

Economic Implications of Home Births and Birth Centers: A Structured Review

Jane Henderson, MSc, and Stavros Petrou, PhD

ABSTRACT: Background: It is widely perceived that home births and birth centers may help decrease the costs of maternity care for women with uncomplicated pregnancies and deliveries. This structured review examines the literature relating to the economic implications of home births and birth center care compared with hospital maternity care. **Methods:** The bibliographic databases MEDLINE (from 1950), CINAHL (from 1982), EMBASE (from 1980), and an “in-house” database, Econ2, were searched for relevant English language publications using MeSH and free text terms. Data were extracted with respect to the study design, inclusion criteria, clinical and cost results, and details of what was included in the cost calculations. **Results:** Eleven studies were included from the United Kingdom, United States, Australia, and Canada. Two studies focused on home births versus other forms and locations of care, whereas nine focused on birth centers versus other forms and locations of care. Resource use was generally lower for women cared for at home and in birth centers due to lower rates of intervention, shorter lengths of stay, or both. However, this fact did not always translate into lower costs because, in the U.K. where many studies were conducted, more midwives of a higher grade were employed to manage the birth centers than are usually employed in maternity units, and because of costs of converting existing facilities into delivery rooms. The quality of much of the literature was poor, although no studies were excluded for this reason. Selection bias was likely to be a problem in those studies not based on randomized controlled trials because, even where birth center eligibility was applied throughout, women who choose to deliver at home or in a birth center are likely to be different in terms of expectations and approach from women choosing to deliver in hospital. **Conclusions:** This review highlights the paucity of economic literature relating to home births and birth centers. Differences in results between studies may be attributed to differences in health care systems, differences in methods used, and differences in costs included. Further economic research that involves detailed bottom-up costing of alternative options for place of birth and measures multiple outcomes, including women’s preferences, would help address the question of whether out-of-hospital birth is beneficial in economic terms. (BIRTH 35:2 June 2008)

Key words: birthing centers, home childbirth, delivery rooms, economics

Jane Henderson is a Researcher in Health Economics and Stavros Petrou is a Health Economist at the National Perinatal Epidemiology Unit, University of Oxford, Oxford, United Kingdom.

The National Perinatal Epidemiology Unit, University of Oxford, is funded by the Department of Health, London, United Kingdom. All views expressed in this paper are those of the authors and do not necessarily represent those of the Department of Health.

Address correspondence to Stavros Petrou, PhD, National Perinatal Epidemiology Unit, University of Oxford (Old Road Campus), Oxford OX3 7LF, UK.

Accepted November 8, 2007

© 2008, Copyright the Authors
Journal compilation © 2008, Wiley Periodicals, Inc.

Since the highly medicalized paradigm of maternity care prevalent in the 1970s and 1980s, views have shifted in favor of a less interventionist approach that allows women more choice over various aspects of their care, including place of birth (1–3). The options for place of birth include home births, birth centers either within a hospital or freestanding, and conventional maternity care in hospital. In the United Kingdom, the issue of choice has become highly political. Recent government documents have stated that by 2009, all women should have a choice, depending on their preferences and circumstances, of having their baby at home, in a local facility cared for by

a midwife, or in a hospital under the care of a full medical team (3,4).

Several clinical studies have examined the outcomes of care in birth centers and at home compared with hospital care. They have been of mixed quality but generally reported no significant increase in maternal or neonatal morbidity; less use of analgesia; less need for augmentation in labor, for operative delivery or suturing; and greatly increased satisfaction with care in birth centers and at home (5–7). A recent Cochrane systematic review of care allocated to a homelike setting or hospital, however, found a nonstatistically significant trend toward higher perinatal mortality in the homelike setting (8). In contrast, a large population-based study including all births in Australia between 1999 and 2002 reported a significantly lower perinatal mortality rate in birth centers compared with those delivered in hospital. Selection bias could not be ruled out in the Australian study, and the authors concluded that further research was necessary (9).

