

Does home birth empower women, or imperil them *and* their babies?

⤵ How safe is home birth? Do mistrust of the medical establishment, fear of cesarean, and other variables affect a woman's decision about where to deliver her infant?

Erin E. Tracy, MD, MPH

Dr. Tracy is an attending physician in the Vincent Department of Obstetrics and Gynecology at the Massachusetts General Hospital and Assistant Professor in Obstetrics, Gynecology, and Reproductive Biology at Harvard Medical School in Boston.

The author reports no financial relationships relevant to this article.

Few issues in obstetrics spark as much controversy as home birth—and where controversy rages, media attention follows.

Press reports of a 2008 policy statement on home birth issued by the American Medical Association (AMA) and the American College of Obstetricians and Gynecologists (ACOG) highlight the rift between the formal medical establishment and advocates of home birth.¹⁻³

On one side, the AMA and ACOG assert that the hospital or an accredited birthing center “is the safest setting for labor, delivery, and the immediate postpartum period.”¹ On the other side, advocates of home birth argue that having the option adds to women's empowerment and choice.

Some people have accused the medical community of trying to corner the “baby birthing industry.”⁴ The title of a recent *Baltimore Sun* article sums up this sentiment: “Home birth battle: Doctors strong-arm women away from healthy alternative to hospital care.”⁵

Neither ACOG nor the AMA advocates criminalization of home deliveries, but their statements on home birth have generated considerable fear that they will.

This article explores the controversy, focusing on the literature on home birth, gaps in knowledge, the state of regulation, liaison with midwives, and other issues. It also offers suggestions on how to discuss labor and delivery with patients so that they clearly understand the risks involved and do not feel that they have “failed” at meaningful childbirth when they choose hospital delivery.

IN THIS ARTICLE

Is evidence about water birth murky?

page 47

AMA and ACOG statements on home birth

page 49

Home birth as a way to avert cesarean?

page 50

CONTINUED ON PAGE 46

>> SHARE YOUR COMMENTS

Have you accepted transfer of a woman whose home birth “failed”? Tell us about it.

E-MAIL obg@dowdenhealth.com
FAX 201-391-2778

Did a rise in hospital births reduce maternal mortality?

Obstetric care changed dramatically in the mid-20th century. In 1940, 55.8% of deliveries occurred in the hospital, but that percentage rose to 99.4 by 1970 and hasn't changed appreciably since.⁶

Some proponents of hospital delivery note that, in 1940, when 44% of births occurred outside the hospital, the maternal mortality rate was 608 deaths for every 100,000 live births, compared with 37 deaths for every 100,000 live births in 1960, when fewer than 4% of deliveries occurred outside the hospital.⁶ And in 2003, with only 1% of deliveries occurring in a home setting, the maternal mortality rate was even lower: 12 deaths for every 100,000 live births.⁷

Others argue that this sharp decrease in maternal mortality cannot be attributed solely to the change in location of the delivery (and subsequent availability of services and personnel), but reflects universal advancement in safe practices such as aseptic technique.⁸

What do the data show? All studies of home birth have serious methodologic flaws, thanks largely to the nature of the subject matter. A recent Cochrane review observes that there is only one randomized, controlled trial—with a sample size of only 11 women—from which to draw conclusions.⁹ The review concludes that “there is no strong evidence to favour either home or hospital birth for selected, low-risk pregnant women.”¹⁰

Most data come from abroad

Much of the literature on home birth comes from international sites because of the higher prevalence of home delivery in other countries. These data reveal that:

- Two percent of deliveries in the United Kingdom occur in the home.¹¹ The British National Institute for Health and Clinical Excellence recommended that all women be offered the option to have their baby at home or in the hospital, although, depending on the “trust” (a geographically based public-system cooperative that provides care), 8% to 76% of women weren't given this choice formally.¹²

- One study conducted in Switzerland involved 489 women who opted for home birth and 385 who chose hospital birth. Of the former, 37 were referred to a specialist during pregnancy, and 70 were referred during labor. The groups had similar birth weights, gestational ages, and clinical conditions.¹³

