generated the largest mean net benefit for perinatal outcomes. For low risk nulliparas the home was the most economical setting, but was associated with significant increases in adverse perinatal outcomes. When maternal outcomes were considered, the home was the optimal birth setting for both multiparas and nulliparas across all thresholds of cost-effectiveness. The study assessed only direct costs to the NHS, and adjusted for confounding factors which included: maternal age, parity, ethnicity, fluency in Eng-
lish, marital status, BMI, socio-economic status, and gestational age at birth.


III: Legal


B) Hafner-Eaton C, Pearce LK. Birth choices, the law, and med-
icines: Balancing individual freedoms and protection of the pub-

IV: Ethics


Part 1 p. 357; doi: 10.1097/AOG.0b013e31826f74ed.


D) Torres J, De Vries RG. Birthing ethics: What mothers, fam-


F) Bell AF. Nurse-Midwife and scientist: Stuck in the mid-

V: Available After Press


B) MacDorman MF, Declercq E, Mathews TJ. Recent trends in out-of-hospital births in the United States. Journal of Mid-

waity & Women's Health, in press.


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METHODS

Search Strategy

Papers were identified through a comprehensive search of the following databases: EBSCO (Academic Search Complete, Medline & CINAHL), PubMed, and Cochrane, along with citation snowballing, and consultations with content experts and key informants. We included articles that were published in English between 1990-2013. The most recent search (August 2012-September 2013) identified 182 articles for assessment, and resulted in the addition of 13 new citations (see diagram on page 2).

The following search terms were applied: “home birth” or “home + childbirth” and “safety”, “risk assessment”, “transfer criteria”, “outcomes”, “screening”, “satisfaction”, “demand”, “preference”, and “perception”.

SECTIONS A-B

Original studies of outcomes from planned home births in high resource countries were selected for inclusion. Studies describing data from developing nations were excluded because they did not meet the definition of planned home birth used for this review, which specifies access to qualified attendants and the ability to transfer to a hospital when necessary.

Criteria for Assessment

Studies were assessed for appropriate application of analytic tools (statistics), and the extent to which the conclusions were based on the reported data. Differences were resolved by discussion. Prior to publication, the bibliography was reviewed by 5 external reviewers with expertise in perinatal epidemiology, statistics, and research related to midwifery, obstetrics, bioethics, and health care delivery.
METHODS BY SECTION

SECTIONS A—B

Criteria for Assessment

Included papers were independently appraised by three authors according to the algorithm to assess the quality of birth research outlined by Vedam.1

Study design should:

• Distinguish between planned home births and unplanned out-of-hospital births
• Discern data from different types of providers
• Provide relevant and consistent inclusion criteria for study subjects across comparison groups
• Adjust for differences in selection criteria for home birth and perinatal management
• Control for differences in transfer criteria and method
• Define terms, such as mortality and morbidity
• Select relevant and consistent outcome measures.

Analysis and discussion should examine the impact of:

• Lack of randomization
• Small and homogeneous sample sizes
• Retrospective and incomplete data in birth records
• Differences among community standards of care and/or region specific policies and protocols.

PAPERS IN SECTIONS C-F

Section C describes articles that provide detailed appraisals of

Criteria for Assessment

Papers in Sections E-F were selected for inclusion if they provide an evidence-based discourse analysis or commentary and have the potential to enhance the reader’s understanding of key legal, policy, economic, and ethical issues, and innovative solutions to controversial topics related to home birth. Authorship by academic and maternity professional experts on birth place was a priority for inclusion.

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New records identified through key informants and citation snowballing 2012-13 (n = 10)

New records identified through database searching 2012-2013 (n = 172)

Records carried over from 2012 edition (n = 75)

New records selected for review (n = 182)

Old records excluded, with reasons (n = 7)

New records excluded, with reasons (n = 16)

Full-text records assessed (n = 18)

Full-text articles excluded, with reasons (n = 5)

New records included in 2013 bibliography (n = 8 unannotated; 5 citations)

Records carried over from 2012 edition (n = 68)

Final # of articles/references included in 2013 bibliography (n = 81)

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communication, and a deep mistrust of NHS by some women can led to a delay in care and poorer outcomes.

