



## Outcomes of Planned Home Birth: An Integrative Review

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Current evidence indicates the critical importance of several factors that contribute to improved perinatal outcomes: a facilitating environment at the place of birth, skilled birth attendance, and the continuum of perinatal care for women and newborns. This level of care is often referred to as “first-level” care, and is most readily provided in birthing centers and primary level health facilities. However, there is a body of evidence that has been compiled over the past several decades that addresses the safety of *planned* home birth, under circumstances that emulate these elements of “first-level” care. These studies demonstrate a remarkable consistency in the generally favorable results of maternal and neonatal outcomes, both over time and among diverse population groups. These outcomes are also favorable when viewed in comparison to various reference groups (birth center births, *planned* hospital births, and vital statistics). These data should influence policy in support of *planned* home birth, including policy that endorses building or sustaining a home birth infrastructure in parallel to the efforts to build capacity for facility-based birth. Such public policy would also be in keeping with the fundamental right of women to have choice in childbirth, particularly when options are equally good. *J Midwifery Womens Health* 2007;52:323–333 © 2007 by the American College of Nurse-Midwives.

**keywords:** health policy, home birth, home childbirth, out-of-hospital birth

### INTRODUCTION

Millennium Development Goals (MDG) were endorsed by 189 countries at the General Assembly of the United Nations in September 2000.<sup>1</sup> Goals 4 and 5 focus on the reduction of mortality for children under the age of 5 and the improvement of maternal health. The targets established are a reduction by two-thirds in the under-5 mortality rate, and a reduction in the maternal mortality ratio by three quarters between 1990 and 2015.

Global analyses of the factors that contribute to the causes of maternal and child morbidity and mortality have been conducted.<sup>2–4</sup> Critical attention has recently been paid to the status of the neonate and the impact that neonatal mortality has on the rate of under-5 child mortality.<sup>5</sup> Studies addressing the maternal intrapartum, immediate postpartum, and neonatal periods have highlighted the importance of the continuum of perinatal care for women and newborns, the health-promoting impact of skilled birth attendance, and the critical importance of a facilitating environment at the place of birth<sup>6–9</sup> wherever that might be . . . in the hospital, out-of-hospital birth center, or the home.

Findings from these studies have been translated into the design and implementation of strategies that could lead to achievement of the MDGs.<sup>10–12</sup> The strategies focus on promoting birth in “first-level” care settings, such as birthing centers and primary level health facilities, where skilled birth providers are more likely to be in attendance.<sup>11</sup> Currently, there are a number of countries in which home birth has been formally incorporated into

the health system infrastructure. Health care policy, in these instances, enables replication of the elements of “first-level” care in the home setting. It is acknowledged that there would be substantial challenges to replicating this infrastructure on a global level.<sup>13</sup>

For this report, we reviewed the body of evidence that has been compiled over the past several decades that addresses the safety of planned home birth, under circumstances that emulate these elements of “first-level” care. The review focuses on outcomes from both retrospective and prospective descriptive studies of home births that were conducted in accord with the “best practice” principles cited above. The evidence is drawn from both published and unpublished studies of planned home births conducted primarily in the United States and in several similarly more-developed international settings.

In these studies, care was provided by skilled attendants (albeit variously defined), and was accomplished within a system that had provided for consultation and referral to higher levels of care for both mother and newborn. The majority of the studies that presented results from individual or group midwifery practices also made reference to the fact that the system of care was designed in recognition and respect of the individual cultural values and preferences for childbirth practices. A number of these studies include a comparison to a reference group, such as unplanned home births, birth centers, and hospital births.

### METHODS

#### Research Design

An integrative review<sup>14</sup> was conducted to summarize the findings of planned home birth studies emulating

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the elements of “first-level” care. A comprehensive literature search was conducted to identify the relevant quantitative studies conducted during the past 40 years. The characteristics of the studies identified and retrieved limited the extent to which quantitative research synthesis<sup>15</sup> could be completed. Therefore, integrative review procedures were followed to summarize the findings of the studies included in this review. The results are summarized in table format.

### Search Strategy

The search strategy focused on home birth studies published in the English language, as well as studies published in other languages with English abstracts that could be reviewed and, if indicated, retrieved for translation. Three indexes (MedLine, Cumulative Index to Nursing and Allied Health Literature, and Hospital Literature Index) were searched manually (from 1965–1980) or via computer (1980–2006). The keywords birth center, childbirth, free-standing birth center, home birth, home childbirth, midwifery, nurse-midwifery, and obstetrics were used in a comprehensive search strategy designed to be over-inclusive, providing the potential to discover additional studies through secondary references. The Internet was also used to search for English language bibliographies on the topic of home birth. The Cochrane Pregnancy and Childbirth Database was reviewed for reports of randomized clinical trials and systematic reviews.

The foreign language literature from 1980 to 2005 was searched on the single keyword “home childbirth.” Twenty-eight foreign-language articles (Danish, Dutch, Finnish, French, German, Japanese, Norwegian, and Swedish) were identified by this keyword. The articles were retrieved and reviewed to determine whether the abstract indicated that data-based outcomes were reported in the article, or if the presence of tabled data suggested that relevant data were being reported. In either case, an attempt was made to retrieve and to translate the article. One of these studies is included in this report.

Three manuscripts were derived from the search for unpublished literature. One study was published in an internal newsletter of a professional organization of direct-entry midwives; two others were unpublished research reports, including one doctoral dissertation. In addition, personal contacts were made by telephone with individuals or organizations involved in advocacy for or

research concerning out-of-hospital birth. These individuals were asked to provide information about studies that might appear in primary or secondary literature sources and unpublished studies.

### Inclusion Criteria

There were certain challenges inherent in selection of the studies for inclusion. A major challenge, and the primary concern with respect to inclusion bias and generalizability of findings, was the issue of group equivalence. Many of the studies that reported outcomes of midwifery practices made reference to a process of screening to determine client eligibility for home birth. However, the details of these eligibility criteria were not provided in all cases, and, in any event, it would not have been possible to determine that the criteria were equivalent or standard. Even criteria such as multiple pregnancy and history of prior cesarean section, mentioned in some, but not all of the reports, were not “standard” criteria for exclusion from eligibility for home birth services. The studies selected for inclusion therefore likely represent a very diverse group of women, if they were evaluated in terms of “risk status.”

