

ACM Homebirth - Literature Review

This review examines the literature on the safety of homebirth. The first section of this review will focus on the research evidence on the safety of homebirth, including transfer to hospital, and the second section will examine the grey literature regarding homebirth. Grey literature includes reports and other literature from governments, agencies and professional organisations.

Search strategy

Databases used for the review include Medline, CINAHL, Cochrane Database of Systematic Reviews, and Maternity and Infant Care (MIDIRS). The reference lists were also used as a source of additional articles.

Keywords

The PICO model was used to identify keywords and to help guide the search. PICO identifies the patient/population and/or problem (P), the intervention (I), comparison (C) and outcome (O). In this review PICO will be articulated as P – pregnant women, I – Planned homebirth with a registered provider/s, and C – hospital birth, and O - maternal and neonatal outcomes. Keywords used were pregnant women, planned home birth or homebirth, home childbirth, neonatal morbidity, neonatal mortality, maternal morbidity, and maternal mortality.

Exclusions

Articles were limited to those from developed countries, written in English, with publication date from years 1995 – current day. Abstracts were read and eligibility for inclusion assessed. Any articles that did not describe studies which included a comparison group, investigate planned homebirths or relate to maternal and/or neonatal outcomes were excluded. Studies using a qualitative design were also excluded as they provide little evidence into the safety of homebirth.

Quality appraisal

All eligible articles were assessed for quality using the Critical Appraisal Skills Program (CASP) rating (Birmingham Critical Appraisal Skills Programme 2010). CASP rates research studies for the effectiveness of the study in its ability to answer the research question, its methodological quality and possible level of bias, statistical quality (including its statistical power) and appropriateness of analysis. The CASP rating (out of 12) was then divided into three quality levels: good- 9-12, fair- 6-8, and poor <5. Studies that scored fair and good were included in this review (Table 1).

Results

After exclusions for studies older than 1995 and studies in languages other than English, 191 articles were identified. The abstracts of the articles were read and a further 176 were excluded for not relating to studies having a comparison group and not relating to maternal and/or neonatal outcomes, and in particular, perinatal mortality rates. After CASP evaluation, 11 studies rated good or fair, and four studies were rated poor. The four studies rated as poor were excluded (Declercq, Paine et al. 1995; Pang, Heffelfinger et al. 2002; Malloy 2010; Wax, Lucas et al. 2010). The 11 remaining studies are set out in Table 1. The meta-analysis by Wax et al (2010) was excluded predominantly because of its methodological flaws, in particular the omission to use the large neonatal dataset from de Jonge (2009), and the use of outdated data in its analysis. These flaws have been internationally recognised (Gyte, Dodwell et al. 2010; Johnson and Daviss 2011; Sandall, Bewley et al. 2011). Similarly, methodological flaws in Malloy (2010) consisted of the use of unreliable birth certificate data to link place of birth and carer with maternal and neonatal outcomes. Malloy (2010), Declercq et al. (1995), and Pang et al. (2002) were unable to ascertain that their sample excluded women who had unplanned homebirths. On the basis of this, these studies were excluded from this review, as women who have unplanned homebirths are known to be of a higher obstetric risk and likely to have worse outcomes, rendering the results of such studies unreliable. Pang et al. (2002) were also unable to provide assurance that qualified birth attendants were present during the homebirths studied, and included preterm births in their analysis.

There were no research studies that focused on rural and/or remote/Indigenous communities.

One study by Schlenzka (1999) was unobtainable in the time period given for this literature review – it was an unpublished dissertation detailing outcomes of 816,000 low risk births related to birth place.

This study would have added weight to the body of evidence below, but its omission would not have changed the conclusion.

Table 1 Included Studies

	Author, year and country	Number of participants	Results
1	*Bastian et al. 1998, Australia	Homebirth – 7002 Hospital birth – 1,502 756	Homebirths carry a higher risk of PNM\$. 7.1 per 1000 births (95% CI 5.2-9.1)
2	Janssen et al. 2002, Canada	Homebirth – 862 Hospital birth (midwife-led) – 571	No increased risk of PNM. Homebirth (midwife-led) compared with hospital birth (physician-

