OBSTETRICS

Planned home births: the need for additional contraindications

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BACKGROUND: Planned home births in the United States are associated with fewer interventions but with increased adverse neonatal outcomes such as perinatal and neonatal deaths, neonatal seizures or serious neurologic dysfunction, and low 5-minute Apgar scores. The American College of Obstetricians and Gynecologists' Committee on Obstetric Practice states that, to reduce perinatal death and to improve outcomes at planned home births, strict criteria are necessary to guide the selection of appropriate candidates for planned home birth. The committee lists 3 absolute contraindications for a planned home birth: fetal malpresentation, multiple gestations, and a history of cesarean delivery.

OBJECTIVE: The aim of this study was to evaluate whether there are risk factors that should be considered contraindications to planned home births in addition to the 3 that are listed by the American College of Obstetricians and Gynecologists.

STUDY DESIGN: We conducted a population-based, retrospective cohort study of all term (≥37 weeks gestation), normal weight (≥2500 grams), singleton, nonanomalous births from 2009–2013 using the Centers for Disease Control and Prevention's period-linked birth-infant death files that allowed for identification of intended and unintended home births. We examined neonatal deaths (days 0–27 after birth) across 3 groups (hospital-attended births by certified nurse midwives, hospital-attended births by physicians, and planned home births) for 5 risk factors: 2 of the 3 absolute contraindications to home birth listed by the American College of Obstetricians and Gynecologists (breech presentation and previous cesarean delivery) and 3 additional risk factors (parity [nulliparous and multiparous], maternal age [women <35 and ≥35 years old], and gestational age at delivery [37–40 and ≥41 weeks]).

RESULTS: The overall risk of neonatal death was significantly higher in planned home births (12.1 neonatal death/10,000 deliveries; $P<.001$) compared with hospital births by certified nurse midwives (3.08 neonatal death/10,000 deliveries) or physicians (5.09 neonatal death/10,000 deliveries). Neonatal mortality rates were increased significantly at planned home births, with the following individual risk factors: breech presentation (neonatal mortality rate, 127.52/10.000 births), nulliparous pregnant women (neonatal mortality rate, 22.5/10,000), previous cesarean delivery (18.91/10,000 births), and a gestational age ≥41 weeks (neonatal mortality rate, 17.17/10,000 births). Planned home births with ≥1 of the 5 risk factors had significantly higher neonatal death risks compared with deliveries with none of the risks. Neonatal death risk was further increased when a woman's age of ≥35 years was combined with either a first-time birth or a gestational age of ≥41 weeks.

CONCLUSIONS: In this study, we show 2 risk factors with significantly increased neonatal mortality rates at planned home births in addition to the 3 factors that are listed by the American College of Obstetricians and Gynecologists. These additional risks factors have neonatal mortality rates that are approaching or exceeding those for planned home birth after cesarean delivery: first-time births and a gestational age of ≥ 41 weeks. Therefore, 2 additional risk factors (first-time births and a gestational age of ≥41 weeks) should be added to the 3 absolute contraindications of planned home births that are listed by the American College of Obstetricians and Gynecologists (previous cesarean delivery, malpresentation, multiple gestations) for a total of 5 contraindications for planned home births.

Key words: breech, home birth, maternal age, midwife, neonatal death, parity, previous cesarean delivery

Home births in the United States have increased over the last decade.[1] The 37,551 home births in the United States in 2014 (0.94% of all US births) are now the highest in absolute numbers of all industrialized countries.[1] Planned home births in the United States are associated with fewer interventions[2] but with an increased risk of perinatal and neonatal death[2-4]; a 3-fold increased risk of neonatal seizures or serious neurologic dysfunction[5,6]; an increased risk of 5-minute Apgar score of 0, <7, and <4[2,6]; an increased risk for neonatal death in a breech presenting fetus,[7] and in women with previous cesarean births.[8]