The 28 articles that were selected for this review<sup>16–43</sup> each met three explicit criteria: 1) there is specific notation that the births were planned to occur in the home setting; 2) there was a birth provider in attendance; and 3) the report speaks about a referral process, when complications occurred at the time of birth, or in the early postpartum and neonatal period (although the actual incidence or rate may not have been explicitly documented). Five of the six studies selected for inclusion by Olsen<sup>44</sup> in his meta-analysis of the safety of home birth also met inclusion criteria for this report; one is excluded<sup>45</sup> because it was not available for translation from the German language.

Each article was independently reviewed by each of the coauthors to determine whether the three primary criteria for inclusion had been explicitly specified. The articles were also reviewed for independence of the reported information. In two instances, an author had presented similar data in two or more separate articles. The unduplicated information from these reports was combined, and is presented in the tabled data with reference only to the most informative of the related reports.

It is important to note that there is some lack of clarity in several of the articles about the skill of the birth attendant. Each included article explicitly denotes the presence of a birth attendant, but a number of the reports do not always speak to the level of education, or the legal status of the provider. The international definitions of midwife,<sup>46</sup> “skilled attendance,” and the “skilled attendant” were recently promulgated.<sup>47,48</sup> Therefore, studies included in this review include those in which there is an explicit statement that a designated birth attendant (e.g., lay midwife, midwife, nurse, or doctor) was present.

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However, that provider may not have been a “skilled provider” according to the present-day definition. We included these studies because any bias that might be introduced would favor the comparison group (e.g., planned hospital births with skilled attendance).

### Exclusion Criteria

There were a number of reports of planned home birth that were based on information gleaned from birth certificate data. In some, but not all, of these cases, the planned status of the birth could not be confirmed. Moreover, the women in these home-birth groups could not be determined to be similar to the women in the planned home birth cohorts, as there was no information concerning their participation in a program or system of perinatal care.<sup>49–52</sup>

A number of studies were excluded because the information contained in the reports was too limited with respect to the variables selected for this review, or was presented in a fashion that would have required that the abstractors make certain assumptions about the definitions of variables.<sup>53–59</sup> The birth provider was not explicitly documented in one report,<sup>60</sup> and in one often-cited study, documented in two separate reports, it is explicitly noted that births were intentionally not attended.<sup>61,62</sup>

### Outcome Measures

Data abstracted from these 28 studies are depicted in Tables 1 and 2. The two process variables presented in these tables are: 1) evidence the home birth was planned, and 2) documentation that women or newborns were transferred to a higher level of care when indicated. The outcome variables are the broad indicators of maternal and newborn health status customarily reported in other studies of home, birth center, and hospital births, in order to provide a basis for comparison. These included preterm delivery, spontaneous vaginal and operative delivery rates, low birth weight, incidence of maternal death, and the computed perinatal mortality rate (PMR). We deliberately searched for explicit documentation of neonatal mortality, given the very recent raising of consciousness about the contribution of neonatal deaths to the infant mortality rate and the PMR, in both developed and developing nations.<sup>5,12</sup>

### Limitations to the Data

There are several limitations to abstraction and interpretation of the data from these published reports. No study provided data on all of the variables of interest, in part because several of the studies were explicitly focused on a narrower domain of interest (e.g., perinatal mortality). Maternal mortality was not explicitly noted in several of the reports. Although an incidence of no mortality might have been inferred from the tenor of the author’s report,

this outcome was nevertheless documented as “no data” during the abstraction process.

The majority of the reports cited a PMR and the majority also made specific mention of neonatal deaths. Johnson and Daviss<sup>43</sup> include a compilation of combined intrapartum and neonatal mortality rates from home and birth center births in their recent report of a prospective study of home births attended by certified professional midwives. They note, and we concur, that direct comparison of such rates is ill advised because it is very likely that the data for any single study are unstable. For example, the small number of births included in the calculations for some studies results in very large confidence intervals surrounding the reported statistic. Moreover, each study was likely to include or exclude certain considerations when computing a rate for any particular variable and, therefore, the reported rates for any particular variable may represent different definitions of the variable.

Moreover, several of the reports included in this review were limited to the data available through the time of the attendant’s departure from the home, limiting the ability to comment on the incidence of perinatal or neonatal mortality through the 30-day post-birth period (the parameter of the neonatal period). There were too few neonatal deaths from which to extrapolate reliable rate calculations. In addition, the definition of perinatal mortality may have differed between countries during the time these studies were conducted. Specifically, the inclusion of stillbirths and the earliest gestational age included in the definition was not standard in all countries. Therefore, for this, and several additional variables, the reported incidence of an event is noted, rather than a rate.

## FINDINGS

### Maternal Demographic, Intrapartum, and Postpartum Data

White women were almost exclusively represented in these studies, each of which presents outcomes of planned home births that occurred in developed countries. Similarly, a married or partnered status was reported in the majority of cases, across all studies. Women having their second or higher order birth were more likely to have selected the home as a place of birth, although in at least one study<sup>22</sup> the majority of primigravidas were not permitted to make this selection, according to the guidelines established by that provider’s practice. These maternal demographic data are similar to those reported by Rooks<sup>63</sup> in the study of 11,814 birth center births. The level of education of women in the included studies (data not shown) was also characteristic of women from developed nations. No study included more than 24% of women with less than 12 years of education.