- In the Netherlands, 30% of infants are born at home.¹⁴ If a woman has an uncomplicated pregnancy, she remains under midwifery care and can decide where to deliver. A study of 280,000 “low-risk” women under primary midwifery care found that 68.1% completed childbirth under that care, 3.6% were referred urgently, and 28.3% were referred without urgency.¹⁴ When referrals were considered as a whole, 11.2% involved urgency, primarily for fetal distress (50.2%) and postpartum hemorrhage (33%). Adverse neonatal outcomes were most common in urgently referred cases, followed by nonurgent referrals. The authors acknowledge the importance of transport time once a referral is initiated, stating that, “The Netherlands is a very densely populated country where the average distance to the hospital is relatively short.” (The same cannot be said of many parts of rural America.)

- A study involving home deliveries in Australia from 1985 to 1990 identified 50 perinatal deaths out of 7,002 planned home births.¹⁵ The perinatal death rate of infants weighing more than 2,500 g exceeded the national average (5.7 versus 3.6 for every 1,000 deliveries), with a relative risk (RR) of 1.6 (95% confidence interval [CI], 1.1–1.4). Intrapartum death not attributable to prematurity or fetal malformation was also higher (2.7 versus 0.9 for every 1,000 deliveries), with a RR of 3.0 (95% CI, 1.9–4.8). According to the authors, the main contributors to excess mortality were underestimation of the risks associated with post-term birth, twin pregnancy, and breech presentation, and a lack of response to fetal distress.

The data we do have are difficult to interpret

Among the limitations of studies of home birth are:

CONTINUED ON PAGE 48



Between 1940 and 1970, the percentage of births delivered in the hospital rose from 55.8% to 99.4%

Is the evidence on water birth just too murky?

In the summer of 1999, a woman delivered a 7.7-lb infant after 42 weeks of gestation. The birth took place in the woman's home in Japan, and the baby was delivered in a bathtub of warm water. The woman had had an uneventful pregnancy, and the baby appeared to be perfectly normal.

Four days later, the infant developed fever and jaundice and was admitted to the hospital, where she was treated with phototherapy. She improved, but her symptoms recurred 3 days later, and she began to vomit. Eight days after birth, she suffered cardiopulmonary arrest and died. An autopsy revealed the cause of death to be legionellosis—infection with *Legionella pneumoniae*. The most likely source was the bathtub in which she was born.⁴³

Other case reports describe similar tragedies associated with water birth (among them, drowning, infection, and a snapped umbilical cord), but no randomized, clinical trial has systematically compared delivery in water with conventional land-based birth.

The death, morbidity, and lack of data so troubled members of the American Academy of Pediatrics that the Committee on Fetus and Newborn issued an advisory in 2005:

*The safety and efficacy of underwater birth for the newborn has not been established. There is no convincing evidence of benefit to the neonate but some concern for serious harm. Therefore, underwater birth should be considered an experimental procedure that should not be performed except within the context of an appropriately designed randomized clinical trial after informed parental consent.*⁴⁴

This statement contrasts the conclusion of the most recent Cochrane review of the subject, which found that, "Immersion in water during the first stage of labour significantly reduces women's perception of pain and use of epidural/spinal analge-



No studies have explored immersion in water during the third stage of labor. 2009 © EDDIE LAWRENCE / PHOTO RESEARCHERS, INC.

sia."⁴⁵ The review also noted, however, that, "No trials could be located that assessed the immersion of women in water during the third stage of labour."⁴⁵

What's in that water?

Amy Tuteur, MD, an ObGyn who publishes a popular blog ("The Skeptical OB"), focused on the topic of water birth earlier this year. "What's in the water at waterbirth?" she asks.⁴⁶

To answer the question, Dr. Tuteur cites a 1999 study of 4,030 deliveries in water, which found that 35 infants suffered serious morbidity and three died—although it is unclear if any of the deaths were a direct result of water birth. "However, of the 32 survivors who were admitted to the NICU," writes Dr. Tuteur, "13 had significant respiratory problems, including pneumonia, meconium aspiration, water aspiration, and drowning. Other complications attributable to water birth include five babies who had significant hemorrhage due to snapped umbilical cord. In all, 18 babies had serious complications directly attributable to waterbirth."⁴⁷

