

HOME BIRTH:

An annotated guide to the literature ©

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This annotated bibliography provides citations and critical appraisal of original studies on home birth. Study selection was based on comprehensive searches of the following databases:

EBSCO (Academic Search Complete, Medline & CINAHL), PubMed, & Cochrane

The following search terms were used:

“home birth”, or “home + childbirth” and
safety, risk assessment, transfer criteria, outcomes, screening, satisfaction,
demand, preference, and perception.

Studies were assessed by two authors independently, according to the algorithm to assess the quality of home birth research outlined by Vedam in *Birth* 2003; (30):1 (see below Section 1J, page 8).

The final sections provide a list of citations for legal, ethical, and policy publications for maternity providers.

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This publication will be updated semi-annually.

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TABLE OF CONTENTS

SECTION 1: Safety & Outcomes, High Quality Studies

A. Meta-analyses and Systematic Reviews	Page 2
B. Randomized Controlled Trials	Page 2
C. North American Cohort Studies	Page 3-4
D. International Cohort Studies	Page 4-5
E. Descriptive Studies and Registry Reports	Page 6-7
F. Integrated Reviews	Page 7
G. Evaluating the Quality of Home Birth Safety Research	Page 7-8

SECTION 2: Safety & Outcomes, Studies with Errors in Design, Analysis, or Reporting

A. Meta-analyses and Systematic Reviews	Page 9-11
B. Descriptive Studies and Registry Reports	Page 11-12

SECTION 3: Studies of Patient Satisfaction, Provider Opinion, & Legal Context

A. Studies of Patient Demand and Satisfaction, Women's Choice, and Provider Attitudes	Page 13
B. Legal, Policy, & Ethics	Page 14

SECTION 4: Policy

A. Maternity Professional Organization Policy Statements	Page 15
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Section 1: A

META-ANALYSES & SYTEMATIC REVIEWS

Leslie MS, Romano A. Birth can safely take place at home and in birthing centers. J Perinat Educ 2007;16(Suppl 1):81S-88S.16. This systematic review of home birth and birth center safety studies followed standard methods, including reporting levels of evidence, disclosure of inclusion and exclusion criteria, and search strategies (detailed in a Methods article by Goer in the same journal issue). Drawing on data from numerous studies, the authors compare incidence of interventions and perinatal outcomes between hospital births and home births and between hospital births and birth center births. The evidence for each claim 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.

Olsen O, Jewell MD. Home versus hospital birth. Cochrane Database of Systematic Reviews 1998, Issue 3. Art. No.: CD000352. DOI: 10.1002/14651858.CD000352. Meta-analysis of randomized controlled trials comparing planned home births to planned hospital births for the following outcomes: interventions, complications, and morbidity. The selection criteria were rigorous. Only one trial was included (n=11). The sample was too small to draw any conclusions about the safety of home birth. Authors note that parturient women's strong opinions about birth place may contribute to the small sample size.

Olsen O. Meta-analysis of the safety of home birth. Birth 1997 Mar;24(1):4-13; discussion 14-6. Meta-analysis of the most methodologically sound, observational, comparative, original studies that investigated differences in perinatal mortality and morbidity between planned home births and planned hospital births. Multivariate statistical analysis controlled for obstetrical background, perinatal factors, comparable populations, inclusion criteria, transfer criteria, and outcome measures. Analysis revealed no statistical difference in mortality between planned home and planned hospital birth and the confidence interval did not allow for extreme excess risks in any of the groups (OR=0.87, 95% CI=0.541.41). Moreover there were significantly fewer medical interventions, fewer severe lacerations, fewer operative births, and fewer low Apgar scores in the home birth groups.

Section 1: B

RANDOMIZED CONTROLLED TRIALS

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 randomized according to 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 indicated that a larger scale trial may be possible. The following outcomes were measured, following an intention to treat analysis: mode of delivery, obstetrical interventions, complications, and infant feeding (breastfeeding versus bottle feeding). However, the authors note that mortality is not an appropriate outcome variable to assess the safety of home birth with a randomized controlled trial because the extremely large number of subjects required to compare rare outcomes would not be feasible.