F) Hendrix M, Pavlova M, Nieuwenhuijze MJ, Severens JL, Nijhuis RG. Differences in preferences for obstetric care between nulliparous and their partners in the Netherlands A dis-


A prospective study to investigate differences between low-risk preg-

nant women and their partners’ preferences regarding obstetric care and place of birth and the extent to which these preferences are influenced by obstetric care and socioeconomic factors. The study employed a method of “discrete choice” to assess prefer-

ence. Data were collected at 32 weeks from 321 pregnant women

and 212 of their partners. This study found that overall women

prefer to be assisted by a midwife during birth and they also prefer to give birth in a home-like setting. Women also place importance on having influence over the decision making pro-

cess and the possibility of pain relief (though the study does not specify what kind of pain relief). Their preferences where similar; high value was placed on a midwifery assisted birth in a home-like setting, and control over decision-making. Partners had a preference for no out-of-pocket payments and a higher preference for access to pain relief.


scribed a study using data from 1212 pregnant women and 900 women who had a planned home birth (n=671) and women who had an elective cesarean section (n=207) between 1997 and 2008. In Sweden, the current medical context neither promotes home birth nor strongly advises against it. The study found sig-

nificant socioeconomic differences between the two groups of women. Compared to women who chose an elective cesarean, women who chose planned home birth were more educated, had a lower BMI, were less likely to smoke, felt less threat to baby’s life during the birth, felt more in control, and were more satisfied with their overall birth experience. Women in the home birth group reported a higher intensity of pain, but a more positive experience of that pain than women who gave birth via cesarean.

H) Lindgren H, Erlandsson K. Women’s Experiences of emp-

owerment in a planned home birth A Swedish population-

based study. Birth 2013;37(4):309-17. Descriptive study using questionnaires of women who had one or more planned home births between 1992 and 2005 (n=733). Birth stories were ana-

lyzed using content analysis and descriptive statistics. Women who birthed at home felt empowered by their environment and

and the people who supported them (midwives, partners, family). Birth stories rarely mentioned pain or suffering and stressed the importance of an undisturbed environment for mother and children. Surveys highlighted the importance of support, guidance, and trust in their attendants to feel safe. Feeling disempowered was related to a poor choice of attendants and the absence of partner support. The replication rate of the study was 99% (70% for the birth story portion of the questionnaire). Limitations: small scale study might not be generalizable to general Swedish population or

iii: Cohort and Population-Based Observational Studies – North America

I: Meta-Analyses & Systematic Reviews

A) Olsen O, Clausen, T. Planned hospital birth versus planned home birth. Cochrane Database of Systematic Reviews Sept-

tember 12, 2014. An updated systematic review of randomized controlled trials (RCTs) comparing planned home births to planned hospital births among women with uncomplicated pregnancies. The selection criteria were rigorous; only one trial (n=11) met the inclusion criteria. The authors report a continu-

ued dearth of evidence from RCTs about the safety of home birth. Authors also conclude that evidence from increasingly well-designed observational studies suggests that low-risk women who plan a home birth experience signifi-

cantly fewer interventions and complications than low-risk wom-

en who deliver in hospital. They provide a detailed discourse analysis of differing approaches to risk assessment, including the ethical application of clinically meaningful evidence, and the interaction of model of care with access to choice of birth place. They recommend that all countries facilitate evidence-based integration of home birth services into the health care system and inform all low-risk women of the option of planned home birth.

B) Leslie MS, Romano A. Appendix Birth can safely take place at home and in birthing centers. J Perinat Educ 2011;30(4) (Suppl 1):81S-88S.16. A systematic review of home birth and birth center safety studies. The authors followed standard systematic review methods, including reporting levels of evidence,

authors compare incidence of interventions and perinatal out-

comes between hospital births and home births and between hospital births and birth center births. The evidence for each outcome is graded for quality, quantity, and consistency. This review reported that out-of-hospital births had similar perinatal outcomes to hospital births and fewer interventions.


tive, original studies that met criteria for rigorous methodolog-

cal and investigated differences in perinatal mortality and morbid-

ity between planned home births and planned hospital births. Multivariate statistical analysis controlled for obstetric back-

ground and perinatal factors. Analysis revealed no statistically

significant difference in mortality between planned home and planned hospital birth and the confidence interval did not allow for ex-

treme excess risks in any of the groups (OR=0.97, 95% CI=0.64-

1.41). There were significantly fewer medical interventions, few-

er severe lacerations, fewer operative births, and fewer low Ap-

gar scores in the home birth groups.

II: Randomized Controlled Trials

A) Hendrix M, Van Horck M, Moreta D, Nieuwenhuijze M, Nijhuis, E. Women who do not participate in a randomization for place of birth: Feasibility of a RCT in the Netherlands. BJOG 2004;111(6):537-544. Based on Downswell’s findings (see II B) the authors designed a RCT to compare home and hospital births for low-risk women, including outcomes: interventions, satisfaction, referral to obstetricians, and costs. After 6 months only one woman had enrolled in the study, therefore the trial was discontinued for lack of feasibility. The research team then re-designed their study to investigate reasons why women declined to participate in the RCT. The four main reasons that women indicated were: 1) they had already decided where to give birth prior to learning about the study; 2) they wished to choose their own place of birth; 3) they wished to avoid delivering in the ‘wrong’ place for their first child; 4) they were concerned about receiving an undesired treatment.