Dr. Tuteur also points to the poor quality of the water in birthing pools, arguing that it is "essentially toilet water."⁴⁶ "The water in a birth pool, conveniently heated to body temperature, the optimum temperature for bacterial growth,

is a microbial paradise," she writes.⁴⁶ She cites a study of 1,500 water births that included analysis of the water found in the birthing pools (before anyone entered the water) and identified:

- coliforms in 21% of samples
- enterococcus in 19% of samples
- *Escherichia coli* in 10% of samples
- *Legionella pneumophila* in 12% of samples
- *Pseudomonas aeruginosa* in 11% of samples.⁴⁸

After a special water filter was installed, contamination diminished but did not disappear completely.

Pools in the home setting were not the only ones implicated in contamination; some hospital pools also were affected.

What's the bottom line?

The American College of Obstetricians and Gynecologists has yet to weigh in on the matter. Until it does, ObGyns may be wise to heed the words of Ruth Gilbert, MD, of the Centre for Paediatric Epidemiology and Biostatistics at the Institute of Child Health in London.

"Can delivery in water cause serious adverse outcomes?" she asks, rhetorically, it turns out.

"Undoubtedly, the answer is 'yes.'"⁴⁹

» JANELLE YATES, SENIOR EDITOR

- lack of follow-up after the delivery
- varying definitions of perinatal mortality internationally
- lack of clarity regarding the identity and education of delivering providers
- the fact that there are often “too few neonatal deaths from which to extrapolate reliable rate calculations.”¹⁶

One meta-analysis found a rate of intrapartum transfer ranging from 7.4% to 16.5%, and a rate of primary cesarean delivery of 1.4% to 17.7% (it was 13.8% to 28.25% in the “comparison group”).¹⁶

A challenge inherent in many of these studies is identifying exactly what the comparison group is. In addition, some of the data are obtained from discharge summary records, which don’t always reflect the level of risk or acuity.

Off-cited study has weaknesses

The study that many advocates of home birth cite was conducted in the United States and Canada and published in 2005.¹⁷ It evaluated “all 5,418 women expecting to deliver in 2000 supported by midwives with a common certification [certified professional midwives] and who planned to deliver at home when labour began.” The hospital transfer rate was 12.1%, in line with other studies. The risk of adverse outcomes was lower in the group that planned to have home delivery, compared with a “relatively low-risk hospital group.”

The study focused on:

- electronic fetal monitoring, used in 9.6% of deliveries in the home-birth group, versus 84.3% of the hospital group
- episiotomy, performed in 2.1% of home deliveries, compared with 33% of hospital births
- cesarean delivery, 3.7% of planned home deliveries, versus 19% of hospital births
- vacuum-assisted vaginal delivery, performed in 0.6% of planned home deliveries, versus 5.5% of hospital births
- neonatal death, at a rate of 2.0 deaths for every 1,000 intended home births. No comparison figure was cited.

One of the weaknesses of this study, as

of others, was identification of a comparison group as a “low-risk” population without data to back up that designation. In addition, this study derived its data from birth certificates for 3,360,868 singleton, vertex births at 37 weeks or more of gestation. Data from birth certificates are limited as a basis for accurate risk assessment. Moreover, although the authors of this study asserted that they had no conflict of interest, the investigation was funded by The Foundation for the Advancement of Midwifery.

Study cited by advocates of hospital birth is also flawed

One of the studies many hospital and birthing center advocates cite was published in 2002.¹⁸ It involved an analysis of birth registry information on uncomplicated singleton pregnancies at 34 weeks or more of gestation in Washington state between 1989 and 1996. These pregnancies were either:

- delivered at home by a health professional (n = 5,854)
- transferred to medical facilities after attempted home delivery (n = 279)
- planned to be delivered in the hospital (n = 10,593).

Infants whose mothers planned to deliver at home had a higher risk of neonatal death (RR, 1.99; 95% CI, 1.06–3.73) and a higher risk of having a 5-minute Apgar score of less than 3 (RR, 2.31; 95% CI, 1.29–4.16). After adjustment for a gestational-age cutoff of 37 weeks, these risks remained similar.