		(physician-led) - 743	attended)- RR=2.5 (95% CI 0.27-24.5) Homebirth PNM – 95% CI 0.9-9 per 1000 births
3	*Ackermann-Liebrich et al. 1996, Switzerland	Homebirth – 489 Hospital birth - 385	No increased risk of PNM. Homebirth – 2.3 per 1000 births Hospital birth – 7.9 per 1000 births
4	Hutton et al. 2009, Canada	Homebirth – 6692 Hospital birth - 6692	No increased risk of PNM. Homebirth and hospital cohort PNM 1 per 1000 births. P=0.600. RR=1.50 (95% CI 0.53-4.21)
5	Johnson & Daviss, 2005, USA	Homebirth – 5418 Hospital birth – 3,360 868	No increased risk of PNM. Homebirth - 1.7 per 1000 births Hospital birth – 1.9 per 1000 births
6	*Kennare et al. 2009, Australia	Homebirth – 1141 Hospital birth – 297,192	No increased risk of PNM. Homebirth cohort- 7.9 per 1000 births. OR=1.38 (95%CI 0.56-3.41). p=0.48 Hospital cohort – 8.2 per 1000
7	De Jonge et al. 2009, Netherlands	Homebirth – 321,303 Hospital birth – 163,261	No increased risk of Intrapartum and neonatal mortality ⁷ days: RR=1.00 (95% CI 0.78-1.27)
8	*Lindgren et al. 2008, Sweden	Homebirth – 897 Hospital birth – 11,341	No increased risk of intranatal and neonatal mortality. RR 3.6, (95% CI 0.8-17.2)
9	*Symon et al. 2009, UK	Homebirth – 1462 Hospital birth - 7214	No increased risk of PNM with low risk mothers. Homebirth – 4.8 per 1000 births Hospital birth – 0.3 per 1000 births OR 2.73 (95% CI 0.87-8.55)
10	Chamberlain et al. 1997, UK	Homebirth – 4500 Hospital birth - 3300	No increased risk of intranatal and neonatal mortality. Stats not available#
11	Janssen et al. 2009, Canada	Homebirth – 2889	No increased risk of PNM. Homebirth cohort – PNM

		Hospital birth (midwife-led) – 4752 (physician-led) - 5331	0.35 per 1000 (95% CI 0-1.03) Hospital (midwife-led) – PNM 0.57 per 1000 births (95% CI 0-1.43) Hospital (physician-led) – 0.64 (95% CI 0-1.56)
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PNM=Perinatal mortality, RR=relative risk, CI=confidence interval.

*These studies included women having homebirths who were at higher obstetric risk

Full report unable to be obtained within the time period for this literature review

§ The higher PNM in this study was related to women who were at high obstetric risk

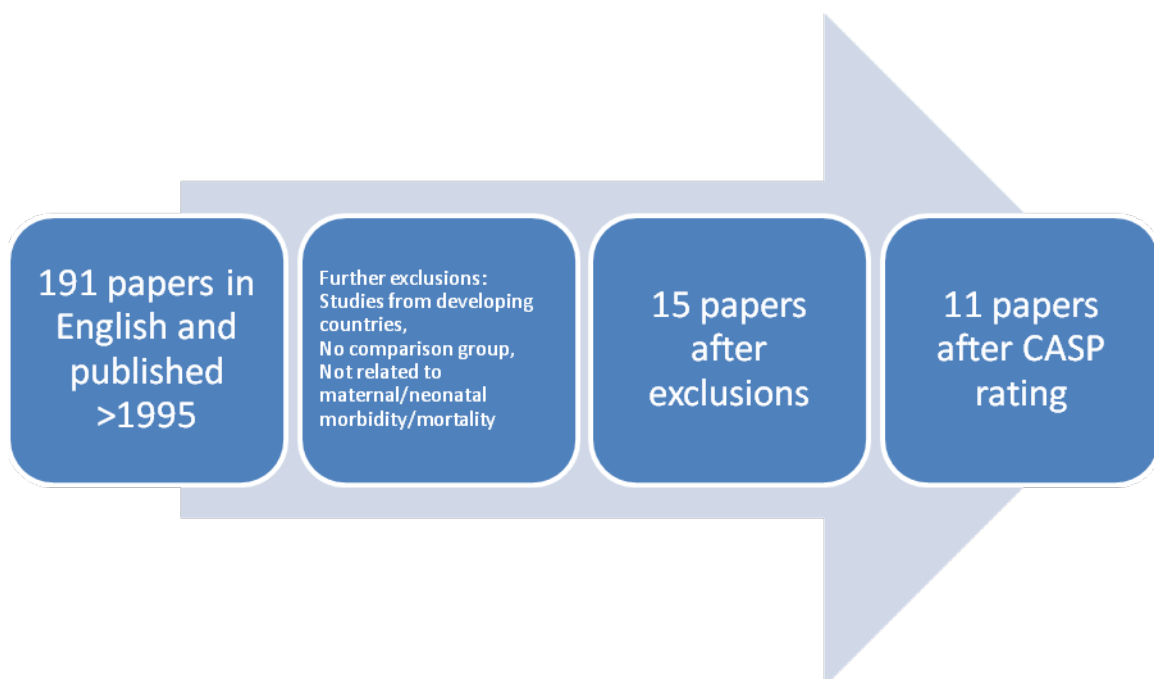


Figure 1. Study inclusion and exclusion

Recent government reports relating to homebirth

Australia

In 2009 the Maternity Services Review released a report that aimed to improve maternity services throughout Australia (Commonwealth of Australia 2009). The Report considered many issues to do with expanding midwifery roles, rural inequities, caesarean section rates, data collection and safety and quality. It also espoused that women should have a choice of carer. However, homebirth was notably absent from its recommendations for funding and support as it was thought that it risked ‘polarising the professions’ (p. 21) and that there were very small numbers involved. Prior to the report, a call for submissions received over 900 responses from

stakeholders and women regarding maternity services. Four hundred and seventy of these mentioned homebirth. The exclusion of homebirth in this report has been criticized in the literature (Dahlen, Schmied et al. 2010).