B) Dowswell T, Thornton JG, Hewison J, Lilford RJL. Should there be a trial of home versus hospital delivery in the United Kingdom? Measuring outcomes other than safety is feasible. BMJ 1996;312:753-757. The authors of this small study (n=11) suggested that conducting a trial to assess birth outcomes by birth place (home versus hospital) would be feasible. Eleven subjects were recruited from a pool of 71 women who met the eligibility criteria for a home birth. This ratio suggested that a larger scale trial may be possible. The following outcomes were measured following an intention to treat analysis: mode of delivery; obstetric inter-

ventional, complications, and infant feeding (breast versus me-

sured bottle feeding). However, the authors note that mortality is not an appropriate outcome to assess the safety of home birth with a randomized controlled trial because of the extremely large number of subjects required to compare such outcomes.

PAGE 14 HOME BIRTH: An annotated guide to the literature

PAGE 3
A) Nove A, Berrington A, Matthews Z. Comparing the odds of peripartum haemorrhage in planned home birth against planned hospital birth: results of an observational study of over 500,000 maternities in the UK. BMJ Pregnancy & Childbirth. 2012, 12 (1), 1-11. This observational cohort study used data from a comprehensive record of all births that occurred in 15 hospitals during the study period, comprising the majority of hospitals in that area. Nove et al. compared the rates of postpartum haemorrhage between women who planned a home birth and those who planned a hospital birth. Postpartum haemorrhage was defined as a loss of more than 1000 mL of blood. Excluded were high-risk pregnancies (according to National Institute for Health and Clinical Excellence guidelines), unplanned home births, preterm births, elective Caesareans, medical indications, miscarriages, terminations and women who moved out of the area during care. A total of 273,872 pregnancies were included: 5,998 planned home births and 267,874 planned hospital births. Logistic regression models were adjusted for confounders. The odds of postpartum haemorrhage (PHH) were significantly higher among planned home births than for planned hospital births (2.5; 95% CI: 1.7-3.8), regardless of actual place of delivery. Strengths of the study include the large sample size, the quality of the data source, and the ascertainment of planned place of birth at the end of pregnancy. In addition, the SMMIS database contains maternal socio-demographic data that could be adjusted for during analysis. The authors acknowledge that the absence of information about PHH in a previous pregnancy is a major limitation of the study. Women with a previous PHH are more likely to hemorrhage in a subsequent pregnancy. For this reason, they might be more likely to plan a hospital birth with subsequent pregnancies, which would inflate the observed odds of PHH in the hospital group. The authors conclude that, while the overall risk of postpartum haemorrhage was low, the significant increase in odds of postpartum haemorrhage associated with hospital birth should be included in public choice discussions around place of birth.

B) Davis D, Baddock S, Pairman S, Hunter M, Benn C, Wilson D, Dixon L, Herbst P. Planned place of birth in New Zealand: Does it affect mode of birth and intervention rates among low-risk women? Birth 2011, 38(2), 111-119. This population-based, retrospective cohort study compared mode of delivery and selected intrapartum interventions and neonatal outcomes among low-risk women who planned to deliver in the following settings: home, primary unit, secondary or tertiary hospital. Planned place of birth was noted at the start of delivery. Using the New Zealand Midwifery Maternity Provider or epidural analgesia, augmentation of induction of labour, and assisted vaginal delivery or caesarean delivery; and significantly fewer adverse outcomes (e.g. postpartum haemorrhage, pre-eclampsia, and 3rd or 4th degree tears). There were no significant differences between the home birth group and either comparison group with respect to a 5-minute Apgar score of less than 7, a diagnosis of asphyxia at birth, seizures, or the need for assisted ventilation between birth and 24 hours of life.

