

Birth Setting Related Outcomes Among Low-Risk, Midwife-Attended Births in Washington State

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Abstract

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Background: Community births attended by midwives have gained attention for their potential to support physiologic childbirth and reduce medical interventions compared to hospital births. However, outcomes comparing midwife-attended births following low-risk pregnancies in community and hospital settings remain understudied. Among midwife-attended births, we examined overall and parity-specific associations of birth setting with physiologic birth and hospital admission within 30 days of delivery for birthing parents and infants.

Methods: This retrospective cohort study analyzed data from the Obstetrical Care Outcomes Assessment Program (OB COAP) in Washington State. The study included 1,442 low-risk midwife-attended births between January 2022 and March 2023. Planned birth settings were categorized as community (home or birth center) or hospital. Physiologic childbirth (defined as spontaneous labor and birth without medical interventions) and hospital admissions within 30 days post-delivery for birthing parents or newborns were the primary outcomes. We used crude and adjusted (for birthing parent age, geographic residence, race, ethnicity, insurance payor type, parity, gestational age, and pre-pregnancy body mass index) modified Poisson regression models to estimate relative risks (RRs) and corresponding 95% confidence intervals

(CIs). We also evaluated parity as a potential effect modifier of the associations using stratified analyses and models with interaction terms.

Results: Among study participants, 744 birthing parents (51.6%) had planned community births. Overall, 55.5% of birthing parents in the sample of low-risk midwife-attended births experienced a physiologic birth, and 0.9% of birthing parents and 2.1% of newborns were admitted to the hospital within 30 days of delivery. Community births had a higher likelihood of physiologic childbirth compared to hospital births (aRR: 5.95, 95% CI: 4.98-7.10). This association was stronger among nulliparous parents (aRR: 10.32, 95% CI: 6.96-15.29) than multiparous parents (aRR: 4.77, 95% CI: 3.93-5.79) (interaction p-value < 0.01). There was no significant difference in hospital admissions/readmission for birthing parents (aRR: 0.93, 95% CI: 0.32-2.73) or newborns (aRR: 0.83, 95% CI: 0.38-1.78) between planned community and hospital births. Similarly, we did not observe significant birth setting and hospital admission associations among groups stratified by parity (all p-values in stratified models and interaction p-value > 0.05).

Conclusion: Planned community births attended by midwives in Washington State had higher rates of physiologic childbirth compared to hospital births, particularly among nulliparous parents. These findings support the role of midwifery care in promoting physiologic birth, suggesting community birth as a viable option for low-risk pregnancies. Further research is needed to explore long-term outcomes and address variations across different settings and populations.

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Introduction

Approximately 87,000 births occur annually in Washington State in 67 hospitals, midwife-attended birth centers, or homes.¹ In recent years, community births (planned home and birth center births) attended by midwives have gained attention for their potential to support the autonomy of birthing parents and reduce interventions (such as labor induction, cesarean, and episiotomy) while obtaining outcomes comparable to hospital births.² “Physiologic childbirth” encompasses spontaneous labor and birth at term without the use of interventions for labor stimulation or pain management throughout labor and birth.³ While medical interventions may be necessary in some cases where the birthing parent or child is at risk, concerns exist that excessive (and potentially unnecessary) use of pharmacologic or mechanical interventions disrupts the natural process of birth, potentially resulting in a cascade of further interventions that the birthing parent did not initially desire or put the birthing parent or offspring at risk.^{4,5} However, there are also risks in community births for the birthing parent and infant when conditions reach a point during labor and delivery that necessitate transfer to a higher level of care.⁶ Currently, community birth remains a rare choice amongst birthing parents in Washington, with the most recently published data indicating that 3.6% of all births in Washington state occurred at home or in birthing centers.^{6,7} An increasing number of families in the United States are choosing to give birth in community settings, in part due to concerns for the safety influenced by the COVID-19 pandemic and increased medicalization of hospital births.⁸⁻¹²

The integration of community birth and midwifery practices within health care systems is essential in understanding differences in obstetric processes and outcomes by birth setting.¹³ According to the International Confederation of Midwives (ICM), midwives aid in optimizing the normal biopsychosocial process of childbirth and promote birthing parents’ personal capabilities to care for themselves and their families.¹⁴ They work in partnership with birthing parents and other healthcare professionals to provide holistic care that meets the individual needs of birthing parents during pregnancy, labor, and the postpartum period. Midwives are generally the birth attendants in community birth settings

but have also been more commonly practicing in hospital settings as part of an integrated care team.¹⁵ Previous studies have found that the proportion of low-risk midwife-attended births that occur in the community varies in the North American setting, with estimates ranging from 15.0 to 37.8%.^{13,16,17}