An incidence or rate of intrapartum, postpartum, or neonatal transfer is explicitly reported for the majority of studies. There is no sound basis for comparing these figures to other published reports, given that criteria for transfer would vary greatly, given site- (or country-)

Table 1. Study Demographics

Study and Geographic Location	Years of Study	Study Design	Home Birth		Comparison Group		Married or Partnered (%)		Primigravid (%)	
			Intended	Actual	Type	N	HB	Control	HB	Control
Mehl-Madrona and Mehl Madrona, <sup>16</sup> CA and WI, USA	1969–1985	R (5 databases)	1000*	1000	Home	1000	ND	ND	ND	ND
Van Alten et al., <sup>17</sup> the Netherlands	1969–1983	P	7980	5981 <sup>†</sup>	NA	NA	ND	NA	50.1	NA
Durand, <sup>18</sup> TN, USA	1971–1992	R	1707	1707	Hospital	14,033	85	81.8	44.7	37.3
Gulbransen et al., <sup>19</sup> New Zealand	1973–1993	R	9776	9776	NA	NA	ND	NA	ND	NA
Shy et al., <sup>20</sup> WA, USA	1975–1977	R	1614	1614	Hospital	157,868	ND	ND	ND	ND
Koehler et al., <sup>21</sup> CA, USA	1976–1982	P	619	424	NA	NA	ND	NA	49.5	NA
Schneider and Soderstrom, <sup>22</sup> Canada	1976–1986	R/P	285	263	NA	NA	ND	NA	9.1	NA
Crotty et al., <sup>23</sup> Australia	1976–1987	R	799	663	NA	NA	94.5	NA	26.8	NA
Ford et al., <sup>24</sup> London, England	1976–1989	R	277	219	NA	NA	ND	NA	ND	NA
Sullivan and Beeman, <sup>25</sup> AZ, USA	1978–1981	R	1449	1243	NA	NA	ND	NA	33	NA
Shearer, <sup>26</sup> England	1978–1983	P	202	178	Hospital	218	ND	ND	‡	‡
Schramm et al., <sup>27</sup> MO, USA	1978–1984	R	3345	3067	Hospital	525,645	95.1	81.6	ND	ND
White, <sup>28</sup> New Zealand	1980–1981	P	89	73	NA	NA	ND	NA	31.4	NA
Hansen and Christoffersen, <sup>29</sup> Denmark	1980–1982	R	123	73	NA	NA	ND	NA	ND	NA
Acheson et al., <sup>30</sup> Pacific Northwest, USA	1980–1984	P	71	44	BC	510	85	ND	27	39.7
Damstra-Wijmenga, <sup>31</sup> the Netherlands	1981	R	396	308	Hospital	1296	ND	ND	ND	ND
Woodcock et al., <sup>32</sup> Australia	1981–1987	R	995	803	Hospital	142,066	88.4	91	41.2	39.3
Howe, <sup>33</sup> Australia	1983–1986	R	165	142	NA	NA	ND	NA	31	NA
Tyson, <sup>34</sup> Canada	1983–1988	R	1001	1001	NA	NA	92	NA	36	NA
Bastian et al., <sup>35</sup> Australia	1985–1990	R	7002	7002	NA	NA	ND	NA	ND	NA
Booker, <sup>36</sup> CA, USA	1985–1991	R	461	363	NA	NA	ND	NA	ND	NA
Anderson and Greener, <sup>37</sup> TX, USA	1987	P	105	98	NA	NA	72.2	NA	28.7	NA
Anderson and Murphy, <sup>38</sup> USA	1987–1991	R	10,176	10,176	NA	NA	ND	NA	ND	NA
Davies et al., <sup>39</sup> England	1993	P	256	142	NA	NA	ND	NA	ND	NA
Murphy and Fullerton, <sup>40</sup> USA	1994–1995	P	1404	1119	NA	NA	97.6	NA	23.3	NA
Parratt and Johnston, <sup>41</sup> Victoria, Australia	1995–1998	P	440	440	NA	NA	ND	NA	30.0	NA
Janssen et al., <sup>42</sup> BC, Canada	1998–1999	P	862	862	Hospital	743 (MD) 571 (MW)	ND	ND	46.6	48.2 (MD) 58.1 (MW)
Johnson and Daviss, <sup>43</sup> USA and Canada	2000	P	5418	5418	Vital stats	3,360,868	95.4	ND	31.2	40.2

Eight studies explicitly reported ethnicity status, and of these, only two studies (White<sup>28</sup> and Johnson and Daviss<sup>43</sup>) reported greater than 10% to 15% ethnic minorities. BC = birth center; HB = home birth; MD = medical doctor; MW = midwife; ND = no data; NA = not applicable; P = prospective; R = retrospective.

\*These births were selected from aggregate databases totaling 4,261 midwife and 4,107 physician home births.

<sup>†</sup>Some of these women were delivered in a maternity unit (birth center) and data could not be disaggregated.

<sup>‡</sup>Primigravid women were excluded from eligibility for home birth.



specific guidelines for care, and the circumstances of geography, distance from the referral facility, and skill of the attendant. However, where rates are given, the range of intrapartum transfers (7.4%–16.5%) are favorable when compared to the rates reported in United States–based studies from freestanding birth centers (i.e., 12.4%,<sup>63</sup> 20%,<sup>64</sup> 21%,<sup>65</sup> and 25.1%<sup>66</sup>). The fact that transfers are reported is the item of note, in accord with the premise that willingness to transfer, making appropriate prearrangements for that event should the need arise, and then enacting that decision, are elements of a safe home birth plan.

The vast majority of home births were spontaneous vaginal deliveries. Cesarean section rates among women transferred to hospitals range from 1.4% to 17.7% (for primary cesarean sections only) in the various home birth reports. These rates compared to a range of 13.8% to 28.2% (again for primary cesarean sections) in the comparison samples. One study<sup>42</sup> compared the 6.4% rate of cesarean section among the midwife-attended, planned home birth clients to two hospital-based samples, noting that the rate for clients delivered in-hospital by midwives (presumably a clientele at similar “risk status”) was almost twice as high (11.9%).

There was a single maternal death reported in the 14 studies that made an explicit note of this event. That single death (from streptococcal puerperal sepsis on day 7) represented 20 years of cumulative data from the home birth practices of New Zealand registered midwives. Two United States–based studies relied on birth registration data for this information, and were of sufficient sample size to generate the probability of maternal death within the sample. Shy<sup>20</sup> took the step of linking birth and death databases for infants, but not for mothers. Schramm et al.<sup>27</sup> did not report data concerning maternal mortality. These data, although limited, are consistent with the very rare incidence of maternal death reflected in the aggregate results reported by Stotland and Declercq<sup>67</sup> in their review of out-of-hospital (home and free-standing birth center) births. They also cite the single death, noted above, found in the 23 studies included in their review.