C) Stramrood CA, Paarlberg KM, Huis In ‘t Veld EM, Berger LW, Vingerhoets AJ, Schultz WC, van Pampus MG. Posttraumatic stress disorder (PTSD) following childbirth in home-like and hospital settings. J Psychosom Obstet Gynaecol. 2011 Jun;32(2):88-97. PubMed PMID: 21557681. This observational cohort study used data from a comprehensive record of all deaths that occurred in 15 hospitals during the study period, comprising the majority of hospitals in that area. Nove et al. compared the rates of postpartum haemorrhage between women who planned a home birth and those who planned a hospital birth from 1988-2000 (n= 585,291). Postpartum hemorrhage (PPH) was defined as a loss of more than 1000 mL of blood. Excluded were high-risk pregnancies (according to National Institute for Health and Clinical Excellence guidelines), unplanned home births, preterm births, elective Caesareans, medical indications, miscarriages, terminations and women who moved out of the area during care. A total of 273,872 pregnancies were included: 5,998 planned home births and 267,874 planned hospital births. Logistic regression models were adjusted for confounders. The odds of postpartum haemorrhage (PHH) were significantly higher among planned home births than for planned hospital births (2.5; 95% CI: 1.7-3.8), regardless of actual place of delivery. Strengths of the study include the large sample size, the quality of the data source, and the ascertainment of planned place of birth at the end of pregnancy. In addition, the SMMIS database contains maternal socio-demographic data that could be adjusted for during analysis. The authors acknowledge that the absence of information about PHH in a previous pregnancy is a major limitation of the study. Women with a previous PHH are more likely to hemorrhage in a subsequent pregnancy. For this reason, they might be more likely to plan a hospital birth with subsequent pregnancies, which would inflate the observed odds of PHH in the hospital group. The authors conclude that, while the overall risk of postpartum haemorrhage was low, the significant increase in odds of postpartum haemorrhage associated with hospital birth should be included in public choice discussions around place of birth.

C) Schlenzka PF. Safety of alternative approaches to childbirth [Unpublished Dissertation]. Palo Alto, CA: Department of Sociology, Stanford University, 1999. Available from: <http://escholarship.org/uc/item/5d6329k5>. In order to account for errors associated with relying solely on birth certificate data, Schlenzka merged birth certificate and hospital discharge data for California for 1989 and 1990, and isolated a cohort of nearly 181,650 low birth weight births, and compared gestation, birth weight, and length of labour. They found that women who had home births were less likely to have Caesarean sections (5.2% vs 8.1%; RR [95% CI]: 0.64 [0.56,0.73]). The study highlights the connection between the calm, undisturbed environment available to women at home with fewer interventions in childbirth. Strengths of this study include its detailed discussion of how the home and its particular environment contribute to a feeling of normal birth. Women in this study directly connected their experiences during labour and birth to their experience of mothering both immediately and long term. This study also aids in dispelling a belief that women who freebirth are poorly informed and undereducated because study participants were more educated than the Australian public and had attended formalized training in obstetric emergencies and neonatal resuscitation.

D) Bils E. Avoiding disturbances Midwifery practice in home births settings in Norway. Midwifery 2011;27(5):687-692. PubMed PMID: 20637533. Qualitative study of 12 Norwegian midwives to examine how midwifery care promotes and supports normal labour and birth and why home births are associated with lower rates of interventions compared with hospital births. The study highlights the connection between the calm, undisturbed environment available to women at home with fewer interventions in childbirth. Strengths of this study include its detailed discussion of how the home and its particular setting might augment “normal birth”.

E) Catling-Paull C, Dahlen H, Homer CS. Multiparous women’s confidence to have a public-funded homebirth: A qualitative study, Women Birth, 2012 Oct 12. Erratum in: Women Birth, 2012 Dec;24(4):180. A qualitative study of 10 multiparous Australian women who chose a public-funded, planned home birth with the St. George Hospital Homebirth Program. The study found that multiparous women who had at least one previous normal birth feel a strong confidence to birth at home. The women cite hospital back up, trust in the skill of their midwives, and their own personal strength as sources of confidence to have a normal birth at home. None of the women felt that they were at increased risk of birth complications because of planning a home birth.
SECTION C: EVALUATING THE QUALITY OF HOME BIRTH RESEARCH

I: Critical Appraisal of Studies


Nove et al. provide a comprehensive discussion of methodological challenges that researcher encounter when comparing perinatal outcomes across birth settings. The following methodological challenges were identified and ways to overcome these challenges discussed: 1) whether to include high-risk pregnancies in the comparative analysis and how to define high-risk, 2) how intrapartum transfers should be recorded in their history, and 3) whether the sample of birth is recorded accurately, 4) how to avoid bias due to deaths which would have occurred regardless of place of birth, 5) the parity of perinatal and planned home births among newborns was compared to the one from all births in this database from 2006-2007 (n=39,677, or 32% of total births in NZ). Of these, 16,453 (41.47%) met the low risk inclusion criteria (no medical condition recorded in their past history, and no consultation with another practitioner). This stringent approach likely excluded women who planned to give birth in secondary and tertiary hospitals to a higher risk of cesarean section, assisted modes of birth, and intrapartum interventions compared to women planning to give birth at home and in primary units. Women planning to give birth in a tertiary hospital had a significantly increased risk of emergency cesarean section compared to women planning to give birth in a primary unit. The study is able to present the more intuitive and relevant risks ratios (rather than odds ratios) due to using a natural prospective approach and requires some extrapolation and statistical expertise to properly interpret. The sample site was too small to compare very rare outcomes and it was not possible to establish whether the study sample was representative of the population of low risk parturients in NZ, which limits the generalizability of findings.