The American College of Obstetricians and Gynecologists' (ACOG) Committee on Obstetric Practice described the safety of planned home births in the United States as controversial.[5] In addition, ACOG states that in order to reduce perinatal mortality at planned home births and achieving favorable home birth outcomes, "…strict criteria are necessary to guide selection of appropriate candidates for planned home birth," and it lists three absolute contraindications for a planned home birth: fetal malpresentation, multiple gestations, and a history of previous cesarean delivery.[5]

The aim of this study was to analyze the association of neonatal death with additional risk factors such as nulliparity, a gestational age ≥ 41 weeks, and women ≥ 35 years of age, and to evaluate whether these risk factors should be considered additional contraindications to planned home birth.

EDITORS' CHOICE

Cite this article as: Grünebaum A, McCullough LB, Sapra KJ, et al. Planned home births: the need for additional contraindications. Am J Obstet Gynecol 2017;216:401.e1-8.

0002-9378/free

http://dx.doi.org/10.1016/j.ajog.2017.01.012

Materials and Methods

Study population

This is a population-based, retrospective cohort study of all term (≥37 weeks gestation), normal weight (≥2500 g), singleton, nonanomalous births from 2009–2013, the last 5 years of the available data, in states that used the 2003 revised birth certificate and the Centers for Disease Control and Prevention's period-linked birth-infant deaths files that allowed for identification of intended and unintended home births. We excluded births if they met any of the following criteria: birthplace outside the hospital or home; unintended home births; gestational age <37 weeks or not recorded; neonatal birthweight <2500 g or not recorded; multiple gestations; any congenital anomaly, Down syndrome or other chromosomal disorder confirmed or pending; and residents of a foreign country. Multiples births were excluded from the data evaluation because there were too few multiples among planned home births to create meaningful data. The data included the location of deliveries (home vs hospital), the attendant at the delivery, and, for deliveries that occurred at home, whether it was intended or unintended. This analysis included only intended home births; for hospital births, the analysis included those who attended the delivery (physician or midwife). Most deaths are linked to their corresponding birth certificates (approximately 99%); however, the deaths are weighted with the use of the weights that were assigned by the Centers for Disease Control and Prevention to account for unlinked deaths.

Statistical analysis

The dataset was analyzed to examine total neonatal deaths (death of a liveborn neonate between days 0–27 of life) across 3 groups: hospital-attended births by certified nurse midwives, hospital-attended births by physicians, and planned home births.

Descriptive statistics for births and neonatal deaths were calculated separately for midwife-attended and physician-attended hospital births and compared with intended home births with the use of chi-square and Fisher's exact tests with significance set at a probability value of <.05.

We calculated the risk of neonatal death per 10,000 deliveries and the standardized mortality ratio (SMR) for planned home births and physician-attended hospital births vs midwife-attended hospital births using the indirect method that accounted for parity (nulliparous vs multiparous), maternal age (women <35 vs ≥35 years old), and gestational age at delivery (37-40 vs ≥41 weeks gestation).

After restricting the sample to a relatively low-risk set of singleton births that delivered at ≥37 weeks gestation, ≥2500 g, and without congenital anomalies, we selected the most parsimonious set of confounding variables to facilitate the adjusted analysis. We controlled for age, parity, and postterm dates because these were determined a priori to be the strongest predictors for neonatal death.

An SMR >1 indicates that the risk of neonatal death in the study population (eg, intended home births or physician-attended hospital births) is higher than expected if the risk of neonatal death were similar to that experienced among midwife-attended hospital births. We also calculated 95% confidence intervals; if the 95% confidence interval did not cross 1.00, the difference in mortality rate was considered statistically significant. The SMRs for 5 risk factors for neonatal death were evaluated: 2 of the 3 absolute contraindications to home birth that are listed by ACOG (breech presentation and previous cesarean delivery) and 3 additional risk factors (parity, maternal age, and gestational age at delivery), as described earlier. We also calculated the risks and SMR for any and none of the aforementioned risk factors and for combinations of parity, maternal age, and gestational age. All data analysis was completed in SAS software (version 9.4; SAS Institute Inc, Cary, NC).