The model for obstetric care delivery in the United States is different from many other high-resource countries in that physicians (i.e., Medical Doctors, Osteopathic Doctors) predominantly provide care for low-risk pregnancies rather than midwives.¹⁸ In countries with well-integrated midwifery practices, outcomes for planned community births are not significantly different from planned hospital births.^{13,19} Although there are significant variations across the United States in the delivery of midwife-led obstetric care, Washington State, in particular, has a highly integrated community of midwifery within the state healthcare system and professional regulatory practices that mirror international best practices.²⁰⁻²² Midwives may play a key role in facilitating physiologic childbirth through several pathways, including the promotion of non-pharmacological pain management during labor and delivery, pushing techniques, flexible sacrum birthing positions (e.g., upright, kneeling, squatting, hands and knees.), and supporting the perineum.²³

Although associations of birth setting with interventions and outcomes during the labor and delivery process have been previously investigated, there are gaps in the literature. More specifically, the difference in risk of physiologic birth or admission to a hospital (for birthing parents or newborns) by birth setting among low-risk midwife-attended births in the United States is largely unknown. This thesis aimed to comprehensively assess and compare the likelihood of physiologic childbirth (a spontaneous birth without medical intervention) and admission to a hospital within 30 days of birth for newborns or birthing parents in a contemporary Washington State cohort of midwife-attended low-risk planned community births and low-risk planned hospital births. The study also evaluated the potential role of parity as an effect modifier of the associations. Understanding how outcomes differ across low-risk community and low-risk hospital births in a setting where midwifery practices are established and regulated, as in Washington State, is valuable to inform future research and clinical practice related to the choice of birth setting and care-leading teams.

Methods

Study Design and Study Setting

This is a retrospective cohort study investigating the association of planned birth settings with obstetric outcomes. The setting of this study is in Washington State. Births attended by a midwife provider at hospitals and in the community setting (either at a birth center or home) were included in the study. Data was obtained from the Obstetrical Care Outcomes Assessment Program (OB COAP). The OB COAP is a clinician-led, continuous quality improvement collaborative based at the Foundation for Health Care Quality (FHCQ), a nonprofit organization in Seattle, Washington, that houses programs dedicated to reducing variations in health outcomes and improving quality and outcomes of care for patients.^{18,24} OB COAP utilizes clinical data from medical records to evaluate care given to pregnant people during labor, delivery, and postpartum to inform actionable and sustainable improvements. Multiple hospitals and delivery sites in Washington state, including urban, suburban, and rural centers that support varying levels of maternal care, participate in OB COAP and provide data for continuous quality improvement purposes. OB COAP also partners with the Midwives Alliance of North America Statistics Project (MANA Stats) to collect data on community births attended by a midwife.

Study Participants

The study population comes from a sample of 32,026 individuals aged 12-55 who gave birth in Washington state at one of the hospitals participating in OB COAP data collection or at home or a birth center with a midwife provider between January 1, 2022, and March 31, 2023. This report uses “birthing parent” as a gender-neutral, inclusive term for study participants. The cohort was restricted to births where the intrapartum practitioner type was a midwife, narrowing the sample to 4,535 index pregnancies. The OB COAP collects data on the type of practitioner who provides prenatal care, admits the birthing parent to the hospital, provides care in labor, and performs the delivery.¹⁸ To optimize the appropriate attribution of intrapartum care to midwife providers and exclude transfers of care for high-risk

pregnancies, we included only those births where the birthing parent was admitted and received their intrapartum care from a midwife. We excluded births for which a midwife provided the prenatal care, but the admitting practitioner was a non-midwife provider.

To identify a study cohort of low-risk births, we limited our study population to singleton cephalic births with the onset of labor between 37 and 41 weeks + 6 days of gestation. The study excluded participants with pre-pregnancy risk factors, including prior cesarean delivery, pre-existing hypertension or diabetes, history of stillbirth, pre-pregnancy obesity (body mass index, BMI > 30 kg/m²), and birthing parent age less than 18 and greater than 45 years at delivery. We also excluded pregnant people with additional risk factors and complications related to the index pregnancy and delivery, including antepartum stillbirths, known fetal anomalies (irrespective of severity), substance use during pregnancy (nicotine, alcohol, and marijuana), incomplete prenatal care, high blood pressure during pregnancy (gestational hypertension, preeclampsia, or eclampsia), and gestational diabetes. Individuals who experienced labor induction were excluded if the indication for induction was for any medical or unknown cause, including abnormal antepartum testing, amniotic fluid abnormalities, suspected intrauterine growth restriction, chorioamnionitis, and isoimmunization. These inclusion and exclusion criteria used for the study sample are similar to the eligibility criteria for community births established by the Midwives' Association of Washington State.^{25,26} After these exclusions, the resulting cohort of low-risk midwife-attended births contained 2,109 index pregnancies, with a final study sample size of 1,442 complete cases without missing data. The analysis was conducted on a de-identified dataset and, therefore, did not require institutional review board approval or an exemption according to guidelines by the University of Washington Institutional Review Board.²⁷

