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Planned Community Birth and Birth Outcomes

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Supplemental content

IMPORTANCE Studies examining community births (ie, births that occur outside of a hospital setting, such as at home or in a birth center) often misclassify transfers to hospitals as hospital births. Oregon uniquely tracks planned birth location at labor onset.

OBJECTIVES To examine the association between planned place of delivery and perinatal outcomes in Oregon.

DESIGN, SETTING, AND PARTICIPANTS This was a population-based cohort study of singleton, nonbreech infants without lethal anomalies born at 37 to 44 weeks' gestation in Oregon between January 2012 and December 2020. Data were analyzed from October 2023 to September 2025.

EXPOSURES Planned hospital births vs planned community births, including completed community deliveries at home or a birthing center and those resulting in hospital transfer.

MAIN OUTCOMES AND MEASURES Outcomes included fetal, neonatal, and infant death; 5-minute Apgar scores less than 7 or less than 4; neonatal seizure; ventilator support; neonatal intensive care unit admission; delivery procedures; maternal intensive care unit admission; maternal blood transfusion; and severe perineal lacerations. Adjusted logistic regression models were used to determine the association between planned community or planned hospital births and outcomes. Propensity score analysis was conducted to account for overall differences in measured covariates between groups.

RESULTS Among 348 641 birthing individuals (mean [SD] age, 29.0 [5.8] years; 7383 non-Hispanic Black [2.1%], 66 013 Hispanic [18.9%], 235 269 non-Hispanic White [67.6%], and 38 668 [11.1%] other, including Asian/Pacific Islander, American Indian or Alaska Native, and multiple races), 332 313 planned to deliver in a hospital (95.3%) and 16 328 planned to have a community birth (4.7%). There were 2402 planned community births that were transferred to a hospital for delivery (14.7%). Compared to planned hospital births, planned community births had higher odds of 5-minute Apgar score less than 7 (adjusted odds ratio [aOR], 1.34; 95% CI, 1.19-1.50) and ventilator support (aOR, 1.14; 95% CI, 1.05-1.24). Transferred deliveries had increased odds of most adverse outcomes and medical interventions (fetal death: aOR, 5.47; 95% CI, 2.67-11.20; 5-minute Apgar score <7: aOR, 2.02; 95% CI, 1.64-2.50; 5-minute Apgar score <4: aOR, 2.21; 95% CI, 1.43-3.41; any ventilator support: aOR, 1.73; 95% CI, 1.47-2.03; neonatal intensive care unit [NICU] admission: aOR, 1.40; 95% CI, 1.15-1.71; any neonatal outcome: aOR, 2.49; 95% CI, 1.76-3.53; augmentation of labor: aOR, 1.65; 95% CI, 1.51-1.80, operative vaginal delivery: aOR, 1.33; 95% CI, 1.11-1.59; and cesarean delivery: aOR, 1.54; 95% CI, 1.39-1.59), whereas completed community births were not associated with most perinatal outcomes and had lower odds of most medical interventions (5-minute Apgar score <4: aOR, 1.01; 95% CI, 0.73-1.40; neonatal seizure: aOR, 1.19; 95% CI, 0.68-2.10; any ventilator support: aOR, 1.01; 95% CI, 0.91-1.11; ventilator support >6 hours: aOR, 0.64; 95% CI, 0.48-0.87; NICU admission: aOR, 0.52; 95% CI, 0.44-0.61; any neonatal outcome: aOR, 0.81; 95% CI, 0.60-1.10; induction of labor: aOR, 0.03; 95% CI, 0.03-0.04; augmentation of labor: aOR, 0.04; 95% CI, 0.03-0.04; operative vaginal delivery: aOR, 0.08; 95% CI, 0.06-0.11; maternal intensive care unit admission: aOR, 0.09; 95% CI, 0.05-0.19; and maternal blood transfusion: aOR, 1.05; 95% CI, 0.83-1.32). Propensity score–adjusted results aligned with the main findings.

CONCLUSIONS AND RELEVANCE While the risks of perinatal outcomes and likelihood of interventions were generally reduced in completed community births, transferred deliveries had higher odds of most perinatal outcomes and interventions. Misclassifying transfers as hospital births may mask risks associated with planned community births. These risks should be clearly communicated during patient counseling and considered in policy decisions.

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The incidence of community births (ie, births that occur outside of a hospital setting, such as at home or in a birth center) in the US has increased in recent years.[1-10] This trend is likely influenced by the expansion of obstetric care deserts[11-17] and evolving patient preferences for models of care that emphasize autonomy, personalized support, and reduced medical interventions.[5,9,18-21] However, these settings have also been associated with poor birth outcomes.[3-6,8,9,22-31] Contributing factors include inappropriate birth setting selection based on maternal risk profiles and the lack of consistent licensure, regulatory oversight, and hospital transfer protocols.[6,24] Additionally, the risks associated with community births may be underestimated due to misclassification bias, which occurs when deliveries transferred to hospitals are misclassified as hospital births, despite being planned as community births at the onset of labor.[5,10,24,28]

In 2023, Oregon reported a community birth rate twice the national average (4% vs 2%),[32] reflecting the state's supportive environment for community births. Following safety concerns and high-profile cases involving infant deaths and permanent disability,[33] Oregon implemented a midwifery licensure mandate in 2015 to improve oversight and accountability for midwives practicing in community settings.[34] While the 2003 revision of the US Standard Certificate of Live Birth introduced a question about whether the birthing individual planned to deliver at home, Oregon remains the only state to further disaggregate hospital births—distinguishing between those that were planned to occur in a hospital and those transferred from community settings. This question, introduced in 2012, enabled a prior analysis of Oregon birth records (2012-2013), to accurately classify transferred deliveries and assess perinatal outcomes by planned birth setting.[5] The study found that planned community births, compared to planned hospital births, were associated with increased odds of perinatal death (adjusted odds ratio [aOR], 2.43; 95% CI, 1.37-4.30) and neonatal seizures (aOR, 3.60; 95% CI, 1.36-9.50) but decreased odds of neonatal intensive care unit (NICU) admission and higher odds of unassisted vaginal deliveries.[5]

To expand on this study, we used linked vital records and hospital data from Oregon (2012-2020) to examine associations between planned community births and perinatal outcomes compared to planned hospital births.

Key Points

Question Are planned community births associated with adverse perinatal outcomes?

Findings In this study of 348 641 Oregon births, planned community birth, including individuals transferred to hospitals, was associated with higher odds of 5-minute Apgar scores less than 7 and ventilator support compared to planned hospital births. Of the planned community births, those who were transferred to hospitals had increased odds of most adverse outcomes and medical interventions, whereas completed community births were not associated with most adverse outcomes and had decreased odds of most medical interventions.

Meaning These findings highlight the need to counsel patients and inform policymakers about the risks associated with planned community births, particularly when transfer to the hospital may be required.

Methods

Study Population

Vital records were used for all births, with additional hospital record linkage for hospital births (planned or transferred). Both datasets were provided by the Oregon Health Authority, which conducted iterative linkage using identifiers such as date of birth, admission/discharge dates, zip code, and facility details. The linkage process achieved a 93% match rate. Institutional review boards at the Children's Hospital of Philadelphia, University of South Carolina, and Oregon Health Authority approved the study. Informed consent was not obtained because records were deidentified. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline was followed.

We excluded unintended home births, births with missing data on intended birth location, and those occurring in clinics or physician offices. The primary cohort included singleton, nonbreech infants without lethal anomalies, born at 37 to 44 weeks' gestation in Oregon from January 2012 to December 2020 (n = 348 641). The secondary cohort had no exclusions applied to births in the same gestational age range (n = 366 403) (eFigure 1 in Supplement 1).

Study Variables

Oregon birth certificates include a question for in-hospital births: "Did you go into labor planning to deliver at home or at a freestanding birthing center?"[35] Based on responses and the recorded place of birth, we defined the exposure variable as planned and actual birth location. Births that were intended to occur out of hospital but ultimately took place in a hospital were classified as transferred deliveries. Primary comparisons included (1) planned and completed hospital births (reference group), (2) planned community births (including transfers), (3) transfers from planned community birth to hospital births, and (4) planned and completed community births. Additional comparisons for completed home vs birth center births are provided in Supplement 1 (eTables 2 and 4-6 for the primary cohort and eTables 11-14 for the secondary cohort).