Because nonidentifiable data from a publicly available dataset were used, our study was not considered human subjects research and did not require review by the Weill Medical College of Cornell University Institutional Review Board.

Results

Characteristics

The study population included a total of 12,953,671 singleton, nonanomalous, term (≥37 weeks) deliveries with infants who weighed ≥2500 g who delivered in states that used the 2003 revised birth certificate from 2009–2013 in a hospital or were intended (or planned) home births. Of the whole group, 11,779,659 deliveries (90.9%) were hospital deliveries by physicians; 1,077,197 deliveries (8.3%) were hospital deliveries by certified nurse midwives, and 96,815 deliveries (0.7%) were intended (planned) home births. Of the total of 6467 neonatal deaths, 6015 deaths (93.0%) were hospital deliveries by physicians; 334 deaths (5.2%) were hospital deliveries by certified nurse midwives, and 118 deaths (1.8%) were intended (planned) home births.

Table 1 shows the characteristics of the 3 subgroups for all deliveries and neonatal deaths. Women with planned home births were significantly more likely to be non-Hispanic white, older, parous, self-payers for delivery, or to deliver infants at ≥4000 g and ≥41 weeks of gestational age (postterm). Approximately 1 in 168 planned home births was a breech delivery, and approximately 1 in 23 planned home births was a vaginal birth after cesarean delivery.

Neonatal death

The risk of neonatal death was significantly higher in planned home births (12.1 neonatal deaths/10,000 births; $P<.001$) compared with hospital births by certified nurse midwives (3.08 neonatal deaths/10,000 births) or physicians (5.09 neonatal deaths/10,000 deliveries; Table 2). Women with the highest increased individual risk for neonatal death at planned home births were those with breech presentation (127.52 neonatal death/10.000 births or 1 in 78 breech births), followed by nulliparous women (22.5 neonatal deaths/10,000 births or 1 in 444 first-time births), those with previous cesarean delivery (18.91 neonatal deaths/10,000 births or 1 in 529 births), pregnancies with a gestational age ≥41 weeks (17.17 neonatal deaths/10,000 births or

TABLE 1
Maternal, newborn infant, and delivery characteristics associated with nonanomalous singleton births[a]