Hendrix M, Van Horck M, Moreta D, Nieman F, Nieuwenhuijze M, Severens J, Nijhuis J. Why women do not accept randomisation for place of birth: feasibility of a RCT in the Netherlands. BJOG 2009;116:537-544. Based on Dowswell's findings the authors designed an RCT to compare home and home-like hospital births in the Netherlands for the following outcomes: Interventions, satisfaction, referral to obstetricians, and costs. After 6 months, only one woman had enrolled in the study, indicating that an RCT was **not** a feasible study design for this question. The research team then re-designed their study to investigate the reasons that women chose to decline participating in the RCT. They developed and administered a postal questionnaire. 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, and 4) they wished to avoid receiving an undesired treatment.

Janssen PA, Saxell L, Page LA, Klein MC, Liston RM, Lee Sk. Outcomes of planned home births with registered midwife versus attended by regulated midwives versus planned hospital birth in British Columbia. CMAJ 2009;181(6):377-83. Prospective, five-year long cohort study comparing outcomes among midwife-attended planned home births (n=2802), midwife-attended planned hospital births (n=5984), and physician-attended hospital births (n=5985). Women in all three groups of the study met eligibility criteria for home birth, and thus had comparable maternal and fetal risk profiles. Women in the home birth group who needed intrapartum transfer to the hospital were retained in their original cohort. This study reported similarly low rates of perinatal death in all three cohorts, and similar or reduced rates of adverse outcomes in the planned home birth group. Women in the planned home birth group had significantly fewer intrapartum interventions, including narcotic or epidural analgesia, augmentation or induction of labour, and assisted vaginal or cesarean delivery. In addition, women in the home birth group were less likely to suffer from postpartum hemorrhage, pyrexia, and 3rd or 4th degree tears. Babies of women planning a home birth were less likely to have Apgar scores of < 5 at one minute and the babies were less likely to need drugs for resuscitation. These differences were associated with planned place of birth and persisted regardless of actual place of birth.

Hutton E, Reitsma A, Kaufman K. Outcomes associated with planned home and planned hospital births in low-risk women attended by midwives in Ontario, Canada, 2003-2006: A Retrospective Cohort Study. Birth 2009;36(3):180-89. Hutton et al. used the Ontario Ministry of Health Midwifery Program (OMP) database to compare outcomes of all women planning home births from 2003-2006 (n=6692) with a matched sample of women planning a hospital birth (n=6692.) Women with contraindications for home birth were excluded from the hospital sample. The home birth group had lower rates of cesarean section (RR 0.64), maternal morbidity/mortality (PP 0.77) and neonatal morbidity/mortality (RR 0.80). Results suggest that Ontario midwives provide adequate screening and safe care for women planning home births.

Johnson K, Daviss 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 in 2000. Describes a 12% transfer rate, a 3.7% c-section rate, 1.7/1000 neonatal mortality rate, and lower intervention rates for planned home births compared to low risk hospital births in the US. Sometimes criticized because the authors describe the design as cohort study but 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.

Janssen PA, Lee SK, Ryan EM, et al. Outcomes of planned home births versus planned hospital births after regulation of midwifery in British Columbia. CMAJ 2002;166(3):315-23. Outcomes of 862 planned home births attended by midwives compared with hospital births attended by either midwives (n=571) or physicians (n=743). Women in the home birth group were matched with women in the physician- and midwife-attended hospital groups who met the eligibility criteria set for home birth subjects. Women were matched according to age, partner status, parity, and hospital where study subject's midwife had privileges. Transfers from home to hospital were tracked, and subjects were retained in their original study groups for analysis. The study reports reasons for transfer, methods of transfer, and time spent in transfer. To assess similarity of groups, investigators also collected data on the process of midwifery care, on prenatal and obstetric history, and rates and indications for consultation or referral. Women in the home birth group were less likely to have epidural analgesia, experience induction or augmentation of labour, or episiotomy compared to women in the physician group. Women in both midwife-attended groups had similar rates of obstetric procedures. There were no significant differences between home and hospital groups for the following outcomes: perinatal mortality, 5-minute APGAR scores, meconium aspiration syndrome, and need for specialized newborn care.