It is widely perceived that home births and birth centers may help decrease the costs of maternity care among women with uncomplicated pregnancies and deliveries (10,11). This perception is based on the premise that women delivering at home or in birth centers are cared for by midwives (certified nurse-midwives in the United States) rather than by more highly paid obstetricians and that women have fewer interventions and thus use fewer resources than women cared for in hospital.

In this review, studies that have examined the economic implications of home birth or birth centers are compared and critically evaluated to assess the factors that may influence the costs and cost-effectiveness of alternative places of birth.

Methods

A structured review of the literature in this area was conducted in June 2007 using MEDLINE (from 1950), CINAHL (from 1982), EMBASE (from 1980), and an “in-house” database, Econ2, which is a compilation of perinatal health economic literature (including unpublished material) accumulated by health economists at the National Perinatal Epidemiology Unit, University of Oxford, over several decades. The “gray” literature (doctoral and master’s theses, conference proceedings, etc.) was not searched. The search strategy applied to all electronic databases included all minor and major topics covered by any one of the following MeSH terms “Birthing-Centers,” “Delivery-Rooms,” “Midwifery,” “Home-Childbirth,” or “Hospitals-Maternity,” or the free text terms “birth* adj cent*” or “midwife?led unit” in combination with all minor

and major topics covered by the MeSH term “Economics” or the free text terms “cost,” “financ*,” or “resourc*” (where “*” allows for any other characters and “?” allows for any other single character). Inclusion in this review was limited to papers relating to industrialized and first world countries, and for pragmatic reasons, searches were limited to the English language literature. Papers relating to general practitioner-led units, in which care in labor was principally provided by general practitioners, were not included in the review since this form of care is now very unusual throughout the industrialized world (12). Due to the small number of relevant studies, no quality criteria were applied.

The titles, MeSH terms, and abstracts of the 201 papers resulting from the search were read by the authors and 18 relevant papers retrieved. The bibliographies of papers were also scanned for relevant material. Six studies that provided information about resource use but did not describe costs were excluded. Twelve papers describing 11 studies were included in this review. They were read and data extracted by the first author. Data were extracted about the study design, inclusion criteria, clinical and cost results, and details of what was included in the cost or cost-effectiveness calculations. The results are presented descriptively; no meta-analysis was attempted due to the heterogeneity of the studies.

Results

The results are summarized in Table 1, giving details of each study in alphabetical order of first author.

Home Births versus Other Forms and Locations of Care

No randomized controlled trials of home birth and only two observational studies that included an economic analysis have been conducted. These studies did not use specific eligibility criteria, but, generally, women choosing a home birth were at low risk of complications. The first of these studies was based on data collected for the 1994 National Birthday Trust Fund Survey in the U.K. (13). This prospective study included data on 4,191 planned home births, 3,470 planned hospital births, and 806 women who planned to have a home birth but delivered in hospital. The overall response rate to joining the study was 61 percent, and therefore, response bias may exist if, for example, outcomes were better where midwives were more enthusiastic and more likely to want to take part in the study. Unit costs extracted from the literature were applied to antenatal, intrapartum, and

Table 1. Summary Table of Literature Relating to Economic Implications of Home Births and Birth Centers