### Infant Data

Low birth weight (<2500 g) and preterm birth (<36 completed weeks of gestation) together contribute to 28% of neonatal deaths globally.<sup>5</sup> The studies reported only a very few babies born at a birth weight less than 2500 grams and only a few births at less than 37 weeks’ gestation. The range of 1.4% to 17% preterm labor rate depicted in the table data represents the proportion of women who were transferred out of home birth care precisely because of preterm labor. The babies were, therefore, likely delivered, and may have died in the referral setting, because of low birth weight or some other complication. The tabled data present the overall

incidence of neonatal death in the various studies, in any birth setting. The tabled data do not explicitly depict the incidence or rate of birth of infants of earlier gestational age or of low birth weight (of any gestational age) who may have been born or died in the home setting.

The perinatal mortality rate cited for comparison populations, when available, represents deaths of infants, likely born in referral facilities, at various limits for gestational age (depending on computation formula), or any birth weight. Generally stated, in each instance in which the perinatal mortality rate is compared to a reference or comparison population, the PMR reported for the planned home births in this review is very similar, or even favorable, to the PMR of the reference or comparison population.

### DISCUSSION

It may be important to restate the fundamental principles that underpinned this analysis. These are that planned home birth might be considered a safe option, under circumstances that emulate the elements that have been identified by the World Health Organization<sup>12</sup> as characteristic of “first-level” care, i.e., that the system of care is designed in recognition and respect of the individual cultural values, rituals and preferences for childbirth (in this case, a specific desire to give birth in the home setting), the care is provided by skilled attendants, and care is provided within a system that had provided for consultation and referral to higher levels of care for both mother and newborn (emergency obstetric care).<sup>68</sup>

It may also be important to restate a primary limitation of studies included in this analysis, which is that the birth attendant in the included studies was not necessarily a “skilled attendant” according to the contemporary definition. The current proportion of births attended by skilled attendants, by world geographic region, is presented in Table 3.<sup>69</sup> There is compelling historical evidence that links a reduction in maternal mortality to the presence of a skilled attendant at birth.<sup>12,70</sup> These data serve as the rationale for the present recommendation that women be encouraged to select birth in a health facility, where skilled attendants may be available to provide this care.<sup>71</sup>

However, globally, the majority of births occur in the home setting (as many as 80–95% in several Asian and African countries<sup>12</sup>). Although the studies included in this review under-represent the situation in less-developed countries, the intention of this integrative review was to consider the findings within the context of the recent recommendations for giving birth in “first-level” care facilities. The results of the review may serve to inform the choice of home birth as another option in “first-level” care, under these precise circumstances, wherever that system of health care services can be accommodated.

**Table 2.** Maternal and Neonatal Outcomes: Women Who Began Labor With Intention of a Planned Home Birth

Study and Geographic Location (n of Home Births in Study)	Labor Before 37 Weeks (n or %)		Maternal and Neonatal Transfers from Home to Hospital (n or %)			Spontaneous Vaginal Vertex Delivery (%)	
	HB	Cmp*	IP	PP	Neo	HB	Cmp
Mehl-Madrona, <sup>16</sup> Western USA (1000)	ND	ND	ND	ND	ND	ND	ND
Van Alten, <sup>17</sup> the Netherlands (5981)	4.4	NA	8.0	ND	ND	ND	NA
Durand, <sup>18</sup> TN, USA (1707)	1.5 <sup>†</sup>	5.7	7.4	4.5	ND	97.8	73.4
Gulbransen, <sup>19</sup> New Zealand (9776)	ND	ND	ND	ND	ND	ND	ND
Shy, <sup>20</sup> WA, USA (1614)	ND	ND	‡	ND	ND	ND	ND
Koehler, <sup>21</sup> CA, USA (424)	n = 2	NA	n = 30	n = 6	NA	93.8	NA
Schneider, <sup>22</sup> Canada (263)	n = 1	NA	n = 8	n = 2	n = 1	100	NA
Crotty, <sup>23</sup> Australia (663)	2.3	4.2	n = 88	n = 16	n = 13	89.2	65.0
Ford, <sup>24</sup> London, England (219)	ND	ND	n = 26	n = 4	NA	95	NA
Sullivan and Beeman, <sup>25</sup> AZ, USA (1243)	ND	ND	14	18	5	ND	NA
Shearer, <sup>26</sup> England (178)	ND	ND	n = 7	ND	ND	ND	NA
Schramm, <sup>27</sup> MO, USA (3067)	ND	ND	ND	ND	ND	ND	ND
White, <sup>28</sup> New Zealand (73)	ND	NA	n = 13	n = 3	n = 2	ND	NA
Hansen and Christoffersen, <sup>29</sup> Denmark (73)	ND	ND	n = 29	ND	ND	85.0	NA
Acheson, <sup>30</sup> Pacific Northwest, USA (44)	0.9	2.4	8.1	ND	ND	ND	ND
Damstra-Wijmenga, <sup>31</sup> the Netherlands (308)	1.6	2.3	n = 66	n = 4	ND	ND	ND
Woodcock, <sup>32</sup> Australia (803)	3.2	6.0	n = 142	n = 14	n = 17	88.5	63.7
Howe, <sup>33</sup> Australia (165)	n = 2	NA	n = 22	n = 11	n = 1	NA	NA
Tyson, <sup>34</sup> Canada (1001)	ND	NA	16.5	0.02	n = 5	93.0	NA
Bastian, <sup>35</sup> Australia (7002)	ND	NA	ND	ND	ND	ND	NA
Booker, <sup>36</sup> CA, USA (363)	ND	ND	n = 56	n = 11	n = 8	96.0	NA
Anderson and Greener, <sup>37</sup> TX, USA (98)	n = 4	NA	n = 2	0	0	96.1	NA
Anderson and Murphy, <sup>38</sup> USA (10,176)	17	NA	8.2	0.8	1.0	ND	NA
Davies et al., <sup>39</sup> England (142)	n = 4	NA	n = 18	n = 2	n = 0	93	NA
Murphy and Fullerton, <sup>40</sup> USA (1119)	1.7	NA	8.3	0.8	1.1	99.6	NA
Parratt and Johnston, <sup>41</sup> Victoria, Australia (440)	0.03	NA	11.5	0.02	NA	91.6	NA
Janssen, <sup>42</sup> BC, Canada (862)	ND	ND	16.5	ND	NA	90.4	68.4 (MD) 75.8 (MW)
Johnson and Daviss, <sup>43</sup> USA and Canada (5418)	1.4	ND	10.1	1.3	0.7	ND	ND