Nulliparous women, in particular, had a higher risk for prolonged labor (RR, 1.73; 95% CI, 1.28–2.34) and postpartum bleeding (RR, 2.76; 95% CI, 1.74–4.36).

The authors themselves point out a potential flaw in this study: the use of data from birth certificates. These data create “the potential for misclassifying unplanned home births as planned home births.” The difference in outcomes could be significant. For example, the neonatal death rate for unplanned home deliveries in North Carolina and Kentucky was 18 to 20 times higher than the rate for planned home births in these states.^{19,20}



The neonatal death rate for unplanned home delivery in North Carolina and Kentucky was 18 to 20 times higher than the rate for planned home birth

A study from Missouri observes that neonatal mortality was elevated for both planned and unplanned home birth, compared with physician-attended hospital birth.²¹

Selection bias is a concern

Selection bias is an inherent difficulty in many of these studies. Except for one previously mentioned paper—a very small study—none of the investigations involve randomization. As a result, we cannot exclude the possibility that “women who choose to deliver at home or in a birth center are likely to be different in terms of expectations and approach from women choosing to deliver in hospitals.”²²

Risk level can escalate rapidly

What is potentially troubling about home birth is the fact that a low-risk pregnancy that was complication-free during antepartum care can become a high-risk pregnancy in a matter of minutes, necessitating urgent, appropriate obstetric care. Some classic examples of urgent events include **cord prolapse**, **postpartum hemorrhage**, **bleeding from vasa previa**, and **shoulder dystocia**.

Let's focus on shoulder dystocia, which occurs in 1.4% of all vaginal deliveries. The authors of one study point out that “most of the traditional risk factors for shoulder dystocia have no predictive value, shoulder dystocia itself is an unpredictable event, and infants at risk for permanent injury are virtually impossible to predict.”²³ This may make delivery in the home a high-risk endeavor because of the inability to mobilize an obstetric team to assist with shoulder dystocia maneuvers or perform a Zavanelli delivery.

Another variable overlooked in most studies is the speed of transfer and the outcomes of pregnancies in which the women intended to deliver at home but ended up requiring urgent transfer. One study that did examine this scenario found that “women who had booked for a home birth, but later needed to transfer their care for a hospital birth, appeared to have the highest risk of intrapartum-related perinatal mortality.”²⁴

There is also some controversy regard-

AMA and ACOG statements on home birth

Although the American College of Obstetricians and Gynecologists (ACOG) reiterated its opposition to home birth in early 2008, its stance on the matter has not shifted since 1979.⁵⁰ In a news release describing that position, ACOG acknowledged “a woman's right to make informed decisions regarding her delivery and to have a choice in choosing her health-care provider,” but made it clear that ACOG “does not support programs that advocate for, or individuals who provide, home births.”³

It emphasized its opposition pointedly, saying: “Choosing to deliver a baby at home...is to place the process of giving birth over the goal of having a healthy baby.”³

AMA resolution includes the reasoning behind the opposition

The American Medical Association (AMA) listed several variables that underscore the need for a clear-cut policy on home birth:

- the fact that 21 states “currently license midwives to attend home births, all using the certified professional midwife credential (CPM or ‘lay’ midwives), not the certified midwives (CM) credential which both the American College of Obstetricians and Gynecologists and American College of Nurse Midwives recognize”
- considerable media attention to celebrities who have given birth at home
- the fact that “an apparently uncomplicated pregnancy or delivery can quickly become very complicated in the setting of maternal hemorrhage, shoulder dystocia, eclampsia, or other obstetric emergencies.”¹

Both ACOG and the AMA consider the following to fall within the category of “hospital”:

- a birthing center situated “within a hospital complex, that meets standards jointly outlined by the American Academy of Pediatrics and ACOG”
- “a freestanding birthing center that meets the standards of the Accreditation Association for Ambulatory Health Care, The Joint Commission, or the American Association of Birth Centers.”³

ing the delivery of women who are pregnant with twins, who have a fetus in breech presentation, or who have a history of cesarean delivery. One study examined outcomes for intended home delivery of 57 women who had a prior abdominal delivery.²⁵ Fifty of these women delivered vaginally in the home, and seven (12.3%) delivered in the hospital. One hospital transfer was urgent for fetal distress. One baby was stillborn, delivered at home.