Data Collection

We obtained clinical, demographic, and birth outcome data from the OB COAP dataset for all low-risk hospital and planned community births attended by midwives. OB COAP uses provider-specific, chart-abstracted data from patients' medical records for quality improvement from all births at

participating sites. Trained abstractors (including obstetric care providers, nurses, health care data, and quality improvement specialists) use the medical record as the source of information on variables defined by the OB COAP and the American College of Obstetricians and Gynecologists obstetric data definitions when applicable.²⁸ The data collected from hospital births capture a range of variables related to the demographic characteristics of the birthing parent, pre-pregnancy health, and obstetric outcomes. The information is entered into a cloud-based, standardized data tool, where data undergo real-time quality checks at the site and aggregate levels.²⁸

The planned birth setting (community or hospital) is determined at the onset of labor and coded during chart abstraction.²⁰ Midwives' data for community births in the Obstetrical Care Outcomes Assessment Program were populated through a semi-annual data transfer from the Midwives Alliance of North America (MANA) Statistics data registry, which is a validated national birth registry of midwife-attended births.^{20,29} For the community birth group, demographic and clinical data for all pregnant clients who provided consent for data collection are prospectively entered into the dataset at the initiation of care as part of the Midwives Alliance of North America Statistics data registry protocol.²⁹ After the community birth, the remaining delivery, neonatal, and postpartum data are abstracted from the birthing parents' and infants' medical records and entered into the online system.²⁰

Exposure, Outcome, and Adjustment Variables

The exposure of interest for this study was planned birth setting (community birth vs hospital birth). We defined planned community birth as births planned at home or freestanding birth centers at the onset of labor, regardless of where the birth occurred. We used physiologic childbirth as the primary outcome for this analysis, which is defined according to the ACOG reVITALize definition as spontaneous labor and birth without the use of interventions, including opiates or nitrous oxide, augmentation of labor (induction), regional analgesia during labor and delivery, artificial rupture of membranes, cesarean, or episiotomy.³ The secondary outcomes for this analysis are admission to the hospital within 30 days of delivery for birthing parents or newborns, separately. The covariates we considered for this analysis

include the age of the birthing parent (continuous), race (categorical), ethnicity (Hispanic/Latino vs other), the geographic residence of the birthing parent (rural vs urban), pre-pregnancy BMI (continuous), parity (nulliparous vs multiparous), gestational age at delivery (continuous), and insurance payor type (commercial vs other). The geographic residence of birthing parents was defined using rural-urban commuting area (RUCA) codes, which are a census-tract-based classification using measures of population density, levels of urbanization, and daily commuting to characterize rural and urban status and relationships (approximated with ZIP code in this dataset).³⁰ The selection of covariates was based on *a priori* identification of potential confounding and precision variables.

Data Analysis

In descriptive analyses, baseline participant characteristics of the study population were summarized overall and by exposure status (planned birth setting) using counts (and percentages) for categorical variables and mean (and standard deviation) for continuous variables. To examine associations of planned birth setting with physiologic birth, we fitted univariate and multivariate modified Poisson regression models with robust standard errors for complete cases with community birth setting as the exposure and physiologic birth as an outcome. Similarly, to examine associations of planned birth setting with admission to the hospital within 30 days of delivery for either birthing parents or newborns, we fitted univariate and multivariate modified Poisson regression models with robust standard errors for complete cases with community birth setting as the exposure and admission to the hospital within 30 days for mothers and newborns (in separate models) as an outcome. The multivariate models were adjusted for sociodemographic factors (i.e., age, geographic residence, race, ethnicity, insurance payor type) and birth-related risk factors (i.e., parity, gestational age, pre-pregnancy BMI). Due to the small number of participants from certain racial groups within the sample, race was binarized into a variable indicating whether the birthparent belonged to a white or non-white racial group for the purposes of the multivariate regression models. The results were reported as unadjusted and adjusted relative risks and 95% CIs with robust standard errors for each outcome of interest. We used a p-value of 0.05 to determine statistical

significance. We also conducted analyses to evaluate effect modification of associations of planned birth setting with physiologic birth or admission to the hospital within 30 days for mothers and newborns (separately) by parity using two approaches: fitting parity stratified adjusted models and fitting an additional model that included an interaction term (interactions of parity with community birth) along with exposure, outcome, parity, and the other adjustment variables described above. P-values of the interaction term were used to determine the statistical significance of interactions between parity and physiologic birth or admission to the hospital within 30 days for mothers or newborns.