Author, Year, and Country	Study Type and Number	Comparison and Geographical Coverage	Inclusion Criteria	Clinical Results (If Included)	Cost and Cost-Effectiveness Results	What was Included in the Costs?	Comment
Anderson and Anderson, 1999 (14), USA	Costs associated with 11,718 home births and 11,592 hospital births	Intended home births 1987-1991 vs hospital births; across USA	Low-risk (undefined) mothers with uncomplicated births	No clinical comparisons made	Average charge in 1991: home \$1,711, hospital \$5,382	Charges by CNMs for home births from survey and by obstetricians for hospital births from literature; included cost for transfer	Survey of CNMs for information on charges for home births: 71% response rate; likely to be selection bias
Byrne et al, 2000 (6), Australia	Cost study integrated into RCT; 200 women randomized, 100 in each arm	BC consisting of 2 rooms close to conventional delivery suite vs conventional care; Adelaide, Australia	Normal, uncomplicated pregnancies presenting to AN clinic before 31 wk	67% transferred from BC to conventional care, no differences in clinical outcomes	"Cost-modeling approach"; actual costs unspecified, but no differences were found	Resource use from case notes, midwives estimated time necessary for procedures; excluded infrastructure costs	Only 23% of eligible women agreed to be randomized, study underpowered
Henderson and Mugford, 1997 (13), UK	Cohort study: 1994 National Birthday Trust Fund—4,191 planned home births, 3,470 planned hospital births, 806 booked for home but delivered in hospital	Women booked for a home birth at 37 wk compared with matched control group of women booked for hospital birth; across UK	None	Equivalent clinical outcomes, higher satisfaction in the home birth group, 15% transferred to hospital	Costs to National Health Service per delivery: home £205, hospital £332, home booked but hospital delivered £405 (1994 prices)	Unit costs from literature applied to AN, IP, and PN resource use	Overall response rate of 61%, so possibility of response bias and selection bias; Unplanned home birth estimated £100 per delivery but increased stillbirth and neonatal death rate
Hundley et al, 1995 (18), UK	Cost analysis based on findings of RCT, RCT 2,844 women	5 rooms in separate unit adjacent to labor ward run by MWs vs consultant-led care; Aberdeen, Scotland	Low obstetric risk, i.e., excluding existing maternal disease, infertility, complicated obstetric history, height < 150 cm or age > 35 yr	No significant differences in fetal outcome or mode of delivery, but less epidural analgesia and CTG monitoring in MW unit	Extra cost of MW unit £41 per woman, ranging from - £10 to + £44 (1992/1993 prices)	Staff, consumables, capital, conversion, and overheads	MW unit only cost saving in scenarios that excluded cost of extra staff and building conversion costs
Lubic, 1983 (17), USA	Examination of accounts of Maternity Center Association	Freestanding childbearing center vs hospital care; geographical coverage of childbearing center not stated	Births in New York hospitals vs childbearing center	No clinical comparisons made	Obstetric fees in New York ranged from \$2,250 to \$5,000 (from <i>New York Times</i> 1980) vs \$1,275 for childbearing center in 1982	Hospital costs not clear; childbearing center costs included salaries, supplies, contracted services, and overheads	Not a valid comparison—hospital costs include more complicated cases; different price years; not clear what is included in hospital costs

(continued)

Table 1. *Continued*

<i>Author, Year, and Country</i>	<i>Study Type and Number</i>	<i>Comparison and Geographical Coverage</i>	<i>Inclusion Criteria</i>	<i>Clinical Results (If Included)</i>	<i>Cost and Cost-Effectiveness Results</i>	<i>What was Included in the Costs?</i>	<i>Comment</i>
Ratcliffe, 2003 (24), UK	Bottom-up costing study; n = BC 35, home 26, hospitals 68	Freestanding BC vs home births vs 2 hospitals; North West Thames Regional Health Authority (as was)	All women fitted (unspecified) criteria for BC	Hospital births had higher rates of induction, epidurals, assisted delivery, and suturing; 3 of 26 women booked to deliver at home transferred for complications; none of the BC women required transfer	Inpatient costs: BC £297, home £194, hospital 1: £424, hospital 2: £428; PN costs: BC £392, home £217, hospital 1: £609, hospital 2: £636 (1999–2000 prices)	Unit costs from finance departments 1999–2000; included type and duration of delivery, staffing, consumables, equipment, investigations, interventions, drugs, transfers, PN admissions, and length of stay; excluded capital costs in baseline analysis	When capital costs were included in the analysis, BC costs increased by 59%, hospital costs increased by 53%; induction and assisted delivery available in BC; likely to be selection bias
Reinharz et al, 2000 (23), Canada	Costing done alongside observational study; 1,000 women who delivered in BCs 1995–1996 matched with 1,000 women giving birth in hospital	Care by MW in local community services center vs physician care in hospital; 7 pilot projects in Quebec	Low-risk women; 134 specific exclusion criteria	BC care was associated with increased satisfaction, less intervention, a reduction in cesarean section and severe perineal injury, and fewer preterm and low-birthweight babies, but a trend toward a higher stillbirth ratio and more frequent neonatal resuscitation	Total direct costs in the midwifery group Can\$2,294 (range \$2,062–\$2,930), in hospital group Can\$3,020 (range \$3,016–\$3,027) (price year not stated)	Resource use from hospital files, costs from physician billing data, average salaries for staff, fees for other services, and minimum wage for women and family	The intervention was not standardized and evolved over time; data collected in 7 centers; costs close and overlapping in 4 of them; problems of access to physician clients; likely to be selection bias
Stone and Walker, 1995 (19), USA; Walker and Stone, 1996 (20), USA	Decision analytic model	Freestanding BC vs hospital care; across USA	Low-risk women (variously defined)	Data from literature review, principally National Birth Center Study; complications categorized as “major” or “minor.” Crude utilities derived using Delphi technique	Mean cost per delivery: BC \$3,385, hospital \$4,673 (price year not stated)	Patient charges, finance managers; practitioner fees, hotel and ambulance charges, building lease, and equipment	Used patient DRG-based charges; method for deriving utilities not stated; sensitivity analysis suggests that BC dominant for transfer rates up to 62%; likely to be selection bias

