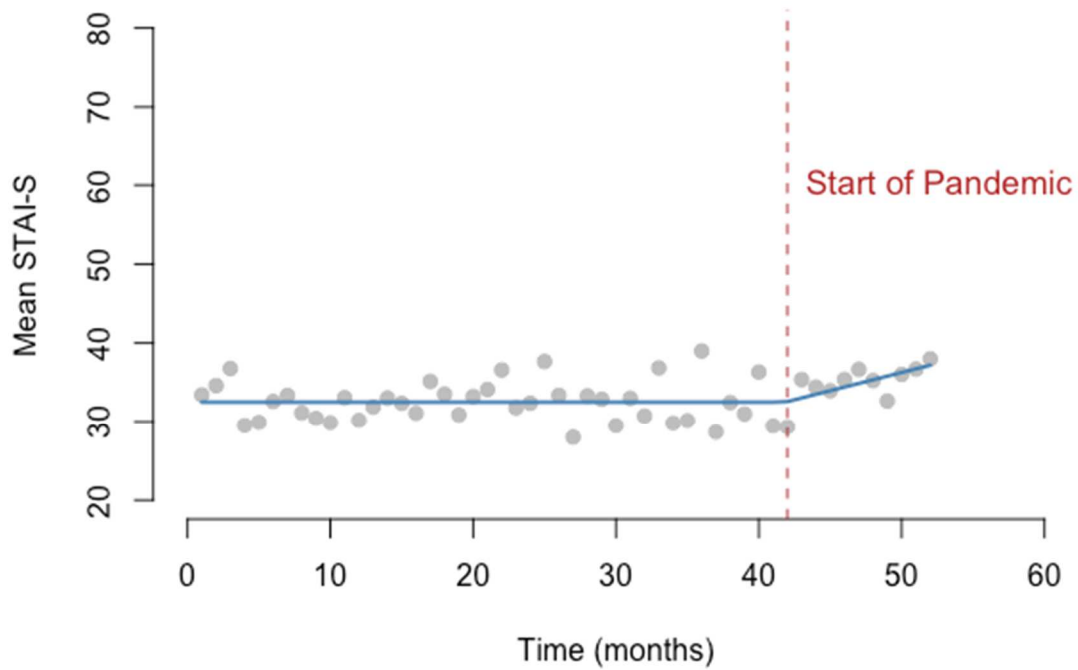
Figure 3. Interrupted time-series analysis of the trends of average anxiety (State-Trait Anxiety Inventory) scores in the Mommy's Milk Study Cohort from April 2016 to January 2021

APPENDIX

Edinburgh Postnatal Depression Scale[1] (EPDS)

Name: _____   Address: _____

Your Date of Birth: _____   _____

Baby's Date of Birth: _____   Phone: _____

As you are pregnant or have recently had a baby, we would like to know how you are feeling. Please check the answer that comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

Here is an example, already completed.

I have felt happy:
- ☐ Yes, all the time
- ☒ Yes, most of the time   This would mean: "I have felt happy most of the time" during the past week.
- ☐ No, not very often   Please complete the other questions in the same way.
- ☐ No, not at all

In the past 7 days:

1. I have been able to laugh and see the funny side of things
   - ☐ As much as I always could
   - ☐ Not quite so much now
   - ☐ Definitely not so much now
   - ☐ Not at all

2. I have looked forward with enjoyment to things
   - ☐ As much as I ever did
   - ☐ Rather less than I used to
   - ☐ Definitely less than I used to
   - ☐ Hardly at all

*3. I have blamed myself unnecessarily when things went wrong
   - ☐ Yes, most of the time
   - ☐ Yes, some of the time
   - ☐ Not very often
   - ☐ No, never

4. I have been anxious or worried for no good reason
   - ☐ No, not at all
   - ☐ Hardly ever
   - ☐ Yes, sometimes
   - ☐ Yes, very often

*5 I have felt scared or panicky for no very good reason
   - ☐ Yes, quite a lot
   - ☐ Yes, sometimes
   - ☐ No, not much
   - ☐ No, not at all

*6. Things have been getting on top of me
   - ☐ Yes, most of the time I haven't been able to cope at all
   - ☐ Yes, sometimes I haven't been coping as well as usual
   - ☐ No, most of the time I have coped quite well
   - ☐ No, I have been coping as well as ever

*7 I have been so unhappy that I have had difficulty sleeping
   - ☐ Yes, most of the time
   - ☐ Yes, sometimes
   - ☐ Not very often
   - ☐ No, not at all

*8 I have felt sad or miserable
   - ☐ Yes, most of the time
   - ☐ Yes, quite often
   - ☐ Not very often
   - ☐ No, not at all

*9 I have been so unhappy that I have been crying
   - ☐ Yes, most of the time
   - ☐ Yes, quite often
   - ☐ Only occasionally
   - ☐ No, never

*10 The thought of harming myself has occurred to me
   - ☐ Yes, quite often
   - ☐ Sometimes
   - ☐ Hardly ever
   - ☐ Never

Administered/Reviewed by _____   Date _____

[1]Source: Cox, J.L., Holden, J.M., and Sagovsky, R 1987. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale.   *British Journal of Psychiatry* 150:782-786 .