Maternal sociodemographic and clinical characteristics were compared across birth location groups. Outcomes included: fetal, neonatal (<28 days), and infant (<1 year) death, 5-minute Apgar score (scale 0-10; 7-10: normal or reassuring, 4-6: moderately abnormal, 0-3: dangerously low) less than 4 or less than 7, neonatal seizures, ventilator use (any or >6 hours), NICU admission, labor induction or augmentation, unassisted vaginal delivery, operative vaginal delivery, cesarean delivery, maternal intensive care unit (ICU) admission, maternal blood transfusion, severe perineal lacerations, and a composite neonatal outcome (fetal or infant death, 5-minute Apgar score less than 4, or seizures).

Vital records provided sociodemographic and clinical characteristics (including maternal and infant outcomes) for both hospital and community births in most cases. Maternal morbidities were examined using hospital records for hospital births (including transfers) to address underreporting in vital records.[36-38] Race and ethnicity are reported here due to racial and ethnic disparities in the prevalence of perinatal outcomes. Data sources are detailed in eTable 1 in Supplement 1.

Statistical Analysis

We compared characteristics and outcomes across birth location groups. Propensity score–weighted standardized mean differences were calculated using psmatch version 9.4; diagnostic plots are provided in eFigures 2-9 in Supplement 1. Unadjusted and adjusted logistic regression models estimated aORs and 95% CIs for associations between planned birth location and outcomes.

Adjusted models included maternal race and ethnicity (other vs non-Hispanic White [hereafter, White], including non-Hispanic Black [hereafter, Black], Hispanic, and Asian/Pacific Islander, American Indian or Alaska Native, and multiple races, consolidated due to sample size), parity (multiparous vs nulliparous), insurance type (other vs public), prenatal care adequacy (inadequate, intermediate, and adequate plus vs adequate),[39] maternal age (≥35 years vs <35 years), education (≤12 years vs >12 years), prior cesarean delivery, and a composite maternal risk indicator (chronic hypertension, gestational hypertension, preeclampsia, eclampsia, prepregnancy diabetes, or gestational diabetes). These covariates, selected a priori, were also used to generate propensity scores via logistic regression, with missing values coded as separate categories to account for differential missingness. Propensity score distributions by exposure group are presented in eFigures 10-14 in Supplement 1. We calculated absolute risk differences and 95% CIs for both adjusted and propensity score–adjusted models using logistic regression with the lsmeans option. To avoid arbitrary categorization of 5-minute Apgar scores, we conducted a sensitivity analysis modeling 5-minute Apgar (0-10) as an ordinal outcome using generalized ordinal logistic regression with unequal slopes. We also calculated *E*-values to assess the minimum strength of unmeasured confounding that could explain away the observed results.

For our secondary cohort, additional adjustments were made for multiples, breech presentation, and lethal anomalies. Absolute risk differences for completed home and birth center births were omitted due to small sample size.

In supplemental analyses, we stratified by parity, maternal age, education, and risk indicator to assess associations between planned community births and (1) composite neonatal outcomes and (2) cesarean delivery. We reported frequencies and strata-specific aORs with 95% CIs, which were calculated with the predictors from the adjusted models, as well as type-3 *P* values for interaction terms (eg, birthplace, parity, parity × birthplace, and insurance status).

For transferred deliveries, we compared maternal morbidity prevalence by data source (vital records vs hospital records). All analyses used SAS version 9.4. Two-tailed P values less than .05 were considered statistically significant. Data were analyzed from October 2023 to September 2025.

Results

Primary Cohort

Of 348 641 births, 332 313 (95.3%) were planned and completed in hospitals; 16 328 (4.7%) were planned community births—8096 (49.6%) at home, 5830 (35.7%) at birth centers, and 2402 (14.7%) transferred to hospitals. Among birthing individuals, 7383 were Black (2.1%), 66 013 were Hispanic (18.9), 235 269 were White (67.6%) and 38 668 were Asian/Pacific Islander, American Indian or Alaska Native, or multiple races (11.1%), combined because of low sample size. The mean (SD) maternal age was 29.0 (5.8) years.

Individuals with planned community births (including transfers) were more likely than those with planned hospital births to be White (85.1% vs 66.7%), 35 years and older (23.2% vs 17.7%), overweight (body mass index [BMI, calculated as weight in kilograms divided by height in meters squared], 25-29.9; 43.4% vs 33.9%), married (80.9% vs 63.5%), college educated (78.7% vs 63.1%), and have self-pay insurance (29.4% vs 1.0%) (**Table 1**). Compared to completed community births, those transferred were less likely to be White (75.7% vs 85.1%) and more likely to be nulliparous (65.6% vs 36.4%), obese (BMI, ≥30; 51.7% vs 40.3%), unmarried (29.6% vs 19.1%), with public or private insurance (40.3% and 55.5%, respectively, vs 24.7% or 44.6%), and to have received adequate-plus prenatal care (18.4% vs 9.7%). Propensity score–weighted standardized mean differences ranged from minimal (<0.1) to moderate (<0.5). Results for completed home and birth center births are shown in eTable 2 in Supplement 1. Individuals with home births had lower levels of education (23.4% with ≤12 years vs 15.6%), fewer prenatal care visits (29.1% with less than adequate prenatal care vs 21.2%), and higher rates of self-pay insurance than birth center births (47.8% vs 14.5%).

Planned hospital births had the highest prevalence of most maternal risk factors and deliveries before 40 weeks, followed by transferred deliveries (**Table 2**). Birth attendant type varied notably between hospital and completed community births, with large standardized mean differences ranging from <0.01 to 1.81. Transferred deliveries had the highest prevalence of hypertensive disorders (10.9% vs 0.6%-9.5%), which were underreported in vital records compared to hospital data (8.7% vs 10.7%) (eTable 3 in Supplement 1). Maternal risk profiles were similar between completed home and birth center births, though home births more often involved individuals 35 years and older (25.9% vs 19.6%) and naturopathic (15.7% vs 8.4%) or nonclinical (4.4% vs 0.0%) birth attendants (eTable 4 in Supplement 1).

Transferred births had the highest prevalence of most adverse outcomes and obstetric procedures compared to completed hospital or community births (**Table 3**). Perinatal outcomes were similar between planned hospital and completed community births. However, all fetal deaths in community settings occurred among home births. Home births had a higher prevalence of operative vaginal deliveries compared to birth center births (0.3% vs 0.1%) (eTable 5 in Supplement 1). Conversely, birth center deliveries had higher rates of 5-minute Apgar score less than 7 (2.1% vs 1.4%) and any ventilator use (4.0% vs 2.7%) than home births.

Table 1. Demographic and Clinical Characteristics of Birthing Individuals by Planned and Actual Birthing Location (Oregon, 2012-2020)