Section 1: C

NORTH AMERICAN COHORT STUDIES (continued)

Schlenzka PF. *Safety of alternative approaches to childbirth* [Unpublished Dissertation]. Palo Alto, CA: Department of Sociology, Stanford University; 1999. Available from: <http://vbfree.org/docs/schlenzka.htm#download>. In order to account for errors associated with relying solely on birth certificate data, Schlenzka merged birth certificate and hospital discharge data from California for 1989 and 1990 to identify a comprehensive risk profile for a cohort of nearly 816,000 low risk births. Planned and actual birth setting are reported and intrapartum transfers to the hospital were allocated to the originating birth setting. Perinatal mortality was compared with two statistical approaches: indirect standardization using only birth weight, sex, race, age, education, and insurance as risk adjusters, and logistic regression controlling for all risk factors available in the database. No differences in perinatal mortality were found across birth sites, with lower rates of obstetric interventions in out-of-hospital groups.

Section 1: D

INTERNATIONAL COHORT STUDIES

de Jonge A, van der Goes B, Ravelli A, Amelink-Verburg M, Mol B, Nijhuis J, et al. **Perinatal mortality and morbidity in a nationwide cohort of 529,688 low-risk planned home and hospital births.** *BJOG* 2009; DOI: 10.1111/j.1471-0528.2009.02175.x. Retrospective cohort study of 529,688 low-risk women in the Netherlands who were in primary midwife-led care at labour onset. This study is the largest study on the safety of home birth to date. Study compared perinatal mortality and morbidity between planned home births (321,301; 60.7%), planned hospital births (163,261; 30.8%), and unknown place of birth (45,120; 8.5%), using the national perinatal and neonatal registration data from 2000-2006. The following differences between groups were controlled for using logistic regression: parity, gestational age, maternal age, ethnic background, and socio-economic 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.

Kennare R, Keirse MJ, Tucker GR, Chan AC. **Planned home and hospital births in South Australia 1991-2006: differences in outcomes.** *Med J Aust* 2009;192(2):76-80. Retrospective population based-study 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 at the time of antenatal booking; 30.6% of the planned home birth occurred in hospital. Perinatal outcomes studied: perinatal death, intrapartum death, intrapartum asphyxiation, Apgar of <7 at 5 minutes, use of pediatric or specialized neonatal care. Maternal outcomes studied: operative delivery, postpartum hemorrhage and perineal trauma including episiotomy (1998-2006 only). Results: Post-term pregnancy (≥ 42 weeks) was more common in the home birth group; 58% (n=25) delivered at home. Perinatal mortality rates (including intrapartum fetal death and stillbirth) were similar between home and hospital groups (7.9 vs. 8.2 per 1000). Excluding congenital anomalies, there was no statistical difference in perinatal mortality between the home and hospital group (4.6 vs. 6.7 per 1000 respectively). Intrapartum fetal death was higher in the home birth group (1.8 vs .8 per 1000), though the absolute numbers were small. Cases of intrapartum death were not necessarily contingent upon place of birth. Of the 9 perinatal deaths total, 3 were antepartum (occurred after transfer to hospital and were unrelated to antenatal care), 2 were attributable to fetal congenital anomaly, and 4 occurred after parents' refused/delayed transfer or declined intervention after transfer. These deaths might indicate a lack of integration of South Australian midwives into the health care system or an underlying distrust of hospitals for parents. The home birth group had lower rates of cesarean delivery (aOR .27), an instrumental delivery (aOR .33), and episiotomy (aOR .14).

Chamberlain G, Wraight A, Crowley P. Home births: Report of the 1994 confidential enquiry of the National Birthday Trust Fund. Cranforth, UK: Parthenon;1997.

Comprehensive investigation of the characteristics and outcomes across United Kingdom, endorsed by the Royal Colleges of Obstetricians, Midwives, and General Practitioners. A prospective trial of 6044 planned home births in Great Britain, compared mortality and perinatal outcomes with a low risk hospital group and found no significant differences in mortality. The home birth group experienced significantly less medical interventions and perinatal complications. Full study report published as book.

Ackermann-Liebrich U, Voegeli T, Gunter-Witt K, et al. Home versus hospital deliveries: follow up study of matched pairs for procedures and outcome. Zurich Study Team. BMJ 1996;313(7068):1313-18. Prospective matched cohort study of 489 planned home and 385 planned hospital births. The study design carefully attended to issues of planning status, transfer criteria, and actual place of delivery. The groups were matched according to age, parity, gynecologic and obstetric history, medical history, partner situation, social class, and nationality. The main outcome measures were need for medication and/or intrapartum intervention, duration of labor, severity of lacerations, hemorrhage, neonatal condition and perinatal mortality. They found a lower incidence of interventions, medications, lacerations and higher Apgar scores in the home birth group and no differences in birth weight, clinical condition, or gestational age between groups. There were no differences in mortality between groups.