In Western Australia, a recent report entitled 'Models of Maternity Care: updated evidence on outcomes and safety of planned home birth' (Department of Health 2011) was released. This literature review examined studies of homebirth at levels of evidence III2-IV (NHMRC 2007) and stated that 'planned home birth with a qualified home birth practitioner is a safe alternative for women determined to be at low risk of pregnancy complications by established screening criteria' (p. 1). It also stated the need for adequate preparation for the potential for transfer to hospital and the need for systems of care for a smooth transition should this occur. This review makes a point of stating that in relation to homebirth, there is evidence of excess neonatal morbidity and mortality in babies of women who are not deemed low risk.

The 12th Perinatal and Infant Mortality Report of Western Australia (PIMC) (2007) reports deaths in the years 2002-2004 and relates them to birthplace, maternal behaviours, population health and other causative factors. This report found, when combining data from 2000-2004, the perinatal mortality rate for planned homebirths was significantly higher than the rate for hospital births. When broken down, there were six perinatal deaths in the 846 planned home births in 2000-04, four of which had preventable medical factors. A review of homebirths in WA was subsequently recommended to assess essential health outcomes, including morbidity and mortality. This was performed by Homer and Nicholl (2008), which made a number of organizational recommendations to improve quality and safety within the Community Midwifery Program in WA.

In 2010, the 13th PIMC was reported. This report also found a higher rate of stillbirths and infant deaths in planned homebirths compared to hospital rates. Six of the seven investigated deaths amongst planned homebirths in the triennium 2005-2007 were in term or post-term women, and three were seen to be potentially avoidable. Alarming, the risk of hypoxic peripartum stillbirth was considerably higher in planned home births compared with planned hospital births. Currently there is an audit underway to assess the implementation of the recommendations of the Review into Home Births in WA (Homer and Nicholl 2008).

Maternity services in rural and remote areas of Australia have particular problems. The National Rural Health Alliance Inc. (NRHA) released a report (2006) outlining the particular difficulties in these areas of Australia. The closure of many regional maternity units often necessitates women in remote areas to travel great distances to hospital, and there are family disruptions and expenses involved when women need to travel and stay in hospital for any length of time.

Women can also have unintended homebirths and roadside births due to the distance. The NHRA recommend the reinstatement of maternity services in rural areas and adequate screening of women to inform decision-making regarding birthplace options. They also state that women should have maternity care as close as possible to their home, including pre-conception care through pregnancy, birth and the postnatal period. Further consideration of the concept of 'Birthing on Country' for Aboriginal women was also an issue, and to provide women the opportunity for assistance from someone known to and chosen by them (this was also a feature in the Maternity Services Report above).

In relation to homebirth, women living in rural and remote areas have very few options of care, although Alice Springs and Darwin do have small publicly-funded homebirth programs.

New Zealand

The Perinatal and Maternal Mortality Review Committee (PMMRC) report (2010) reviewed perinatal neonatal and maternal deaths in New Zealand. Midwifery is well integrated into the health system in New Zealand, and many practices incorporate homebirth as an option for women. The report found that there were 21 stillborn babies or babies who died in the first month of life that were born at home. Only one of these was an intended birth at home, whereas ten were less than 24 weeks gestation, and five were neonatal deaths after birth at term. The report found that the intrapartum stillbirth and neonatal death rate was highest in Maori and Pacific women when compared with New Zealand European and Asian (not including Indian) women, which was recommended for investigation. None of the maternal deaths (n= 9) were related to homebirth.

Also in New Zealand, the Midwifery and Maternity Providers Organisation (2008) provide annual reports on quality and safety relating to maternal and neonatal outcomes. This report stated 7.4 per cent of babies were born at home, with almost half of all homebirths occurring in rural or remote areas. Intranatal transfer rates to hospital from home were 22.9%, which is higher than most reported international rates, and may reflect issues with distance to hospital and preventive strategies. Similar to other studies, this report found a higher percentage of multiparous women than primiparous women having homebirths and a high rate of the use of water in labour for pain management.