Characteristic	No. (%) Planned and completed hospital births (n = 332 313)	All planned community births including transfers (n = 16 328)	Transfers from community birth to hospital birth (n = 2402)	Planned and completed community births (n = 13 926)	PSW SMD[a]	PSW SMD[b]	PSW SMD[c]
Race and ethnicity[d]							
Non-Hispanic Black	7232 (2.2)	151 (0.9)	49 (2.0)	102 (0.7)	0.25	0.06	0.03
Hispanic	64 958 (19.5)	1055 (6.5)	289 (12.0)	766 (5.5)	0.16	0.11	0.23
Non-Hispanic White	221 728 (66.7)	13 901 (85.1)	1819 (75.7)	12 082 (86.8)	0.21	0.09	0.07
Other[e]	37 561 (11.3)	1107 (6.8)	228 (9.5)	879 (6.3)	0.01	0.03	0.17
Missing	834 (0.3)	114 (0.7)	17 (0.7)	97 (0.7)	NA	NA	NA
Parity							
1	132 634 (39.9)	5948 (36.4)	1576 (65.6)	4372 (31.4)	0.26	0.04	0.04
2	108 781 (32.7)	5252 (32.2)	445 (18.5)	4807 (34.5)	0.14	0.04	0.02
≥3	90 898 (27.4)	5128 (31.4)	381 (15.9)	4747 (34.1)	0.14	0.00	0.02
Maternal age, y							
<20	16 241 (4.9)	194 (1.2)	59 (2.5)	135 (1.0)	0.10	0.08	0.15
20-34	257 286 (77.4)	12 353 (75.7)	1802 (75.0)	10 551 (75.8)	0.00	0.04	0.05
≥35	58 785 (17.7)	3780 (23.2)	541 (22.5)	3239 (23.3)	0.04	0.07	0.01
Missing	1 (0.0)	1 (0.0)	0	1 (0.0)	NA	NA	NA
Delivery BMI							
Underweight (<18.5)	89 (0.0)	1 (0.0)	1 (0.0)	0	0.07	0.00	NA
Normal (18.5-24.9)	30 664 (9.2)	2051 (12.6)	215 (9.0)	1836 (13.2)	0.01	0.03	0.02
Overweight (25-29.9)	112 554 (33.9)	7082 (43.4)	867 (36.1)	6215 (44.6)	0.09	0.01	0.06
Obese (≥30)	185 639 (55.9)	6575 (40.3)	1242 (51.7)	5333 (38.3)	0.10	0.01	0.07
Missing	3367 (1.0)	619 (3.8)	77 (3.2)	542 (3.9)	NA	NA	NA
Marital status							
Married	211 166 (63.5)	13 208 (80.9)	1688 (70.3)	11 520 (82.7)	0.10	0.09	0.05
Unmarried	121 122 (36.4)	3118 (19.1)	712 (29.6)	2406 (17.3)			
Missing	25 (0.0)	2 (0.0)	2 (0.1)	0	NA	NA	NA
Education							
No high school	10 473 (3.2)	111 (0.7)	55 (2.3)	56 (0.4)	0.27	0.14	0.03
Some high school or high school diploma	110 751 (33.3)	3224 (19.7)	480 (20.0)	2744 (19.7)	0.07	0.05	0.13
Some college or college degree	171 070 (51.5)	10 293 (63.0)	1441 (60.0)	8852 (63.6)	0.11	0.05	0.08
Some graduate education	38 522 (11.6)	2571 (15.7)	399 (16.6)	2172 (15.6)	0.04	0.05	0.03
Missing	1497 (0.5)	129 (0.8)	27 (1.1)	102 (0.7)	NA	NA	NA
Insurance							
Public	150 259 (45.2)	4031 (24.7)	968 (40.3)	3063 (22.0)	0.15	0.06	0.07
Private	172 750 (52.0)	7279 (44.6)	1334 (55.5)	5945 (42.7)	0.13	0.05	0.05
Self-pay	3206 (1.0)	4797 (29.4)	81 (3.4)	4716 (33.9)	0.03	0.00	0.02
Other	6040 (1.8)	114 (0.7)	16 (0.7)	98 (0.7)	0.01	0.07	0.02
Missing	58 (0.0)	107 (0.7)	3 (0.1)	104 (0.7)	NA	NA	NA
Adequacy of prenatal care[f]							
Inadequate	24 579 (7.4)	1996 (12.2)	258 (10.7)	1738 (12.5)	0.00	0.02	0.04
Intermediate	50 580 (15.2)	2193 (13.4)	337 (14.0)	1856 (13.3)	0.30	0.07	0.26
Adequate	162 358 (48.9)	9494 (58.1)	1128 (47.0)	8366 (60.1)	0.20	0.03	0.08
Adequate plus	65 410 (19.7)	1586 (9.7)	441 (18.4)	1145 (8.2)	0.02	0.04	0.11
Missing	29 386 (8.8)	1059 (6.5)	238 (9.9)	821 (5.9)	NA	NA	NA

Abbreviations: BMI (calculated as weight in kilograms divided by height in meters squared); PSW, propensity score weighted; SMD, standardized mean difference.

[a] Comparing all planned community births including transfers vs planned and completed hospital births.

[b] Comparing transfers vs planned and completed hospital births.

[c] Comparing planned and completed community births vs planned and completed hospital births.

[d] Race and ethnicity data are reported as per state vital records and are included here due to racial and ethnic disparities in the prevalence of perinatal outcomes.

[e] Other race and ethnicity groups included Asian/Pacific Islander, American Indian or Alaska Native, or multiple races, consolidated due to sample size.

[f] Adequacy of prenatal care was defined using the Kotelchuck Adequacy of Prenatal Care Utilization Index.[39]

In adjusted analyses, planned community births (including transfers) had higher odds of 5-minute Apgar score less than 7 (aOR, 1.34; 95% CI, 1.19-1.50) and any ventilator use (aOR, 1.14; 95% CI, 1.05-1.24) compared to planned hospital deliveries but lower odds of NICU admission (aOR, 0.69; 95% CI, 0.61-0.78), labor induction (aOR, 0.09; 95% CI, 0.09-0.10) or augmenta-

Table 2. Maternal Risk Factors and Delivery Characteristics of Birthing Individuals by Planned and Actual Birthing Location (Oregon, 2012-2020)

Characteristic	No. (%) Planned and completed hospital births (n = 332 313)	All planned community births including transfers (n = 16 328)	Transfers from community birth to hospital birth (n = 2402)	Planned and completed community births (n = 13 926)	PSW SMD[a]	PSW SMD[b]	PSW SMD[c]
Delivery BMI							
<40	292 225 (87.9)	15 031 (92.1)	2158 (89.8)	12 873 (92.4)	0.13	0.03	0.11
≥40	36 721 (11.1)	678 (4.2)	167 (7.0)	511 (3.7)			
Missing	3367 (1.0)	619 (3.8)	77 (3.2)	542 (3.9)	NA	NA	NA
Maternal age							
<35 y	273 527 (82.3)	12 547 (76.8)	1861 (77.5)	10 686 (76.7)	0.04	0.07	0.01
≥35 y	58 785 (17.7)	3780 (23.2)	541 (22.5)	3239 (23.3)			
Missing	1 (0.0)	1 (0.0)	0	1 (0.0)	NA	NA	NA
Chronic hypertension							
No	306 395 (92.2)	16 165 (99.0)	2256 (93.9)	13 909 (99.9)	0.07	0.02	0.11
Yes	7103 (2.1)	33 (0.2)	16 (0.7)	17 (0.1)			
Missing	18 815 (5.7)	130 (0.8)	130 (5.4)	0	NA	NA	NA
Prepregnancy diabetes							
No	310 136 (93.3)	16 190 (99.2)	2270 (94.5)	13 920 (100.0)	0.13	0.01	0.14
Yes	3362 (1.0)	8 (0.0)	2 (0.1)	6 (0.0)			
Missing	18 815 (5.7)	130 (0.8)	130 (5.4)	0	NA	NA	NA
Gestational hypertension, preeclampsia, or eclampsia							
No	281 966 (84.8)	15 861 (97.1)	2012 (83.8)	13 849 (99.4)	0.33	0.00	0.18
Yes	31 593 (9.5)	338 (2.1)	261 (10.9)	77 (0.6)			
Missing	18 754 (5.6)	129 (0.8)	129 (5.4)	0	NA	NA	NA
Gestational diabetes							
No	285 415 (85.9)	15 831 (97.0)	2182 (90.8)	13 649 (98.0)	0.17	0.01	0.08
Yes	28 083 (8.5)	367 (2.2)	90 (3.7)	277 (2.0)			
Missing	18 815 (5.7)	130 (0.8)	130 (5.4)	0	NA	NA	NA
Prior cesarean delivery							
No	287 667 (86.6)	15 686 (96.1)	2243 (93.4)	13 443 (96.5)	0.08	0.14	0.39
Yes	44 154 (13.3)	635 (3.9)	152 (6.3)	483 (3.5)			
Missing	492 (0.1)	7 (0.0)	7 (0.3)	0	NA	NA	NA
Planned birth attendant							
MD or DO	258 210 (77.7)	1447 (8.9)	1447 (60.2)	0	0.03	0.22	NA
Naturopathic physician	5 (0.0)	1766 (10.8)	0	1766 (12.7)	0.00	NA	0.00
Certified nurse-midwife	72 935 (21.9)	4057 (24.8)	944 (39.3)	3 113 (22.4)	0.03	0.22	1.81
Licensed direct entry midwife	5 (0.0)	7553 (46.3)	1 (0.0)	7552 (54.2)	0.00	0.00	0.00
Other midwife	4 (0.0)	1131 (6.9)	0	1131 (8.1)	0.00	NA	0.00
Other licensed health care professional, such as RN or EMT	1088 (0.3)	12 (0.1)	9 (0.4)	3 (0.0)	0.02	0.01	0.54
Other person, such as a relative	66 (0.0)	362 (2.2)	1 (0.0)	361 (2.6)	0.00	0.00	0.01
Weeks of gestation							
37	27 371 (8.2)	433 (2.7)	107 (4.5)	326 (2.3)	0.08	0.08	0.12
38	49 050 (14.8)	1214 (7.4)	198 (8.2)	1016 (7.3)	0.07	0.01	0.05
39	129 374 (38.9)	3125 (19.1)	467 (19.4)	2658 (19.1)	0.10	0.13	0.09
40	86 615 (26.1)	7275 (44.6)	718 (29.9)	6557 (47.1)	0.06	0.05	0.09
41	37 096 (11.2)	3457 (21.2)	638 (26.6)	2819 (20.2)	0.16	0.04	0.10
42-44	2807 (0.8)	824 (5.0)	274 (11.4)	550 (3.9)	0.09	0.01	0.02