Wiegers TA, Keirse MJ, van der Zee J, Berghs GA. Outcome of planned home and planned hospital births in low risk pregnancies: prospective study in midwifery practices in The Netherlands. BMJ 1996;313(7068):1309-13. Prospective cohort trial that studied 1836 women with low risk pregnancies, 1140 home and 696 hospital. The design controlled for provider type, parity, social, medical and obstetric background. Researchers developed a tool that assigns an overall perinatal outcome index score based on "maximal result with minimal intervention". This tool integrates data from 22 items on intrapartum course, nine items on the condition of the newborn, and five items from the postpartal period. It allows researchers to evaluate factors that detract from optimal perinatal health as well as their clinical significance. This study found no relation between planned place of birth and perinatal outcome in primiparas ($t=1.99$, $p<.05$) when controlled for favorable or less favorable background, and significantly better perinatal outcomes in multiparous women ($t= 5.56$, $P<0.001$) with or without controls.

Northern Region Perinatal Mortality Survey Coordinating Group. Collaborative survey of perinatal loss in planned and unplanned home births. BMJ 1996;313(7068):1306-09. The Coordinating Group collected and analyzed data for 558,691 births over the first 14 years (1981-1994), with 2888 booked for home delivery at term. They found perinatal mortality in the planned home birth group was less than half the average for all births even when the cases referred to hospital were included. Mortality for unplanned home births was four times as high as for all registered births. Perinatal mortality for women booked for home delivery was judged mostly unavoidable and not associated with place. Home birth critics often misquote this study as 134 losses in 3466 births, but 97% of those losses occurred in unplanned home births. The remaining losses were due to causes unaffected by birth site. Further analysis, comparing data from the planned home birth group to low risk term hospital births concluded that there were no significant differences in rates of perinatal mortality.

Declercq E, MacDorman M, Menacker F, Stotland Nb. 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 sociodemographic profiles of women choosing planned home births from women who had unplanned home births. Approximately 83.2% (N= 9,810) of the total home births occurring in the 19 states (N=11,787) were planned home births. The demographics of 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 pre-term, 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 on the accuracy of the planning status variable.

MacDorman, M, Declercq E, Menacker, Fay. Trends and characteristics of home births in the United States by race and ethnicity, 1990-2006. *Birth* 2011;38(1):1-7.

MacDorman et al used data from the U.S National Center for Health Statistics to examine the trends and characteristics of home births in the United States from 1990 to 2006 with a focus on race, ethnic and geographic differences. Home birth was highly correlated with being non-Hispanic white, over the age of 30, multigravida, married, singleton birth over 37 weeks of gestation and delivered by midwives. While home birth rates steadily increased for non-Hispanic whites, they declined for all other race and ethnic groups. Home births to non-Hispanic white women were mostly attended by midwives and were less likely to be preterm. Home births for all other ethnic groups were more likely to be preterm and delivered by either physicians or 'other' attendant, suggesting that these births were likely 'unplanned' emergency home births. Most current Birth Certificate in the U.S. do not distinguish between planned and unplanned home births, thus further data is needed to conclude any differences.

Amelink-Verburg MP, Verloove-Vanhorick SP, Hakkenberg RMA, Veldhuijzen IME, Bennebroek Gravenhorst J, Buitendijk SE. Evaluation of 280 000 cases in Dutch midwifery practices: a descriptive study. *BJOG* 2008;115:570-78. This study discusses the importance of effective home birth risk selection in the Dutch obstetric system. The authors found that the current selection process results in a small number of urgent referrals and favourable perinatal outcomes for home births.

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 (N1404). Of those beginning labor at home, 102 (8.3%) were transferred to the hospital in labor, 10 (0.8%) were postpartum transfers and 14 (1.1%) infants were transferred. For the whole sample of women beginning labor 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 .

Davies J, Hey E, Reid W, Young G. Prospective regional study of planned home births. Home Birth Study Steering Group. *BMJ* 1996;313(7068):1302-06. Examines experience and outcome of pregnancy, indications for hospital transfer, and attitudes of mothers and providers in the Northern Region Perinatal Mortality study.