CONTINUED ON PAGE 50

Home birth as a way to avert cesarean delivery?

Many policy makers decry the high prevalence of cesarean delivery in the United States and argue that providers who don't perform this procedure offer a low-cost alternative for obstetric care.³⁶ Some proponents of elective primary cesarean argue that it protects the perineum, but this issue is largely absent from the debate on home birth. Nor have I seen any study that addresses long-term outcomes in women who deliver at home, as most data collection ends after the delivery.

This oversight concerns me when I see interviews of midwives who doubt the existence of fetopelvic disproportion, who make statements such as, "You can get a baby through a knothole" and "I've never seen [a pelvis] that isn't large enough."³⁷

If patients are encouraged to have a prolonged second stage of labor, does it have a harmful effect on their pelvic floor in later years? This important question merits further discussion.

>> ERIN E. TRACY, MD, MPH

EDITOR'S NOTE: See the related item, "Award-winning video urges women to avoid cesarean delivery," at obgmanagement.com.



Certification as a "lay" or certified professional midwife does not require a high school diploma

A 10-year prospective study of vaginal birth after cesarean (VBAC) in birth centers found that more than 50% of uterine ruptures and 57% of perinatal deaths involved the 10% of women who had more than one prior cesarean delivery or who had reached a gestational age of more than 42 weeks.²⁶

Skill of the caregiver is important

The training and qualifications of the obstetric care provider are incredibly important. One study evaluated 4,361 home births attended by "apprentice-trained midwives from 1970 to 1985 and 4,107 home births attended by family physicians from 1969 to 1981."²⁷ The perinatal mortality rate for the midwife-attended births was 14 for every 1,000 births, in contrast to the rate of 5 for every 1,000 physician-attended births.

Three types of midwife are credentialed in this country:

- certified nurse-midwife (CNM)
- certified midwife (CM)
- certified professional midwife (CPM).

The first two categories are certified by

the American Midwifery Certification Board (AMCB). CNMs and CMs undergo rigorous training and examination, and this designation will require a graduate degree within the next few years. The CPM category, however, requires much less rigorous training. Its midwives are certified by the North American Registry of Midwives. The clinical requirements for certification as a CPM include:

- attending a "minimum of 20 births"
- managing at least 20 additional births, at least half of them in the home or another out-of-hospital setting
- performing a small number of prenatal, newborn, and postpartum exams.²⁸

A high school diploma is not required.

I suspect that concerns about this lax certification process contributed to ACOG's decision to issue a statement from its executive board in 2006: "While ACOG supports women having a choice in determining their providers of care, ACOG does not support the provision of care by lay midwives or other midwives who are not certified by the American College of Nurse-Midwives (ACNM) or AMCB."²⁹

A number of midwifery advocates have made a legislative push to expand licensure for CPMs in this country, and the debate continues on a state-by-state basis.³⁰

Economics and other variables affect delivery decision

Some advocates of home birth note that the "average uncomplicated vaginal birth costs 68% less in a home than in a hospital."³¹ Others try to organize support for women who want to give birth at home, such as the Home Birth Hotline, a voluntary, UK-based organization.³²

Some articles suggest that patient satisfaction is of significant importance in the decision about where to deliver. One noted that women who delivered where they had planned had higher overall satisfaction when that place was in the home ($P < .01$).³³

A randomized, controlled trial (n = 3,510) simulated home delivery in a hospital, with "home delivery" patients having midwifery care in a room "similar to one in one's own home" and the others having "consultant-led

care” in rooms in the delivery suite that contained equipment to resuscitate both mother and baby, as well as monitors and other technology.³⁴ This study found no significant differences in measured outcomes, but “generally higher levels of satisfaction” among the women who had simulated home delivery.

A study from “remote and rural Scotland” found that most women “expressed a preference to give birth in hospital and have consultant-led care because they felt safer.”³⁵

Does the rhetoric surrounding home birth “empower” women?

