

Newborn Outcomes Among Veterans Utilizing VHA Maternity Benefits, 2016-2020

Rebecca L. Kinney, PhD*,†; Laurel A. Copeland, PhD*,†; Aimee R. Kroll-Desrosiers, PhD*,†; Lorrie Walker, MS*; Valerie Marteeny, MS*; Kristin M. Mattocks, PhD*,†

ABSTRACT

Introduction:

Public Law 111-163 Section 206 of the Caregivers and Veteran Omnibus Health Services Act amended the Veterans Health Administration's (VHA) medical benefits package to include 7 days of medical care for newborns delivered by Veterans. We examined the newborn outcomes among a cohort of women Veterans receiving VHA maternity benefits and care coordination.

Materials and Methods:

We conducted a secondary analysis of phone interview data from Veterans enrolled in the COMFORT (Center for Maternal and Infant Outcomes Research in Translation) study 2016–2020. Multivariable regression estimated associations with newborn outcomes (preterm birth; low birthweight).

Results:

During the study period, 829 infants were born to 811 Veterans. Mothers reported “excellent health” for 94% of infants. The prevalence of preterm birth was slightly higher in our cohort (11% vs. 10%), as were low birthweight (9%) deliveries, compared to the general population (8.28%). Additionally, 42% of infants in our cohort required follow-up care for non-routine health conditions; 11% were uninsured at 2 months of age. Adverse newborn outcomes were more common for mothers who were older in age, self-identified as non-white in race and/or of Hispanic ethnicity, had a diagnosis of posttraumatic stress disorder, or had gestational comorbidities.

Conclusions:

The current VHA maternity coverage appears to be an effective policy for ensuring the well-being and health care coverage for the majority of Veterans and their newborns in the first days of life, thereby reducing the risk of inadequate prenatal and neonatal care. Future research should examine costs associated with extending coverage to 14 days or longer, comparing those to the projected excess costs of neonatal health problems. VHA policy should continue to support expanding care and resources through the Maternity Care Coordinator model.

INTRODUCTION

In 2010, the Veterans Health Administration (VHA) enacted Public Law (PL) 111-163, Section 206 of the Caregivers and Veterans Omnibus Health Services Act, expanding the VHA medical benefits package for pregnant Veterans to include up to 7 days of health care for their newborns. In addition to providing Veterans with prenatal care throughout pregnancy, the VHA expansion coverage helps to ensure a healthy start for newborns who may not have insurance coverage otherwise. This expansion of VHA coverage to the first 7 days of the newborn's life could potentially be one step in reducing disparities in chronic comorbidities across a lifetime.

In the United States, 1 in 10 babies are born prematurely, or at less than 37 weeks gestation, annually.^{1,2} One repercussion of preterm deliveries is low-birthweight neonates weighing less than 5 pounds, 8 ounces at birth.³ In the United States, 8% of deliveries are low birthweight (LBW) newborns.^{1,4} Premature delivery and LBW contribute to infant mortality and are leading causes of complex comorbidities throughout infancy and into adulthood. The costs associated with caring for infants with morbidity due to preterm delivery or LBW in the United States is estimated around \$6 million more than for normal birthweight (NBW) babies.^{5,6} Despite efforts to reduce the prevalence of preterm deliveries and LBW, little progress has been made over the past two decades.⁷ Early access to routine health care, as enacted by PL 111-163, provides an important opportunity for improving newborn outcomes.

Several risk factors for preterm birth (PTB) and LBW have been identified as prevalent in Veterans.^{8–10} Compared to the general population, women Veterans have a higher prevalence of complex clinical (diabetes and hypertension) and mental health (depression, posttraumatic stress disorder [PTSD], and anxiety) comorbidities.^{9,11–13} Previous studies of the general population have concluded that increased maternal clinical

*VA Central Western Massachusetts Healthcare System, Leeds, MA 01053, USA

†Department of Population and Quantitative Health Sciences, University of Massachusetts Medical School, Worcester, MA 01655, USA

The views expressed are those of the authors and do not necessarily represent the views of the U.S. Department of Veterans Affairs.

doi:https://doi.org/10.1093/milmed/usab457

Published by Oxford University Press on behalf of the Association of Military Surgeons of the United States 2021. This work is written by (a) US Government employee(s) and is in the public domain in the US.

comorbidities and advanced age are associated with PTB.^{6,14} Maternal mental health symptoms also have been related to preterm delivery and LBW.^{15–17}