(continued)

Table 1. Continued

Author, Year, and Country	Study Type and Number	Comparison and Geographical Coverage	Inclusion Criteria	Clinical Results (If Included)	Cost and Cost-Effectiveness Results	What was Included in the Costs?	Comment
Stone et al, 2000 (11), USA	Quasi-experimental: 69 BC, 77 hospital; New York	Freestanding BC, care provided by CNMs vs hospital care provided by physicians	Eligibility assessed using 65-item instrument at 34–36 wk. English literate	Increased rates of intact perineae, breastfeeding at 6 wk and satisfaction in BC group	Mean cost of maternity care: BC \$6,087, hospital \$6,803 (not significantly different); mean IP costs: BC \$4,257, hospital \$5,729 ($p < 0.01$) (1996 prices)	Fixed and variable costs from BC, hospital and physician practices	Some costs based on billing reports; sensitivity analysis suggests that higher throughput in the BC would decrease costs significantly; likely to be selection bias
Walker and Stone, 1996 (20), USA	Quasi-experimental: 75 women purposefully selected to obtain representative sample of outcomes	Freestanding BC care provided by CNMs vs women's clinic care by various staff vs traditional obstetric practice; New York	BC eligibility as defined in Stone et al, (1998) applied throughout	Women in the BC had significantly less uterine monitoring, IV fluids, and episiotomies, and shorter lengths of stay	Professional fees for prenatal care and delivery were the following: BC \$1,076, clinic \$1,658, hospital \$2,228 (price year not stated)	Fixed and variable costs from BC, hospital, and physician practices	Not clear how many women in each group; costing based on DRG-based charges; likely to be selection bias
Young et al, 1997 (21), UK	Costing study based on RCT; $n = 648$ in midwifery care, 651 in traditional care	MW-managed care in designated home birth rooms in hospital vs traditional hospital care, 1993–1994; Glasgow, Scotland	Women experiencing normal, healthy pregnancy	Midwifery care associated with fewer AN visits and admissions, fewer inductions and PN checks, and increased satisfaction	Assuming a caseload of 29 women per MW, no significant differences in costs AN or IP exist, but mean PN care costs were £497 in midwifery group vs £397 in traditional group (price year not stated)	Resource use data collected included AN visits, day care attendances, AN admissions, tests and drugs, mode of delivery, PN stay, and PN checks. Costs of capital assets not included, except for equipment for fetal monitoring	Costing based on incomplete samples ranging from 59% to 100%. Only 34% of midwifery group stayed in this group, others transferred temporarily or permanently (analysis by intention to treat); if caseload increased to 39 women per MW, PN care costs still significantly greater in midwifery group