In a sensitivity analysis evaluating the effects of incomplete data on the analyses, we repeated the analyses by imputing missing data using the multiple imputation for chained equations technique (MICE) that replaces missing values from the dataset with predicted values conditional on observed data. All analyses were performed using the Rstudio Statistical Software version 4.3.2.

Results

Selected characteristics of study participants are shown in **Table 1**. Among the analytic study population (N=1,442), 744 birthing parents (51.6%) had planned community births attended by a midwife in an out-of-hospital setting (of which 6.59% were transferred to a higher level of care intrapartum for complications related to the birthing parent, infant, or both). Birthing parents with a planned community birth had a slightly greater mean maternal age (30.97 vs 30.28 years), lower pre-pregnancy BMI (23.13 vs 23.66), and greater gestational age at delivery (39.61 vs 39.32 weeks) compared to parents with planned hospital birth (all p-values < 0.01). Birthing parents who had a planned community birth were significantly more likely to be non-Hispanic (95.4% vs 92.3%), White (89.9% vs 67.9%), living in a rural residence (1.9% vs 0.3%), and have commercial insurance (69.2% vs 63.3 %) compared to birthing parents who had a planned hospital birth setting (all p-values < 0.05). Of the covariates, race and gestational age at delivery were associated with having a planned community birth at the highest significance level (p < 0.001).

Overall, 55.5% of birthing parents in the sample of low-risk midwife-attended births experienced a physiologic birth, and 0.9% of birthing parents and 2.1% of newborns were admitted to the hospital within 30 days of delivery. Among birthing parents who had a planned community birth, 93.0% experienced a physiologic birth, and 0.9% of birthing parents and 1.7% of newborns were admitted to the hospital within 30 days of delivery. Corresponding rates for birthing parents who had planned hospital births were 15.5% (physiologic birth), 0.9% (admitted birthing parent), and 2.6% (admitted newborn), respectively.

In unadjusted models using complete cases (**Table 2**), parents who had planned community births had a 6.01-fold higher relative risk (95% CI: 5.05-7.16; p-value < 0.001) of experiencing a physiologic birth compared to birthing parents who had a planned hospital birth. This association was slightly attenuated but remained statistically significant after adjustment for covariates (adjusted RR: 5.95; 95% CI: 4.98-7.10; p-value < 0.001). The association of community birth setting with physiologic birth was

stronger among nulliparous birthing parents, compared with multiparous birthing parents (nulliparous: adjusted RR: 10.32; 95% CI: 6.96-15.29, and, multiparous: adjusted RR: 4.77; 95% CI: 3.93-5.79; interaction p-value < 0.01).

In the unadjusted model examining associations of planned birth setting with admission to the hospital within 30 days of delivery using complete cases for birthing parents (**Table 3**) and newborns (**Table 4**), the risk of admission to the hospital within 30 days of delivery among planned community births, compared with planned hospital births, was 1.09-fold higher for birthing parents (RR: 1.09; 95% CI: 0.37 - 3.24) and 0.67-fold lower for newborns (RR: 0.67; 95% CI: 0.33 - 1.37), although the estimates were not statistically significant. After adjustment for covariates, the direction of the association between birth setting and birthing parent admission to the hospital within 30 days of delivery was reversed (adjusted RR: 0.93; 95% CI: 0.32-2.73), while the magnitude of association between birth setting and newborn admission to the hospital within 30 days of delivery was attenuated (adjusted RR: 0.83; 95% CI: 0.38 - 1.78). Both estimates were not statistically significant, similar to the observation in the unadjusted models (p-value > 0.05). The associations of community birth setting with admission to the hospital within 30 days of delivery did not significantly differ by parity among birthing parents (nulliparous: adjusted RR: 0.34; 95% CI: 0.07-1.71, and, multiparous: adjusted RR: 3.72; 95% CI: 0.43-32.19; interaction p-value > 0.05) or newborns (nulliparous: adjusted RR: 0.89; 95% CI: 0.32-2.52, and, multiparous: adjusted RR: 0.76; 95% CI: 0.27-2.15; interaction p-value > 0.05).