Variable	Deliveries (n=12,953,671)				Neonatal deaths (n=6467)			
	Hospital midwife (n=1,077,197), n (%)	Hospital physician (n=11,779,659), n (%)	Intended home birth (n=96,815), n (%)	*P* value[b]	Hospital midwife (n=334), n (%)	Hospital physician (n=6015), n (%)	Intended home births (n=118), n (%)	*P* value[b]
Maternal ethnicity				<.001				<.001
Non-Hispanic								
White	577,665 (53.6)	6,276,662 (53.3)	87,253 (90.1)		188 (56.3)	3176 (52.8)	110 (93.2)	
Black	137,484 (12.8)	1,539,889 (13.1)	1,890 (2.0)		54 (16.2)	1054 (17.5)	0	
Hispanic	283,687 (26.3)	3,042,950 (25.8)	4,643 (4.8)		65 (19.5)	1362 (22.6)	4 (3.4)	
Other	71,335 (6.6)	828,184 (7.0)	1,614 (1.7)		22 (6.6)	332 (5.5)	1 (0.8)	
Unknown	7,026 (0.7)	91,974 (0.8)	1,415 (1.5)		5 (1.5)	90 (1.5)	3 (2.5)	
Maternal age, y				<.001				<.001
<25	390,660 (36.3)	3,745,494 (31.8)	15,294 (15.8)		134 (40.1)	2311 (38.4)	26 (22.0)	
25–34	567,481 (52.7)	6,336,325 (53.8)	61,409 (63.4)		168 (50.3)	2906 (48.3)	64 (54.2)	
≥35	119,030 (11.0)	1,697,022 (14.4)	20,106 (20.8)		32 (9.6)	797 (13.3)	27 (22.9)	
Unknown	26 (0.0)	818 (0.0)	6 (0.0)		0	1 (0.0)	0	
Maternal education, y				<.001				.37
<13	496,538 (46.1)	4,998,057 (42.4)	38,443 (39.7)		173 (51.8)	3122 (51.9)	56 (47.5)	
≥13	566,134 (52.6)	6,642,060 (56.4)	57,729 (59.6)		153 (45.8)	2722 (45.3)	60 (50.8)	
Unknown	14,525 (1.3)	139,542 (1.2)	643 (0.7)		9 (2.7)	172 (2.9)	1 (0.8)	
Prenatal visits, n				<.001				<.001
0	8,839 (0.8)	145,689 (1.2)	2,652 (2.7)		10 (3.0)	228 (3.8)	13 (11.0)	
1–5	49,372 (5.6)	519,504 (4.4)	13,255 (13.7)		20 (6.0)	482 (8.0)	24 (20.3)	
≥6	973,834 (90.4)	10,679,376 (90.7)	79,765 (82.4)		281 (84.1)	4934 (82.0)	78 (66.1)	
Unknown	45,152 (4.2)	435,090 (3.7)	1,143 (1.2)		23 (7.9)	371 (6.2)	3 (2.5)	
Insurance[c]				<.001				<.001
Private	294,262 (27.3)	3,464,544 (29.4)	12,174 (12.6)		71 (21.3)	1346 (22.4)	11 (9.3)	
Government	319,590 (29.7)	3,337,667 (28.3)	6,145 (6.3)		118 (35.3)	2096 (34.8)	4 (3.4)	
Self-pay/other	47,071 (4.4)	423,746 (3.6)	42,808 (44.2)		18 (5.4)	257 (4.3)	67 (56.8)	
Unknown	12,945 (1.2)	89,663 (0.8)	3,055 (3.2)		4 (1.2)	55 (0.9)	4 (3.4)	
Not reported	403,329 (37.4)	4,464,039 (37.9)	32,633 (33.7)		123 (36.8)	2262 (37.6)	31 (26.3)	
Parity				<.001				.25
Nulliparous	424,060 (39.4)	4,756,609 (40.4)	20,125 (20.8)		157 (47.0)	2482 (41.3)	45 (38.1)	
Parous	641,625 (59.6)	6,952,531 (59.0)	75,809 (78.3)		171 (51.2)	3475 (57.8)	70 (59.3)	
Unknown	11,512 (1.1)	70,519 (0.6)	881 (0.9)		6 (1.8)	56 (0.9)	2 (1.7)	
Previous cesarean delivery				<.001				<.01
No	1,048,436 (97.3)	9,961,948 (84.6)	92,199 (95.2)		323 (96.7)	5108 (84.9)	106 (89.8)	
Yes	22,176 (2.1)	1,782,055 (15.1)	4,273 (4.4)		5 (1.5)	867 (14.4)	8 (6.8)	
Unknown	6,585 (0.6)	35,656 (0.3)	343 (0.4)		6 (1.8)	40 (0.7)	4 (3.4)	

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(continued)

TABLE 1
Maternal, newborn infant, and delivery characteristics associated with nonanomalous singleton births[a] *(continued)*

