

Trends in Maternity Risk, Care and Outcomes in the Pre- and Post-Pandemic Eras: A Longitudinal Observational Study

Stephanie Ann Lynch, Tiffany Inglis, Courtney Carmicheal-Swanner, Cynthia Brown, Eric Stanek

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Trends in Maternity Risk, Care and Outcomes in the Pre- and Post-Pandemic Eras: A Longitudinal Observational Study

Stephanie Ann Lynch^{1*} MPH; Tiffany Inglis^{2*} MD; Courtney Carmicheal-Swanner^{3*} MD; Cynthia Brown^{4*} MD, MHA, FACOG; Eric Stanek^{5*} PharmD

¹Clinical Research Caredon Research Elevance Health Newton US

²Medical Management Caredon Health Elevance Health Columbus US

³Medicaid Enterprise Wellpoint Elevance Health Grand Prairie US

⁴Indiana Medical Management Clinical Operations Elevance Health Wisconsin US

⁵Caredon Research Scientific Support Caredon Research Elevance Health Wilmington US

*these authors contributed equally

Corresponding Author:

Stephanie Ann Lynch MPH

Clinical Research

Caredon Research

Elevance Health

55 Chapel St

Ste 105

Newton

US

Abstract

Background: The SARS-CoV-2 2019 (COVID-19) pandemic directly and indirectly impacted both healthcare delivery and outcomes in the United States. While there are some data pertaining to this impact in maternity, there are no national data on trends in combined maternal risk, prenatal care delivery, and a broad range of maternal and infant outcomes, or any beyond 2020.

Objective: We sought to provide these data in a large United States population over the early and mid-pandemic era referent to the pre-pandemic era.

Methods: This observational study used integrated medical and pharmacy claims data from 658,538 commercially-insured mother-infant dyads with deliveries occurring between January 1, 2019 and December 31, 2021. Mothers with live births during the study period and their infants were included in the study population if both had health plan benefit coverage. Variables of interest were reported in three categories: Maternal Risk, Prenatal Care, and Delivery Outcomes. The Maternal Risk category included diagnoses of metabolic disorders and behavioral health disorders. Metabolic disorders included pre-eclampsia or eclampsia, gestational diabetes, and hypertension, and behavioral health disorders included substance use disorders, depression, anxiety, phobia, and stress/post-traumatic stress disorder. The Prenatal Care category was comprised of medical claims, including encounters and procedure codes, for prenatal care delivery and pharmacy claims for prenatal drug therapy targeting metabolic and behavioral health conditions. This included "Appropriate Ultrasound Timing & Frequency" and "Lab Screening Completion" variables, which are internal quality measures of the completion of American College of Obstetrics and Gynecology recommended screenings during pregnancy. Delivery Outcomes category included medical claims, with procedure, diagnosis, and revenue codes, for maternal outcomes occurring through the first 42 days postpartum and infant outcomes in the first 1 year of life. Relative differences were calculated for each variable by comparing the absolute rates in 2020 or 2021 to the baseline year (2019), and differences >20% or 10-20% were assessed as large or moderate, respectively.

Results: Large increases in multiple maternal behavioral health disorders were observed during the early pandemic era, along with moderate increases in metabolic disorders. Behavioral health disorders continued to increase into 2021 which may reflect the cumulative effect of pandemic-era stress overall. Prenatal care delivery remained stable throughout the pandemic era. There was a large reduction in opioid use which may reflect coordinated programmatic efforts to reduce substance use disorders in pregnancy. Moderate changes were observed for use of antidepressants, anxiolytics, and insulin, and were concordant with increases in related maternal morbidities, whereas there was a discordant <10% reduction in the use of antihypertensive

therapies. Maternal outcomes were stable, except for large increases in depression and postpartum onset preeclampsia. Infant outcomes also remained stable except for large bidirectional changes in mortality, likely influenced by very low absolute rate, and large decreases in asthma and digestive system disorders. While the relative rate difference for asthma was >70%, the incidence of asthma diagnosis in infants under 12 months is low, as expected. The absolute rate difference for asthma was <1%, which is consistent with recent national data, and may be due in part to difficulty in definitively diagnosing asthma in this age group as well as changes in assessment, exposure, and sensitization during the pandemic.