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); EMT, emergency medical technician; PSW, propensity score weighted; RN, registered nurse; SMD, standardized mean difference.

[a] Comparing all planned community births including transfers vs planned and completed hospital births.

[b] Comparing transfers vs planned and completed hospital births.

[c] Comparing planned and completed community births vs planned and completed hospital births.

tion (aOR, 0.19; 95% CI, 0.18-0.21), operative deliveries (operative vaginal: aOR, 0.30; 95% CI, 0.26-0.35, cesarean: aOR, 0.18; 95% CI, 0.16-0.19), maternal ICU admission (aOR, 0.13; 95% CI, 0.08-0.23), and severe perineal lacerations (aOR, 0.51; 95% CI, 0.44-0.60) (**Table 4**). Compared to planned hospital births, transfers had higher odds of fetal death (aOR, 5.47; 95% CI, 2.67-11.20), 5-minute Apgar score less than 7 (aOR, 2.02; 95% CI, 1.64-2.50) and less than 4 (aOR, 2.21; 95%

Table 3. Birth Outcomes in Infants and Birthing Individuals (Oregon, 2012-2020)

Outcome	No. (%) Planned and completed hospital births (n = 332 313)	All planned community births including transfers (n = 16 328)	Transfers from community birth to hospital birth (n = 2402)	Planned and completed community births (n = 13 926)
Infant outcomes				
Fetal death				
No	331 997 (99.9)	16 307 (99.9)	2388 (99.4)	13 919 (99.9)
Yes	336 (0.1)	21 (0.1)	14 (0.6)	7 (0.1)
Neonatal death				
No	332 154 (100.0)	16 324 (100.0)	2398 (99.8)	13 926 (100.0)
Yes	159 (0.0)	4 (0.0)	4 (0.2)	0
Infant death				
No	331 821 (99.9)	16 321 (100.0)	2395 (99.7)	13 926 (100.0)
Yes	492 (0.1)	7 (0.0)	7 (0.3)	0
5-min Apgar score[a]				
<7				
No	325 735 (98.0)	15 736 (96.4)	2279 (94.9)	13 457 (96.6)
Yes	6172 (1.9)	343 (2.1)	108 (4.5)	235 (1.7)
Missing	406 (0.1)	249 (1.5)	15 (0.6)	234 (1.7)
<4				
No	330 650 (99.5)	16 012 (98.1)	2359 (98.2)	13 653 (98.0)
Yes	1257 (0.4)	67 (0.4)	28 (1.2)	39 (0.3)
Missing	406 (0.1)	249 (1.5)	15 (0.6)	234 (1.7)
Neonatal seizures				
No	314 628 (94.7)	16 194 (99.2)	2288 (95.3)	13 906 (99.9)
Yes	375 (0.1)	20 (0.1)	7 (0.3)	13 (0.1)
Missing	17 310 (5.2)	114 (0.7)	107 (4.5)	7 (0.1)
Any ventilator support				
No	318 347 (95.8)	15 666 (95.9)	2202 (91.7)	13 464 (96.7)
Yes	13 630 (4.1)	641 (3.9)	186 (7.7)	455 (3.3)
Missing	336 (0.1)	21 (0.1)	14 (0.6)	7 (0.1)
Ventilator support for >6 h				
No	329 457 (99.1)	16 219 (99.3)	2346 (97.7)	13 873 (99.6)
Yes	2520 (0.8)	88 (0.5)	42 (1.7)	46 (0.3)
Missing	336 (0.1)	21 (0.1)	14 (0.6)	7 (0.1)
NICU admission				
No	320 855 (96.6)	16 011 (98.1)	2265 (94.3)	13 746 (98.7)
Yes	11 122 (3.3)	296 (1.8)	123 (5.1)	173 (1.2)
Missing	336 (0.1)	21 (0.1)	14 (0.6)	7 (0.1)
Any neonatal outcome				
No	330 013 (99.3)	16 225 (99.4)	2352 (97.9)	13 873 (99.6)
Yes	2300 (0.7)	103 (0.6)	50 (2.1)	53 (0.4)
Maternal outcomes				
Induction of labor				
No	221 048 (66.5)	15 555 (95.3)	1848 (76.9)	13 707 (98.4)
Yes	110 437 (33.2)	745 (4.6)	533 (22.2)	212 (1.5)
Missing	828 (0.2)	28 (0.2)	21 (0.9)	7 (0.1)
Augmentation of labor				
No	224 126 (73.5)	15 144 (92.7)	1423 (59.2)	13 721 (98.5)
Yes	87 359 (26.3)	1156 (7.1)	958 (39.9)	198 (1.4)
Missing	828 (0.2)	28 (0.2)	21 (0.9)	7 (0.1)
Type of delivery				
Unassisted vaginal				
No	91 933 (27.7)	904 (5.5)	868 (36.1)	36 (0.3)
Yes	240 380 (72.3)	15 424 (94.5)	1534 (63.9)	13 890 (99.7)
Operative vaginal				
No	321 230 (96.7)	16 153 (98.9)	2263 (94.2)	13 890 (99.7)
Yes	11 083 (3.3)	175 (1.1)	139 (5.8)	36 (0.3)
Cesarean				
No	251 463 (75.7)	15 599 (95.5)	1673 (69.7)	13 926 (100.0)
Yes	80 850 (24.3)	729 (4.5)	729 (30.3)	0

(continued)

Table 3. Birth Outcomes in Infants and Birthing Individuals (Oregon, 2012-2020) (continued)

Outcome	No. (%)			
	Planned and completed hospital births (n = 332 313)	All planned community births including transfers (n = 16 328)	Transfers from community birth to hospital birth (n = 2402)	Planned and completed community births (n = 13 926)
ICU admission				
No	310 698 (93.5)	16 180 (99.1)	2264 (94.3)	13 916 (99.9)
Yes	2800 (0.8)	18 (0.1)	8 (0.3)	10 (0.1)
Missing	18 815 (5.7)	130 (0.8)	130 (5.4)	0
Blood transfusion				
No	310 929 (93.6)	16 102 (98.6)	2259 (94.0)	13 843 (99.4)
Yes	2569 (0.8)	96 (0.6)	13 (0.5)	83 (0.6)
Missing	18 815 (5.7)	130 (0.8)	130 (5.4)	0
Severe perineal lacerations				
No	306 480 (92.2)	16 001 (98.0)	2191 (91.2)	13 810 (99.2)
Yes	7018 (2.1)	197 (1.2)	81 (3.4)	116 (0.8)
Missing	18 815 (5.7)	130 (0.8)	130 (5.4)	0

Abbreviations: ICU, intensive care unit; NICU, neonatal intensive care unit; SMD, standardized mean difference.