Variable	Deliveries (n=12,953,671)				Neonatal deaths (n=6467)			
	Hospital midwife (n=1,077,197), n (%)	Hospital physician (n=11,779,659), n (%)	Intended home birth (n=96,815), n (%)	*P* value[b]	Hospital midwife (n=334), n (%)	Hospital physician (n=6015), n (%)	Intended home births (n=118), n (%)	*P* value[b]
Newborn weight, g				<.001				<.001
2500–3999	982,994 (91.3)	10,744,142 (92.2)	76,428 (78.9)		318 (95.2)	5560 (92.4)	98 (83.1)	
≥4000	94,203 (8.7)	1,035,517 (8.8)	20,387 (21.1)		16 (4.8)	455 (7.6)	20 (16.9)	
Gestational age, wk				<.001				<.001
37-38	256,151 (23.8)	3,341,327 (28.4)	14,205 (14.7)		93 (27.8)	2261 (37.6)	18 (15.3)	
39-40	606,165 (56.3)	6,645,173 (56.4)	54,232 (56.0)		164 (49.1)	2824 (46.9)	50 (42.4)	
≥41	214,881 (19.9)	1,793,159 (15.2)	28,378 (29.3)		78 (23.4)	930 (15.5)	49 (41.5)	
Presentation				<.001				<.01
Cephalic	1,036,683 (96.2)	10,977,624 (93.2)	93,462 (96.5)		321 (96.1)	5325 (88.5)	105 (89.0)	
Breech	1,921 (0.2)	300,204 (2.5)	553 (0.6)		3 (0.9)	358 (6.0)	7 (5.9)	
Other	11,189 (1.0)	259,162 (2.2)	470 (0.5)		2 (0.6)	170 (2.8)	1 (0.8)	
Unknown	27,404 (2.5)	242,669 (2.1)	2,330 (2.4)		8 (2.4)	162 (2.7)	5 (4.2)	
Risk composite[d]				<.001				.21
No risk present	414,744 (38.5)	3,464,701 (29.4)	37,286 (38.5)		108 (32.3)	1689 (28.1)	28 (23.7)	
Any risk present	637,530 (59.2)	8,124,803 (69.0)	57,831 (59.7)		218 (65.3)	4185 (69.6)	87 (73.7)	
Unknown	24,923 (2.3)	190,155 (1.6)	1,698 (1.8)		8 (2.4)	141 (2.3)	3 (2.5)	

Percent totals may not add up to 100% because of rounding; data were weighted to reflect neonatal deaths that could not be linked to birth certificate, rounded to nearest whole number for presentation in the Table.

[a] At ≥37 weeks gestation and ≥2500 g by place of delivery and attendant; US national data (among states using the 2003 revised birth certificate), 2009–2013, total births: n=12,953,671; neonatal deaths: n=6494; [b] Probability values were calculated with the use of the Chi square test for deliveries and Fisher's exact test for neonatal deaths, which compared planned home births/deaths with hospital midwife-attended births/deaths; [c] Not reported in 2009–2010; [d] Risk composite (age ≥35 years and/or nulliparous and/or postterm, previous cesarean delivery or breech) vs no risk composite (age <35 years, parous, term, no previous cesarean delivery, and cephalic).

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1 in 582 births with a gestational age ≥41 weeks), and women who were ≥35 years old (13.61 neonatal deaths or 1 in 735 births of women ≥35 years of age; Table 3). The difference in risks of neonatal death between women <35 and >35 years old was not so large (11.66 vs 13.61 neonatal deaths per 10,000 births). For those who were >35 years old, the neonatal death risk was below the risk of those with previous cesarean delivery (13.61 neonatal deaths/10,000 births among those ≥35 years of age vs 18.91 neonatal deaths/10,000 births for those with previous cesarean deliveries). Physician-attended hospital births had a higher neonatal mortality rate when compared with midwife-attended hospital births.

Among planned home births, 59.7% of deliveries had ≥1 of the 5 risks. Among midwife- or physician-attended hospital births, the risks were 59.2% and 69.0%, respectively (*P*<.001 for comparison between hospital physicians vs intended home births and hospital midwives vs intended home births). Planned home births with ≥1 of the 5 risk factors had a significantly higher neonatal death risk when compared with deliveries with none of the risk factors (14.96 neonatal deaths/10,000 births with risk factors vs 7.55 neonatal deaths/10,000 births without risk factors; *P*<.001; Table 4).