Conclusions: With some exceptions, notably for maternal risk variables and associated prescription drug therapy consistent with overall national trends, prenatal care delivery, maternal outcomes, and infant outcomes remained stable during the first 2 years of the pandemic era. Overall, these data are reassuring, and likely reflect the sum of efforts by healthcare providers, healthcare systems, and payors to preserve the continuity of maternal and infant care despite the negative impact of COVID-19 infection on both moms and babies. Observed pandemic era trends for moderate-large shifts in specific maternal risk variables, maternal outcomes, and neonatal outcomes warrant ongoing monitoring and further research regarding their root causes and impact on longer-term outcomes.

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Original Manuscript

Title

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Authors

Stephanie A Lynch, MPH, Caredon Research

Tiffany Inglis, MD, Elevance Health

Courtney Carmicheal-Swanner, MD, Elevance Health

Cynthia Brown, MD, MHA, FACOG, Elevance Health

Eric Stanek, PharmD, Caredon Research

Corresponding Author

Name: Stephanie Lynch

Degree: MPH

Affiliation: Caredon Research

Mailing address: 55 Chapel Street Ste 105, Newton, MA 02458

Email address: stephanie.lynch@caredon.com

Telephone: 339-368-9294

Fax: NA

Abstract / Summary Sentence

Using medical and pharmacy claims data from mother-infant dyads in a large United States population, we describe changes in maternity care and maternal and infant outcomes during the early and mid-SARS-CoV-2 2019 (COVID-19) pandemic era.

Introduction