United Kingdom

In the UK, the 'Maternity Matters: choice, access and continuity of care in a safe service' report (Department of Health 2007) outlines four national choice guarantees women have regarding their care. These are choices of how to access care, the type of care, the birthplace and the place of postnatal care. Within the choices of birthplace, homebirth is explicitly stated as an option. This report was followed by a comprehensive strategic vision of new entitlements for women in regards to maternity and early childhood services (UK Department of Health 2010).

The National Institute for Clinical Excellence (NICE) Intrapartum Care (IPC) Guideline, (NICE, 2007) considered the evidence on the comparative safety of planned home birth and planned hospital birth. This comprised of a comprehensive literature review together with ten years of data from England and Wales on intrapartum related perinatal mortality. The report states that women should be given the choice to have a homebirth, but that there was a lack of evidence to give women information about the risks involved in relation to birthplace. This guideline led the National Childbirth Trust to perform its own review of homebirth literature using strict inclusion criteria. This review concluded that despite the low quality of the comparative evidence on safety of home birth, the risk of perinatal mortality is similar in women at low risk of complications choosing home birth compared with women at low risk of complications choosing hospital birth (Gyte and Dodwell 2007). The study also recommended that maternity services adapt to meet women's needs irrespective of where they choose to give birth, which included adequate transfer arrangements, and staffing to accommodate these needs.

United States

The Centers for Disease Control, and the US Census Bureau do not hold information about homebirth rates or activity in the United States. Professional midwifery organizations such as the Midwives Alliance of North America (MANA), and the Northern American Association of Certified Professional Midwives (NACPM) support homebirth (NAPCPM, 2004; MANA, 2011).

Canada

Canada has provision for homebirth in every province or territory (Canadian Institute for Health Information 2004). Both the Canadian Perinatal Health Report (2008) and Maternal and Child report (Public Health Agency of Canada 2005) do not specifically state perinatal morbidity or mortality rates in relation to birthplace, or mention homebirth. There are no government reports from Canada that relate homebirth to maternal or neonatal outcomes.

Publicly-funded Homebirth Evaluations in Australia

There are currently around 13 publicly-funded homebirth services around Australia. Most are related to a Midwifery Group Practice caseload model of care, some were established from private practice origins, and others are very small services that are part of a wider midwifery consultant role. The publicly-funded homebirth services adhere to the Australian College of Midwives Consultation and Referral Guidelines (2008) and/or the South Australian policy (2007) regarding criteria for booking women onto their service (unpublished data, 2011). Many services have also created their own local hospital policies regarding criteria for transfer, booking and general homebirth guidelines and have a stipulation that women living 'more than 30 minutes travelling time from the support health unit' (South Australian Government 2007 p. 8) are

precluded from booking for a homebirth. A few of these services have been evaluated, although most are relatively unstudied.

The evaluations available from publicly-funded homebirth services are from Western Australia (WA), South Australia (SA) and New South Wales (NSW). Evaluations from WA and SA incorporate rural areas and Indigenous populations.

In Western Australia, the Fremantle Community Based Midwifery Program (Thiele and Thorogood 1997) used data from interviews with midwives, project records and consumer satisfaction surveys in its evaluation. It found high satisfaction rates of women, less analgesia usage and lower rates of perineal trauma. Specific survey questions about the influences women had regarding their choice of birth place showed that apart from themselves, their partners, midwives and GPs held significant influence. Despite the small sample size, this evaluation showed cost-effective care and positive results for women and babies, although it did not engage as many non-English speaking women in the program as anticipated. A further evaluation of the Community Midwifery Program was performed in 2008 by Homer and Nicholl (2008). This review recommended systems be developed for quality assessment, transfer to hospital, criteria for entry into the homebirth program and documentation during labour, amongst others. Recommendations to improve all areas of practice to optimise maternal and newborn outcomes were stated. Most recently, the Women's and Newborn's Health Network in WA (Department of Health 2011) reported outcomes of the safety of planned homebirth in a literature review, as an update to Henderson et al. (2007). This comprehensive review determined that a planned homebirth with a qualified homebirth practitioner for women with a low risk pregnancy was a safe option. Emphasis was placed on the necessity for women to be counseled on the possibility of a hospital transfer if complications arise, and that there was a higher likelihood of neonatal morbidity and mortality for women choosing homebirth who were not deemed low risk.

Another evaluated homebirth program in Australia was the Northern Women's Community Midwifery Programme (NWCMP), based in the Northern suburbs of Adelaide. This was undertaken by Nixon et al. (2003) who undertook an independent, external evaluation using interviews, questionnaires, focus groups and other records as data. They concluded that the programme was successful in caring for Indigenous women, teenagers, and other women of high needs, and although clinical outcomes were similar for the rest of the state, women reported using less analgesia, and there were fewer episiotomies performed.