Another frequently overlooked issue is the passionate rhetoric used to describe home birth—and the effect of that passion on women whose birth plan doesn’t play out as expected. Words such as “choice” and “empowerment” are often used. Regrettably, there is considerable mistrust of the medical system.

One woman describes how her planned home delivery, “influenced by the feminist literature,” went awry.³⁸ After a long labor, she wrote, she “just wanted the baby out, safe and healthy. It no longer mattered how it happened....I couldn’t get rid of the underlying feeling that I had ‘failed’ in some way....”³⁸

Because of her strong desire for home delivery, this woman was deeply affected when the delivery became difficult: “I did not have the authority to proclaim whether or not various medical interventions were necessary, or whether my case actually did constitute a medical emergency....Faced with these ‘options’—safe birth or potential death—how could I be said to be making a ‘choice’? ... The obstetrician has more power than the woman because s/he has more knowledge.”³⁸

Despite having come to this realization, and delivering a healthy baby, she still experienced “a sense of disappointment and anger” and “traumatic flashbacks.”

I worry that patients may become so caught up in the rhetoric of their own power and choice that, when uncontrollable events occur, the happiness of a healthy delivery is overshadowed by deep disappointment.

Heated debate isn’t helpful

An unfortunate rift seems to have developed between some members of the midwifery community and some physicians. ACOG and the ACNM have a longstanding policy that: “In those circumstances in which obstetrician/gynecologists and certified nurse-midwives/certified midwives collaborate in the care of women, the quality of those practices is enhanced by a working relationship characterized by mutual respect and trust.”³⁹

Whether individual physicians agree with the practice of planned home birth or not, the health and welfare of the patient must be paramount. The American Public Health Association and the ACNM support home birth.^{40,41}

When obstetric emergencies do arise in the home setting, necessitating emergent transfer, it is critical that the transfer be managed in a way that ensures the best outcome.

One disturbing article describes both “disarticulations” that occur “when there is no correspondence of information or action between the midwife and the hospital staff” and “fractured articulations” that arise from “partial and incomplete correspondence.”⁴² A number of midwives were interviewed who no longer feel comfortable bringing patients to certain hospitals because of the negative response they received from health-care providers, sometimes to the detriment of the patient.

Can we improve the situation?

First, we need to choose our words carefully when we counsel women about labor and delivery, in recognition of the buzzwords used by advocates of home birth (“empowerment,” “choice”) and the sense of failure and distress some women feel when they eventually require heightened medical intervention.

Perhaps we should dispense with the term “failure,” as in failure to progress, failure to dilate, and so on, to avoid implying that this “failure” is the woman’s fault. And instead of saying that a patient’s pelvis is “adequate,” implying that another woman’s pelvis isn’t, we could use a term that sounds less judgmental.



The American Public Health Association and the American College of Nurse Midwives both support home birth

CONTINUED ON PAGE 52

We can also make the hospital environment more nurturing and supportive of women's choices for labor, as long as safety isn't compromised. And when we receive a transfer of a patient whose home delivery has gone awry, we should openly, efficiently, and professionally communicate with the home-delivery provider to best benefit the patient, regardless of our feelings on the subject.

Home birth isn't going away

That's my take on the literature. There are certainly data supporting the safety of home birth for the vast majority of women who choose it, but there is also a significant number of women who will experience unpredictable events that could be fatal if blood products or surgery isn't rapidly available. For that reason, and in light of the very high stakes involved, I wonder: Why take that chance? 🚫