The SARS-CoV-2 2019 (COVID-19) pandemic directly and indirectly impacted both healthcare delivery and outcomes in the United States. While there are some data pertaining to this impact in maternity, there are no national data on trends in combined maternal risk, prenatal care delivery, and a broad range of maternal and infant outcomes, or any beyond 2020.¹⁻³ We sought to provide these data in a large United States population over the early and mid-pandemic era referent to the pre-pandemic era.

Methods

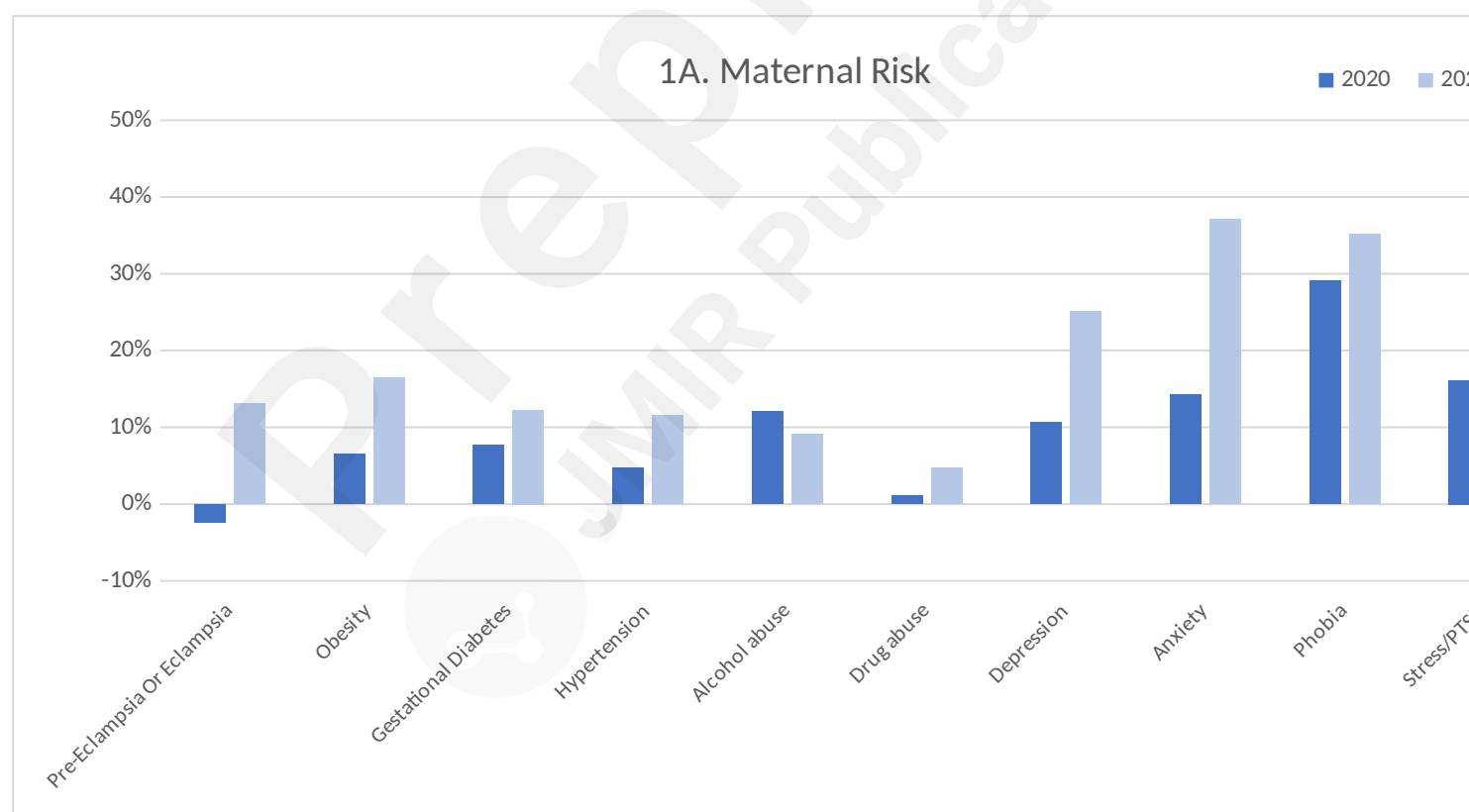
This observational study used integrated medical and pharmacy claims data from 658,538 commercially-insured mother-infant dyads with deliveries occurring between January 1, 2019 and December 31, 2021. Mothers with live births during the study period and their infants were included in the study population if both had health plan benefit coverage. Variables of interest were reported in three categories: Maternal Risk, Prenatal Care, and Delivery Outcomes. The Maternal Risk category included diagnoses of metabolic disorders and behavioral health disorders. Metabolic disorders included pre-eclampsia or eclampsia, gestational diabetes, and hypertension, and behavioral health disorders included substance use disorders, depression, anxiety, phobia, and stress/post-traumatic stress disorder. The Prenatal Care category was comprised of medical claims, including encounters and procedure codes, for prenatal care delivery and pharmacy claims for prenatal drug therapy targeting metabolic and behavioral health conditions. This included “Appropriate Ultrasound Timing & Frequency” and “Lab Screening Completion” variables, which are internal quality measures of the completion of American College of Obstetrics and Gynecology

