OBSTETRICS

Selected perinatal outcomes associated with planned home births in the United States

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OBJECTIVE: More women are planning home birth in the United States, although safety remains unclear. We examined outcomes that were associated with planned home compared with hospital births.

STUDY DESIGN: We conducted a retrospective cohort study of term singleton live births in 2008 in the United States. Deliveries were categorized by location: hospitals or intended home births. Neonatal outcomes were compared with the use of the χ^2 test and multivariable logistic regression.

RESULTS: There were 2,081,753 births that met the study criteria. Of these, 12,039 births (0.58%) were planned home births. More planned home births had 5-minute Apgar score <4 (0.37%) compared with hospital births (0.24%; adjusted odds ratio, 1.87; 95% confidence interval, 1.36—2.58) and neonatal seizure (0.06% vs 0.02%, respectively; adjusted odds ratio, 3.08; 95% confidence interval, 1.44—6.58). Women with planned home birth had fewer interventions, including operative vaginal delivery and labor induction/augmentation.

CONCLUSION: Planned home births were associated with increased neonatal complications but fewer obstetric interventions. The trade-off between maternal preferences and neonatal outcomes should be weighed thoughtfully.

Key words: neonatal outcome, planned home birth

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The American Congress of Obstetricians and Gynecologists (ACOG) issued a Committee Opinion by the Committee on Obstetric Practice in 2011 that stated that "hospitals and birthing centers are the safest setting for birth, but it respects the right of a woman to make a medically informed decision about delivery."[1] Most recently in 2013, the American Academy of Pediatrics (AAP) concurred with the ACOG and stated that "pediatricians should advise parents who are planning a home birth that AAP and ACOG recommend only midwives who are certified by the American Midwifery Certification Board."[1,2] The American College of Nurse-Midwives (ACNM) also maintains that "every family has a right to experience child birth in an environment where human dignity, self-determination, and the family's cultural context are respected and that every woman has a right to an informed choice regarding place of birth and access to safe home birth services."[3,4] Although informed decision-making necessitates accurate assessment of risks and benefits, to date few studies have examined perinatal outcomes of home birth in the United States. The safety of home birth specifically in the United States remains debatable.

Common challenges in the study of the relative risks/benefit of planned home birth include small sample sizes, the rare nature of severe maternal and neonatal morbidity/death, ascertainment that relies on self-reporting or voluntary submission, variable definitions that are used to quantify and qualify morbidity, and accuracy in discerning planned home vs hospital births.[1] To date, randomized controlled trials have not been conducted to examine planned home birth. Among the many barriers to the conduct of such a study is that women likely would be reluctant to be assigned randomly to home vs hospital deliveries.[1,3]

The current literature on the safety of home birth consists of large population-based studies mostly from outside the United States. Although some studies report no difference in perinatal outcomes in women who had planned home births compared with those who had hospital births,[5-8] other studies demonstrate worse neonatal outcomes in planned home birth, even in systems in which this birth option is integrated fully into the medical care system in countries such as Australia, The Netherlands, and the United Kingdom.[9-11] A recent metaanalysis of 12 studies from North America,

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Australia, and Europe compared planned home births to planned hospital births and found that planned home birth was associated with fewer obstetric interventions, such as electronic fetal heart rate monitoring in labor, epidural anesthesia for pain control, and operative deliveries (including assisted vaginal deliveries with forceps or vacuums, and cesarean delivery). However, planned home birth was also associated with a 2- to 3-fold increase in the odds of neonatal death.[12]

Literature on the safety of planned home birth in the United States is also mixed, and controversy regarding the validity of these studies exists because of questions about data sources and analyses.[13] For example, analyses that used Washington state birth certificate data and Missouri vital records independently found that home birth is associated with a 2- to 10-fold increase in the risk of fetal/neonatal death, an Apgar score $\leq$3 at 5 minutes, and neonatal seizure.[14,15] One study that examined birth certificate data from US births in 2006 also reported neonates who were delivered at home were more likely to have an Apgar score of <7 at 5 minutes[16]; other studies report similar neonatal outcomes among planned home births that were attended by certified nurse-midwives and certified professional midwives compared with low-risk hospital births.[17,18]

Although the safety of planned home birth in the United States remains controversial, the proportion of women who choose to deliver outside of hospitals increased by 29% between 2004 and 2009, and this rising trend appears to be continuing.[19] In 2009, approximately 1 in 90 births to non-Hispanic white women occurred at home.[20] In light of the unclear data and the increasing frequency of home births, our study objective was to compare neonatal outcomes in women who had a planned home birth with outcomes in women whose births occurred in hospitals.