In NSW, the publicly-funded homebirth service at St George Hospital was evaluated two years after it began operation in 2005 (Homer and Caplice 2007). Anonymous questionnaires were

collected from women who had used the service and midwives, managers and obstetricians were interviewed or canvassed as part of a focus group. The homebirth service was found to be operating appropriately with a great deal of satisfaction from the midwives working within the service and the women. The few negative comments were related to the ability of the health system's policies to accommodate women's individual needs.

Professional organization statements

There are conflicting statements from professional organizations around the world regarding homebirth.

USA

The Position Statement of the American College of Nurse-Midwives (2005) supports the right of women who meet selection criteria to choose a homebirth. And states that 'evidence indicates that appropriate client selection, attendance by a qualified provider, sound clinical judgment, and transfer to a receptive environment when necessary, promote safe outcomes' (p. 1). The American College of Obstetricians and Gynecologists (ACOG) (2011) does not support planned homebirths as 'published medical evidence shows it does carry a two-three fold increase in the risk of newborn death compared to hospital births' (p. 1). ACOG cites data from Wax (2010), which is a study that has been widely criticized for its methodological flaws.

Australia and New Zealand

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) do not support homebirth (2009). RANZCOG cite a report from Western Australia (2007) and Bastian et al. (1998) that state higher perinatal mortality rates in neonates born at home compared to hospital births. Both these studies included women of higher obstetric risk. The position statement does not recommend that homebirth is promoted as a model of care.

UK

The Royal College of Obstetricians and Gynaecologists and the Royal College of Midwives have a joint position statement that support homebirth for women with uncomplicated pregnancies (2007). They state that 'there is ample evidence showing that labouring at home increases a woman's likelihood of a birth that is both satisfying and safe, with implications for her health and that of her baby' (p.1). The comprehensive statement stresses the need for multidisciplinary communication, adequate transfer policies, and training.

Canada

The Canadian Association of Midwives supports homebirth (2001). The Society of Gynecologists and Obstetricians of Canada do not have a position statement on homebirth.

Safety of homebirth

The best evidence for the safety of a specified situation is through a Randomised Controlled Trial (RCT). There are no RCTs comparing home and hospital birth as few women would be willing to be randomly assigned to either home or hospital. This was demonstrated by Dowswell et al (1996) in a small feasibility study where only 11 out of 500 women agreed to randomisation, and also Hendrix et al. (2009) who also found women were reluctant to hand over their choice of birth place. Johnsson and Daviss (2005) remark that prospective cohort studies are the most appropriate measure of the safety of homebirth, given the unfeasibility of an RCT. Currently underway is the large 'Birthplace in England study' which is studying a range of birthplaces and their relation to safety and women's satisfaction and quality of care, transfer systems and cost-effectiveness (National Perinatal Epidemiology Unit (NPEU) 2011). When finished, this study will provide further evidence on the safety of alternative places of birth and contribute to the ongoing debate on this issue.

There is extensive evidence (levels III-2-IV) (NHMRC 2007) supporting homebirth as a safe option for the majority of healthy women at low obstetric risk using cohort or observational studies (Ackermann-Lieblich, Voegeli et al. 1996; Weigers, Keirse et al. 1996; Chamberlain, Wraight et al. 1997; Bastian, Keirse et al. 1998; Janssen, Lee et al. 2002; Johnson and Daviss 2005; Lindgren, Radestad et al. 2008; de Jonge, van der Goes et al. 2009; Hutton, Reitsma et al. 2009; Janssen, Saxell et al. 2009; Symon, Winter et al. 2009; Kennare, Keirse et al. 2010). This review will discuss each of these studies that fit into the inclusion criteria above, and relate them to similar studies (outside of the review criteria).

Although not included in this review, it is important to acknowledge the meta-analysis undertaken into the safety of homebirth (Olsen 1997). This study reviewed international controlled observational studies, comparing perinatal and maternal mortality. Of the six studies that met the inclusion criteria (out of 607 reviewed), none showed any significant differences in outcome between home or hospital birth for low-risk women and perinatal mortality rates between the groups were comparable. However, there were fewer interventions and morbidity in the homebirth group, notably a large reduction in rates of perineal trauma. This began a rigorous review of the global evidence around the safety of homebirth at the time. The next year Olsen and Jewell (1998) undertook a review of their meta-analysis and searched the Cochrane Register for controlled trials that compared home and hospital birth. Only one study by Dowswell et al. (1996) fitted the criteria but was too small to draw any conclusions. The Cochrane Register repeated the search again in 2006, but no new trials were found (Olsen and Jewell 2009).