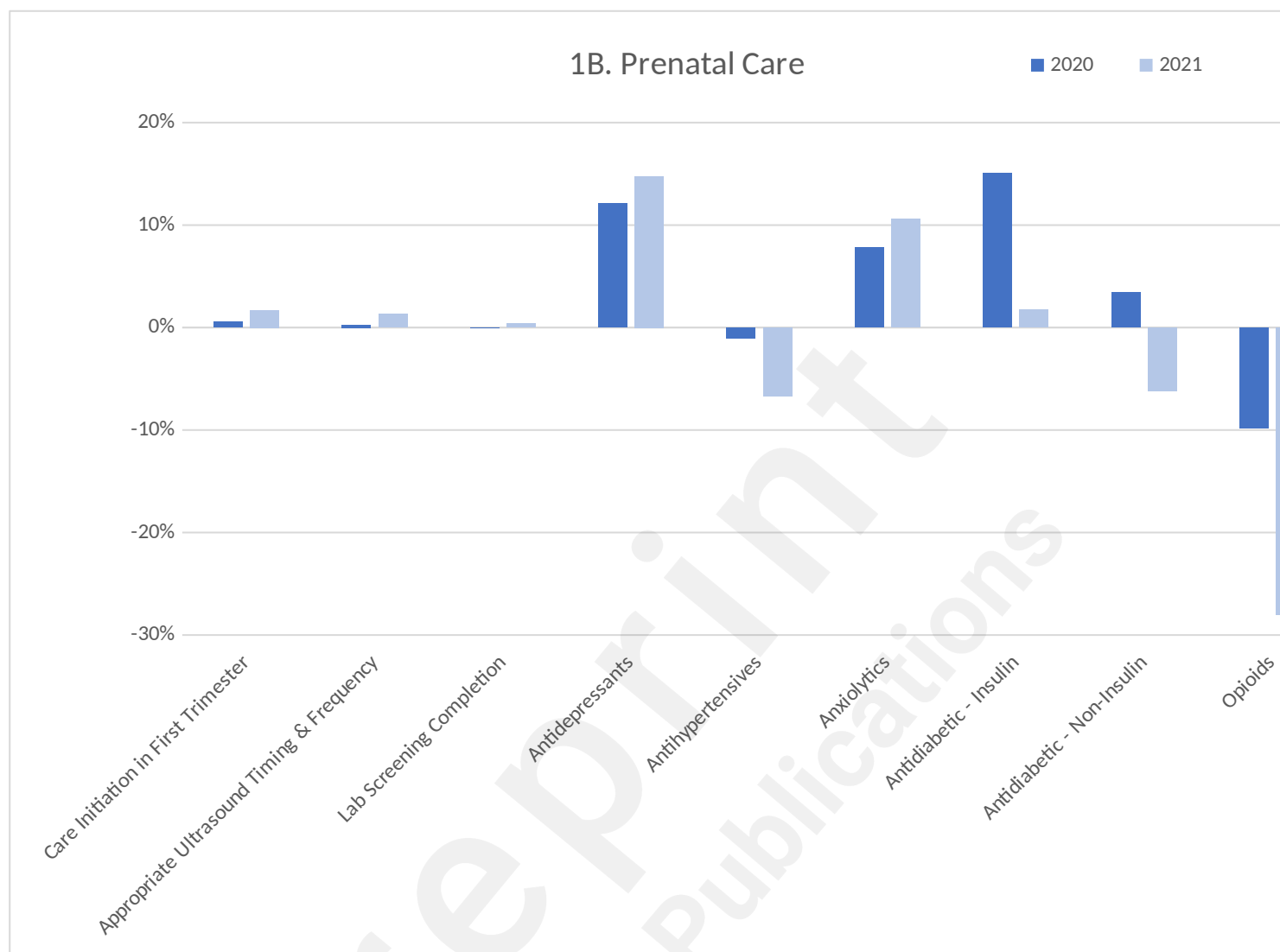
recommended screenings during pregnancy. Delivery Outcomes category included medical claims, with procedure, diagnosis, and revenue codes, for maternal outcomes occurring through the first 42 days postpartum and infant outcomes in the first 1 year of life. Relative differences were calculated for each variable by comparing the absolute rates in 2020 or 2021 to the baseline year (2019), and differences $>20\%$ or $10\text{-}20\%$ were assessed as large or moderate, respectively.