For the full detailed analysis of the findings and inherent problems presented by the 2010 meta-analysis (see Section B.LA) readers may wish to access this article. The authors include principal investigators for three of the original studies included in the meta-analysis. Each of the significant methodological, statistical, and logical errors, errors in definitions, errors in inclusion/exclusion of data for analysis, and mistaken conflation of association with causation, are delineated. Methodological problems with study design, inclusion and exclusion criteria, interpretation of results, and the use of a faulty computational tool are delineated.

C) Gyte G, Newburn M, Macfarlane A. Critique of a meta-analysis by Wyx and colleagues which has claimed that there is a higher risk of Greater or longer obstetric complications in home births than in hospital births, using birth certificate data. BMJ 2011;343:d7400.

A prospective cohort study in England from April 2008-April 2010 compared perinatal and maternal outcomes and interventions by planned place of birth, using data from English maternity data set and including intrapartum stillbirth, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, and birth related injuries including brachial plexus injury, fractured humerus or clavicle. Stillbirths before onset of labour were excluded. Women who planned to give birth at the risk of place of care during postpartum outcome measure was low for the entire sample (4.3/1000 births), and there were no statistically significant differences in the odds of the primary outcome in home, free-standing birth centers, or alongside midwifery units when compared with planned birth in obstetric units. When the sample was split into nulliparous and multiparous women, the adverse outcome measures during planned home birth were higher than for hospital birth for nulliparous, but not for multiparous women when compared to others. There was no evidence of a difference in adverse outcomes for freestanding or alongside midwifery units as compared to obstetric units. For low-risk birthing in an obstetric unit, the odds of having an abnormal analysis, general anesthesia, vacuum or forceps delivery, cesarean section, episiotomy, and active management of third stage were higher than all other settings. Given the rarity of events for any of the included perinatal outcomes, and as some of them typically appear as comorbidities, a composite index might inflate some differences in outcomes as attributable to place of birth. It is unclear how some of the items selected for inclusion in the composite index relate specifically to place of birth delivery rather than skill of provider.

D) van der Kooj J, Peoran J, de Graaf JP, Birnie E, Denktas S, Steegers EAP, Gouke JB. Planned home compared with planned hospital births in the Netherlands intrapartum and early neonatal death in low-risk pregnancies. Obstet Gynecol 2011;117:1837-46. In this retrospective study, records of 587952 low risk women from the Netherlands Perinatal Registry (2000-2007) were analyzed to compare intrapartum and early neonatal mortality rates (0.7 days after birth) of planned home versus planned hospital births attended by midwives. Outcomes for a third group of women, for which the planned place of birth was unknown, were also reported. The hospital cohort was used as the comparison group in all analyses. The authors used two methods for analyzing data: a ‘per protocol analysis’, or ‘perfect guideline approach’, which examined outcomes from only those low risk women who were eligible for planned home birth according to Dutch guidelines (n=620331), and a ‘natural prospective approach’, which looked at outcomes for all women who planned a home birth under the care of midwives (n=679952). The per protocol analysis excluded midwifery clients with one of more of the following conditions: intrauterine death, prolonged rupture of membranes, gestational ages < 37 weeks and > 41 weeks. Results revealed a significantly decreased risk of intrapartum and early neonatal mortality in the home birth group, using the natural prospective approach (RR: 0.82; 95% CI: 0.71-0.91). When the authors calculated RR’s using the perfect guideline approach, and adjusted OR’s using either approach, they found no increased risk/odds of intrapartum and early neonatal death in the home birth group. A sensitivity analysis of these findings was repeated by De Jong et al. (2009) using a similar cohort of women (2000-2000). A problematic secondary analysis of data was also reported (see review: Section B, III, A).
E) de Jonge A, van der Goes B, Balelli A, Amelink-Verburg M, Mol B, Nijhuis J, Bennebroek Gravenhorst J, Buitendijk SE. Perinatal mortality and morbidity in a nationwide cohort of 529,688 low-risk planned home and hospital births. BJOG 2009;116(11):1471-1508. doi: 10.1111/j.1470-0325.2009.01973.x. Retrospective cohort study of 529,688 low-risk women in the Netherlands who were in primary midwifery care at labour onset. This study compared perinatal mortality and morbidity between planned home births (321,307; 60.7%) and planned hospital births (163,378; 30.8%), adjusting for maternal age, birth weight (45,120; 8.5%), using the national perinatal and neonatal registration data from 2002-2006. The following differences between groups were controlled for using logistic regression: parity, gestational age, maternal age, ethnicity, background and socioeconomic status. Inclusion criteria ensured the subjects were strictly low-risk. The main outcomes were intrapartum death, intrapartum and neonatal death within 24 hours and 7 days after birth, and admission to a neonatal intensive care unit. No significant differences were found between planned home and planned hospital births for any of the main outcomes. The authors concluded that planned home birth in a low-risk population is not associated with higher perinatal mortality rates or an increased risk of admission to a NICU compared to planned hospital birth.