Materials and Methods

This is a retrospective cohort study of low-risk women at term with singleton vertex live births who were delivered in 2008 in the United States with data from the Vital Statistics Natality Data provided by the Centers for Disease Control and Prevention. The 2008 birth data were compiled with the use of either the 2003 revision or the 1989 revision of the US Standard Certificate of Live Birth. The 2003 revision delineates the location of birth as hospital, freestanding birthing center, or home and is further specified as accidental, intended, or unknown if intended. We included only births in the 27 states that used the 2003 revision of the birth certificate. These states represent 65% of all 2008 US births and include California, Colorado, Delaware, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Montana, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Washington, and Wyoming.[21]

We compared outcomes of neonates whose mothers had planned home births to those who delivered in hospitals. We did not have information to differentiate different types of hospitals (such as academic, community, or military). We included term, singleton, vertex live births. We also included women with previous cesarean delivery in the analysis because some women chose to have home vaginal birth after previous cesarean delivery in the United States and increasingly so; home vaginal birth after previous cesarean delivery increased from 1% in 1996 to 4% in 2008.[22] Exclusion criteria were breech deliveries, multifetal gestations, deliveries at <37 weeks of gestational age or at $\geq$43 weeks' gestational age. We also excluded women who delivered in freestanding birthing centers, those who did not intend to deliver at home but did (ie, accidental home births), and home deliveries for which planned birth location was unclear. For this study, gestational age was based on the obstetric/clinical dating because studies have shown that such estimates provide the best approximation for dates.[23,24] Institutional Review Board approval was obtained from the Committee on Human Research at the University of California, San Francisco, and the institutional review board at Oregon Health & Science University.

We examined the risk of a 5-minute Apgar score <4 as a primary outcome,because an Apgar score of 0-3 at 5 minutes has been shown to be a valid predictor of neonatal death[25] and is associated with an increased risk of cerebral palsy.[26] An Apgar score of 0-3 at >5 minutes is recommended by the ACOG and the AAP as one criterion for the diagnosis of an intrapartum asphyxial insult.[27] Other secondary outcomes included 5-minute Apgar score <7, assisted ventilation for >6 hours, neonatal seizure, and admission to a neonatal intensive care unit (NICU). Additionally, we examined the following maternal obstetric interventions: operative vaginal delivery (forceps or vacuum-assisted), induction of labor, augmentation of labor, and maternal antibiotic use in labor. The definition and diagnostic criteria for outcomes in the birth data were based on definitions compiled by a committee of federal and state health statistics.[28,29]

We compared the absolute risk (expressed as frequency) of neonatal/obstetric outcomes among planned home births with births that occurred in hospitals. We also performed a stratified analysis to examine perinatal outcomes that were associated with location of birth in nulliparous women separately from multiparous women. Multivariable logistic regression models were used to control for potential confounders, which included parity, maternal age, race/ethnicity (self-reported), educational attainment, marital status, gestational age at delivery, cigarette use during pregnancy, prenatal visits, and medical conditions (prepregnancy hypertension, gestational hypertension and/or preeclampsia, eclampsia, prepregnancy diabetes mellitus, gestational diabetes mellitus). Further, we examined perinatal outcomes that were associated with birth attendants (recorded as Doctor of Medicine, Doctor of Osteopathy, Certified Nurse-Midwife [CNM], other midwife, others, unknown/not stated). Of note, certified professional midwives were categorized as CNMs in the 2003 Revision of Birth Certificate. More specifically, we compared hospital births to planned home births that were attended by CNMs and planned home births attended by other midwives. In this stratification, we