In a sensitivity analysis evaluating the impact of missing data on results using multiple imputation with chained equations (MICE), the findings were largely similar to what was reported in the primary models, with no notable changes in the direction or magnitude of association for the estimated adjusted relative risks.

Discussion

In the current study, we found that among low-risk midwife-attended births, having a planned community birth was associated with a higher rate of experiencing a physiologic birth compared with having a planned hospital birth. Participants who had a planned community birth had a 5.95-fold higher relative risk of experiencing a physiologic birth compared with participants who had a planned hospital birth, after adjustment for covariates. Further, this association was stronger among nulliparous birthing parents than multiparous birthing parents. Associations of planned birth setting with birthing parent or newborn admission to the hospital within 30 days were not observed.

Among our study participants in the original sample, 4.1% of birthing parents gave birth in a community setting in Washington state between January 2022 and March 2023. This number is slightly higher than the 3.6% reported in the most recent vital statistics assessing the rate of community births in Washington State in 2018.^{6,7} Additionally, among complete cases, 51.6% of low-risk midwife-attended births occurred in a community setting during the sample period, which is greater than previous estimates in the North American setting ranging from 15.0-37.8%.^{13,16,17} These differing proportions of planned community births in Washington in the 15-month sample period for the general population and for low-risk midwife-attended births may be explained by shifting attitudes towards giving birth in a hospital setting influenced by the COVID-19 pandemic. During the most acute period of the pandemic from 2020-2021, hospital births were highly regulated, with restrictions on masking, social distancing, and visitation that made the process of labor and delivery more stressful for birthing parents, particularly for birthing communities of color.³¹⁻³³ There was also widespread fear about the dangers of entering a hospital setting during this period due to concerns about contracting the virus for birthing parents, newborns, and their families.^{34,35} Additionally, the spread of misinformation about vaccines and treatments for COVID-19 has further promoted a culture of hesitancy toward traditional medical interventions throughout society.³⁶ The combination of these lived experiences and cultural forces during the most acute periods of the pandemic has affected how parents perceive the safety and autonomy of giving birth in a

hospital setting and may explain why there has been a shift towards more planned community births in the following years. These differences in prevalence could also be attributed to ascertainment bias explained by variations in the data collected by OB COAP compared to the previous studies, including differences in the criteria to define low-risk birth used in each study, differences in the community birth setting classification, differences in midwifery licensure for the practitioners in studies, and varying levels of community birth and midwife practice integration in different parts of North America.

There is limited evidence linking community birth setting with physiologic birth. One study of Washington state births from 2015-2020 observed that the rate of physiologic birth among low-risk midwife-attended births was greater for births in a community setting (85.3%) than births in a hospital setting (39.4%).²⁰ A UK study of women who labored in water found that planned birth in the community was associated with a greater likelihood of normal physiologic birth than planned births in an obstetric unit (adjusted OR = 2.58; 95% CI, 2.22-2.99).³⁷ Although the association between community birth setting and physiologic birth has not been thoroughly examined in the United States among low-risk midwife-attended births, our results are consistent with studies that investigated the association of birth setting with the occurrence of obstetric interventions during labor and delivery. A study comparing planned home births attended by certified professional midwives to relatively low-risk hospital births in the United States found that planned home births had lower rates of labor induction (9.6% vs 21.0%), stimulation of labor (9.2% vs 18.9%), episiotomy (2.1% vs 33.0%), cesarean section (3.7% vs 19.0%), and vacuum extraction (0.6% vs 5.5%).³⁸ Another study of United States low-risk births in 2008 found that birthing parents who had planned home births were less likely to experience operative vaginal delivery (aOR = 0.12, 95% CI: 0.08-0.17), induction of labor (aOR = 0.19, 95% CI: 0.18-0.22), or augmentation of labor (aOR = 0.29, 95% CI: 0.27-0.42) compared to planned hospital births.³⁹ A study in British Columbia from 2000-2004 found that compared to planned hospital births with a midwife, birthing parent who had a planned home birth with a midwife had a lower risk of augmentation of labor (RR = 0.59, 95% CI: 0.55-0.69), narcotic analgesia (RR = 0.27, 95% CI: 0.22-0.32), epidural analgesia (RR = 0.39, 95% CI: 0.33-0.46), assisted vaginal delivery (RR = 0.41, 95% CI: 0.33-0.52), cesarean

delivery (RR = 0.76, 95% CI: 0.64-0.91), or episiotomy (RR = 0.49, 95% CI: 0.38-0.63).¹⁷ Our study findings of the association of community birth setting with a greater likelihood of physiologic birth have potential implications on the health of birthing parents and newborns, given that many parents choose to give birth in a community setting to have improved autonomy during childbirth and avoid unwanted or unnecessary interventions.