Cawthon L. Planned home births: outcomes among Medicaid women in Washington State. Olympia, WA: Washington Department of Social and Health Services; 1996. This study described perinatal data for 2,054 Medicaid women who were cared for by licensed midwives between 1989-1994. Births were then categorized by birth place type; and maternal characteristics, prenatal care, and birth outcomes were compared between planned home births and births in birth centers or in hospitals. Researchers compared all women receiving some 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), and the rate of transfer to hospital delivery for the women who experienced fetal or neonatal death was 100% suggesting appropriate screening and site selection by licensed midwives

Anderson RE, Murphy PA. Outcomes of 11,788 planned home births attended by certified nurse-midwives. A retrospective descriptive study. J Nurse Midwifery 1995;40(6):483-92. Similar findings as the more recent prospective study by Murphy and Fullerton

Fullerton JT, Navarro AM, Young SH. Outcomes of planned home birth: an integrative review. J Midwifery and Women's Health 2007, 52 (4): 323-333

Vedam, S., & Burkhardt, P. (2004). Evidence-based home birth practice. In Gruer, J., et.al. (Eds.). ACNM Home Birth Practice Handbook (2nd ed.). Washington, D.C.: ACNM Publications

Gyte G, Newburn M, Macfarlane A. Critique of a meta-analysis by Wax and colleagues which has claimed that there is a three-times greater risk of neonatal death among babies without congenital anomalies planned to be born at home [Internet]. NCT 2010 [cited 2011 March 1]:1-8. Available from: <http://www.scribd.com/doc/34065092/Critique-of-a-meta-analysis-by-Wax> Detailed review of Wax's meta-analysis outlining a range of data reporting errors and methodological weaknesses, which include: insufficient details about choice of included and excluded studies, lack of clarity or consistency about the definition of neonatal mortality, including whether stillbirth data were included. Wax misclassified singleton newborns with a gestational age of 34 wks who were born after transfer from home as 'planned' home birth if birth certificate indicated delivery was initially attempted at home. Gyte argues that the authors' conclusion that "less medication intervention during planned home birth is associated with a tripling of neonatal mortality rate" is unsupported by the poor quality of their data and that the article should not have been accepted by AJOG

Keirse MJ. Home Birth: Gone Away, Gone Astray, and Here To Stay. Birth 2010;37(4):341-46. Commentary on Wax JR et al. Maternal and newborn outcomes in a planned home birth vs. planned hospital birth. Keirse highlights the weakness and results of Wax et al.'s meta-analysis of home birth. Keirse examines which studies Wax included and excluded from his meta-analysis in order to conclude that home birth is related to a 2.6 increase of maternal mortality and a tripling of neonatal mortality. Keirse also cites either statistical errors or reporting errors of data present in the study that contribute to his results. Wax's meta-analysis refers only to planned home birth but includes statistics from U.S. birth certificates that do not differentiate between planned and unplanned home birth, and this inclusion significantly contributes the higher rate of neonatal mortality. Although useful when randomized control trials are unavailable, meta-analyses need to consider the impact culture, geography, and health care systems have on data when consolidating smaller studies

de Jonge A, Mol BW, van der Goes B, Nijhuis J, van der Post J, Buitendijk S. Too early to question effectiveness of Dutch maternity care system. Commentary on: Perinatal Mortality and severe morbidity in low- and high-risk term pregnant women in the Netherlands: a prospective study. BMJ 2010;341:c7020. Detailed review of Evers et al prospective cohort study that identifies several weaknesses in the study's methodology which include: a retrospective definition of 'population of risk' despite claims that the study is a prospective cohort study; all intrapartum deaths were included but not all births; for midwives whose practices cross boundaries, deaths outside catchments were included in the study but not births which hence artificially inflated the numbers; the neonatal mortality rates of catchment are twice as high as the rates of previous national studies, which requires further investigation. In the Netherlands primary maternity care often is equated to women who attended by midwives. Evers et al suggest that home birth is the cause of increased perinatal morbidity, but there is no data presented that links site of birth or planning status to the reported outcomes. Data of a large birth registry database were used and adjustment for confounders, including appropriate referrals from primary to secondary care before the onset of labour, was not possible. Given so many discrepancies from national studies, the authors find that Evers conclusion that "the obstetric care system in the Netherlands possibly contributes to the high perinatal mortality rate" is not supportable by this study alone

Vedam, S. Home versus hospital birth: questioning the quality of the evidence on safety. Birth 2003; 30(1):57-63. Detailed review of Pang study, including well acknowledged errors in methodology and definitions. Outlines flaws associated with using birth certificate data to study outcomes of planned home births Includes algorithm for evaluating quality of trials on home birth safety. Studies must adhere to following study design criteria in order to avoid common confounding factors: 1) differentiate between planned and unplanned home births, 2) accurately discriminate between provider types, 3) use consistent inclusion criteria across groups, 4) adjust for home birth selection criteria, 5) control for transfer criteria and 6) select consistent outcome measures. Compares the methodology used by Pang with the methodology other commonly cited home birth studies, with examples of reliable and unreliable designs.