Furthermore, a substantial number of women Veterans have sociodemographic characteristics that may impact newborn outcomes. Maternal economic and health care instability are significant challenges to accessing quality prenatal care and attaining positive outcomes for both the mother and the newborn. It is not unusual for women to experience a gap in coverage within 6 months of giving birth, making health care for the mother and infant a challenge. Previous literature has underscored the role of continuous maternal health insurance coverage on newborn outcomes among the Medicaid population.¹⁸ Insurance gaps may be even more common among Veterans and their newborns. Women Veterans are more likely to be uninsured or be utilizing the VHA as their sole source of health care compared to their male counterparts.¹⁹ Over half of women Veterans who use VHA health care also have a service-connected disability rating, indicating an injury or illness incurred or aggravated during military service, rated on a severity scale from 0% (lowest disability rating) to 100% (highest disability rating). Women are more likely to be at the higher disability ratings, which are also associated with unemployment and may explain why women are more likely to have no personal income and to be living below the poverty line compared to their male Veteran counterparts.¹⁹

Adverse maternal and newborn outcomes are amenable to prevention but unaddressed can result in hospitalizations, emergency room visits, and higher overall costs over a lifetime.²⁰ The cost implications of infant morbidity make newborn outcomes an important VHA policy issue. Yet, relatively little is known about the babies born to Veterans utilizing the VHA maternity care benefit.⁸ In recent years, the VHA has also offered Maternity Care Coordinators (MCCs) for all eligible Veterans in an effort to reduce the risk for adverse maternal and newborn outcomes.²¹ Through regular phone communication, VHA MCCs help pregnant Veterans coordinate and navigate their health care between the VHA and community-based obstetrics settings. It is unclear whether the VHA's enhanced services, such as MCC and the newborn expansion policy, are enough support to ensure good maternal and newborn health. Our goal was to examine the newborn outcomes of Veterans, with a focus on the overall infant health and health care. Of interest are the relationships between maternal risk factors and newborn outcomes (e.g., gestation and birthweight) among Veterans utilizing VHA Maternity Care Coordination and PL 111-163 benefit.

METHODS

Study Design

This study utilized data collected in the ongoing COMFORT (Center for Maternal & Infant Outcomes Research in

Translation) study to analyze the characteristics of infants born to women Veterans.⁸ To be eligible for the COMFORT study, participants were English-speaking women Veterans, 18 years of age or older, with a confirmed pregnancy and enrolled in VHA care at one of the 15 COMFORT study sites throughout the United States.

Potential participants were mailed a study invitation letter, which included a phone number to opt out of the study. Two weeks after the invitation letter was mailed, the research team made follow-up phone calls to see if the Veteran was interested in participating. Veterans who consented to participate completed two telephone surveys: the first around 20 weeks of pregnancy and the second around 10 weeks postpartum. All phone surveys were conducted by a trained research coordinator. Participants received a \$25 gift card for the completion of each interview. The COMFORT study was approved by the Veterans Administration Central Institutional Review Board, along with the Research and Development Committee at each site.

Survey data were collected and managed in Research Electronic Data Capture and included maternal sociodemographic characteristics, mental health symptoms, clinical comorbidities, social support, military service, and pregnancy-related factors.⁸ For this analysis, Veterans had to have completed both the prenatal and postpartum interviews. Additionally, all Veterans in this cohort had to be matched in the VHA Electronic Medical Record (EMR) database so that maternal clinical characteristics could be confirmed. For women with more than one delivery during the study period, only the first delivery was included.

Study Outcomes

Dependent variables included newborn PTB, defined as an infant born prior to 37 weeks gestational age and contrasted with full-term birth (FTB) and LBW.²² Due to the constraints of the data collection instrument, LBW was defined as a newborn weight equal to or less than 5.8 pounds. We defined the comparison group as newborn weight greater than 5.8 pounds (NBW); high birthweight or weighing more than 9 pounds at birth was not assessed.²³ We also analyzed self-reported newborn insurance coverage at 2 months after delivery as a dependent variable.

Independent Variables

Sociodemographic variables were chosen based on previous literature^{1,7,24} and include maternal age dichotomized as greater or less than 35 years, minority race or ethnicity defined as not white in race and/or Hispanic or Latino ethnicity (yes/no), marital status (married/not married), and maternal health insurance (VHA insurance vs. private vs. both VHA and private/other). Military characteristics included ever deployed (yes/no) and history of military sexual trauma (MST). MST included both harassment and rape and was assessed using the VHA's universal MST

screening questions^{25,26} and combined into a single indicator for multivariable models.