[a] Apgar scale: 0-10; 7-10: normal or reassuring, 4-6: moderately abnormal, 0-3: dangerously low.

Table 4. Odds Ratios for Birth Outcomes in Infants and Birthing Individuals (Oregon, 2012-2020)

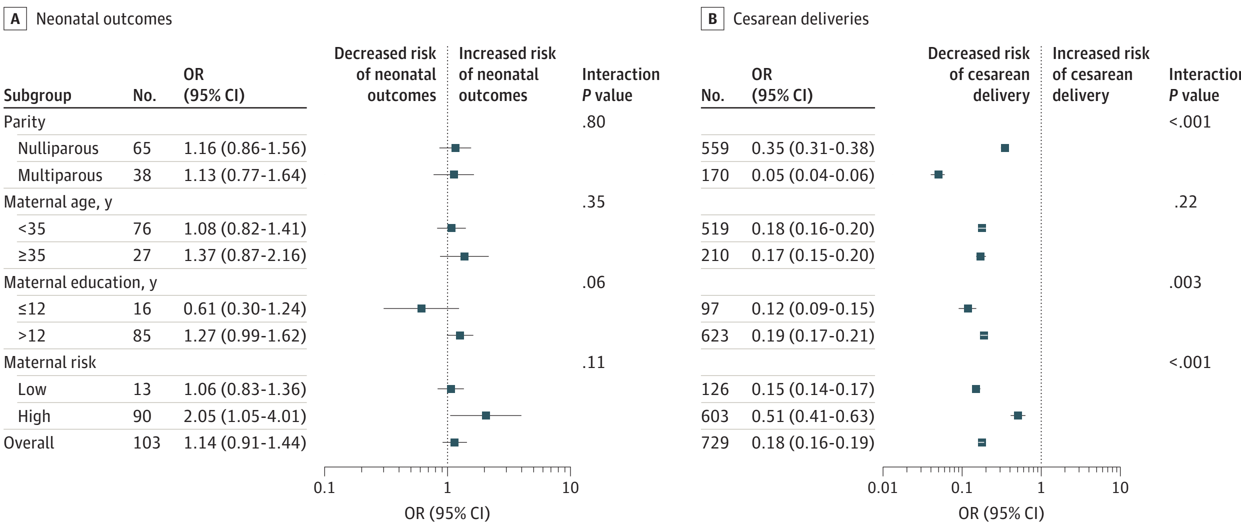
Outcome	OR (95% CI)					
	All planned community births including transfers vs planned and completed hospital births		Transfers from community birth to hospital birth vs planned and completed hospital births		Planned and completed community births vs planned and completed hospital births	
	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]
Infant outcomes						
Fetal death	1.27 (0.82-1.98)	0.80 (0.39-1.64)	5.79 (3.39-9.90)	5.47 (2.67-11.20)	0.50 (0.24-1.05)	NA
Neonatal death	0.51 (0.19-1.38)	NA	3.49 (1.29-9.41)	NA	NA	NA
Infant death	0.29 (0.14-0.61)	NA	1.97 (0.93-4.16)	NA	NA	NA
5-min Apgar score[b]						
<7	1.15 (1.03-1.28)	1.34 (1.19-1.50)	2.50 (2.06-3.04)	2.02 (1.64-2.50)	0.92 (0.81-1.05)	1.17 (1.02-1.35)
<4	1.10 (0.86-1.41)	1.26 (0.96-1.64)	3.12 (2.14-4.55)	2.21 (1.43-3.41)	0.75 (0.55-1.03)	1.01 (0.73-1.40)
Neonatal seizures	1.04 (0.66-1.63)	1.32 (0.81-2.14)	2.57 (1.21-5.43)	1.80 (0.74-4.38)	0.78 (0.45-1.36)	1.19 (0.68-2.10)
Any ventilator support	0.96 (0.88-1.04)	1.14 (1.05-1.24)	1.97 (1.70-2.29)	1.73 (1.47-2.03)	0.79 (0.72-0.87)	1.01 (0.91-1.11)
Ventilator support for >6 h	0.71 (0.57-0.88)	0.90 (0.72-1.13)	2.34 (1.72-3.18)	1.93 (1.36-2.74)	0.43 (0.32-0.58)	0.64 (0.48-0.87)
NICU admission	0.53 (0.48-0.60)	0.69 (0.61-0.78)	1.57 (1.31-1.88)	1.40 (1.15-1.71)	0.36 (0.31-0.42)	0.52 (0.44-0.61)
Any neonatal outcome	0.91 (0.75-1.11)	1.14 (0.91-1.44)	3.05 (2.30-4.05)	2.49 (1.76-3.53)	0.55 (0.42-0.72)	0.81 (0.60-1.10)
Maternal outcomes						
Induction of labor	0.10 (0.09-0.10)	0.09 (0.09-0.10)	0.58 (0.52-0.64)	0.53 (0.48-0.59)	0.03 (0.03-0.04)	0.03 (0.03-0.04)
Augmentation of labor	0.21 (0.20-0.23)	0.19 (0.18-0.21)	1.88 (1.73-2.04)	1.65 (1.51-1.80)	0.04 (0.04-0.05)	0.04 (0.03-0.04)
Type of delivery						
Unassisted vaginal	6.53 (6.10-6.98)	5.53 (5.12-5.97)	0.68 (0.62-0.74)	0.63 (0.58-0.70)	147.51 (106.36-204.60)	135.57 (96.54-190.38)
Operative vaginal	0.31 (0.27-0.37)	0.30 (0.26-0.35)	1.78 (1.50-2.12)	1.33 (1.11-1.59)	0.08 (0.05-0.10)	0.08 (0.06-0.11)
Cesarean	0.15 (0.14-0.16)	0.18 (0.16-0.19)	1.36 (1.24-1.48)	1.54 (1.39-1.70)	NA	NA
ICU admission	0.12 (0.08-0.20)	0.13 (0.08-0.23)	0.39 (0.20-0.79)	0.32 (0.15-0.72)	0.08 (0.04-0.15)	0.09 (0.05-0.19)
Blood transfusion	0.72 (0.59-0.89)	0.96 (0.77-1.19)	0.70 (0.40-1.20)	0.58 (0.31-1.09)	0.73 (0.58-0.90)	1.05 (0.83-1.32)
Severe perineal lacerations	0.54 (0.47-0.62)	0.51 (0.44-0.60)	1.62 (1.29-2.02)	1.08 (0.85-1.36)	0.37 (0.31-0.44)	0.38 (0.32-0.46)

Abbreviations: ICU, intensive care unit; NA, not applicable; NICU, neonatal intensive care unit.

[a] All models were adjusted for maternal race and ethnicity (other vs non-Hispanic White), parity (multiparous vs nulliparous), insurance type (other vs public), prenatal care adequacy (inadequate, intermediate, and adequate plus vs adequate), maternal age (≥35 years vs <35 years), education (≤12 years vs >12 years), history of cesarean delivery (yes vs no), and a composite marker of chronic hypertension, gestational hypertension, preeclampsia, eclampsia, prepregnancy diabetes, or gestational diabetes (yes vs no).

[b] Apgar scale: 0-10; 7-10: normal or reassuring, 4-6: moderately abnormal, 0-3: dangerously low.

CI, 1.43-3.41), ventilator support (any: aOR, 1.73; 95% CI, 1.47-2.03, >6 hours: aOR, 1.93; 95% CI, 1.36-2.74), NICU admission (aOR, 1.40; 95% CI, 1.15-1.71), augmentation of labor (aOR, 1.65; 95% CI, 1.51-1.80), and operative deliveries (operative vaginal: aOR, 1.33; 95% CI, 1.11-1.59, cesarean: aOR, 1.54; 95% CI, 1.39-1.70). Transfers had decreased odds of induction (aOR, Figure. Planned Out-of-Hospital and Planned Hospital Births by Subgroup



0.53; 95% CI, 0.48-0.59), unassisted vaginal deliveries (aOR, 0.63; 95% CI, 0.58-0.70), and maternal ICU admission (aOR, 0.32; 95% CI, 0.15-0.72). In contrast, completed community births had increased odds of 5-minute Apgar score less than 7 (aOR, 1.17; 95% CI, 1.02-1.35) and unassisted vaginal deliveries (aOR, 135.57; 95% CI, 96.54-190.38) and decreased odds of most medical interventions. Results were similar for completed home and birth center deliveries with the exception of 5-minute Apgar score less than 7, which was associated with birth center births but not home births (eTable 6 in Supplement 1). When 5-minute Apgar score was modeled as an ordinal outcome, planned community births (including transfers) had increased odds of lower scores at thresholds 5 to 7, and decreased odds of scores 8 to 9 (eTable 7 in Supplement 1).