References

- American Medical Association. Resolution on home deliveries. April 28, 2008. Available at: www.ama-assn.org/ama1/pub/upload/mm/471/205.doc. Accessed July 1, 2009.
- Boyle C. Ricki Lake's home-birth film upsets AMA. *New York Daily News*. June 17, 2008. Available at: www.nydailynews.com/entertainment/2008/06/17/2008-06-17_ricki_lakes_homebirth_film_upsets_ama.html. Accessed July 1, 2009.
- American College of Obstetricians and Gynecologists. ACOG statement on home births [press release]. Washington, DC: ACOG; Feb. 6, 2008. Available at: www.acog.org/from_home/publications/press_releases/nr02-06-08-2.cfm. Accessed July 1, 2009.
- Celizic M. Ricki Lake takes on baby birthing industry. Available at: <http://www.msnbc.msn.com/id/22592397/>. Accessed June 29, 2009.
- www.chicagotribune.com/news/opinion/oped/bal-op.homebirth13jul13,0,6603392.story. Accessed July 23, 2008.
- National Center for Health Statistics. Vital statistics rates in the United States 1940-1960. Washington, DC: NCHS; 1968.
- Hoyert DL. Maternal mortality and related concepts. National Center for Health Statistics. *Vital Health Stat*. 2007;3(33). Available at: www.cdc.gov/nchs/data/series/sr_03/sr03_033.pdf. Accessed July 9, 2009.
- Högberg U. The decline in maternal mortality in Sweden: the role of community midwifery. *Am J Public Health*. 2004;94:1312-1320.
- MacVicar J, Dobbie G, Owen-Johnstone L, Jagger C, Hopkins M, Kennedy J. Simulated home delivery in hospital: a randomized controlled trial. *Br J Obstet Gynaecol*. 1993;100:316-323.
- Olsen O, Jewell MD. Home versus hospital birth. *Cochrane Database Syst Rev*. 2000;(2):CD000352.
- Newburn M. Culture, control and the birth environment. *Pract Midwife*. 2003;6:20-25.
- Kmietowicz A. More than four in 10 women were not offered the choice of a home birth, report says. *BMJ*. 2007;335:112.
- Ackermann-Liebrich U, Voegeli T, Günter-Witt K, et al. Home versus hospital deliveries: follow up study of matched pairs for procedure and outcome. *BMJ*. 1996;313:1313-1318.
- Amelink-Verburg MP, Verloove-Vanhorick SP, Hakkenberg RM, Veldhuijzen IM, Bennebroek Gravenhorst J, Buitendijk SE. Evaluation of 280,000 cases in Dutch midwifery practices: a descriptive study. *BJOG*. 2008;115:570-578.
- Bastian H, Keirse MJ, Lancaster PA. Perinatal death associated with planned home birth in Australia: population based study. *BMJ*. 1998;317:384-388.
- Fullerton JT, Navarro AM, Young SH. Outcomes of planned home birth: an integrative review. *J Midwifery Womens Health*. 2007;52:323-333.
- Johnson KC, Daviss BA. Outcomes of planned home births with certified professional midwives: large prospective study in North America. *BMJ*. 2005;330:1416-1422.
- Pang JW, Heffelfinger JD, Huang GJ, Benedetti TJ, Weiss NS. Outcomes of planned home births in Washington State: 1989-1996. *Obstet Gynecol*. 2002;100:253-259.
- Burnett CA 3rd, Jones JA, Rooks J, Chen CH, Tyler CW Jr, Miller CA. Home delivery and neonatal mortality in North Carolina. *JAMA*. 1980;244:2741-2745.
- Hinds MW, Bergeisen GH, Allen DT. Neonatal outcome in planned v unplanned out-of-hospital births in Kentucky. *JAMA*. 1985;253:1578-1582.
- Schramm WF, Barnes DE, Bakewell JM. Neonatal mortality in Missouri home births, 1978-84. *Am J Public Health*. 1987;77:930-935.
- Henderson J, Petrou S. Economic implications of home births and birth centers: a structured review. *Birth*. 2008;35:136-146.
- Nocon JJ, McKenzie DK, Thomas LJ, Hansell RS. Shoulder dystocia: an analysis of risks and obstetric maneuvers. *Am J Obstet Gynecol*. 1993;168(6 Pt 1):1732-1739.
- Mori R, Dougherty M, Whittle M. An estimation of intrapartum-related perinatal mortality rates for booked home births in England and Wales between 1994 and 2003. *BJOG*. 2008;115:554-559.