Our study findings indicated that, among a sample of low-risk midwife-attended births, there is no significant association between birth setting and postpartum admission/readmission to a hospital for birthing parents or newborns within 30 days of labor and delivery. The results are similar to that of a study done using data from Washington state births 2015-2020, which found that the rate of late admissions to the hospital (> 6 hours-6 weeks after birth) was similar between births that occurred in a community and hospital setting for newborns (2.3% vs 1.4%) and birthing parents (1.0% vs. 0.96%).²⁰ Another study in British Columbia using data from 2000-2004 found that the risk of admission to the hospital for newborns within 28 days of age was not significantly different between newborns of birthing parents who had a planned home birth with a midwife and newborns of those who had a planned hospital birth with a midwife (RR = 1.09, 95% CI: 0.83, 1.42).¹⁷ A study evaluating the relationship between inpatient midwifery staffing levels and postpartum readmissions in England from 2015-2020 found that lower-than-expected midwifery staffing was not significantly associated with readmission of birthing parents within 30 days of discharge (aOR = 1.08, 95% CI: 0.99-1.18), suggesting that the midwife model of care implemented in community birth settings and hospitals is effective at reducing the risk of hospital admission for birthing parents in the postpartum period.⁴⁰ Other US-based studies assessing factors that affect hospital readmissions in the weeks following delivery found that cesarean section delivery and assisted vaginal delivery were associated with a greater risk of late postpartum readmission, which may indicate that the higher likelihood of physiologic birth in the community may also confer a reduced risk of postpartum hospital admission for birthing parents in the weeks following birth.⁴¹⁻⁴³ However, we did not see significant differences in admission in the current study. While a similar lack of significant associations was observed among subgroups defined by parity, the estimates for birthing parents hospital

admission varied among nulliparous (aRR: 0.34; 95% CI: 0.07-1.71) and parous (aRR: 3.72; 95% CI: 0.43-32.19) birthing parents. This potential parity-specific, non-statistically significant difference in admission for birthing parents needs further investigation. Prior literature evaluating the use of postpartum admissions data describes the challenges in using this metric for evaluating quality of care, given that the baseline rate of 1% to 2% may be too low to discriminate between random variation and controllable factors accurately.⁴⁴

The current study has several strengths. To our knowledge, this is the first study to investigate the association between community birth setting and physiologic birth or admission to the hospital within 30 days of delivery for birthing parents or newborns in a population of low-risk midwife-attended births during the period following the acute effects of the COVID-19 pandemic. On the other hand, several limitations deserve mention. We are unable to account for the exact licensing background of midwife birth attendants in community settings, as the data available through MANA STATS does not include information on whether community midwives were certified nurse-midwives (CNM) or direct entry licensed midwives (LM). CNMs are registered nurses who obtain a graduate-level degree in midwifery and practice in both hospital and community settings. LMs enter the field of midwifery directly and not via the nursing profession. Instead, they obtain licensure through accredited midwifery graduate degree programs and do not have hospital privileges, meaning that LMs practice exclusively in community settings at free-standing birth centers or homes in Washington State. Certified nurse-midwives have a broader scope of practice and greater prescriptive authority compared to licensed midwives but practice less commonly than licensed midwives, with recent estimates from the Midwives' Association of Washington State membership data finding that 93% of professional members were LMs and 7% were CNMs.^{20,45} The differing scope of practice for midwives in different birth settings may impact the ability to make causal interpretations of these results. There may also be unmeasured differences in the characteristics of birthing parents by birth setting, such as attitudes and beliefs about labor interventions and physiologic birth, which may further influence the causal interpretation of the findings from this study.

Moreover, FHCQ's partnership with a subset of hospitals restricts the generalizability of our results, both within community and hospital settings. Additionally, the unique landscape of midwifery integration and legislative frameworks in Washington state may limit the extrapolation of our findings to states with differing practices and regulations concerning midwifery and community births. While our study cohort may not fully represent the broader United States birthing population, this limitation does not compromise the internal validity of our comparisons between community and hospital births or the generalizability of our findings to low-risk cohorts within similarly integrated states. Another limitation is that the dataset did not include patient-level identifiers, meaning we cannot account for non-independence between outcomes of successive births to the same person. Furthermore, there is a moderate to high degree of missingness (>5% missing data) for certain variables in the dataset, including race and geographic residence, which could affect the precision and reliability of our estimates related to these covariates. The results from the sensitivity analysis indicate that accounting for missing data does not result in notable changes in the associations of interest. Still, these results are based on the assumption that the missing data were missing at random. These limitations underscore the need for a cautious interpretation of our findings going forward.