Clinical factors included self-reported first prenatal care appointment as early enough (within the first 13 weeks of pregnancy, yes/no), first pregnancy (yes/no), self-reported receipt of VHA MCC, self-reported gestational diabetes or gestational hypertension (combined into a single indicator, yes/no), provider visit(s) for a newborn complication or illness after hospital discharge (yes/no), newborn health status at 2 months rated as excellent or very good (yes/no), maternal satisfaction with newborn health care rated as very satisfied or satisfied (yes/no), and newborn hospital stay after delivery as 8 or more days (yes/no). Additional maternal clinical comorbidities were abstracted from the EMR and included mental health conditions (depression or anxiety; PTSD) diagnosed within three timeframes of interest: 9 months prior to conception, pregnancy, and 9 months after delivery. Also abstracted from the EMR was service-connected disability status as determined by the Veterans Benefits Administration²⁷ and Veteran service period during Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF)/Operation New Dawn (OND) (yes/no).

Statistical Analysis

Associations between sociodemographic and outcome measures (PTB, LBW, and newborn insurance at 2 months) were assessed using χ^2 statistics for nominal data and Student *t*-tests for continuous measures. Multivariable logistic regression examined the factors associated with each outcome. These models adjusted for covariates previously shown to be associated with newborn outcomes: maternal age, race, ethnicity, comorbidity (PTSD, MST, and gestational hypertension/diabetes), use of VHA MCC, and use of the VHA maternity benefit. All tests were two-sided; *P*-values <.05 indicated statistical significance. Adjusted odds ratios (OR) were presented with their 95% confidence intervals (CI95); CI95 excluding 1.0 denoted significant associations. Analyses were conducted using STATA 14 (StataCorp LLC., 2017. College Station, TX).

RESULTS

COMFORT Women Veterans

Overall, 1,223 pregnant Veterans were enrolled in the COMFORT study from January 2016 to December 2020. Of these women, 26% had yet to complete the postdelivery interview, 2% had miscarriages, and 6% were missing EMR data resulting in a sample of 811 Veterans eligible for this analysis.

The average age of the mothers was 32.2 years (SD: 4.6; range: 20–49); 51% were non-Hispanic white in race and ethnicity (25% identified as black, 2% Asian, 14% “other race”; 20% Hispanic or Latinx in ethnicity); and 67% were married. Sixty percent of women were deployed during their military service; 98% of Veterans served in OEF/OIF/OND. The

majority of Veterans (96%) were utilizing the VHA maternity care benefit for their pregnancy and 84% reported receiving VHA MCC. Fifty-five percent reported a history of MST. As documented by the EMR, Veterans had a high prevalence of mental health comorbidities in the months prior to, during, and following pregnancy, including depression/anxiety (63%) and PTSD (39%). Eight percent of the mothers reported being diagnosed with gestational diabetes or hypertension during their pregnancy.

Infant Outcomes

Our infant cohort included 829 infants (18 twin births), of which 34% were delivered by cesarean section. On average, newborns were delivered at 37.6 weeks gestation; 11% were PTBs. Nine percent of newborns were of LBW. After discharge from the hospital, 42% of newborns experienced complications, primarily jaundice, tongue tied, or lack of weight gain. Eleven percent of newborns had hospital stays of 8 or more days after their deliveries. Eleven percent of newborns did not have health insurance 2 months following birth. In addition, 95% of Veterans rated their newborn’s health as “excellent” or “very good”; 91% were “very satisfied” or “satisfied” with their newborn’s health care.

Table I presents the bivariate associations with PTB, affecting 11% of our newborns. Infants born before 37 weeks gestation were more likely to be delivered to older mothers ($X = 33.6 \pm 4.7$ years) in comparison to their younger counterparts ($X = 32.0 \pm 4.6$ years). Veterans with a history of depression/anxiety accounted for a higher percentage (65%) of PTB compared to their counterparts without a mental history (35%), but the difference was not statistically significant. PTB infants were more likely to be born at a lower birthweight than their counterparts ($P < .001$). Veterans with a gestational diagnosis of hypertension and/or diabetes were significantly more likely to deliver preterm infants compared to those mothers without a comorbidity ($P < .001$). Preterm infants were more frequently rated as having “poor” health status by their Veteran mothers in comparison to full-term newborns whose mothers reported their health status as “excellent or good” ($P = .006$). There were no significant differences in gestational age at birth by the remainder of the maternal sociodemographic factors, including newborn insurance at 2 months postdelivery.