Wax JR, Lucas FL, Lamont M, Pinette MG, Cartin A, Blackstone J. Maternal and newborn outcomes in planned home birth vs planned hospital births: a metaanalysis. Am J Obstet Gynecol 2010;203:243.e1-8. This article presents a purported 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 threefold increase in neonatal mortality. The methodology and statistical analysis employed in this systematic review were deeply flawed. This meta-analysis is fraught with calculation errors, with selective and mistaken inclusion/exclusion of studies when analyzing specific outcomes, as well as logical flaws in terms of definitions. A more detailed critique of this article, authored by a team of experts in the field (including the authors of studies included in the meta-analysis), can be accessed at: <http://www.medscape.com/viewarticle/739987>

Chang JJ, Macones GA. Birth Outcomes of Planned Home Births in Missouri: A Population-Based Study. Am J Perinatol. 2011;[Epub ahead of print]. DOI:10.1055/s-0031-1272971. A retrospective cohort study to compare outcomes between planned home births attended by non-CNMs, physicians, and CNMs to outcomes of births in hospitals and birth centers birth attended by physicians and CNMs. Data was collected from linked Missouri live birth and fetal death files, for the years 1989 through 2005. Study sample included singleton pregnancies, delivered between 36-44 weeks gestation. Pregnancies with major fetal anomalies and breech were excluded. Authors found that planned home birth by non-CNMs, physicians and CNMs was protective against selective obstetric procedures and complications such as fever, moderate to heavy meconium, dysfunctional labour, but that planned home births attended by non-CNMs was associated with prolonged labour, and a fivefold odds of newborn seizure, and planned home births attended by all three groups (physicians, CNMs and non-CNMs) held a higher risk of intrapartum death. There are several weaknesses of the design and interpretation of data in this study. The small numbers for non-CNM attended home births do not meet power requirements, and the authors used an unconventional definition of 'low-risk', which includes all births from gestational ages of 36-44 weeks. Further, there are multiple issues of data validity using birth record data related to identification of planned home births and type of attendant. Authors suggest the non-CNM group may include certified professional midwives but there were none in practice in Missouri at the beginning of the study period; and the CPM credential was not accepted for licensure in Missouri until 2008. Even today there are not enough Missouri based CPMs to attend the number of births indicated as attended by 'other midwives'. Prior to legislation families who delivered outside the hospital filled out their own birth certificate record. Several of those births may be misclassified unplanned accidental home births, or attended by someone without credentials. Most importantly, given the sample size and wide confidence intervals, misclassification of even a few records could skew results.

Evers A, Browsers H, Hukkelhoven C, Nikkels P, Boon J, van Egmond-Linden A, Hillegerberg J, Snuif Y, Sterken-Hooisma S, Bruinse H, Kwee A. Perinatal mortality and severe morbidity in low- and high-risk term pregnant women in the Netherlands: a prospective study. *BMJ* 2010;341:c5639doi:10.1136/bmj.c5639. This was not a study of home birth safety but rather focused on primary and secondary care referrals. A purported prospective cohort study to compare the incidences of perinatal mortality and severe perinatal morbidity between low-risk term pregnancies in primary care with a midwife and high-risk secondary care with an obstetrician. The study found that infants of low risk women who started labour under primary care of a midwife had a significant higher risk of perinatal death than infants of high risk women who labour started in secondary care under the care of an obstetrician. While NICU admission rates did not differ between groups, infants who were referred to a physician by a midwife during labour had a 3.66 times higher risk of related perinatal death. Nulliparous women had a significantly higher risk of NICU admission than multiparous women. The most common reason for admission was asphyxia. Data extracted from a large birth registry database and adjustment for confounders, including excluding appropriate referrals from primary to secondary care before and during the onset of labour, was not possible. These findings do not correlate to any previous studies of the Dutch maternity care system. The results may be mostly of a reflection of the inter-professional relationships that are specific to the Utrecht region