*(continued)*

This review of home birth studies does not attempt to provide any definitive answer about the relative safety of home birth. Fundamentally, the ability to address the question is limited. The prospective randomized clinical trial that would be needed to provide that answer would be difficult to implement. Women would likely be unwilling to agree to give birth in a setting determined by random assignment. It would be a challenge to achieve a

sufficiently reliable sample size. The single such randomized study enrolled 11 women.<sup>72,73</sup>

Even if the choices made by pregnant women were not an issue, it would be difficult to identify any geographic setting(s) for the conduct of the study that could be considered sufficiently characteristic so that results could be generalizable. Additionally, the geographic settings that might be considered appropriate for the study might

**Table 2 (Cont'd).** Maternal and Neonatal Outcomes: Women Who Began Labor With Intention of a Planned Home Birth

C-section (%)		Birth Weight <2,500 g (n or %)		Maternal or Neonatal Deaths: HB group (n)		Perinatal Mortality (n or rate per 1,000)	
HB	Cmp	HB	Cmp	Mat	Neo	HB	Cmp
ND	ND	ND	ND	ND	5	14	5
1.4	NA	4.9	ND	ND	39	11.1	14.5
1.46	16.46	3.8	5.8	0	ND	1.0	1.33
ND	ND	ND	ND	1	ND	2.97	2.34
ND	ND	0.58	NA	ND	ND	ND <sup>§</sup>	ND
6.1	NA	NA	ND	0	1	n = 3	NA
0	NA	n = 2	NA	0	2	0.002	NA
5.5	18.8	2.4	5.9	ND	5	2.17	3.4
ND	NA	n = 2	NA	0	ND	n = 1	NA
ND	NA	ND	NA	0	2	ND	NA
0	0	ND	ND	ND	ND	ND	ND
ND	ND	3.4	6.8	ND	n = 17	ND	ND
ND	NA	ND	NA	0	0	ND	ND
n = 4	NA	ND	NA	ND	ND	0	NA
17.7 <sup>¶</sup>	ND	0.5	2.1	ND	ND	n = 10	ND
ND	ND	ND	ND	ND	ND	ND	ND
4.2	13.8	1.9	4.7	ND	n = 5	10.1	9.7
1.2	19	1.8	5.7	ND	n = 1	ND	ND
3.5	NA	ND	NA	0	n = 2	ND	NA
ND	NA	ND	NA	ND	n = 19	n = 50	10.8
5.6	NA	1.5	NA	0	0	7.1	7.7
2.9	NA	0.3	NA	0	0	n = 1	NA
0.3	NA	0.04	NA	0	n = 9	2.2	NA
7.0	NA	0	NA	0	0	n = 1	NA
2.3	NA	n = 4	NA	0	n = 1	4.2	Range: 1.3 – 2.1
0.05	NA	ND	NA	0	n = 1	2.5	ND
6.4	18.2 (MD) 11.9 (MW)	0.8	2.0 (MD) 0.7 (MW)	ND	n = 1 <sup>#</sup>	n = 5	n = 2 (MD) n = 0 (MW)
3.7	Range: 19.0 – 24.0	1.1	2.4	0	6	n = 3	2.0 <sup>#</sup> 1.7

Cmp = comparison group; HB = home birth; IP = intrapartum; Mat = maternal; MD = medical doctor; MW = midwife; NA = not applicable; ND = no data; Neo = neonatal; PP = postpartum.

\*Several studies that did not have a control group (Table 1) did report a comparison with other vital statistic data.

†Statistic cited is birth before 36 weeks.

\*Information on maternal transfers presented by authors cannot be clearly attributed to stage of labor.

§Authors report an infant mortality rate for HB (12.6), birth center (5.1), and hospital (11.8) births for the period 1975–1977.

¶Data are for primary cesarean section only.

#Data exclude neonates born with major congenital anomalies.

**Table 3.** Proportion of Births Conducted by Skilled Attendants, by Global Region

Region/Subregion	% of Births With Skilled Attendant
World Total	61.5
More developed regions	99.1
Less developed regions	57.4
Least developed countries	33.7
Africa	46.7
Eastern Africa	34.5
Middle Africa	54.0
Northern Africa	70.3
Southern Africa	82.8
Western Africa	40.9
Asia	58.3
Eastern Asia	97.0
South-Central Asia	38.9
Western Asia	73.4
Europe	99.1
Eastern Europe	99.2
Northern Europe	99.2
Southern Europe	97.5
Western Europe	99.9
Latin American & the Caribbean	83.2
Caribbean	73.7
Central America	77.3
South America	86.8
Northern America	98.9
Oceania	83.9
Australia/New Zealand	100.0
Melanesia	61.2
Micronesia	93.9
Polynesia	97.6

\*Source: World Health Organization, Department of Reproductive Health and Research, 2006.<sup>68</sup>

be further limited if the number of skilled attendants who provide services in the home setting is not sufficient to provide services to the number of women who would comprise the study sample.

There is evidence that, when given the choice of birth settings, women make decisions about the preferred site of birth based on their perception of the quality of care provided in the various settings.<sup>7,74</sup> There is other evidence that suggests that facility-based births may be more accessible only to the wealthier segments of the population.<sup>75,76</sup> Even when birthing services are provided free of charge, expenses related to transportation, food, and supplies might be incurred by families. Nevertheless, there is also evidence that women are willing to pay out-of-pocket when possible to ensure that their preferred choice (whether home or hospital) is available to them.<sup>77</sup>

There is also recognition of the fact that the universal adoption of facility-based births may lead to unintended and undesirable consequences. The incidence of caesarean section has risen in the United States and in other developed and developing countries.<sup>78,79</sup> The increase has been attributed to increasing demand for elective caesarean birth<sup>80,81</sup> and changes in financial access to this service.<sup>82,83</sup> These higher caesarean section rates have

been associated with an increase in maternal<sup>84</sup> and fetal mortality rates and a higher rate of admission to neonatal intensive care units.<sup>85</sup> Use of other obstetric interventions is also more likely when births occur in facilities.<sup>86</sup> In other words, when higher levels of care and/or technological services are available, the tendency is to use the available services,<sup>6</sup> and there is some evidence of economic incentives to do so.<sup>87</sup>