TABLE 2
Neonatal death risk and standardized mortality ratio estimates for hospital births and intended home births

Variable	Risk of neonatal death (deaths per 10,000 births)	Standardized mortality ratio[a] (95% confidence interval)
Hospital midwife births	3.08	1.00 (reference)
Intended home births	12.1	4.13 (3.38-4.88)
Hospital physician births	5.09	1.66 (1.62-1.71)

[a] Indirectly standardized with the use of maternal age (<35 vs ≥35 years), parity (nulliparous vs parous), and gestational age (37-40 vs ≥ 41 weeks).

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TABLE 3
Standardized mortality ratio estimates for neonatal deaths in intended home births and physician-attended hospital births vs midwife-attended hospital births by individual risk factors

Variable	Risk in midwife hospital births neonatal deaths per 10,000 births (95% confidence interval)	Risk in intended home births neonatal deaths per 10,000 births (95% confidence interval)	Risk in physician hospital births neonatal deaths per 10,000 births (95% confidence interval)	Standardized mortality ratio (95% confidence interval)	
				Planned home birth vs midwife hospital births	Physician vs midwife hospital births
Parity					
Parous	2.66 (2.26–3.06)	9.29 (7.12–11.46)	5.00 (4.83–5.16)	3.49 (2.68–4.30)	1.88 (1.82–1.94)
Nulliparous	3.71 (3.13–4.29)	22.50 (15.95–29.04)	5.22 (5.01–5.42)	6.06 (4.30–7.83)	1.41 (1.35–1.46)
Gestational age, wk					
37–40	2.95 (2.59–3.32)	9.94 (7.57–12.32)	5.07 (4.93–5.21)	3.37 (2.57–4.17)	1.72 (1.67–1.77)
≥41	3.59 (2.79–4.40)	17.17 (12.33–22.0)	5.18 (4.85–5.52)	4.78 (3.43–6.12)	1.44 (1.35–1.54)
Maternal age, y					
<35	3.13 (2.78–3.49)	11.66 (9.23–14.08)	5.16 (5.02–5.30)	3.72 (2.95–4.50)	1.65 (1.60–1.69)
≥35	2.67 (1.73–3.60)	13.61 (8.49–18.74)	4.65 (4.32–4.97)	5.11 (3.19–7.03)	1.74 (1.62–1.87)
Fetal presentation					
Cephalic	3.10 (2.76–3.44)	11.19 (9.05–13.34)	4.85 (4.72–4.98)	3.61 (2.92–4.31)	1.57 (1.52–1.61)
Breech	15.66 (0.00–33.35)	127.52 (34.00–221.04)	11.93 (10.69–13.16)	8.14 (2.17–14.11)	0.76 (0.68–0.84)
Previous cesarean delivery					
No	3.08 (2.75–3.42)	11.46 (9.27–13.64)	5.13 (4.99–5.27)	3.72 (3.01–4.43)	1.66 (1.62–1.71)
Yes	2.27 (0.29–4.25)	18.91 (5.88–31.93)	4.86 (4.54–5.19)	8.33 (2.59–14.07)	2.14 (2.00–2.29)

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The combination of nulliparity and ≥41 weeks gestational age and a woman's age of ≥35 years combined with either of the 2 risk factors of first-time births and a gestational age of ≥41 weeks further increased the neonatal death risk at planned home births (Table 5).

Comment

The results of our study confirm the findings of other studies that show an increased risk of neonatal death in planned home births.[2,4,5] We have demonstrated that 2 risk factors, namely first-time and postterm (≥41 weeks) pregnancies, significantly had increased neonatal mortality rates, approaching or exceeding those for planned home birth after cesarean delivery, 1 of the 3 ACOG absolute contraindications for planned home birth.[5] Therefore, 2 risk factors (first-time births and births at ≥41 weeks gestation), with a woman's age of ≥35 years further increasing neonatal death risk, should be added to the 3 risk factors that are listed by ACOG (previous cesarean delivery, malpresentation, and multiple gestations)[5] to comprise a list of 5, rather than 3, absolute contraindications to planned home births.