Wax JR, Pinette MG, Cartin A, Blackstone J. Maternal and newborn morbidity by birth facility among selected United States 2006 low-risk births. *Am J Obstet Gynecol* 2010;202:152.e1-5. A retrospective population-based cohort study to evaluate perinatal mortality by place of birth. (hospital, birth center, home) using 2006 U.S. birth certificate data from 19 states available through the CDC. Of 745,690 total births included, 733,143 occurred in hospital, 4661 in freestanding birth centers, and 7427 at home. Excluded from the study were: preterm (<37 weeks), smokers, women with Type I, II or gestational diabetes, either chronic or pregnancy induced hypertension and a prior cesarean. Conclusion: home births are associated less frequent adverse perinatal outcomes (chorioamnionitis, fetal intolerance of labour, meconium staining, assisted ventilation, NICU admissions and birthweights of <2500g), but more frequent abnormal labours and 5-minute apgar scores of <7 and birth weight >2500g. The study does not differentiate between planned and unplanned home births, and does not provide data about home to hospital transfers.

Malloy MH. Infant Outcomes of Certified Nurse Midwife Attended Home Births: United States 2000 to 2004. *J Perinatol* 2010;30(9):622-27. A retrospective cohort study using linked US birth and death certificate files from National Center for Health Statistics from 2000-2004, to compare the safety of CNM deliveries at home to CNM deliveries in hospital (data also examined 'other' midwives' deliveries in hospital and home). Malloy concludes that neonatal mortality rates of certified nurse midwives or 'other' midwives at home births and at birthing centers are statistically higher than in hospital births attended by certified nurse midwives or 'other' midwives. Method of selection did not distinguish planned from unplanned home birth nor if hospital birth CNMs were in attendance at home births or appeared on birth certificates as certifier. Analysis does not distinguish between "other midwife" attendant and no attendant.

Pang J, Heffelfinger J, Huang G, Benedetti T, Weiss N. Outcomes of planned home births in Washington state: 1989-1996. *Obstet Gynecol* 2002;100(2):253-59. Method of selection did not distinguish between the planned home births, out-of-hospital births that had no attendant, or births with unknown or unnamed attendants. Premature births occurring between 34 and 37 weeks were incorrectly included in the initial analysis. A higher incidence of congenital heart disease in the home birth population could partially explain the higher neonatal mortality and would reflect a difference in populations

Bastian H, Keirse MJ, Lancaster PAL. Perinatal death associated with planned home birth in Australia: Population based study. *BMJ* 1998;317(7155):384-88. Reported outcomes of births attended by unregistered midwives, many of whom had limited training, experience, and no access to resuscitation equipment. Births occurring without qualified attendants are not consistent with definitions of planned home birth in most countries

Schramm WF, Barnes DE, Bakewell JM. Neonatal mortality in Missouri home births, 1978-84. *Am. J. Public Health* 1987;77(8):930-35. Compared planned home and planned hospital births in Missouri. Within the group of the planned home births attended by physicians, certified nurse-midwives, and licensed midwives, the differences in neonatal mortality when compared with physician-attended hospital births were not significant. Any increased relative risk shown was attributable to unskilled providers.

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(24):2741-45. Examined planned and unplanned home births in North Carolina in a demographically high-risk group of women. When unplanned home births and high-risk births were excluded, there were no significant differences in neonatal mortality between planned home and planned hospital births

Wax JR, Lucas FL, Lamont M, Pinette MG, Cartin A, Blackstone J. Maternal and newborn outcomes in planned home birth vs planned hospital births: a metaanalysis. *Am J Obstet Gynecol* 2010;203:243.e1-8. This article presents a purported 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 threefold increase in neonatal mortality. The methodology and statistical analysis employed in this systematic review were deeply flawed. This meta-analysis is fraught with calculation errors, with selective and mistaken inclusion/exclusion of studies when analyzing specific outcomes, as well as logical flaws in terms of definitions. A more detailed critique of this article, authored by a team of experts in the field (including the authors of studies included in the meta-analysis), can be accessed at: <http://www.medscape.com/viewarticle/739987>