There is also compelling evidence that companionship in birth leads to improved birth outcomes and satisfaction.<sup>88</sup> This premise is supported by inquiries among women who were interested in choosing a home birth were that option available to them. Factors associated with interest in home birth included the wish to have other family members present (including siblings),<sup>89</sup> and the perception of greater participation in decision-making about and control of the birth environment.<sup>8,90,91</sup> However, there is both anecdotal and empirical evidence from developing countries that notes the inverse relationship between facility-based births and the encouragement or facilitation of the presence of a birth companion. There is also less likelihood that cherished family or birth traditions would be accommodated in those settings.<sup>92</sup>

## CONCLUSION AND POLICY CONSIDERATION

There has been increasing emphasis in the global community on promoting facility-based births in the interest of increasing the proportion of births attended by a skilled provider, the two strategies that have been proven to have substantial impact in reducing global rates of maternal and neonatal mortality. The public discourse concerning this policy shift<sup>93</sup> should include a reflection on the models of home-based birth care, specifically when those models emulate the components of “first-level” care. Public discourse should also include consideration of the adverse impacts of enforcing a universal policy of facility-based births.

Reports of home birth studies that reflected these elements of “first-level” care conducted over 4 decades demonstrate results of maternal and neonatal outcomes that are generally favorable when viewed in comparison to diverse reference groups (birth center births, planned hospital births, and vital statistics). These data should, at a minimum, compel policy consideration of sustaining similar infrastructure, where it presently exists, or for building this capacity in parallel to the efforts to build capacity for facility-based birth. Such public policy would also be in keeping with the fundamental right of women to have choice in childbirth, particularly when options are equally good.<sup>94</sup>

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## REFERENCES

1. United Nations Web site. The Millenium Development Goals. Available from: [www.un.org/millenniumgoals/](http://www.un.org/millenniumgoals/) [Accessed February 27, 2007].



2. Khan K, Wojdyla D, Say L, Gülmezoglu AM, Van Look PFA. WHO analysis of causes of maternal death: A systematic review. *Lancet* 2006;367:1066–74.
3. World Health Organization. Strategy to accelerate progress towards the attainment of international development goals and targets related to reproductive health. *Reprod Health Matters* 2005; 13:11–8.
4. United Nations Web site. Department of Economic and Social Affairs. The World's Women 2005: Progress in statistics. Available from: <http://unstats.un.org/unsd/demographic/products/indwm/wwwpub.htm> [Accessed February 27, 2007].
5. Lawn J, Lancet Neonatal Survival Series Team. Executive summary: The problem of newborn death. *Lancet* 2005;365:1–5.
6. Kornelsen J. Essences and imperatives: An investigation of technology in childbirth. *Soc Sci Med* 2005;61:1495–504.
7. Matthews Z, Ramakrishna J, Mahendra S, Kilaru A, Ganapathy S. Birth rights and rituals in rural south India: Care seeking in the intrapartum period. *J Biosoc Sci* 2005;37:385–411.
8. Janssen P, Carty E, Reime B. Satisfaction with planned place of birth among midwifery clients in British Columbia. *J Midwifery Womens Health* 2006;51:91–7.
9. Lindgren H, Hildingsson I, Rådestad I. A Swedish interview study: Parents' assessment of risks in home births. *Midwifery* 2006;22:15–22.
10. Ronsmans C, Graham W. Maternal mortality: Who, when, where, and why. *Lancet* 2006;368:1189–200.
11. Campbell O, Graham W. Strategies for reducing maternal mortality: Getting on with what works. *Lancet* 2006;368:1284–99.
12. World Health Organization Web site. The World Health Report 2005. Make every mother and child count. Available from: [www.un.org/Pubs/chronicle/2005/issue3/0305p65.html](http://www.un.org/Pubs/chronicle/2005/issue3/0305p65.html) [Accessed February 27, 2007].
13. Costello A, Azad K, Barnett S. An alternative strategy to reduce maternal mortality. *Lancet* 2006;368:1477–9.
14. Whittemore R. The integrative review: Updated methodology. *J Adv Nurs* 2005;52:546–53.
15. Cooper H, Hedges L. The handbook of research synthesis. New York: Russell Sage Foundation; 1994.
16. Mehl-Madrona L, Mehl Madrona M. Physician- and midwife-attended home births. Effects of breech, twin, and post-dates outcome data on mortality rates. *J Nurse Midwifery* 1997;42:91–8.
17. Van Alten D, Eskes M, Treffers PE. Midwifery in the Netherlands. The Wormerveer study: Selection, mode of delivery, perinatal mortality, and infant morbidity. *Br J Obstet Gynaecol* 1989;96:656–62.
18. Durand AM. The safety of home birth: The Farm study. *Am J Public Health* 1992;82:450–3.
19. Gulbransen G, Hilton J, McKay L, Cox A. Home birth in New Zealand 1973–93: Incidence and mortality. *N Z Med J* 1997;110:87–9.
20. Shy KK, Frost F, Ullom J. Out of hospital delivery in Washington State: 1975–1977. *Am J Obstet Gynecol* 1980;137: 547–52.
21. Koehler NU, Solomon DA, Murphy M. Outcomes of a rural Sonoma County home birth practice: 1976–1982. *Birth* 1984;11:165–9.
22. Schneider G, Soderstrom B. Analysis of 275 planned home births and 10 unplanned home births. *Can Fam Physician* 1987; 33:1163–71.
23. Crotty M, Ramsay AT, Smart R, Chan A. Planned home-births for Southern Australia 1976–1987. *Med J Aust* 1990;153: 664–71.
24. Ford C, Iliffe S, Franklin O. Outcome of planned home births in an inner city practice. *Br Med J* 1991;303:1517–9.
25. Sullivan DA, Beeman R. Four years' experience with home birth by licensed midwives in Arizona. *Am J Public Health* 1983; 73:641–5.
26. Shearer JML. Five year prospective survey of risk of booking for home birth in Essex. *Br Med J* 1985;291:1478–80.
27. Schramm WF, Barnes DE, Bakewell JM. Neonatal mortality in Missouri home births, 1978–1984. *Am J Public Health* 1987; 77:930–5.
28. White S. Planned home birth in Auckland. *N Z Nurs Forum* 1981;10:4–7.
29. Hansen J, Christoffersen C. Home delivery in the Municipality of Copenhagen in 1980–1982. I. Obstetric data [in Danish]. *Ugeskr Laeger* 1985;147:2873–5.
30. Acheson LS, Harris SE, Zyzanski ST. Patient selection and outcomes for out-of-hospital births in one family practice. *J Fam Pract* 1990;21:128–36.
31. Damstra-Wijmenga SM. Home confinement: The positive results in Holland. *J R Coll Gen Pract* 1984;34:425–30.
32. Woodcock HC, Read AW, Bower C, Stanley FJ, Moore DJ. A matched cohort study of planned home and hospital births in Western Australia 1981–1987. *Midwifery* 1994;10:125–35.
33. Howe KA. Home births in south-west Australia. *Med J Aust* 1988;149:296–7, 300, 302.
34. Tyson H. Outcomes of 1001 midwife-attended home births in Toronto, 1983–1988. *Birth* 1991;18:14–9.
35. Bastian J, Keirse MJ, Lancaster PA. Perinatal death associated with planned home birth in Australia: Population based study. *Br Med J* 1998;317:384–8.
36. Booker G. A study of 461 midwife-managed births in California. Sacramento, CA: California Association of Midwives; 1991.
37. Anderson R, Greener D. Descriptive analysis of home births attended by CNMs in two nurse-midwifery services. *J Nurse Midwifery* 1991;36:95–103.
38. Anderson R, Murphy P. Outcomes of 11,788 planned home births attended by certified nurse-midwives. *J Nurse Midwifery* 1995;40:483–92.
39. Davies J, Hey E, Reid W, Young G. Prospective regional study of planned home births. *Br Med J* 1996;313:1302–6.
40. Murphy P, Fullerton J. Outcomes of intended home births in nurse-midwifery practice: A prospective descriptive study. *Obstet Gynecol* 1998;92:461–70.