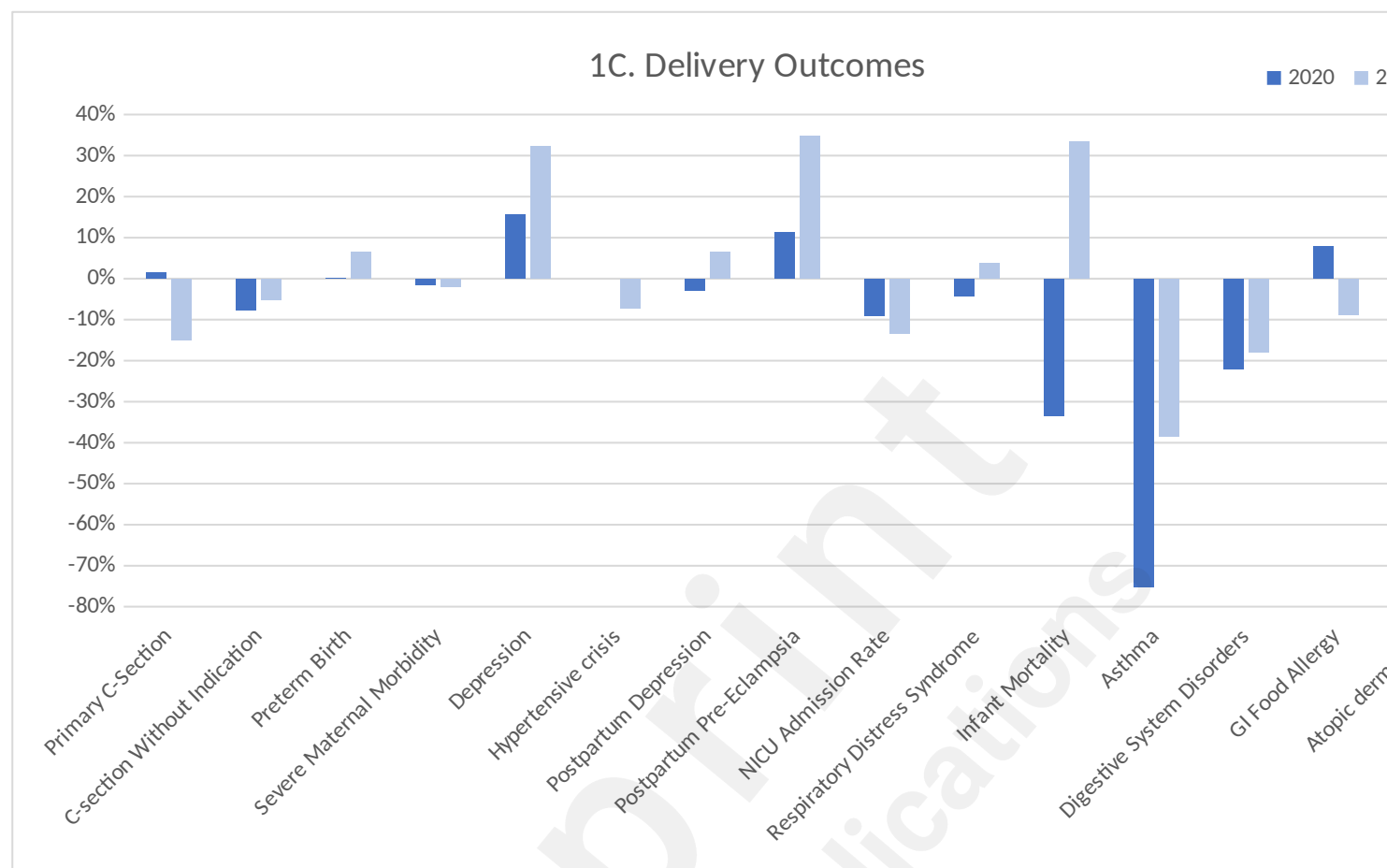
Results

Results are provided in Figure 1. Large increases in multiple maternal behavioral health disorders were observed during the early pandemic era, along with moderate increases in metabolic disorders (Figure 1A). Behavioral health disorders continued to increase into 2021 which may reflect the cumulative effect of pandemic-era stress overall.⁴

Figure 1. Trends in Maternity Care Compared to 2019







Prenatal care delivery remained stable throughout the pandemic era (Figure 1B). There was a large reduction in opioid use which may reflect coordinated programmatic efforts to reduce substance use disorders in pregnancy. Moderate changes were observed for use of antidepressants, anxiolytics, and insulin, and were concordant with increases in related maternal morbidities, whereas there was a discordant <10% reduction in the use of antihypertensive therapies.

Maternal outcomes were stable, except for large increases in depression and postpartum onset preeclampsia (Figure 1C). Infant outcomes also remained stable except for large bidirectional changes in mortality, likely influenced by very low absolute rate, and large decreases in asthma and digestive system disorders. While the relative rate difference for asthma was >70%, the incidence of asthma diagnosis in infants under 12 months is low, as expected. The absolute rate difference for asthma was <1%, which is consistent with recent national data⁵, and may be due in part to difficulty in definitively diagnosing asthma in this age group as well as changes in assessment, exposure, and

sensitization during the pandemic.⁶

Discussion

With some exceptions, notably for maternal risk variables and associated prescription drug therapy consistent with overall national trends, prenatal care delivery, maternal outcomes, and infant outcomes remained stable during the first 2 years of the pandemic era. Overall, these data are reassuring, and likely reflect the sum of efforts by healthcare providers, healthcare systems, and payors to preserve the continuity of maternal and infant care despite the negative impact of COVID-19 infection on both moms and babies. Observed pandemic era trends for moderate-large shifts in specific maternal risk variables, maternal outcomes, and neonatal outcomes warrant ongoing monitoring and further research regarding their root causes and impact on longer-term outcomes.

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Figure Title and Legend**Figure 1. Trends in Maternity Care Compared to 2019**

Each outcome was reported by pandemic-era year (2020 and 2021) compared to the baseline year (2019). Outcomes are categorized by Maternal Risk factors, including Metabolic and Behavioral Health Disorders (**Figure 1A.**), Prenatal Care, including care delivery and prescription drug therapy (**Figure 1B.**), and Delivery Outcomes, including maternal and infant outcomes (**Figure 1C.**).

List of Abbreviations

C-Section	Cesarean-Section
PTSD	Post-Traumatic Stress Disorder
NICU	Neonatal Intensive Care Unit
GI	Gastrointestinal

Supplementary Files

Figures

Trends in maternity care compared to 2019. A. Maternal risk; B. Prenatal care; C. Delivery outcomes.