Table II presents the bivariate associations with newborn birthweight. Sixty-eight percent of LBW babies were born to minority mothers. Veterans of LBW newborns were less likely to be married (60%) compared to their counterparts (71%) who had NBW deliveries. PTSD was more common among mothers who delivered LBW babies (55%) versus NBW babies (37%; $P = .003$), as was a diagnosis of depression or anxiety (72% LBW vs. 62% NBW; $P = .12$). Among LBW deliveries, 18% of Veterans had a comorbidity of gestational hypertension or diabetes in comparison to 7% of mothers with NBW deliveries ($P = .004$).

TABLE I. Maternal Characteristics by Newborn Gestation ($N = 811$)

		Total $N = 811$ mothers	PTB <37 weeks ($N = 86$) * 10 twins	NTB ≥37 weeks ($N = 725$) * 8 twins	P-value
Age		32.2 (SD: 4.6; Range: 20–49)	33.6 (SD: 4.7; Range: 24–45)	32.0 (SD: 4.6; Range: 20–49)	.11
Minority race	Yes	390 (48%)	47 (55%)	343 (48%)	.21
Married	Yes	543 (67%)	55 (68%)	488 (71%)	.61
OEF/OIF/OND	Yes	796 (98%)	85 (99%)	711 (98%)	.62
Deployed (ever)	Yes	488 (60%)	48 (57%)	440 (62%)	.43
Service connected ^a	Yes	445 (55%)	42 (86%)	403 (83%)	.66
First pregnancy?	Yes	273 (34%)	26 (31%)	247 (35%)	.46
Prenatal care early as wanted	Yes	576 (71%)	60 (71%)	516 (72%)	.85
VA maternity benefit*	Yes	776 (96%)	83 (98%)	693 (96%)	.55
Maternity care coordinator	Yes	679 (84%)	70 (83%)	609 (85%)	.66
LBW	Yes	71 (9%)	48 (56%)	23 (3%)	$P < .001$
Problem or illness since birth	Yes	337 (42%)	42 (49%)	295 (41%)	.35
Mental Health (MH) Diagnosis	Depression/anxiety PTSD	513 (63%)	56 (65%)	457 (63%)	.71 .12
		314 (39%)	40 (47%)	274 (38%)	
MST	Harassment/rape*	439 (54%)	53 (62%)	386 (55%)	.18
Gestational comorbidity		64 (8%)	19 (23%)	45 (7%)	$P < .001$
Newborn health status	Excellent/very good	763 (94%)	76 (88%)	687 (95%)	.006
Health care satisfaction	Very satisfied/satisfied	724 (89%)	79 (92%)	645 (91%)	.73
Newborn length of stay (LOS)	≥8 days	87 (11%)	15 (17%)	72 (10%)	.003
Newborn health insurance	Yes	723 (89%)	80 (93%)	643 (90%)	.53

Abbreviation: FTB, full-term birth; LBW, low birthweight; MST, military sexual trauma; PTB, preterm birth; PTSD, posttraumatic stress disorder.

*To identify $P < .05$.

^aDenominator is smaller on these datapoints due to missing data.

There were no significant findings between maternal characteristics and newborn health insurance coverage at 2 months postdelivery.

Multivariable Regression Models

Table III presents the results of the multivariable models. After adjusting for selected characteristics, PTB was associated with a maternal age: Veterans who were 35 years or older during their pregnancies were twice as likely to have PTB newborn (OR: 1.1; 95% CI: 1.0, 1.1). Veterans diagnosed with a gestational comorbidity (hypertension and/or diabetes) were more than three times more likely to have a preterm delivery than their counterparts (OR: 3.5; CI: 1.8–6.5; $P < .001$). Maternal minority race, PTSD diagnosis, and newborn complications after discharge were not associated with PTB.

An LBW delivery was significantly more likely among mothers who self-reported their race and/or ethnicity as non-white and/or Hispanic (OR: 2.3; 95% CI: 1.3, 4.0; $P = .003$) and among Veterans with a diagnosis of PTSD (OR: 2.2; 95% CI: 1.3, 3.6; $P = .003$). The remainder of the maternal sociodemographic and clinical characteristics were not associated with newborn birthweight in the final model. Neither PTB nor LBW was associated with VHA maternity care coordination or utilization of the VHA maternity benefit for prenatal and newborn care.