F) Kennare R, Keise MJ, Tucker GR, Chan AC. Planned home and hospital births in South Australia 1991-2006: differences in outcomes. Med J Aust 2003;179(27):1786-91. Retrospective population-based study of all births and perinatal deaths from 1991-2006 in South Australia. 1141 planned home births and 297,192 hospital births were included. Planned home birth was defined as any birth that was intended to occur at home with antenatal and intrapartum care provided. The perinatal outcomes studied were: perinatal death, intrapartum death, intrapartum asphyxiation, Apgar <7 at 5 minutes, and use of pediatric or specialized neonatal care. Post-term pregnancy (42 weeks) was more common in the planned home birth group. The planned home birth group had lower rates of caesarean delivery (OR = 27), instrumental delivery (OR = 33), and episiotomy (OR = 14). Perinatal mortality rates (including intrapartum fetal death and stillbirth) were similar between home and hospital groups (7.9 vs. 8.2 per 1000). There was no statistical difference in perinatal mortality between the home and hospital group (4.5 vs. 5.7 per 1000 respectively). Intrapartum fetal death was higher in the home birth group (1.8 vs. 0.8 per 1000), though the absolute numbers were small. Of the 9 perinatal deaths in the home birth group, 3 might have been avoided with a different choice of care provider, location of birth, or timing of transfer to hospital (1 postmature pregnancy, 1 twin pregnancy, and 1 pregnancy complicated by fetal surveillance during labour).


III) Cronforth, UK: Parthenon; 1997. Perinatal mortality and morbidity in a nationwide cohort of 529,688 low-risk planned home and hospital births. BJOG 2009;116(11):1471-1508. doi: 10.1111/j.1470-0325.2009.01973.x. Retrospective cohort study of 529,688 low-risk women in the Netherlands who were in primary midwifery care at labour onset. This study compared perinatal mortality and morbidity between planned home births (321,307; 60.7%) and planned hospital births (163,378; 30.8%), adjusting for maternal age, birth weight (45,120; 8.5%), using the national perinatal and neonatal registration data from 2002-2006. The following differences between groups were controlled for using logistic regression: parity, gestational age, maternal age, ethnicity, background and socioeconomic status. Inclusion criteria ensured the subjects were strictly low-risk. The main outcomes were intrapartum death, intrapartum and neonatal death within 24 hours and 7 days after birth, and admission to a neonatal intensive care unit. No significant differences were found between planned home and planned hospital births for any of the main outcomes. The authors concluded that planned home birth in a low-risk population is not associated with higher perinatal mortality rates or an increased risk of admission to a NICU compared to planned hospital birth.


A) van der Kooy J, Peoran J, de Graff JP, Birnie E, Denktas S, Steegers EAP, Gouke JB. Planned home compared with planned hospital births in the Netherlands: Intrapartum and early neonatal death in low-risk pregnancies. Am J Obstet Gynecol 2000;183(5):1037-46. [See review of study: Section A, IV, D3]. In addition to reporting the usual statistics (RRs and adjusted ORs) to compare perinatal outcomes across birth settings, the authors performed additional analyses, e.g. they divided the crude mortality rates of the home and hospital groups by the prevalence of the 'Big 4' (congenital anomalies, IUGR, preterm birth, Apgar <7; these 4 conditions accounted for 83% of the neonatal mortality in the sample) to 'obtain case mix adjustment'. The rationale for this adjustment was to remove clinical determinants of neonatal mortality, and focus on 'setting' dependent mortality. Using this approach, the authors reported up to 20% excess mortality in the home setting, leading the authors to conclude that women with certain risk factors (e.g. pregnancy duration more than 41 weeks and having an infant that is small for gestational age) can reduce their risk of intrapartum and early neonatal death by planning a hospital birth. It should be noted that the index does not allow for assessment of statistical significance (and thus more emphasis should be placed on the adjusted ORs reported in tables 2 and 3). As the authors themselves note in post-publication correspondence, "In both RCT and observational designs, post-hoc exclusion of patients or replacement of treatment allocation by the treatment actually received is not allowed under the intention-to-treat principle"; hence, at minimum the analysis and reporting of outcomes should have been limited to their "perfect guideline approach".