By far the largest study into homebirth safety was by de Jonge et al. (2009). This retrospective study compared perinatal mortality and severe perinatal morbidity between planned

homebirths and planned hospital births. Set in the Netherlands, the authors studied a nationwide cohort of 529,688 women, spanning seven years. Results showed that planned homebirth in low-risk women was not associated with higher perinatal morbidity or mortality compared to hospital birth provided women had Registered Midwives in attendance and systems of transfer to hospital in place. Similar mortality and morbidity rates in home and hospital birth were found in analyses: both with and without adjustment for the confounding factors of gestational age, maternal age, ethnicity, number of previous children and socio-economic status. There were some missing data in this study, notably paediatric data from non-academic (non-teaching) hospitals, which was acknowledged. It is important to note that midwifery and homebirth in the Netherlands are well integrated into the health care system.

Another large study on the safety of homebirth comes from a prospective cohort study by Johnson and Daviss (2005). This US study compared 5418 women who intended to have a homebirth with 3,360,868 women giving birth in hospital. The main outcomes measures were intrapartum and neonatal mortality, perinatal transfer to hospital care, medical intervention during labour, breastfeeding and maternal satisfaction. Similar to Olsen (2009), the homebirth cohort had significantly less medical intervention (epidural, episiotomy, forceps, vacuum extraction, and caesarean section) - substantially lower than rates of intervention for low risk women having a hospital birth. Perinatal mortality for the homebirth cohort was 2 per 1000 planned homebirths (planned breech births, twins, deaths in utero prior to labour, and babies with fatal birth defects excluded). This was consistent with similar studies of out-of-hospital birth low risk women (Tyson 1991; Duran 1992; Murphy and Fullerton 1998; Schlenzka 1999). However, the homebirth cohort were more highly educated, older and of different ethnicity to the hospital cohort, which may or may not have had a bearing on outcomes.

Two studies by Janssen and colleagues (Janssen, Lee et al. 2002; Janssen, Saxell et al. 2009) have been undertaken in Canada into the safety of homebirth. The most recent, and larger study (Janssen, Saxell et al. 2009) found no increased perinatal mortality among planned home compared to planned hospital birth for low risk women, and significantly less likelihood of neonatal morbidity and low birthweight. The earlier study had similar outcomes in relation to safety, as well as reduced rates of epidurals, inductions, caesarean sections and episiotomies for women who had a homebirth. The strength of these studies relate to the fact that the women having both home and hospital births were attended by the same cohort of midwives, and as such the study was unconfounded by type of caregiver. British Columbia in Canada has a universal health system with fully integrated midwifery care, providing access to home or hospital care for women who fit the low-risk criteria. Also in Canada, the study by Hutton et al. (2009) showed lower rates of maternal morbidity in the planned homebirth group, as well as lower rates of interventions such as caesarean section.

Similar results were found by Ackermann-Liebrich et al (1996). This Swiss study showed favourable outcomes regarding perinatal mortality and morbidity, including lower rates of low birthweight, low apgar scores (<8 at 5 minutes), resuscitation and birth trauma. Unlike the Canadian studies, this study did not have a formal policy of criteria of women who were accepted to have a homebirth, although women's health characteristics and socioeconomic status were matched in each cohort.

In Sweden, a population based study by Lindgren et al. (2008) also found no significant differences in intranatal and neonatal mortality between home and hospital birth. The authors also found less interventions were prevalent in the homebirth group as well as less vaginal tears and sphincter/rectal ruptures. Sweden has a health care system that does not cater to women having a homebirth, hence midwives work in a private capacity and refer to obstetricians if they need to transfer women to hospital. The hospital midwives and obstetrician then usually assume responsibility for the women after transfer. This system has similarities with how privately practicing midwives operate in Australia.

A small number of other studies have shown homebirth appear to show higher rates of perinatal mortality rates amongst homebirths (Crotty, Ramsay et al. 1990; Bastian, Keirse et al. 1998; Pang, Heffelfinger et al. 2002; Symon, Winter et al. 2009). Bastian, Keirse et al. (1998) studied all births notified to Homebirth Australia, a national consumer organization, between 1995-1990 (n=7002). They cited an overall perinatal mortality rate of 7.1 per 1000 planned homebirths which is higher than the estimated rate in Australia of 6 per 1000 (World Health Organisation 2006). The authors conceded that women of low obstetric risk had good outcomes whereas the inclusion of the less favourable outcomes of women with high obstetric risk made this perinatal mortality rate artificially high. The study also partly used a national consumer's association register as a source of data, and any statement regarding cross-checking with government birth statistics was absent. The retrospective method of analysis has also been criticized as the authors may simply have found data to fit their hypothesis and is challenged in terms of data collection, given the numbers of independent midwives who withdrew from the study or refused to submit their data. Despite this, the study was included in this review, as it is the largest study of homebirth in Australia. The authors also suggested that high intervention rates in hospitals and a lack of choice for women with risk associated pregnancies may encourage some women with high risk pregnancies to choose home rather than hospital birth. This can be seen within a context where home birth and hospital birth both carry different risks and offer different benefits to individual women. The study is used consistently by those opposed to homebirth to argue against its safety (Sullivan 1999; RANZCOG, 2008).