DISCUSSION

This is the first study to examine newborn outcomes among women Veterans since the expansion of the VHA maternity benefit. Overall, the majority of Veterans' newborns were full-term and NBW, and most newborns did not require extended hospital stays of more than 7 days suggesting that the expansion of the maternity care benefit has resulted in positive outcomes. The prevalence of PTB was slightly higher in our cohort (11% vs. 10%), as was LBW (9%) deliveries, compared to the general population (8.28%).² In our study, infants who did experience problems at birth were more likely to have mothers who were older, self-identified as being non-white and/or Hispanic, and who were diagnosed with pregnancy-related health conditions (e.g., gestational diabetes and hypertension). Among women aged 35 years or older, gestational hypertension and diabetes as maternal risk factors for adverse newborn outcomes is a well-known finding.^{24,28} Risk factors for gestational diabetes and hypertension often coincide with other medical and socioeconomic vulnerabilities, underscoring the essential need for VHA MCC and for having a patient advocate and co-navigator during the prenatal period and the time following delivery.

Previous literature has demonstrated the association between the timing and frequency of prenatal care on newborn outcomes.²⁸ Our study findings highlight the need

TABLE II. Maternal Characteristics by Newborn Birthweight ($N = 811$)

		Total $N = 811$ mothers	LBW 9 twin births (71)	NBW 9 twin births (740)	P -value
Age		32.2 (SD: 4.6; Range: 20–49)	33.6 (SD: 4.9; Range: 23–43)	32.0 (SD: 4.6; Range: 20–49)	.02
Minority race	Yes	390 (48%)	48 (68%)	342 (46%)	<.001
Married ^a	Yes	543 (67%)	41 (60%)	502 (71%)	.58
OEF/OIF/OND	Yes	796 (98%)	71 (100%)	725 (98%)	.23
Deployed (ever)	Yes	488 (60%)	41 (59%)	447 (61%)	.65
Service connected ^a	Yes	445 (55%)	37 (82%)	408 (84%)	.81
First pregnancy? ^a	Yes	273 (34%)	23 (33%)	250 (34%)	.81
Prenatal care early as wanted	Yes	576 (71%)	51 (73%)	525 (72%)	.90
Veterans Administration (VA) maternity Benefit [*]	Yes	776 (96%)	67 (96%)	709 (97%)	.70
Maternity care coordinator	Yes	679 (84%)	56 (82%)	623 (85%)	.53
Problem or illness since birth	Yes	337 (42%)	29 (41%)	308 (42%)	.94
Diagnosis of MH	Depression/anxiety	513 (63%)	51 (72%)	462 (62%)	.12 .003
	PTSD	314 (39%)	39 (55%)	275 (37%)	
MST	Harassment/rape [*]	439 (54%)	43 (61%)	396 (55%)	.38
Gestational comorbidity [*]		64 (8%)	12 (18%)	52 (7%)	.004
Newborn health status	Excellent/very Good	763 (94%)	63 (89%)	700 (95%)	.02
Health care satisfaction	Very satisfied/satisfied	724 (89%)	63 (90%)	661 (91%)	.80
Newborn LOS	≥8 days	87 (11%)	13 (19%)	74 (10%)	.009
Newborn health insurance	Yes	723 (89%)	63 (89%)	660 (90%)	.85

*To identify $P < .05$.

^aDenominator is smaller on these datapoints due to missing data.

TABLE III. Predictors of Newborn Outcomes Among Newborns of Women Veterans ($N = 811$)

		Low birthweight <5.8 pounds odds ratio (OR)	PTB <37 weeks gestation at birth odds ratio (OR)
Age		1.1 (95% CI: 1.0–1.1; $P = .3$)	1.1 (95% CI: 1.0–1.1; $P = .02$)
Race	Non-white, minority race or ethnicity	2.3 (95% CI: 1.3–4.0; $P = .003$)	1.1 (95% CI: 0.7–1.8; $P = .73$)
PTSD	Yes	2.2 (95% CI: 1.3–3.6; $P = .003$)	1.4 (95% CI: 0.9–2.3; $P = .14$)
Gestational comorbidity	Yes	1.8 (95% CI: 0.9–3.7; $P = .12$)	3.5 (95% CI: 1.8–6.5; $P < .001$)
Infant complications		0.9 (95% CI: 0.5–1.5; $P = .63$)	1.3 (95% CI: 0.8–2.1; $P = .34$)

to further understand how these risk-specific factors and community-engaging models of prenatal care could be implemented in different profiles of Veterans to reduce PTB and LBW, most specifically among older and minority mothers, along with those diagnosed with PTSD. Increasing the number of maternity care coordinators at VHA facilities could be a way in which to identify high-risk Veterans and coordinate care between VHA providers and community-based providers at earlier prenatal timepoints. The benefits of MCC have already been described in the Veteran population²¹; however, limited time and personnel make it very challenging to coordinate comprehensive care for all pregnant Veterans.