weeks were incorrectly included in the initial analysis. A higher incidence of congenital heart disease in the home birth popula- tion could partially explain the higher neonatal mortality and would reflect a difference in populations.
SECTION B: STUDIES WITH ERRORS IN DESIGN, ANALYSIS OR REPORTING

NICU, and maternal and infant outcomes, operative vaginal delivery, induction of labour, augmentation of labour, and maternal use of antibiotics in labour). Outcomes of hospital births were compared to those from planned home births attended by CNMs and other midwives. The authors claim, incorrectly, that certified midwives in Michigan were categorized as Certi-fied Nurse Midwives on the 2003 revised birth certificates. Compared to hospital deliveries, planned home births attend- ed by CNMs and other midwives were associated with in- creased odds of spontaneous vaginal delivery (OR 1.87, 95% CI 1.36-2.58) and neonatal sepsis (adjusted OR 3.08, 95% CI 1.44-6.58), adjusting for parity, maternal age, race/ethnicity, education, gestational age at delivery, number of prenatal care visits, cigarette smoking during pregnancy, and medical/obstetric conditions. In a subset analysis, the authors looked at neonatal outcomes for planned home birth attended by 1 CNMs and 2 Other midwives. They found that adverse outcomes were different for At Home Hires and other midwives, with a non-significant decreased risk of 5 minute Apgar scores of 4 and neonatal seizures among women attended by CNMs and significant increased risks of these outcomes for women attend- ed by Other midwives. However, the data collection fields on the current form of the US birth certificate do not provide sufficient information to allow comparisons of outcomes between providers, and do not reliably link planned and actual places of birth. Outcomes for other variables were not empha-sized in the text. For example, planned home births had significan-tly lower risk of NICU admission (OR=0.23), and women who planned hospital births were at a higher risk for obstetric interventions, including operative vaginal delivery, induction and augmentation of labour, and maternal antibiotic use. (C) Chang J, Macoag GA. Birth Outcomes of planned home births in Michigan: A randomized controlled trial. Am J Perinatol. 2012;28(7):529-536. A retrospective cohort study to com-pare birth outcomes across three groups: home births attended by non-CNMs (n=2157), home births attended by physicians or CNMs (n=2738) and hospital and birth center births attend- ed by physicians or CNMs (n=853,542). Data was collected from linked Missouri birth and fetal death files, for the years 1989 through 2005. The study sample included singleton pregnancies with known gestational age and birth weight. Preg-nancies with major fetal aneuploidy and breech presentation were excluded. Authors found that planned home birth by non-CNMs, physicians and CNMs was protective against selec-tive obstetric procedures and complications such as fever, moder-ate to severe meconium, and dysfunctional labour, but that planned home births attended by non-CNMs were associated with prolonged labour and fivefold increased odds of new-born seizure. Planned home births attended by all three groups (physicians, CNMs and OB/GYNs) had similar outcomes to planned home births. Nulliparas in the home birth group had reduced risks for assisted vaginal deliv-ery (OR 0.32, 95% CI 0.22-0.48), epidural analgesia (OR 0.21; CI 0.14-0.33) and dystocia (OR 0.40; CI 0.27-0.59). Multiparaes had reduced risks for operative vaginal delivery (OR 0.26; CI 0.12-0.36), epidural analgesia (OR 0.28; CI 0.20-0.41), epidu-ral (OR 0.48; CI 0.31-0.72), and splinitocentesis tears (OR 0.30; CI 0.12-0.70), dystocia (OR 0.10; CI 0.06-0.17) and postpartum hemorrhage (OR 0.27; CI 0.17-0.41). Perinatal and neonatal mortality rates were similar between groups; the perinatal mortal-ity rate was 0.6/1000 and neonatal mortality rate 0.6/1000 in the home birth group and 0.6/1000 and 0.9/1000 in the hospi-tal birth group. The small sample size prevented any statistical comparison of these rates. Because homebirth data was collected from midwives who agree to participate in studies, results of this type are subject to self-selection and possibly disclosure bias.
SECTION A: BEST AVAILABLE STUDIES GROUPED BY DESIGN

B) Declercq E, MacDorman M, Menacker F, Storland N. Characteristics of planned and unplanned home births in 19 states. Obstet Gynecol 2010;116(1):93-9. Declercq et al. used data from the 2006 U.S. vital statistics in 19 states to compare the socio-demographic profiles of women choosing planned home births with women who had unplanned home births. Among approximately 9.8% (n=10,810) of the total home births occurring in the 19 states (n=11,787) were planned home births. Women in the unplanned home birth group were more likely to be non-white, younger, unmarried, foreign-born, smokers, have no prenatal care, and no college education. Unplanned home births are more likely to be preterm, and attended by someone who is listed as "other" or unknown on the birth certificate. The majority of planned home births were attended by "other midwives". Birth certificate data do not include information about planned or unplanned home birth transfer to hospital, nor can they guarantee the accuracy of the planning status variable.