Propensity score-adjusted and unadjusted absolute risk differences were similar, with the largest differences in the risk of fetal death, any neonatal outcome, unassisted vaginal and cesarean delivery, and ICU admission (eTable 8 in Supplement 1). Results of the *E*-values for each outcome and birth location are presented in eTable 9 in Supplement 1.

Stratified analyses showed that planned community births were generally not associated with neonatal outcomes, however, individuals with high maternal risk had higher odds of neonatal outcomes (aOR, 2.05; 95% CI, 1.05-4.01) (**Figure**, A). The odds of cesarean delivery were low for planned community births, especially among multiparous individuals and those with 12 years of education or less, with the highest odds among nulliparous and high-risk individuals (Figure, B).

Secondary Cohort

Including all births at 37 to 44 weeks increased the prevalence of transfers to 15.2%. Demographic and clinical characteristics are shown in eTable 10 in Supplement 1, and maternal risk factors and delivery characteristics in eTable 11 in Supplement 1. Multiples were most commonly planned hospital births but all multiples delivered in a community setting occurred at home. Breech presentation and lethal anomalies were most prevalent in transferred deliveries. Infant and maternal outcomes by birthing location are shown in eTable 12 in Supplement 1. Associations between birthing location and outcomes were consistent with those in the primary cohort (eTables 13-16 in Supplement 1).

Discussion

In this cohort study of Oregon births (2012-2020), we leveraged a unique birth certificate item identifying planned place of delivery at labor onset to accurately classify hospital transfers and reduce misclassification bias. We found that planned community births (including transfers) were associated with increased odds of 5-minute Apgar score less than 7 and any ventilator support but decreased odds of NICU admission, labor induction or augmentation, operative delivery, ICU admission, and severe perineal laceration compared to planned hospital births. Transfers, accounting for 14.7% of planned community births, were associated with increased odds of fetal death, low 5-minute Apgar score, ventilator support, NICU admission, labor augmentation, and operative deliveries. In contrast, completed community births were associated only with increased odds of 5-minute Apgar score less than 7 and decreased odds of most interventions and adverse outcomes, reflecting the low-intervention model of community-based care. Differences in payor type and rates of inadequate prenatal care reflect policy and practice features of community birth and midwifery models, which emphasize reduced medicalization and often serve populations with distinct socioeconomic and health care access profiles.

Our findings build on a study from Snowden et al[5] conducted in Oregon from 2012 to 2013, with our study covering a longer timeframe (2012-2020) encompassing the 2015 policy mandating licensure for the practice of midwifery in community settings in Oregon. While the distribution of birth settings was similar across both studies, we observed a lower transfer rate among planned community births (14.7% vs 17.2%). Consistent with Snowden et al, we found increased odds of low 5-minute Apgar score and ventilator use among planned community births (including transfers).[5] Our results also align with those of Cheng et al,[9] who used vital records to examine low-risk hospital and planned home births across 27 US states (2008), although their inability to distinguish transfers likely introduced misclassification bias. We also found that completed home and birth center births had similar perinatal outcomes, consistent with findings from Washington State (2015-2020) and 2 national community birth registries that tracked both planned and actual birth locations.[10,40]

Unlike some prior studies, we found no significant differences in the odds of fetal, neonatal, or infant death, 5-minute Apgar score less than 4, neonatal seizures, or maternal transfusion between planned hospital and planned community births (including transfers).[4,5,9,22,24,25] However, by distinguishing transferred from completed community deliveries, we showed that only transfers were associated with increased odds of fetal death and 5-minute Apgar score less than 4. Snowden et al[5] also classified transfers as planned community births and reported increased odds of fetal, perinatal, and neonatal death, neonatal seizures, and maternal transfusion.

Our findings are different from those of Cheng et al,[9] who found increased odds of 5-minute Apgar score less than 4 and neonatal seizures among home births in a low-risk cohort, though their study was limited by misclassification of hospital births. Using national linked vital records (2010-2017) without exclusions for maternal risk, Way et al[4] identified an increased risk of infant mortality for community births, particularly in rural areas, although they were unable to differentiate between planned hospital births and transfers. Using vital records (2007-2010), Grünebaum et al,[25] found higher risks of 5-minute Apgar score of 0, neonatal seizures, and neurological dysfunction in community births attended by midwives compared to hospital births attended by midwives or physicians. Another study[22] using vital records (2010-2017) reported significantly increased risk of neonatal mortality among planned home births compared to midwife-attended hospital births. However, differences in policy environments, inclusion criteria, health care professional type, and birth setting classification limit direct comparison across studies.

International studies generally report insignificant differences in the risk of adverse outcomes between community and hospital births.[41-46] These studies are limited to low-risk pregnancies and often compare midwife-led birth settings. There are critical differences in the standards of midwifery training and community birth regulation in these settings compared to the US. In some high-income countries, midwifery and community births are well regulated and integrated into the health care system.[24,28,47] In contrast, the US has wide variation in midwifery credentials,[24,48] and only 80% of birth centers have some form of regulation.[48,49] Of the 406 freestanding birth centers, it is unclear how many are state licensed,[48,49] presenting challenges in tracking and quality control.

Oregon is 1 of 41 states that mandate licensure for birth centers, which may contribute to improved perinatal outcomes compared to states without such oversight (eg, Alabama, Idaho, Maine, Michigan, North Carolina, North Dakota, Vermont, Virginia, and Wisconsin).[40,48,49] Licensure entails credentialing and emergency transfer agreements, although rural centers may struggle securing hospital transfer agreements,[48,49] delaying timely emergency care. Additionally, Oregon introduced a midwifery licensure mandate in 2015[34] and limits reimbursement for planned community births to clinically low-risk pregnancies.[50] These policies likely contribute to improved outcomes in our cohort and may underestimate risks associated with community birth in less regulated environments.

These regulatory gaps are particularly concerning as some states expand community-based obstetric services, including cesarean sections in freestanding clinics (eg, Florida's advanced birth centers).[51-54] While hospital births have been criticized for the overuse of interventions, surgical deliveries carry inherent risks. In community settings, limited infrastructure for safe surgical care and post-operative monitoring may further increase the risk of maternal morbidity and mortality—already higher in the US than in other high-income countries.[24,55-63]

This study highlights important clinical and policy implications. Transfers exhibited high rates of hypertensive disorders and other complications, emphasizing the importance of risk-appropriate prenatal counseling. Health care professionals should offer clear, evidence-based guidance to help individuals align their birth plans with their clinical profiles and preferences. Comprehensive informed consent should explicitly communicate the quantified risks of planned community birth, including intrapartum transfer and its implications. Our findings also underscore the need to optimize care systems to support timely and seamless transfers from community to hospital settings when complications arise. Regulatory oversight of community birth settings must ensure adherence to evidence-based standards of care, including training requirements for birth attendants and formalized hospital transfer agreements. Enhanced collaboration between hospitals and community-based clinicians is pivotal to mitigate risks, ensure continuity of care, and improve outcomes for birthing individuals and newborns.

The documentation of planned place of delivery at labor onset, as implemented in Oregon, provides a valuable model for other states. Such standardized documentation is particularly vital in states lacking birth center licensure requirements, where the risk of adverse perinatal outcomes in community settings may be even higher. Expanding this approach nationally could enhance surveillance, inform quality improvement initiatives, and guide policy decisions. Future research should also examine perinatal outcomes in emerging models, such as advanced birth centers.