Advanced maternal age is a risk factor for negative pregnancy outcomes, including LBW and PTB, among both

primiparas and multiparas.^{29,30} Among our cohort, Veterans who were 35 years or older were at a higher risk of having a PTB. Previous work has described the impact of premature birth and its associated costs³¹ along with the need for novel interventions that seek to delay premature labor, specifically in older Veterans. Delaying premature labor may lead to shorter stays, cost savings, and better neonatal outcomes.

Minority infants die of complications associated with LBW at almost three times the rate of their white counterparts.³² Our study findings suggest that among newborns, those of non-white, minority race or ethnicity are more than two times more likely to be born at a LBW, even after adjusting for VHA benefit and MCC. Previous literature has underscored the role of maternal health care coverage on minority

newborn outcomes. The expansion of Medicaid coverage for underserved women has resulted in the improved continuity and access to prenatal care, as well as better newborn outcomes.^{33,34} Specifically, literature has reported greater reductions in rates of LBW and PTB outcomes among black infants relative to white infants in expansion Medicaid states.³² VHA maternity care coordination is a critical tool in improving access to and the continuity of quality prenatal care in minority Veterans, particularly for those women who remain uncertain on how to navigate between VA and non-VA care settings.

Other potential, yet more complex explanations for the increased risk for LBW among non-white, minority race or ethnicity newborns include maternal distrust in the health care system, social disparities such as income and neighborhood factors, stress, or physical health (including prepregnancy weight); yet, these factors were beyond the scope of this study.³⁵ Understanding these complex relationships is especially relevant in VHA mothers because many identify as non-white, minority race or ethnicity, and providing the best care possible, including averting adverse outcomes for Veterans' newborns, is an important part of the VHA mission. VA maternity care coordination would be enhanced if future efforts were made to identify community-based obstetric providers who are trained to address racism and disparities in addition to the prenatal needs of women Veterans.

Our study found that women with a PTSD diagnosis had twice the odds of delivering a LBW newborn. Previous literature has assessed the relationship between PTSD and adverse newborn outcomes; yet, these studies were often limited by small sample size or not exclusive to Veterans.³⁶ One study that did examine a large Veteran cohort found that women with a diagnosis of PTSD during pregnancy had a 35% increase in their odds for adverse newborn outcomes.⁷ The early identification of Veterans of child-bearing age with PTSD is imperative to preventing adverse pregnancy outcomes. It is important that Veterans with a PTSD diagnosis have adequate mental health care coordinated with their prenatal care in an effort to reduce stress before, during, and after pregnancy. Connecting Veterans diagnosed with PTSD to an MCC at the onset of pregnancy will ensure a comprehensive, continuous approach to care that incorporates both VHA mental health services and the non-VHA prenatal provider.

Coordinated care is particularly important among Veterans who have a dual diagnosis of PTSD and depressive disorder, which elevates the risk of PTB almost four-fold.³⁷ Forty-six percent of our cohort had a dual diagnosis of PTSD and depression resulting in women and newborns being particularly vulnerable. The VHA maternity care coordinator may be an effective resource in helping reduce adverse newborn outcomes among Veterans given that the first step toward better outcomes is to encourage prenatal care at an earlier date. This care should include the opportunity for the Veteran to discuss her PTSD with her prenatal care team/provider,

ongoing VHA mental health care, and an active collaboration with a maternity care coordinator to address concerns about labor, breastfeeding, and prenatal visits that may further increase stress. The early identification of women with PTSD (and depression/anxiety) may help reduce adverse pregnancy repercussions and morbidity; future research is needed on how to best intervene with mental health conditions to produce positive outcomes.

At 2 months postdelivery, 89% of our newborns had health insurance coverage. Although younger Veterans were less likely to have babies who were insured at 2 months, we did not find any significant associations between any of the maternal characteristics and newborn coverage. Our finding suggests opportunity to incorporate counseling on newborn insurance coverage into VHA MCC activities.³⁸ Alternative explanations, such as residing in a state where insurance options are more costly or less available, should also be explored.

Limitations of the study included lack of information on women Veterans who decided not to participate or were at VHA sites outside our sampling frame; however, sites were chosen to ensure racial and geographic diversity. Twenty-six percent of the Veterans enrolled in the COMFORT cohort were lost to follow-up and did not complete the second interview; it could be that some of these women suffered miscarriages or adverse events during their pregnancies, thus resulting in an underreporting of adverse outcomes in our study findings. Sociodemographic characteristics and clinical diagnoses made during pregnancy were self-reported as obstetrical and neonatal providers' data were unavailable. Although most of the COMFORT sample were matched with their VHA EMR, some did not provide sufficient data to be matched. The measure of LBW (<5.8 pounds) is a relatively unrefined measure. Still, the COMFORT cohort provides a large and diverse dataset in which to explore correlates of newborn outcomes among women Veterans.