C) Johnson K, Davies BA. Outcomes of planned home birth with certified professional midwives. Large prospective study in North America. BMJ 2005;330;1416. A prospective study of 5418 planned home births in a single year of mandatory data collection for all Certified Professional Midwives (CPM) in 2000. The authors describe the design as a cohort study; however, the comparison group for rates of intervention was a composite of low risk term hospital births as reported by the National Center for Health Statistics in 2000, and intrapartum and neonatal death rates were compared with those in other North American studies of at least 500 births that were either planned out of hospital or low risk hospital births. In their sample of planned home births attended by CPs, the transfer rate was 12.1%, the cesarean section rate was 3.7%, the intrapartum and neonatal mortality rate was 1.7/1000, intervention rates were lower among women who planned a home birth and live in low birth certification areas but differences were not significant.

D) Murphy PA, Fullerton J. Outcomes of intended home births in nurse-midwifery practice: A prospective descriptive study. Obstet Gynecol 1998;92(3);461-70. Prospective study describing various outcomes of home births attended by CNMs during 1994-1995 (n=410). Of those beginning labour at home, 102 (8.9%) were transferred to the hospital in labour, 10 (0.8%) were postpartum transferees and 14 (1.1%) infants were transferred. For the whole sample of women beginning labour at home, fetal and neonatal mortality was 2.5/1000. For those actually birthing at home this mortality was 1.8/1000. Intrapartal problems were positively associated with transfer to hospital-based care and overall outcomes were consistent with expected outcomes for low-risk birth.

E) Cauthon L. Planned home births: Outcomes among Medicaid women in Washington State. Washington Department of Social and Health Services. This study described planned home births for 2,054 Medicaid women who were cared for by licensed midwives between 1989 and 1994. Births were categorized by birth place, maternal characteristics, and prenatal care. Outcomes between planned home births and births in birth centers or in hospitals were compared. Researchers compared all women receiving care from licensed midwives, women receiving care from certified nurse-midwives, and all other Medicaid women and found no statistically significant differences in mortality rates. Congenital anomalies and SIDS caused the majority of deaths. The number of stillbirths or neonatal deaths among women who delivered at home was zero (0); all women who planned a home birth and who experienced a fetal or neonatal death delivered at the hospital after appropriate transfer.

SECTION B: STUDIES WITH ERRORS IN DESIGN, ANALYSIS OR REPORTING

A) Grünbaum A, McCullough LB, Supra KJ, Brent RL, Levene MJ, Arabin B, Chervenak FA. Apgar Score of Zero at Five Minutes and Neonatal Seizures or Serious Neurologic Dysfunction in Relation to Birth Setting. American Journal of Obstetrics and Gynecology (2013), doi: 10.1016/j.ajog.2013.06.025. This article describes a meta-analysis of the safety of planned home versus planned hospital birth. The authors conclude that planned home births are associated with similar maternal outcomes, but with a two-fold increase in neonatal morbidity and no statistical analysis employed in this systematic review were flawed. This meta-analysis contains calculation and numerical errors, selective and mistaken inclusion/exclusion of studies when analyzing specific outcomes, as well as logical flaws in terms of definitions. Many of the odds ratios (ORs) and confidence intervals (CIs) were calculated incorrectly. In some cases, this was the result of errors apparently made in the extraction of data from original studies. The authors used to calculate the statistics had embedded errors that can dramatically underestimate confidence intervals (CIs), and result in at least 1 false statistically significant result.

B) Cheng YW, Snowden JM, King TL, et al. Selected perinatal outcomes associated with planned home births in the United States. Am J Obstet Gynecol 2013;209(4):325.e1-8. This retrospective cohort study used birth certificate data from those states that used the 2003 revised birth certificate to compare perinatal outcomes by place of birth (planned or unplanned home birth). Limitations of the study include certain types of births not included, the authors were not able to differentiate between certified nurse midwives, certified professional midwives, and lay midwives in their analysis. Another limitation of this study is that the authors were not able to determine if the maternal outcomes were better for planned home births compared to hospital births. This study resulted in at least 1 false statistically significant result.