The findings of this study have significant implications for research, practice, policy, and patient experience in the field of maternal and child health. The strong association between planned community births and a higher likelihood of physiologic childbirth highlights the potential benefits of integrating midwife-led care and out-of-hospital birth settings into mainstream obstetric practice in the United States. For researchers, this highlights how further studies are necessary to explore the means by which community births reduce medical interventions and identify best practices for managing low-risk pregnancies outside the hospital. Practitioners of obstetrical care should consider adopting more holistic, midwifery-based models of care, even within hospital settings, to promote physiologic childbirth. Furthermore, policymakers in the United States could support these practices by ensuring robust regulatory frameworks for midwifery practice and out-of-hospital childbirth, along with supporting legislation that provides funding to midwifery training programs and birth centers.

The COVID-19 pandemic has also reshaped attitudes toward hospital births, revealing the importance of providing safe, community-based options for expectant parents. Future research should utilize longitudinal study designs to comprehensively evaluate long-term maternal and neonatal health outcomes associated with planned community births compared to hospital births in the post-pandemic period. These future studies should aim to explore the specific factors contributing to the higher rates of physiologic childbirth in community settings, such as the role of midwifery care, birthing parents' attitudes and beliefs towards medical intervention in the process of labor and delivery, the impact of the birthing environment, and the level of autonomy of birthing parents. Additionally, large-scale, multi-site studies with diverse populations are necessary to generalize the findings from this study, which will help build an understanding of the implications of these results across different demographic and socioeconomic groups and identify context-specific best practices in settings other than Washington state. There is also a need for mixed-methods studies with a qualitative component exploring the experiences and preferences of birthing parents, particularly in light of the COVID-19 pandemic. Incorporating qualitative findings with quantitative results will ultimately aid researchers in understanding the decision-making processes of birthing parents, provide insights into the psychosocial benefits of out-of-hospital birth, and further inform patient-centered care.

In summary, we found a significant association of community birth setting with physiologic birth among low-risk midwife-attended births. This association was stronger among nulliparous birthing parents than multiparous birthing parents. There was no significant association of community birth setting with admission to the hospital within 30 days of delivery for birthing parents or newborns. Findings from our study, if supported by other studies, suggest that community birth practices promote normal physiologic birth and do not put birthing parents or newborns at risk for adverse outcomes in the period following birth.

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Tables

Table 1: Baseline participant characteristics for low-risk, midwife-attended births, stratified by birth setting, Washington, USA 2022-2023

Characteristics	All Participants	Planned Birth Setting		P-Value*
		Hospital	Community	
N (%)	1442	698 (48.4)	744 (51.6)	
Birth Parent Age (Median (SD))	30.64 (4.89)	30.28 (4.78)	30.97 (4.97)	0.007
Prepregnancy BMI (Median (SD))	23.39 (3.05)	23.66 (3.10)	23.13 (2.98)	0.001
Gestational Age At Delivery (Median (SD))	39.47 (1.04)	39.32 (1.01)	39.61 (1.05)	<0.001
Race (N (%))				<0.001
American Indian/Alaskan Native	9 (0.6)	4 (0.6)	5 (0.7)	
Asian	100 (6.9)	82 (11.7)	18 (2.4)	
Black/African American	38 (2.6)	30 (4.3)	8 (1.1)	
Multiple Race	48 (3.3)	11 (1.6)	37 (5.0)	
Native Hawaiian/Pacific Islander	9 (0.6)	9 (1.3)	0 (0.0)	
Other Race	95 (6.6)	88 (12.6)	7 (0.9)	
White	1143 (79.3)	474 (67.9)	669 (89.9)	
Ethnicity (N (%))				0.016
Hispanic or Latino	88 (6.1)	54 (7.7)	34 (4.6)	
Not Hispanic or Latino	1354 (93.9)	644 (92.3)	710 (95.4)	
Geographic Residence (N (%))				0.008
Urban	1426 (98.9)	696 (99.7)	730 (98.1)	
Rural	16 (1.1)	2 (0.3)	14 (1.9)	
Insurance Coverage Type (N (%))				0.021
Commercial	957 (66.4)	442 (63.3)	515 (69.2)	
Other	485 (33.6)	256 (36.7)	229 (30.8)	
Parity (N (%))				0.338
Multiparous	887 (61.5)	420 (60.2)	467 (62.8)	
Nulliparous	555 (38.5)	278 (39.8)	277 (37.2)	