Previous studies have reported the reasons that home births in the United States have worse neonatal outcomes, including the location, less well-trained midwives, poor risk selection, and system issues.[3,4] The increased neonatal death risks and adverse outcomes in US planned home births may be more common, because there are increased perinatal risks in US planned home births[5,9] and because selection criteria are not applied broadly.[5,10] The causes of the increased risks of neonatal death in planned home births include neonatal brain damage and infections,[11] which likely are related to the inability to respond to emergent situations at home and a piecemeal approach to training and credentialing of home birth attendants,[10] although the increased risk of neonatal deaths in US home births is related more closely to the location of birth than to the level of professional certification of birth attendants.[12]

It is very difficult to measure the regional collaboration between home birth midwives and hospitals in retrospective data sets or whether a different collaboration between home birth attendants and hospitals can improve outcomes sufficiently enough to improve neonatal outcomes to acceptable levels. In previous articles, we have stated that every woman who starts labor at home and is transferred to a hospital has to be treated with respect on arrival in the hospital.[11,12]

TABLE 4
Standardized mortality ratio estimates for neonatal death in intended home births and physician-attended hospital births vs midwife-attended hospital births by risk composite

Variable	No risk neonatal deaths per 10,000 births (95% confidence interval)	Any risk neonatal deaths per 10,000 births (95% confidence interval)	Standardized mortality ratio (95% confidence interval)	
			No risk	Any risks
Midwife hospital births	2.61 (2.12–3.10)	3.42 (2.96–3.87)	1.00 (Reference)	1.00 (Reference)
Intended home births	7.55 (4.76–10.34)	14.96 (11.81–18.12)	2.89 (1.82–3.96)	4.38 (3.46–5.30)
Physician hospital births	4.87 (4.64–5.11)	5.15 (5.00–5.31)	1.87 (1.78–1.95)	1.51 (1.46–1.55)

Risk composite (age ≥35 years, nulliparous, postterm, previous cesarean delivery, or breech) vs no risk composite (age <35 years, parous, term, no previous cesarean delivery and cephalic).
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Selection of patients for home births by countries with midwife organizations, such in England, Canada and the Netherlands, follows strict selection criteria. For example, the Royal Dutch Organisation of Midwives has defined collaborative guidelines together with obstetricians on how to select and exclude patients for planned home births.[13] Selections criteria usually include the absence of any preexisting disease, a singleton cephalic pregnancy, gestations <41–42 weeks of pregnancy, and spontaneous labor without preterm rupture of membranes.[13] With strict selection criteria of low-risk patients for planned home births outside the United States, perinatal mortality rates were more comparable with those in the hospital.[14-16] Poor selection of candidates for home births was responsible for an increase in neonatal death in planned home births.[17,18]

Even though most other industrialized nations with established planned home births have strict protocols to choose appropriate candidates for planned home births and to exclude those who are at risk, these protocols do not exist in the United States. The American College of Nurse Midwives has no defined guidelines of patient selection for home births in the United States saying that "…guidelines would impact [midwives'] autonomy" and "…might not support midwives if they choose to attend the home birth of a woman with a breech presentation or a twin gestation or a woman who desires a trial of labor after a previous cesarean."[19]

Pregnancies at ≥41 weeks gestation, women who are ≥35 years old, and

TABLE 5
Standardized mortality ratio estimates for neonatal deaths in intended home births vs midwife-attended hospital births by combinations of selected risk factors