41. Parratt J, Johnston J. Planned homebirths in Victoria, 1995–1998. *Aust J Midwifery* 2002;15:16–25.
42. Janssen P, Lee S, Ryan E, Etches D, Farquharson D, Peacock D, et al. Outcomes of planned home births versus planned hospital births after regulation of midwifery in British Columbia. *Can Med Assoc J* 2002;166:315–23.
43. Johnson K, Daviss B. Outcomes of planned home births with certified professional midwives: Large prospective study in North America. *Br Med J* 2005;330:1416–22.
44. Olsen O. Meta-analysis of the safety of home birth. *Birth* 1997;24:4–16.
45. Ackermann-Liebrich U, Guenter-Witt K, Zuelling M, Kunz I, Voegel T. Comparing home to hospital deliveries: Recruitment, referrals and neonatal outcome. *Soz Praventivmed* 1994;39:28.
46. International Confederation of Midwives. Definition of the midwife. Available from: [www.internationalmidwife.org](http://www.internationalmidwife.org) [Accessed February 27, 2007].
47. International Confederation of Midwives, World Health Organization, International Federation of Obstetricians and Gynecologists. Definition of the skilled attendant. Available from: [www.who.int/reproductive-health/mpr/attendants.html](http://www.who.int/reproductive-health/mpr/attendants.html) [Accessed February 27, 2007].
48. World Health Organization Web site. Making pregnancy safer: The critical role of the skilled attendant. A joint statement by WHO, ICM and FIGO. 2004. Available from: [www.who.int/reproductive-health/global\\_monitoring/skilled\\_attendant.html](http://www.who.int/reproductive-health/global_monitoring/skilled_attendant.html) [Accessed February 27, 2007].
49. Burnett C, Jones J, Rooks J, Chen C, Tyler C, Miller CA. Home delivery and neonatal mortality in North Carolina. *JAMA* 1980;244:2741–5.
50. Hines MW, Bergeisen G, Allen D. Neonatal outcome in planned vs unplanned out-of-hospital births in Kentucky. *JAMA* 1985;253:1578–82.
51. Bateman DA, O'Bryan L, Nicholas SW, Heagarty MC. Outcome of unattended out-of-hospital births in Harlem. *Arch Pediatr Adolesc Med* 1994;148:147–52.
52. Pang J, Heffelfinger J, Huang G, Benedetti T, Weiss N. Outcomes of planned home births in Washington State: 1989–1996. *Obstet Gynecol* 2002;100:253–9.
53. Janssen P, Holt V, Myers S. Licensed midwife-attended, out-of-hospital births in Washington state: Are they safe? *Birth* 1994;21:141–8.
54. Campbell R, Davies I, MacFarlane A, Beral V. Home births in England and Wales, 1979: Perinatal mortality according to intended place of delivery. *Br Med J* 1984;289:721–4.
55. Parazzini F, La Vecchia C. Perinatal and infant mortality rates and place of birth in Italy, 1980. *Am J Public Health* 1988;78:706–7.
56. Cole S, MacFarlane A. Safety and place of birth in Scotland. *J Public Health Med* 1995;17:17–24.
57. Wieggers TA, Keirse MJNC, van der Zee J, Berghs GAH. Outcome of planned home and hospital births in low risk pregnancies: Prospective study in midwifery practices in the Netherlands. *Br Med J* 1996;313:1309–13.
58. Simmons R, Bernstein S. Out-of-hospital births in Michigan, 1972–1979: Trends and implications for the safety of planned home deliveries. *Public Health Rep* 1983;98:161–70.
59. Schneider D. Planned out-of-hospital births, New Jersey, 1978–1990. *Soc Sci Med* 1986;23:1011–5.
60. Abernathy T, Lentjes D. Planned and unplanned home births and hospital births in Calgary, Alberta, 1984–1987. *Pub Health Rep* 1989;104:373–7.
61. Kaunitz AM, Spence C, Danielson TS, Rochat RW, Grimes DA. Perinatal and maternal mortality in a religious group avoiding obstetric care. *Am J Obstet Gynecol* 1984;150:826–31.
62. Spence C, Danielson TS, Kaunitz A. The Faith Assembly: A study of perinatal and maternal mortality. *Indiana Med* 1984;180–4.
63. Rooks JP, Weatherby NL, Ernst EK, Stapleton S, Rosen D, Rosenfield A. Outcomes of care in birth centers. The National Birth Center Study. *N Engl J Med* 1989;321:1804–11.
64. Garite TJ, Snell BJ, Walker DL, Karrow VC. Development and experience of a university-based, freestanding birthing center. *Obstet Gynecol* 1995;86:411–6.
65. Scupholme A, McLeod AG, Robertson EG. A birth center affiliated with the tertiary care center: Comparison of outcome. *Obstet Gynecol* 1986;67:598–603.
66. Fullerton J, Jackson D, Snell BJ, Besser M, Dickinson C, Garite T. Transfer rates from freestanding birth centers. A comparison with the National Birth Center Study. *J Nurse Midwifery* 1997;42:9–16.
67. Stotland N, Declercq E. Safety of out-of-hospital birth in industrialized nations: A review. *Curr Probl Obstet Gynecol* 2002;25:134–44.
68. Paxton A, Maine D, Freedman L, Fry D, Lobis S. The evidence for emergency obstetric care. *Int J Gynaecol Obstet* 2005;88:181–93.
69. World Health Organization Web site. Factsheet: Skilled attendant at birth 2006 updates. Available from: [www.who.int/reproductive-health/global\\_monitoring/skilled\\_attendant\\_at\\_birth2006.pdf](http://www.who.int/reproductive-health/global_monitoring/skilled_attendant_at_birth2006.pdf) [Accessed February 27, 2007].
70. Save the Children Web site. State of the World's Mothers 2006: Saving the lives of mothers and newborns. Available from: [www.savethechildren.org/publications/SOWM\\_2006\\_final.pdf?stationpub=000000&ArticleID=&NewsID](http://www.savethechildren.org/publications/SOWM_2006_final.pdf?stationpub=000000&ArticleID=&NewsID) [Accessed January 11, 2007].
71. Filippi V, Ronsmans C, Campbell O, Graham W, Mills A, Borghi J, et al. Maternal health in poor countries: The broader context and a call for action. *Lancet* 2006;368:1535–41.
72. Dowswell T, Thornton JG, Hewison J, Lilford RJL. Should there be a trial of home versus hospital delivery in the United Kingdom? *Br Med J* 1996;312:753–7.
73. Olsen O, Jewell MD. Home versus hospital birth. *Cochrane Database Syst Rev* 1998;3:CD000352.
74. Longworth L, Ratcliffe J, Boulton M. Investigating women's preferences for intrapartum care: Home versus hospital births. *Health Soc Care Community* 2001;9:404–13.
75. Chowdhury M, Ronsmans C, Killewa J, Anwar I, Gausia K, Das-Gupta S, et al. Equity in use of home-based or facility-based skilled obstetric care in rural Bangladesh: An observational study. *Lancet* 2006;367:327–32.