* P-values from t-test for continuous variables (BMI, birthing parent Age, Gestational Age at Delivery), Chi-square test for categorical variables (Race, Ethnicity, Geographic Residence, Insurance Coverage Type, Parity)

Table 2: Relative risks for the association between planned birth setting and physiologic birth stratified by parity, retrospective cohort study, Washington, USA 2022-2023

Planned Birth Setting	Physiologic Birth*		Unadjusted		Adjusted **	
	No N=642	Yes N=800	RR (95% CI)	P-Value	RR (95% CI)	P-Value
All Participants						
Hospital	590 (84.5)	108 (15.5)	<i>Reference</i>		<i>Reference</i>	
Community	52 (7.0)	692 (93.0)	6.01 (5.05-7.16)	<0.001	5.95 (4.98-7.10)	<0.001
Multiparous						
Hospital	335 (79.8)	85 (20.2)	-----	-----	<i>Reference</i>	
Community	11 (2.4)	456 (97.6)			4.77 (3.93-5.79)	<0.001
Nulliparous						
Hospital	255 (91.7)	23 (8.3)	-----	-----	<i>Reference</i>	
Community	41 (14.8)	236 (85.2)			10.32 (6.96-15.29)	<0.001

* Physiologic Birth is defined as spontaneous birth without interventions in the course of labor or delivery

** Adjusted for age of birthing parent, race, ethnicity, geographic residence, prepregnancy BMI, parity, gestational age at delivery, and insurance type

Table 3: Relative risks for the association between planned birth setting and admission of the birthing parent to the hospital within 30 days of delivery, stratified by parity, retrospective cohort study, Washington, USA 2022-2023

Planned Birth Setting	Admission to Hospital		Unadjusted		Adjusted *	
	No N=1429	Yes N=13	RR (95% CI)	P-Value	RR (95% CI)	P-Value
All Participants						
Hospital	692 (99.1)	6 (0.9)	<i>Reference</i>		<i>Reference</i>	
Community	737 (99.1)	7 (0.9)	1.09 (0.37 - 3.24)	0.87	0.93 (0.32-2.73)	0.90
Multiparous						
Hospital	419 (99.8)	1 (0.2)	-----	-----	<i>Reference</i>	
Community	462 (98.9)	5 (1.1)			3.72 (0.43-32.19)	0.23
Nulliparous						
Hospital	273 (98.2)	5 (1.8)	-----	-----	<i>Reference</i>	
Community	275 (99.3)	2 (0.7)			0.34 (0.07-1.71)	0.20

* Adjusted for age of birthing parent, race, ethnicity, geographic residence, prepregnancy BMI, parity, gestational age at delivery, and insurance type

Table 4: Relative risks for the association between planned birth setting and admission of the newborn to the hospital within 30 days of delivery, stratified by parity, retrospective cohort study, Washington, USA 2022-2023

	Admission to Hospital		Unadjusted		Adjusted *	
	Newborn		RR	P-Value	RR	P-Value
Planned Birth Setting	No N=1411	Yes N=31	(95% CI)		(95% CI)	
All Participants						
Hospital	680 (97.4)	18 (2.6)	<i>Reference</i>		<i>Reference</i>	
Community	731 (98.3)	13 (1.7)	0.67 (0.33-1.37)	0.28	0.83 (0.38-1.78)	0.62
Multiparous						
Hospital	411 (97.9)	9 (2.1)	-----	-----	<i>Reference</i>	
Community	461 (98.7)	6 (1.3)			0.76 (0.27-2.15)	0.61
Nulliparous						
Hospital	269 (96.8)	9 (3.2)	-----	-----	<i>Reference</i>	
Community	270 (97.5)	7 (2.5)			0.89 (0.32-2.52)	0.83

* Adjusted for age of birthing parent, race, ethnicity, geographic residence, prepregnancy BMI, parity, gestational age at delivery, and insurance type

Table 5: Sensitivity analysis assessing the effects of multiple imputation for missing data on the relative risks for the association between planned birth setting and birth outcomes, Washington, USA 2022-2023

	aRR* (95% CI)	MI aRR* (95% CI)
Physiologic Birth	5.95 (4.98-7.11)	6.21 (5.12-7.53)
Admission to Hospital Within 30 Days of Delivery		
Birthing parent	0.93 (0.32-2.73)	0.70 (0.26-1.86)
Newborn	0.83 (0.38-1.78)	0.98 (0.48-2.00)

* Adjusted for age of birthing parent, race, ethnicity, population density category of residence, prepregnancy BMI, parity, gestational age at delivery, and insurance type