In the UK, Symon et al. (2009) compared clinical outcomes of women who had a homebirth with independent midwives to those having hospital births. Similar good outcomes relating to normal birth and rates of perineal trauma were found in the homebirth cohort, as were perinatal mortality rates when women were matched for low-risk status. Similar to Bastian et al. (1998), perinatal mortality rates of women with high risk pregnancies (i.e. multiple pregnancy, breech presentation) were significantly higher.

An important study from South Australia regarding perinatal safety was a population-based study by Kennare et al (2010). The authors found similar rates of perinatal mortality to planned hospital births, but a significantly higher rate of intrapartum death and death from intrapartum asphyxia. These results have wide confidence intervals so should be interpreted with caution. Upon further exploration, the authors determined that factors that changed women's status to that of high risk were responsible for the majority of adverse outcomes. This study, together with Bastian et al. (1998), Symon (2009) and Pang et al (2002) demonstrate the necessity to ensure ongoing risk assessment throughout pregnancy and transfer to hospital care when women's risk status changes to ensure safety.

Transfer to hospital

There is a possibility that women choosing homebirth may need a transfer to hospital care antenatally, during labour or in the postnatal period for unforeseen complications. A number of the reviewed studies above have included transfer rates in their analysis, however further studies will be discussed as they are highly relevant to this issue. As there are relatively few studies that have analysed homebirth transfer rates and their relation to maternal and neonatal morbidity and mortality, all relevant peer-reviewed studies from developed countries published from 1995 were included in this part of the review.

There are many studies that state rates of intrapartum transfer to hospital from a home setting (Anderson and Murphy 1995; Ackermann-Liebrich, Voegeli et al. 1996; Davies, Hey et al. 1996; Ngenda and Khoo 1996; Chamberlain, Wraight et al. 1997; Murphy and Fullerton 1998; Janssen, Lee et al. 2002; Parratt and Johnston 2002; Johnson and Daviss 2005; Lindgren, Hildingsson et al. 2008; Mori, Dougherty et al. 2008; Hutton, Reitsma et al. 2009; McMurtrie, Teate et al. 2009). These are described in Table 1. It is important to note that the outcomes of women and their babies who transfer to hospital during labour will generally compare unfavourably with those not transferred due to the change in risk status of the women.

Table 2 Homebirth studies that include transfer to hospital rates

	Sample size	Intranatal transfer rate	Postnatal transfer rate	Other findings
Anderson and Murphy, 1995, USA	11,788 planned homebirths	8%	ND	Overall antenatal, intranatal and postnatal transfer rate of 15.9%
Ackermann-Liebrich et al. 1996, Switzerland	439 planned homebirths	15.9%	ND	
Davies et al 1996, UK	177 planned homebirths	14%	1% maternal transfer after birth	
Parrat and Johnston, 2002, Australia	440 planned homebirths (included high risk women)	20% (included antenatal transfers)	ND	
Chamberlain et al, 1997, UK	4500 planned homebirths	16% (included 'late pregnancy' transfers)	ND	
Murphy and Fullerton, 1998, USA	1404 planned homebirths	7.7%	0.7% maternal transfer after birth 1.1% neonatal transfer	
Janssen et al, 2002, Canada	862	1.5%	0.9% maternal transfer after birth 0.9% neonatal transfer	Overall antenatal, intranatal and postnatal transfer rate - 21.7%
McMurtrie et al, 2009, Australia	100 planned homebirths	10%	3%	

Johnson and Daviss, 2005, USA	5418 planned homebirths	10.1%	1.3% maternal transfer after birth 0.7% neonatal transfer	
Hutton et al. 2009, Canada	6692	12.5%	1.8% postnatal transfer	
Lindgren et al. 2008, Sweden	1025	ND	ND	Overall antenatal, intranatal and postnatal transfer rate – 12.5%

ND=no data

In Australia, three studies have stated transfer rates of women in a homebirth program (Ngenda and Khoo 1996; Parratt and Johnston 2002; McMurtrie, Catling-Paull et al. 2009). McMurtrie et al. (2009) showed an antenatal transfer rate of 30%, an intranatal rate of 10% and postnatal rate of 3%. This study had a small sample size (n=100) so these figures should be viewed with caution. However, the intrapartum rates in this study are comparable with larger international studies (Murphy and Fullerton 1998; Johnson and Daviss 2005). In Victoria, Parrat and Johnston (2002) reported outcomes of 440 planned homebirths (including high risk women) during a three-year period. This showed a 20% transfer rate that included antenatal transfers, and stated that half the intranatal transfers were due to slow progress in labour.