AN = antenatal; BC = birth center; CNM = certified nurse-midwife; CTG = cardiotocograph; DRG = diagnosis-related group; IP = intrapartum; IV = intravenous; MW = midwife; PN = postnatal; RCT = randomized controlled trial.

postnatal resource use values including equipment and transfers. Health service costs were £205, £332, and £405 per delivery (at 1994 price levels) for planned home births, planned hospital births, and booked home but hospital-delivered births, respectively; differences were mainly due to the daily hospital costs and transfer costs (13).

The other study relating to the economic implications of home births, published in 1999, was from the U.S. (14). In this study, certified nurse-midwife charges for 11,788 planned home births occurring between 1987 and 1991 were compared with obstetrician charges for 11,592 hospital births from two earlier studies (15,16). The response rate to the certified nurse-midwife survey was 71 percent, and so bias is, again, a possibility. Mean charges for home births in 1998 prices were \$1,823 per delivery compared with mean hospital charges in 1991 prices of \$5,382 per delivery. If the hospital charge was inflated for comparative purposes to 1998 prices, it would be approximately \$7,481.

Both these studies are likely to be subject to selection bias since women who opt for a home birth are not representative of the general population. Interpretation therefore must be cautious. However, it is probable that health service resource use is less in home births than in hospital births, certainly in terms of "hotel" costs (accommodation, catering, and overhead costs).

A further consideration is the perspective of the analyses. Henderson and Mugford (13) noted that partners of women having home births took more time off work (before the recent introduction of paternity leave entitlements in the U.K.). Some women also hired or bought a birth pool and paid for an independent midwife or complementary therapist. If these costs had been included in the analyses, the differences in costs between home and hospital births would be considerably reduced.

Birth Centers versus Other Forms and Locations of Care

Nine studies (reported in 10 papers) have considered the economic implications of birth centers (6,11,17–24). Three studies were economic evaluations based on randomized controlled trials (6,18,21), one (reported in two publications) was based on decision analytic modeling (19,20), and five were essentially costing studies (11,16,22–24). All studies were restricted to women at low risk of complications, although this was defined in different ways.

In the first of the randomized controlled trials, the costs of intrapartum care in a midwife-managed deliv-

ery unit and a consultant-led labor ward were compared from a hospital perspective (18). This facility was not a freestanding birth center but, rather, consisted of five "homely" rooms 20 yards from the delivery suite. It was staffed by hospital midwives who circulated from the delivery suite, but additional higher grade midwives were employed to manage it. The study included 2,844 women and found no differences in maternal or fetal outcomes in women or their babies delivered at the midwifery unit compared with the labor ward. Length of labor and length of postnatal stay were similar in both groups, but a small reduction occurred in the use of epidural analgesia and continuous tocographic monitoring. Costs of equipment and consumables were also slightly less in the midwifery unit. Overall, care in the midwifery unit increased costs by £41 per woman (at 1992/1993 prices) due to increased midwifery staff costs. In a range of sensitivity analyses, the only scenario that showed the midwifery unit being cost saving was when additional staff and building conversion costs were excluded.

The other Scottish randomized controlled trial that included an economic analysis recruited 648 women to the midwifery group and 651 to traditional shared care in 1993 to 1994 (21). As with the earlier Scottish trial (18), the midwifery group delivered in designated birth rooms within the hospital. Whereas the earlier trial was limited to intrapartum care, this study also included antenatal and postnatal care. A relatively high proportion of women were transferred either temporarily or permanently out of the midwifery care group (33% each), mostly for clinical reasons. Analysis was by intention to treat. Women receiving midwifery care had fewer antenatal and postnatal visits, fewer antenatal admissions, and fewer inductions of labor. They also expressed greater satisfaction with care. Costing was based on variable samples of women for whom full information was available, ranging from 59 to 100 percent of the total number of women. However, these samples were considered representative with respect to baseline characteristics and resource use. Based on a median caseload of 29 women per midwife, costs were not significantly different between the two groups antenatally or intrapartum, but postnatally costs were higher in the midwifery group. Overall, costs were £497 per woman in the midwifery group and £397 per woman in the group receiving traditional care. This difference was due to the higher grade of midwives employed in the midwifery group, their hospital postnatal care being in a small dedicated ward, and postnatal visits being made in the woman's home rather than the health center clinics. The size of the caseload was also an important factor. Median caseload would have to be