Strengths and Limitations

Our study is strengthened by the use of linked vital records and hospital administrative data, rather than vital records alone,[3,5,9,22,25] which reduces underreporting bias, particularly for maternal risk factors.[36-38] In our Oregon cohort, these sources were comparable for all but one maternal risk factor, which may not hold in other states.[41,42] Limitations include the racial and ethnic homogeneity of the study population, which may exclude groups at higher risk of morbidity and mortality and therefore limit generalizability. We were also unable to quantify underreporting bias in completed community births, potentially introducing differential measurement error between groups. We also lacked data on postpartum outcomes, and unmeasured factors not included in the propensity score models may have contributed to residual confounding.

Conclusions

This population-based cohort study found that planned community births (including individuals transferred to the hospital) were associated with increased odds of several adverse perinatal outcomes. Transferred deliveries had the highest prevalence of hypertensive disorders and increased odds of most outcomes and interventions. Completed community births were not associated with most outcomes and had decreased odds of most interventions. Misclassifying transfers as planned hospital births may underestimate risks associated with planned community deliveries. These findings are crucial for patient counseling, clinical decision-making, and policy development aimed at ensuring risk-appropriate care and timely access to emergency services.

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REFERENCES

1. MacDorman MF, Declercq E, Mathews TJ. Recent trends in out-of-hospital births in the United States. *J Midwifery Womens Health*. 2013;58(5):494-501. doi:10.1111/jmwh.12092

2. Girsen AI, Mayo JA, Lyell DJ, et al. Out-of-hospital births in California 1991-2011. *J Perinatol*. 2018;38(1):41-45. doi:10.1038/jp.2017.156

3. Grunebaum A, Chervenak FA. Out-of-hospital births in the United States 2009-2014. *J Perinat Med*. 2016;44(7):845-849. doi:10.1515/jpm-2015-0396

4. Way EA, Carwile JL, Ziller EC, Ahrens KA. Out-of-hospital births and infant mortality in the United States: effect measure modification by rural maternal residence. *Paediatr Perinat Epidemiol*. 2022;36(3):399-411. doi:10.1111/ppe.12862

5. Snowden JM, Tilden EL, Snyder J, Quigley B, Caughey AB, Cheng YW. Planned out-of-hospital birth and birth outcomes. *N Engl J Med*. 2015;373(27):2642-2653. doi:10.1056/NEJMsa1501738

6. Lang G, Farnell EA IV, Quinlan JD. Out-of-hospital birth. *Am Fam Physician*. 2021;103(11):672-679.

7. MacDorman MF, Declercq E. Trends and characteristics of United States out-of-hospital births 2004-2014: new information on risk status and access to care. *Birth*. 2016;43(2):116-124. doi:10.1111/birt.12228

8. Bachilova S, Czuzoj-Shulman N, Abenhaim HA. Effect of maternal and pregnancy risk factors on early neonatal death in planned home births delivering at home. *J Obstet Gynaecol Can*. 2018;40(5):540-546. doi:10.1016/j.jogc.2017.07.029

9. Cheng YW, Snowden JM, King TL, Caughey AB. Selected perinatal outcomes associated with planned home births in the United States. *Am J Obstet Gynecol*. 2013;209(4):325.e1-325.e8. doi:10.1016/j.ajog.2013.06.022

10. Bovbjerg ML, Cheyney M, Hoehn-Velasco L, et al. Planned home births in the United States have outcomes comparable to planned birth center births for low-risk birthing individuals. *Med Care*. 2024;62(12):820-829. doi:10.1097/MLR.0000000000002074

11. Sonenberg A, Mason DJ. Maternity care deserts in the US. *JAMA Health Forum*. 2023;4(1):e225541. doi:10.1001/jamahealthforum.2022.5541

12. Walter G, Topmiller M, Jetty A, Jabbarpour Y. Family physicians providing obstetric care in maternity care deserts. *Am Fam Physician*. 2022;106(4):377-378.

13. Wallace M, Dyer L, Felker-Kantor E, et al. Maternity care deserts and pregnancy-associated mortality in Louisiana. *Womens Health Issues*. 2021;31(2):122-129. doi:10.1016/j.whi.2020.09.004

14. Carroll C, Interrante JD, Daw JR, Kozhimannil KB. Association between medicaid expansion and closure of hospital-based obstetric services. *Health Aff (Millwood)*. 2022;41(4):531-539. doi:10.1377/hlthaff.2021.01478

15. Hung P, Kozhimannil KB, Casey MM, Moscovice IS. Why are obstetric units in rural hospitals closing their doors? *Health Serv Res*. 2016;51(4):1546-1560. doi:10.1111/1475-6773.12441

16. Kozhimannil KB, Hung P, Henning-Smith C, Casey MM, Prasad S. Association between loss of hospital-based obstetric services and birth outcomes in rural counties in the United States. *JAMA*. 2018;319(12):1239-1247. doi:10.1001/jama.2018.1830

17. Parks Santangelo E, Osypuk T, Mason SM. Distance to hospital-based intrapartum care and planned home birth in Minnesota. *J Midwifery Womens Health*. 2020;65(4):496-502. doi:10.1111/jmwh.13095

18. Cheyney M, Bovbjerg M, Everson C, Gordon W, Hannibal D, Vedam S. Outcomes of care for 16,924 planned home births in the United States: the Midwives Alliance of North America Statistics Project, 2004 to 2009. *J Midwifery Womens Health*. 2014;59(1):17-27. doi:10.1111/jmwh.12172

19. Stapleton SR, Osborne C, Illuzzi J. Outcomes of care in birth centers: demonstration of a durable model. *J Midwifery Womens Health*. 2013;58(1):3-14. doi:10.1111/jmwh.12003

20. Niles PM, Baumont M, Malhotra N, et al. Examining respect, autonomy, and mistreatment in childbirth in the US: do provider type and place of birth matter? *Reprod Health*. 2023;20(1):67. doi:10.1186/s12978-023-01584-1

21. Kennedy HP, Rousseau AL, Low LK. An exploratory metasynthesis of midwifery practice in the United States. *Midwifery*. 2003;19(3):203-214. doi:10.1016/S0266-6138(03)00034-2

22. Grünebaum A, McCullough LB, Orosz B, Chervenak FA. Neonatal mortality in the United States is related to location of birth (hospital versus home) rather than the type of birth attendant. *Am J Obstet Gynecol*. 2020;223(2):254.e1-254.e8. doi:10.1016/j.ajog.2020.01.045

23. Jones P, Alberti C, Julé L, et al. Mortality in out-of-hospital premature births. *Acta Paediatr*. 2011;100(2):181-187. doi:10.1111/j.1651-2227.2010.02003.x

24. Grünebaum A, Bornstein E, McLeod-Sordjan R, et al. The impact of birth settings on pregnancy outcomes in the United States. *Am J Obstet Gynecol*. 2023;228(5S):S965-S976. doi:10.1016/j.ajog.2022.08.011

25. Grünebaum A, McCullough LB, Sapra KJ, et al. Apgar score of 0 at 5 minutes and neonatal seizures or serious neurologic dysfunction in relation to birth setting. *Am J Obstet Gynecol*. 2013;209(4):323.e1-323.e6. doi:10.1016/j.ajog.2013.06.025

26. Murphy JF, Dauncey M, Gray OP, Chalmers I. Planned and unplanned deliveries at home: implications of a changing ratio. *BMJ (Clin Res Ed)*. 1984;288(6428):1429-1432. doi:10.1136/bmj.288.6428.1429

27. Murphy PA, Fullerton J. Outcomes of intended home births in nurse-midwifery practice: a prospective descriptive study. *Obstet Gynecol*. 1998;92(3):461-470. doi:10.1097/00006250-199809000-00028

28. Caughey AB, Cheyney M. Home and birth center birth in the United States: time for greater collaboration across models of care. *Obstet Gynecol*. 2019;133(5):1033-1050. doi:10.1097/AOG.0000000000003215

29. Grünebaum A, McCullough LB, Sapra KJ, Arabin B, Chervenak FA. Planned home births: the need for additional contraindications. *Am J Obstet Gynecol*. 2017;216(4):401.e1-401.e8. doi:10.1016/j.ajog.2017.01.012