Implications for Practice and Policy

As the number of women Veterans utilizing the VHA maternity benefit for pregnancy and delivery continues to increase, so does the need to provide targeted, collaborative prenatal care to Veterans who are older in age, of minority populations, who are at risk for gestational comorbidities, and who have been diagnosed with PTSD in the effort to produce the best maternal and newborn outcomes. Future VHA policies should aim to expand comprehensive care and resources to Veterans during their pregnancies by continuing to enhance the maternity care coordination model.

CONCLUSIONS

The majority of our Veteran cohort delivered full-term, NBW babies, similar to those mothers in the general population. Eighty-nine percent of Veterans' newborns had health insurance coverage at 2 months after delivery. Yet, Veterans

have excess risk of adverse newborn outcomes, including PTB and LBW. PTB and LBW deliveries increase the risk of complex medical comorbidities throughout childhood and adulthood. It is important that maternal risk factors are addressed early in pregnancy to facilitate full-term gestation and healthy newborns. The VHA MCC is essential to ensuring that Veterans can successfully navigate between the VA and non-VA prenatal care settings and that comprehensive health care needs are being met in the effort to produce the best pregnancy outcomes.

Furthermore, VHA PL 111-163, Section 206 aids in providing a healthy start for Veterans' newborns by providing health insurance for the first 7 days of life, which is particularly important in caring for PTB and LBW infants.

FUNDING

This research was supported by Veterans Health Administration, Health Services Research & Development award #HX-13-081 awarded to K.M.M.

CONFLICT OF INTEREST STATEMENT

The authors report no conflict of interests.