- Latendresse G, Murphy PA, Fullerton JT. A description of the management and outcomes of vaginal birth after cesarean birth in the homebirth setting. *J Midwifery Womens Health*. 2005;50:386-391.
- Lieberman E, Ernst EK, Rooks JP, Stapleton S, Flamm B. Results of the national study of vaginal birth after cesarean in birth centers. *Obstet Gynecol*. 2004;104(5 Pt 1):933-942.
- Mehl-Madrona L, Mehl-Madrona MM. Physician- and midwife-attended home births. Effects of breech, twin, and post-date outcome data on mortality rates. *J Nurse-Midwifery*. 1997;42:91-98.
- How to become a NARM certified professional midwife (CPM). North American Registry of Midwives. Available at: www.narm.org/htb.htm. Accessed June 29, 2009.
- www.acog.org/publications/policy_statements/sop0602.cfm. Accessed August 26, 2008.
- Reed A, Roberts E. State regulation of midwives: issues and options. *J Midwifery Womens Health*. 2000;45:130-149.
- Anderson RE, Anderson DA. The cost-effectiveness of home birth. *J Nurse-Midwifery*. 1999;44:30-35.
- Shaw R, Kitzinger C. Calls to a home birth helpline: empowerment in childbirth. *Soc Sci Med*. 2005;61:2374-2383.
- Janssen PA, Carty EA, Reime B. Satisfaction with planned place of birth among midwifery clients in British Columbia. *J Midwifery Womens Health*. 2006;51:91-97.
- MacVicar J, Dobbie G, Owen-Johnstone L, Jagger C, Hopkins M, Kennedy J. Simulated home delivery in hospital: a randomized controlled trial. *Br J Obstet Gynaecol*. 1993;100:316-323.
- Pitchforth E, Watson V, Tucker J, et al. Models of intrapartum care and women's trade-offs in remote and rural Scotland: a mixed-methods study. *BJOG*. 2007;115:560-569.
- Barbieri RL. How will we know it when we've got the right cesarean rate? *OBG Management*. 2008;20(6):10-15.
- Sakala C. Midwifery care and out-of-hospital birth settings: how do they reduce unnecessary cesarean section births? *Soc Sci Med*. 1993;37:1233-1250.
- Crossley ML. Childbirth, complications, and the illusion of "choice": a case study. *Fem Psychol*. 2007;17:543-563.
- www.acog.org/publications/policy_statements/sop0210.htm. Accessed September 4, 2008.
- American Public Health Association. Increasing access to out-of-hospital maternity care services through state-regulated and nationally certified direct-entry midwives. January 1, 2001. Available at: www.apha.org/advocacy/policy/policysearch/default.htm?id=242. Accessed June 29, 2009.
- American College of Nurse-Midwives. Backgrounds of CNMs/CMs rich in diversity. Available at: www.midwife.org/background_of_cnms.cfm. Accessed June 29, 2009.
- Davis-Floyd R. Home-birth emergencies in the US and Mexico: the trouble with transport. *Soc Sci Med*. 2003;56:1911-1931.
- Nagai T, Sobajima H, Iwasa M, et al. Neonatal sudden death due to Legionella pneumonia associated with water birth in a domestic spa bath. *J Clin Microbiol*. 2003;41:2227-2229.
- Batton DG, Blackmon LR, Adamkin DH, et al; Committee on Fetus and Newborn, 2004-2005, American Academy of Pediatrics. Underwater births. *Pediatrics*. 2005;115:1413-1414.
- Cluett ER, Nikodem VC, McCandlish RE, Burns EE. Immersion in water in pregnancy, labour and birth. *Cochrane Database Syst Rev*. 2004;(2):CD000111.
- Tuteur A. What's in the water at waterbirth? Skeptical OB. February 19, 2009. Available at: <http://skepticalob.blogspot.com/2009/02/whats-in-water-at-waterbirth.html>. Accessed July 7, 2009.
- Gilbert RE, Tookey PA. Perinatal mortality and morbidity among babies delivered in water: surveillance study and postal survey. *BMJ*. 1999;319:483-487.
- Thoeni A, Zech N, Moroder L. Water birth and the risk of infection: experience after 1,500 water births. *Pol J Gyn Invest*. 2004;7(1/4):21-26.
- Gilbert R. Water birth—a near-drowning experience. *Pediatrics*. 2002;110(2 Pt 1):409.
- E-mail correspondence from American College of Obstetrics and Gynecology staff. July 22, 2008.