Larger and higher quality studies from the US and the UK include those by Anderson and Murphy (1995), Chamberlain et al. (1997) and Murphy and Fullerton (1998). Anderson and Murphy studied 11,788 intended homebirths and state the rate of intrapartum transfer was 8%, with an overall antenatal, intranatal and neonatal transfer rate of 15.9%. This study did not analyse the neonatal outcomes of the women who were transferred to hospital, but stated an overall intrapartum/neonatal mortality at 2 per 1000 births, which compares favourably to Australia's overall neonatal mortality rate (3 per 1000 births) (World Health Organisation 2006). Murphy and Fullerton (1998) stated a similar rate of 7.7% intrapartum transfer in their multisite prospective study of 1404 women having planned homebirths. The authors found that a gestational age of 42 weeks or more and the presence of meconium were factors that greatly increased the risk of transfer to hospital and perinatal mortality. Chamberlain et al. (1997), in the UK, states that 16% women were transferred into hospital in late pregnancy or labour. Similar intrapartum transfer

rates have been found by Johnson and Daviss (2005) at 10.1%, and in Canada by Hutton et al. (2009), who stated 12.5%, and Janssen et al. (2009) at 16.5%.

Primigravid women are more likely to be transferred than multigravid women. This has been found by a number of studies (Ackermann-Lieblich, Voegeli et al. 1996; Wieggers, Keirse et al. 1996; Johnson and Daviss 2005; Lindgren, Hildingsson et al. 2008; Hutton, Reitsma et al. 2009). Reasons for transfer differ in each study, although many cite a failure to progress in labour as common (Chamberlain, Wraight et al. 1997; Johnson and Daviss 2005; McMurtrie, Teate et al. 2009). Other common reasons include preterm labour, prolonged rupture of membranes, malpresentation, meconium stained liquor, fetal distress and need for analgesia.

There have been studies that show a higher rate of neonatal morbidity in babies that transfer to hospital during a homebirth (Ngenda and Khoo 1996; Mori, Dougherty et al. 2008; Symon, Winter et al. 2010). Mori et al (2008) used data from all births in a population-based cross-sectional study in England and Wales to study intrapartum-related perinatal mortality (IPPM) rates. The study showed a higher IPPM in babies of mothers who were transferred during labour (6.05 per 1000 births), however did not exclude women who had unintended homebirths from this figure. The authors state that their results should be interpreted with caution due to data inconsistencies. Symon et al. (2010) show 7 perinatal neonatal deaths out of 1462 intended homebirths that occurred during or after intranatal transfer to hospital. These are not elaborated upon as the data for the homebirth cohort surrounding transfer to hospital were limited. Ngenda and Khoo (1996), in an Australian study of 27 women who transferred to hospital during a homebirth show a high rate of neonatal morbidity. The study states that many of the women were resistant to medical help, self-discharged and refused follow-up. These factors are likely indicative of women conceding to hospital transfer at a late stage, which would have contributed to the high rate of morbidity in this study. Also, the higher likelihood of neonatal morbidity was logical due to women's intranatal change in risk status.

There are few studies that relate travel time to hospital to adverse perinatal outcomes in women and babies (Parker, Dickinson et al. 2000; Dummer and Parker 2004; Ravelli, Jager et al. 2010), although these are not related specifically to women having a homebirth. Both large studies by Parker (2000) and Dummer (2004) did not find a significant rise in mortality or stillbirth in relation to proximity to hospital. In contrast Ravelli (2010) did find that a travel time greater than 20 minutes to hospital was associated with greater morbidity in women, neonatal mortality (OR 1.18, 95% CI 1.0–1.4) and adverse outcomes (OR 1.19, 95% CI 1.10–1.30). This study examined 751,926 women in the Netherlands who travelled to hospital in labour, included women of all risk levels, and noted that it was likely that high risk women had further to travel to tertiary centres, which may have had a bearing on the outcome of the study.

In conclusion, it is inevitable that a number of women, despite careful selection for a homebirth, will need to transfer to hospital during their labour for unforeseen circumstances. It is necessary that all women booking for a homebirth and their support partners be given counseling regarding the indicators for intrapartum transfer to hospital, and that transfer is appropriate and measured. Evidence is inconclusive regarding the risk of higher rates of morbidity or mortality in relation to intrapartum transfer to hospital. It seems reasonable to expand women's choice of birth place to include the home setting as there will always be those who choose this option, and some who, in the absence of local homebirth services, will opt to freebirth in order to avoid going to hospital.

It seems evident from the literature that planned home birth is a safe option for women who are at low risk of complications and who receive care from qualified attendants with adequate access to support, advice, referral and transfer mechanisms. There is no evidence that shows an increase of risk of maternal morbidity or mortality in relation to homebirth. There is a lack of homogenous Australian data of maternal and neonatal outcomes in studies of low risk women who plan to have a homebirth.

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