REFERENCES

- Behrman RE, Butler AS: *Institute of Medicine (US) Committee on Understanding Premature Birth and Assuring Healthy Outcomes. Preterm Birth: Causes, Consequences, and Prevention*. Institute of Medicine; 2007.
- Centers of Disease Control (CDC): *Birthweight and Gestation; Data are for the U.S.* United States Department of Health and Human Services; 2021.
- March of Dimes: Preterm Birth. 2020. marchofdimes.org; accessed July 3, 2021.
- Maternal and Child Health Bureau: *Preterm Birth*. United States Department of Health and Human Services; 2011.
- Guillory VJ, Samuels ME, Probst JC, Sharp G: Prenatal care and infant birth outcomes among Medicaid recipients. *J Health Care Poor Underserved* 2003; 14(2): 272–89.
- Auger N, Abrahamowicz M, Wynant W, Lo E: Gestational age-dependent risk factors for preterm birth: associations with maternal education and age early in gestation. *Eur J Obstet Gynecol Reprod Biol* 2014; 176: 132–6.
- Shaw JG, Asch SM, Kimerling R, Frayne SM, Shaw KA, Phibbs CS: Posttraumatic stress disorder and risk of spontaneous preterm birth. *Obstet Gynecol* 2014; 124(6): 1111–9.
- Mattocks KM, Baldor R, Bean-Mayberry B, et al: Factors impacting perceived access to early prenatal care among pregnant veterans enrolled in the department of veterans affairs. *Womens Health Issues* 2019; 29(1): 56–63.
- Mattocks KM, Skanderson M, Goulet JL, et al: Pregnancy and mental health among women veterans returning from Iraq and Afghanistan. *J Womens Health (Larchmt)* 2010; 19(12): 2159–66.
- Hugin M, Shaw JG: Obstetric outcomes in U.S. veterans: emerging knowledge, considerations, and gaps. *Semin Reprod Med* 2019; 37(1): 17–23.
- Gelaye B, Kajeepeta S, Williams MA: Suicidal ideation in pregnancy: an epidemiologic review. *Arch Womens Ment Health* 2016; 19(5): 741–51.
- Frayne SM, Skinner KM, Sullivan LM, et al: Medical profile of women Veterans Administration outpatients who report a history of sexual assault occurring while in the military. *J Womens Health Gend Based Med* 1999; 8(6): 835–45.
- Eggleston B, Dismuke-Greer CE, Pogoda TK, et al: A prediction model of military combat and training exposures on VA service-connected disability: a CENC study. *Brain Inj* 2019; 33(13–14): 1602–14.
- Auger N, Hansen AV, Mortensen L: Contribution of maternal age to preterm birth rates in Denmark and Quebec, 1981–2008. *Am J Public Health* 2013; 103(10): e33–8.
- Cook N, Ayers S, Horsch A: Maternal posttraumatic stress disorder during the perinatal period and child outcomes: a systematic review. *J Affect Disord* 2018; 225: 18–31.
- Gelaye B, Sanchez SE, Andrade A, et al: Association of antepartum depression, generalized anxiety, and posttraumatic stress disorder with infant birth weight and gestational age at delivery. *J Affect Disord* 2020; 262: 310–6.
- Mannisto T, Mendola P, Kiely M, et al: Maternal psychiatric disorders and risk of preterm birth. *Ann Epidemiol* 2016; 26(1): 14–20.
- Zephyrin LCA, Nuzum R, Getachew Y: To the Point [Internet]: The Commonwealth Fund. 2019. Updated 2020. <https://doi.org/10.26099/ejtb-te04>; accessed August 18, 2021.
- Women Veterans Report: *The Past, Present, and Future of Women Veterans*. National Center for Veterans Analysis and Statistics, Department of Veterans Affairs; 2017.
- Taylor YJ, Liu TL, Howell EA: Insurance differences in preventive care use and adverse birth outcomes among pregnant women in a medicaid nonexpansion state: a retrospective cohort study. *J Womens Health (Larchmt)* 2020; 29(1): 29–37.
- Mattocks KM, Kuzdeba J, Baldor R, Casares J, Lombardini L, Gerber MR: implementing and evaluating a telephone-based centralized maternity care coordination program for pregnant Veterans in the Department of Veterans Affairs. *Womens Health Issues* 2017; 27(5): 579–85.
- College of Obstetricians and Gynecologists: *Preterm (Premature) Labor and Birth: Resource Overview*. Wolters Kluwer; 2013.
- Kapral N, Miller SE, Scharf RJ, Gurka MJ, DeBoer MD: Associations between birthweight and overweight and obesity in school-age children. *Pediatr Obes* 2018; 13(6): 333–41.
- Goldenberg RL, Culhane JF, Iams JD, Romero R: Epidemiology and causes of preterm birth. *Lancet* 2008; 371(9606): 75–84.
- Kimerling R, Gima K, Smith MW, Street A, Frayne S: The Veterans Health Administration and military sexual trauma. *AJPH* 2007; 97(12): 2160–6.
- Kimerling R, Street A, Gima K, Smith MW: Evaluation of universal screening for military-related sexual trauma. *Psychiatr Serv* 2008; 59(6): 635–40.
- Frayne SM, Phibbs, CS, Saechao F, et al. (editors): *Longitudinal Trends in Sociodemographics, Utilization, Health Profile, and Geographic Distribution*. Vol 4. Veterans Healthcare Administration; 2018.
- Goldenberg RL, Culhane JF: Low birth weight in the United States. *Am J Clin Nutr* 2007; 85(2): 584s–90s.
- Saloojee H, Coovadia H: Maternal age matters: for a lifetime, or longer. *Lancet Glob Health* 2015; 3(7): e342–3.
- Bewley S, Davies M, Braude P: Which career first? *BMJ* 2005; 331(7517): 588–9.
- Phibbs C, Schmitt SK: Estimates of the cost and length of stay changes that can be attributed to one-week increases in gestational age for premature infants. *Early Hum Dev* 2006; 82(2): 10.
- Brown CC, Moore JE, Felix HC, et al: Association of state Medicaid expansion status with low birth weight and preterm birth. *JAMA* 2019; 321(16): 1598–609.
- Bhatt CB, Beck-Sague CM: Medicaid expansion and infant mortality in the United States. *Am J Public Health* 2018; 108(4): 565–7.
- Daw JR, Hatfield LA, Swartz K, Sommers BD: Women in the United States experience high rates of coverage 'churn' in months before and after childbirth. *Health Aff (Millwood)* 2017; 36(4): 598–606.

35. Alhusen JL, Ayres L, DePriest K: Effects of maternal mental health on engagement in favorable health practices during pregnancy. *J Midwifery Womens Health* 2016; 61(2): 210–6.
36. Seng JS, Oakley DJ, Sampsel CM, Killion C, Graham-Bermann S, Liberzon I: Posttraumatic stress disorder and pregnancy complications. *Obstet Gynecol* 2001; 97(1): 17–22.
37. Yonkers KA, Smith MV, Forray A, et al: Pregnant women with post-traumatic stress disorder and risk of preterm birth. *JAMA Psychiatry* 2014; 71(8): 897–904.
38. US. Department of Veterans Affairs: The Veterans Health Administration Washington DC 2019. <https://www.va.gov/health/aboutVHA.asp>; accessed August 8, 2021.