76. Borghi J, Ensor T, Neupane BD, Tiwari S. Financial implications of skilled attendance at delivery in Nepal. *Trop Med Int Health* 2006;11:228–37.
77. Duong DV, Lee A, Binns C. Measuring preferences for delivery services in rural Vietnam. *Birth* 2005;32:194–202.
78. Meikle SF, Steiner CA, Zhang J, Lawrence WL. A national estimate of the elective primary cesarean delivery rate. *Obstet Gynecol* 2005;105:751–6.
79. Elvedi-Gasparović V, Klepac-Pulnaić T, Peter B. Maternal and fetal outcome in elective versus emergency caesarean section in a developing country. *Coll Antropol* 2006;30:113–8.
80. Plante LA. Public health implications of cesarean on demand. *Obstet Gynecol Surv* 2006;61:807–15.
81. Druzin ML, El-Sayed YY. Cesarean delivery on maternal request: Wise use of finite resources? A view from the trenches. *Semin Perinatol* 2006;30:305–8.
82. Tsia Y, Hu T. National health insurance, physician financial incentives, and primary cesarean deliveries in Taiwan. *Am J Public Health* 2002;92:1514–7.
83. Turcotte L, Robst J, Polachek S. Medicaid coverage and medical interventions during pregnancy. *Int J Health Care Finance Econ* 2005;5:255–71.
84. Deneux-Tharoux C, Carmona E, Bouvier-Colle MH, Bréart G. Postpartum maternal mortality and cesarean delivery. *Obstet Gynecol* 2006;108(3 Pt 1):541–8.
85. Villar J, Valladares E, Zavaleta N, Carroli G, Velazco A, Shah A, et al. Caesarean delivery rates and pregnancy outcomes: The 2005 WHO global survey on maternal and perinatal health in Latin America. *Lancet* 2006;367:1819–29.
86. Van Der Hulst LA, Van Teijlingen ER, Bonsel GJ, Eskes M, Bleker OP. Does a pregnant women's intended place of birth influence her attitudes toward and occurrence of obstetric interventions? *Birth* 2004;31:28–33.
87. Sakala C. Midwifery care and out-of-hospital birth settings: How do they reduce unnecessary cesarean section births? *Soc Sci Med* 1993;37:1233–50.
88. Hodnett ED, Gates S, Hofmeyr GJ, Sakala C. Continuous support for women during childbirth. *Cochrane Database Syst Rev* 2003;3:CD003766.
89. Hildingsson I, Walderström U, Rådestad I. Swedish women's interest in home birth and in-hospital birth center care. *Birth* 2003;30:11–22.
90. Viisainen K. Negotiating control and meaning: Home birth as a self-constructed choice in Finland. *Soc Sci Med* 2001;52:1109–21.
91. Pettersson K, Christensson K, Gomes de Freitas E, Johansson E. Adaptation of health care seeking behavior during childbirth: Focus group discussions with women living in the suburban areas of Luanda, Angola. *Health Care Women Int* 2004;25:255–80.
92. Blum L, Sharmin T, Ronsmans C. Attending home vs. clinic-based deliveries: Perspectives of skilled birth attendants in Matlab, Bangladesh. *Reprod Health Matters* 2006;14:51–60.
93. Ross J, Begala J. Measures of strength for maternal health programs in 55 developing countries: The MNPI study. *Matern Child Health J* 2005;9:59–70.
94. Hafner-Eaton C, Pearce L. Birth choices, the law and medicine: Balancing individual freedoms and protection of the public's health. *J Health Polit Policy Law* 1994;19:813–35.