Hildingsson I, Rådestad I, Lindgren H. Birth Preference that Deviate from the Norm in Sweden: Planned Home Birth versus Planned Cesarean Section. Birth 2010;37(4):288-95. Descriptive and comparative study using secondary data analysis (questionnaires) of women who had a planned home birth (N=671) and women who had an elective cesarean (N=126) between 1997-2008. In Sweden the current medical context neither promotes home birth or elective cesarean. Study found significant socioeconomic differences between the two groups of women. Compared to women who chose an elective cesarean, women who chose planned home birth were associated with a higher level of education, lower BMI, lower smoking rate, felt less threat to baby's life during the birth and a higher satisfaction with their overall birth experience. Women in home birth group reported a higher intensity of pain, but more positive experience of that pain than cesarean group. Women in home birth group also felt higher sense of control.

Lindgren H, Erlandsson K. Women's Experiences of Empowerment in a Planned Home Birth: A Swedish Population-based Study. Birth 2010;37(4):309-17. Descriptive study using secondary data analysis (questionnaires) of women who had a planned home birth between 1992-2005 (N=735). Birth stories were analyzed using content analysis and descriptive statistics. Demographics of women who birth at home tended to be older, multiparous, higher level of education, and not born in Sweden, with a lower family income. Study found that women who birth at home felt empowered by their environment and from the people who are supporting them at the birth (midwives, partners, family). Birth stories rarely mentioned pain or suffering and stressed the importance of an undisturbed space and sense of control. Surveys highlighted the importance of support and 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 response rate of the study was 99%. Limitations: small scale study might not be generalizable to general Swedish population or international context.

Janssen P, Henderson A, Vedam S. The experience of planned home birth: Views of the First 500 Women Birth 2009;36:4:297-304. A qualitative study that aims to describe the experiences of women who had planned a home birth with a regulated midwife in British Columbia. Methods: data analysis was an adaptation of interpretive description of anonymous questionnaire distributed by clients' midwives. Study found that these women were overwhelmingly positive about their experience. Main themes that emerged included: clients' confidence in midwives skill, a sense of empowerment from being a decision maker in their own care, a sense of emotional and informational support, a feeling that they received 'holistic' care, which included comprehensive post-partum care at home and a sense of confidence from feeling like they had access to their midwives. Other themes included the confidence they felt from birthing in a familiar, family-centred space, and viewed birthing in the home as a way of maintaining control while avoiding interventions. When women transferred to the hospital women felt supported and able to transition smoothly. No single theme emerged from the 7 negative comments. Study was limited by initial failure of some midwives to distribute study in the early stages of the study but of those who received the questionnaires the response rate was 82%.

- Vedam S, Stoll K, White S, Aaker J, Schummers L. American Nurse-Midwives' Experiences with Planned Home Birth: Impact on Attitudes and Practice. Birth 2009;36(4):274-82.** Survey-based study of Nurse-Midwives' experiences with and attitudes toward planned home birth. Study found strong correlation between choice of practice site and comfort with planned home birth and the amount of exposure to home birth during education, practice experiences, and inter-professional, logistic, and environmental factors
- Lindgren HE; Radestad IJ; Christensson K, Wally-Bystrom K, Hildingsson IM. Perceptions of risk and risk management among 735 women who opted for a home birth. Midwifery 2010;26(2):163-72.** Using data from a national survey of all women who birthed at home in Sweden between 1992 and 2005, this study aims to describe women's perceptions of risk and risk management related to childbirth. Categories of perceived risk related to hospital and home births emerged. Perceived risks of hospital births included loss of autonomy, impersonal care, and subjection to interventions; perceived risks of home birth included centered around difficulty accessing emergency care in a worst-case scenario. The study found that women avoided discussing risks with care providers (other than their homebirth midwife) as a strategy to manage perceived risks.
- Boucher D, Bennet C, McFarlin B, Freeze R. Staying home to give birth: why women in the United States choose home birth. Journal of Midwifery & Women's Health 2009. 54(2): 119-126.** Qualitative descriptive secondary analysis of survey data: sample size 160, 508 separate statements submitted to content analysis. Most common reasons given for wanting to birth at home were: 1) safety ; 2) avoidance of unnecessary medical interventions common in hospital births 3) previous negative hospital experience; 4) more control; and 5) comfortable, familiar environment . Another dominant theme was women's trust in the birth process. Women equated medical intervention with reduced safety and trusted their bodies' inherent ability to give birth without interference
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