[2]Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002, 194-199

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Edinburgh Postnatal Depression Scale[1] (EPDS)

Postpartum depression is the most common complication of childbearing.[2] The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a valuable and efficient way of identifying patients at risk for "perinatal" depression. The EPDS is easy to administer and has proven to be an effective screening tool.

Mothers who score above 13 are likely to be suffering from a depressive illness of varying severity. The EPDS score should not override clinical judgment. A careful clinical assessment should be carried out to confirm the diagnosis. The scale indicates how the mother has felt *during the previous week*. In doubtful cases it may be useful to repeat the tool after 2 weeks. The scale will not detect mothers with anxiety neuroses, phobias or personality disorders.

Women with postpartum depression need not feel alone. They may find useful information on the web sites of the National Women's Health Information Center <www.4women.gov> and from groups such as Postpartum Support International <www.chss.iup.edu/postpartum> and Depression after Delivery <www.depressionafterdelivery.com>.

SCORING

QUESTIONS 1, 2, & 4 (without an *)
Are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.

QUESTIONS 3, 5-10 (marked with an *)
Are reverse scored, with the top box scored as a 3 and the bottom box scored as 0.

     Maximum score: 30
     Possible Depression: 10 or greater
     Always look at item 10 (suicidal thoughts)

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Instructions for using the Edinburgh Postnatal Depression Scale:

1. The mother is asked to check the response that comes closest to how she has been feeling in the previous 7 days.

2. All the items must be completed.

3. Care should be taken to avoid the possibility of the mother discussing her answers with others. (Answers come from the mother or pregnant woman.)

4. The mother should complete the scale herself, unless she has limited English or has difficulty with reading.

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[1]Source: Cox, J.L., Holden, J.M., and Sagovsky, R. 1987. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150:782-786.

[2]Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002, 194-199

PERCEIVED STRESS SCALE

Sheldon Cohen

The *Perceived Stress Scale* (PSS) is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. The PSS was designed for use in community samples with at least a junior high school education. The items are easy to understand, and the response alternatives are simple to grasp. Moreover, the questions are of a general nature and hence are relatively free of content specific to any subpopulation group. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way.

Evidence for Validity: Higher PSS scores were associated with (for example):
- failure to quit smoking
- failure among diabetics to control blood sugar levels
- greater vulnerability to stressful life-event-elicited depressive symptoms
- more colds

Health status relationship to PSS: Cohen et al. (1988) show correlations with PSS and: Stress Measures, Self-Reported Health and Health Services Measures, Health Behavior Measures, Smoking Status, Help Seeking Behavior.

Temporal Nature: Because levels of appraised stress should be influenced by daily hassles, major events, and changes in coping resources, predictive validity of the PSS is expected to fall off rapidly after four to eight weeks.

Scoring: PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. A short 4 item scale can be made from questions 2, 4, 5 and 10 of the PSS 10 item scale.

Norm Groups: L. Harris Poll gathered information on 2,387 respondents in the U.S.

Norm Table for the PSS 10 item inventory

Category	N	Mean	S.D.
Gender			
Male	926	12.1	5.9
Female	1406	13.7	6.6
Age			
18-29	645	14.2	6.2
30-44	750	13.0	6.2
45-54	285	12.6	6.1
55-64	282	11.9	6.9
65 & older	296	12.0	6.3
Race			
white	1924	12.8	6.2
Hispanic	98	14.0	6.9
black	176	14.7	7.2
other minority	50	14.1	5.0

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Name _____   Date _____

Age _____   Gender (*Circle*):   **M   F**   Other _____

0 = Never   1 = Almost Never   2 = Sometimes   3 = Fairly Often   4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Please feel free to use the *Perceived Stress Scale* for your research.

Mind Garden, Inc.
info@mindgarden.com
www.mindgarden.com

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The PSS Scale is reprinted with permission of the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24,* 386-396.
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STAI FORM X-1

<u>DIRECTIONS</u>: A Number of statements which people have used to describe themselves are given below. Read each statement and then circle the response option to the right to indicate <u>how you feel *right* now</u>, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately so	Very much so
1.	I feel calm	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I am tense	1	2	3	4
4.	I am regretful	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying about possible misfortunes	1	2	3	4
8.	I feel rested	1	2	3	4
9.	I feel anxious	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel "high strung"	1	2	3	4
15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I am worried	1	2	3	4
18.	I feel over-excited and rattled	1	2	3	4
19.	I feel joyful	1	2	3	4
20.	I feel pleasant	1	2	3	4

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