Factor A	Factor B	Risk in intended home births neonatal deaths per 10,000 births (95% confidence interval)	Risk in midwife hospital births neonatal deaths per 10,000 births (95% confidence interval)	Standardized mortality ratio[a] (95% confidence interval)
Nulliparous	≥35 Y	52.33 (18.25–86.42)	4.22 (1.48–6.95)	12.41 (4.33–20.49)
Nulliparous	≥41 Wk	40.34 (24.61–56.07)	4.21 (2.93–5.50)	9.57 (5.84–13.30)
Nulliparous	<35 Y	19.71 (13.30–26.12)	3.68 (3.09–4.28)	5.35 (3.61–7.09)
≥41 Wk	≥35 Y	19.89 (8.17–31.60)	4.09 (1.28–6.89)	4.87 (2.00–7.73)
37–40 Wk	≥35 Y	11.19 (5.72–16.66)	2.38 (1.41–3.34)	4.71 (2.41–7.01)
≥41 Wk	<35 Y	16.50 (11.21–21.79)	3.54 (2.70–4.38)	4.66 (3.16–6.15)
Nulliparous	37–40 Wk	14.48 (8.16–20.81)	3.56 (2.91–4.21)	4.07 (2.29–5.84)
≥41 Wk	Parous	10.56 (6.26–14.87)	3.06 (2.05–4.07)	3.45 (2.04–4.85)
Parous	≥35 Y	9.95 (5.37–14.53)	2.32 (1.35–3.28)	4.30 (2.32–6.28)
37–40 Wk	<35 Y	9.61 (6.98–12.24)	3.03 (2.63–3.42)	3.18 (2.31–4.04)
Parous	<35 Y	9.08 (6.62–11.54)	2.72 (2.29–3.16)	3.34 (2.43–4.24)
37–40 Wk	Parous	8.77 (6.27–11.27)	2.58 (2.14–3.01)	3.41 (2.44–4.38)

[a] Risk in intended home births is listed from highest to lowest.
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nulliparous women have an increased risk of neonatal death.[20-25] Older nulliparous women and those who are >1 week past their due date have a higher chance of transfers from a planned home birth to the hospital.[26] In the national prospective cohort study on home births in England, where there are strict selection criteria, nulliparous women had higher transfers from home to the hospital and had poorer neonatal outcomes,[27] which led Buekens and Keirse[28] to recommended that women with their first pregnancies should not deliver at home. Similarly, Nijhuis[29] from the Netherlands recommended that all primiparous women should deliver in the hospital.

The increased neonatal mortality rate of deliveries by physicians in the hospital when compared with certified nurse midwife hospital deliveries, although still significantly lower than neonatal death at intended home births, likely is due to the increased risk profile of pregnant women delivered by physicians and transfers of at risk patients from midwives to physicians in the hospital.

The strength of our study is that we used the linked birth/infant death dataset (period-linked file), which is generally the preferred source for infant and neonatal mortality rates in the United States.[30] There are also limitations in our study: Criticism has been expressed about some of the data collected in birth and death certificates[31]; other investigators believe that the data are reliable, especially with the data used in this study.[32-34] The present US birth certificate data identify the actual location of delivery and the attendant of the birth, and only queries whether deliveries that occurred at home were intended or unintended. Therefore, these data do not allow for documentation of hospital births about their original intent. Our results likely underestimate the actual neonatal mortality rates in home births because the higher adverse neonatal outcomes for patients who are transferred from home to the hospital are counted in the Centers for Disease Control and Prevention–linked data as hospital and not home birth neonatal outcomes.

Our study shows that there are 2 more risk factors with significantly increased neonatal mortality rates among planned home births: primiparous women and pregnancies with a gestational age of ≥41 weeks. These 2 should be added to the 3 absolute contraindications of intended home births listed by ACOG (previous cesarean, malpresentation, multiple gestations).[5] Neonatal death risk was further increased when a woman's age of ≥35 years was combined with either a first-time birth or a gestational age of ≥41 weeks.

Home births in the United States have increased significantly over the last decade.[1] Obstetricians and other concerned professionals should understand, identify, and correct the root causes of the recrudescence of planned home birth. Within hospital settings, they should create not only a strong culture of safety with the lowest possible risks but also an environment committed to fewer interventions such as the prevention of first-time cesarean deliveries[35] and to helping women experience a more home-birth-like delivery.[36-38] ■

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Received Nov. 11, 2016; revised Dec. 19, 2016; accepted Jan. 13, 2017.

The authors report no conflict of interest.

To be presented at the 2017 SMFM yearly meeting in Las Vegas.

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