30. Grünebaum A, McCullough LB, Arabin B, Brent RL, Levene MI, Chervenak FA. Home birth is unsafe: FOR: the safety of planned homebirths: a clinical fiction. *BJOG*. 2015;122(9):1235-1235. doi:10.1111/1471-0528.13410

31. Chang JJ, Macones GA. Birth outcomes of planned home births in Missouri: a population-based study. *Am J Perinatol*. 2011;28(7):529-536. doi:10.1055/s-0031-1272971

32. Wonder CDC. Natality Information. Accessed August 7, 2025. https://wonder.cdc.gov/natality.html

33. Home birth tragedies lead to changes in Oregon—science-based medicine. Accessed August 7, 2025. https://sciencebasedmedicine.org/oregon-health-plan-will-cover-only-low-risk-births-planned-for-home-and-birth-centers/

34. Oregon Health Authority. Board of Direct Entry Midwifery—information on traditional midwifery. Accessed August 7, 2025. https://www.oregon.gov/oha/PH/HLO/Pages/Board-Direct-Entry-Midwifery-Traditional-Information.aspx

35. Oregon Health Authority. Oregon birth data: birth data: state of Oregon. Accessed December 29, 2024. https://www.oregon.gov/oha/PH/BirthDeathCertificates/VitalStatistics/birth/Pages/index.aspx

36. Gemmill A, Passarella M, Phibbs CS, et al. Validity of birth certificate data compared with hospital discharge data in reporting maternal morbidity and disparities. *Obstet Gynecol*. 2024;143(3):459-462. doi:10.1097/AOG.0000000000005497

37. Roohan PJ, Josberger RE, Acar J, Dabir P, Feder HM, Gagliano PJ. Validation of birth certificate data in New York state. *J Community Health*. 2003;28(5):335-346. doi:10.1023/A:1025492512915

38. Dietz P, Bombard J, Mulready-Ward C, et al. Validation of selected items on the 2003 U.S. standard certificate of live birth: New York City and Vermont. *Public Health Rep*. 2015;130(1):60-70. doi:10.1177/003335491513000108

39. NJSHAD. The Kotelchuck index. Accessed September 8, 2025. https://www-doh.nj.gov/doh-shad/query/Kotelchuck.html

40. Nethery E, Schummers L, Levine A, Caughey AB, Souter V, Gordon W. Birth outcomes for planned home and licensed freestanding birth center births in Washington state. *Obstet Gynecol*. 2021;138(5):693-702. doi:10.1097/AOG.0000000000004578

41. Cicero RV, Zambri F, Grandolfo M, Varone F, Smith M, Colaceci S. Characteristics of out-of-hospital births and perinatal outcomes: data from the Lazio Region, Italy, cross-sectional study from 2019 to 2021. *Ann Ist Super Sanita*. 2024;60(2):98-106. doi:10.4415/ANN_24_02_03

42. Rollet C, Le Ray C, Vendittelli F, Blondel B, Chantry AA; MDN Research Group. Severe adverse maternal and neonatal outcomes according to the planned birth setting being midwife-led birth centers or obstetric-led units. *Acta Obstet Gynecol Scand*. 2024;103(12):2465-2474. doi:10.1111/aogs.14971

43. Janssen PA, Saxell L, Page LA, Klein MC, Liston RM, Lee SK. Outcomes of planned home birth with registered midwife versus planned hospital birth with midwife or physician. *CMAJ*. 2009;181(6-7):377-383. doi:10.1503/cmaj.081869

44. Hutton EK, Cappelletti A, Reitsma AH, et al. Outcomes associated with planned place of birth among women with low-risk pregnancies. *CMAJ*. 2016;188(5):E80-E90. doi:10.1503/cmaj.150564

45. de Jonge A, Geerts CC, van der Goes BY, Mol BW, Buitendijk SE, Nijhuis JG. Perinatal mortality and morbidity up to 28 days after birth among 743 070 low-risk planned home and hospital births: a cohort study based on three merged national perinatal databases. *BJOG*. 2015;122(5):720-728. doi:10.1111/1471-0528.13084

46. Scarf VL, Rossiter C, Vedam S, et al. Maternal and perinatal outcomes by planned place of birth among women with low-risk pregnancies in high-income countries: a systematic review and meta-analysis. *Midwifery*. 2018;62:240-255. doi:10.1016/j.midw.2018.03.024

47. Scrimshaw SC, Backes EP, eds; National Academies of Sciences. Engineering, and Medicine. *Birth Settings in America: Outcomes, Quality, Access, and Choice*. The National Academies Press; 2020.

48. MACPAC. *Access to Maternity Providers*. Midwives and Birth Centers; 2023.

49. American Association Of Birth Centers. Birth Center Regulations. Published 2019. Accessed December 18, 2024. https://www.birthcenters.org/birth-center-regulations

50. Oregon Health Authority. Planned community births (out-of-hospital births) prior authorization and billing guide. Published 2021. Accessed October 22, 2025. https://www.oregon.gov/oha/HSD/OHP/Tools/Planned-Community-Birth-Guide.pdf

51. CNN. Florida allows doctors to perform C-sections outside of hospitals. Accessed December 17, 2024. https://www.cnn.com/2024/05/29/health/florida-c-section-clinics/index.html

52. KFF Health News. Florida allows doctors to perform C-sections outside of hospitals. Accessed December 17, 2024. https://kffhealthnews.org/news/article/florida-c-sections-outside-hospitals-advanced-birth-centers-obstetrics/

53. WPBF. New Florida law allows C-sections performed outside of hospitals. Accessed December 17, 2024. https://www.wpbf.com/article/new-florida-law-allows-caesarean-sections-outside-hospitals-controversy-birth/60984028

54. Cowan K. Florida becomes first state in the U.S. to allow C-sections outside of hospitals. FOX 13 News. Published online May 29, 2024. Accessed December 17, 2024. https://www.fox13news.com/news/florida-becomes-first-state-u-s-allow-c-sections-outside-hospitals

55. CIA. Maternal mortality ratio. Published 2020. Accessed September 2, 2024. https://www.cia.gov/the-world-factbook/field/maternal-mortality-ratio/country-comparison/

56. Chinn JJ, Eisenberg E, Artis Dickerson S, et al. Maternal mortality in the United States: research gaps, opportunities, and priorities. *Am J Obstet Gynecol*. 2020;223(4):486-492.e6. doi:10.1016/j.ajog.2020.07.021

57. Collier AY, Molina RL. Maternal mortality in the United States: updates on trends, causes, and solutions. *Neoreviews*. 2019;20(10):e561-e574. doi:10.1542/neo.20-10-e561

58. Wang S, Rexrode KM, Florio AA, Rich-Edwards JW, Chavarro JE. Maternal mortality in the United States: trends and opportunities for prevention. *Annu Rev Med*. 2023;74:199-216. doi:10.1146/annurev-med-042921-123851

59. Diop H, Declercq ER, Liu CL, et al. Trends and inequities in severe maternal morbidity in Massachusetts: a closer look at the last two decades. *PLoS One*. 2022;17(12):e0279161. doi:10.1371/journal.pone.0279161

60. Somerville NJ, Nielsen TC, Harvey E, et al. Obstetric comorbidity and severe maternal morbidity among Massachusetts delivery hospitalizations, 1998-2013. *Matern Child Health J*. 2019;23(9):1152-1158. doi:10.1007/s10995-019-02796-3

61. Dakin A, Clinton S, Sloan J, Dicker P, Byrne BM. Severe maternal morbidity trends over 20 years in a tertiary referral stand-alone maternity unit. *Eur J Obstet Gynecol Reprod Biol*. 2023;283:136-140. doi:10.1016/j.ejogrb.2023.02.009

62. US Centers for Disease Control and Prevention. Severe maternal morbidity in the United States. Accessed September 5, 2023. https://www.cdc.gov/maternal-infant-health/php/severe-maternal-morbidity/

63. Gibson C, Rohan AM, Gillespie KH. Severe maternal morbidity during delivery hospitalizations. *WMJ*. 2017;116(5):215-220.