increased to greater than 39 women per midwife for midwifery care to be cost neutral.

The Canadian randomized controlled trial recruited 200 women who were randomized between birth center care and delivery suite care (6). The birth center consisted of two rooms close to the delivery suite with a "homelike" environment. Of the 100 women randomized to birth center care, 67 were transferred to the delivery suite for clinical reasons. No significant differences in outcomes were evident, although women thought that breastfeeding was encouraged more in the birth center. Resource use data were derived from case note review, but it is not clear from the data provided what unit costs were applied. No significant differences in costs are reported, but absolute costs are not specified. The study was underpowered because only 23 percent of eligible women agreed to be randomized.

Stone and Walker (1995) (19) used a decision analytic model to examine the cost-effectiveness of a freestanding birth center care compared with hospital care. They used outcome data from the literature, principally the National Birth Center Study, which had attempted to collect data from all birth centers in the U.S. (25). Crude health utilities (cardinal measures of health that reflect preferences for different forms of care (26)), which were focused on appropriateness of place of birth, were derived using a "Delphi technique." The birth centers generally provided antenatal and intrapartum diagnostic and treatment facilities for women requiring a postnatal stay of less than 24 hours; care was mostly provided by certified nurse-midwives. Sixteen percent of women booked for birth center care were transferred to hospital. Rates of cesarean section and serious complications (defined as maternal and infant outcomes best managed in hospital) were higher in the hospital group, whereas rates of minor complications were higher in the birth center group. The authors reported that the mean cost per labor and delivery was \$3,385 for birth center care and \$4,673 for hospital care (price year not stated). This difference mainly reflected the higher "hotel" costs in hospital. The authors found overall costs sensitive to variations in transfer rates, with birth center care being less costly with transfer rates of up to 62 percent. The health utilities focused on appropriateness of place of birth were anchored at 1.0 for uncomplicated births at a birth center. In the overall cost-effectiveness analysis, birth centers were dominant in health economic terms, being both more appropriate for low-risk women and less costly.

The same authors also carried out an observational study in Rochester, New York, comparing structures, processes, and charges for care in a birth center staffed by certified nurse-midwives, a women's clinic com-

bined with hospital care, and traditional obstetric practice with hospital care (20). The total sample size was 75 women, implied to be 25 in each group. The study was conducted retrospectively with the women purposefully selected to obtain a representative sample of outcomes and using the birth center eligibility criteria throughout. Women in birth centers had significantly less uterine monitoring, intravenous fluids, and episiotomies, and shorter lengths of postnatal stay than those in the hospital group. In both these studies, costs were approximated by the use of diagnosis-related group reimbursement rates or charges (19,20). In this study (19), birth center costs were \$1,076 per woman compared with \$1,658 in the clinic and \$2,228 in the hospital (price date not stated). This result was mainly due to staffing differences, fewer interventions, and shorter duration of postnatal stay in the birth center.

A further prospective observational study by the same authors (11,20) examined the cost per delivery in a freestanding birth center predominantly staffed by certified nurse-midwives compared with traditional hospital care. Eligibility was assessed at 34 to 36 weeks of pregnancy and was applied equally to those in hospital care. This study included 146 women, and charges were again used as a proxy for costs. Clinical outcomes were similar, except for significantly increased rates of intact perineum, breastfeeding at 6 weeks, and satisfaction in the birth center. Mean total charges were not significantly different at \$6,087 per delivery in the birth center and \$6,803 in hospital (price date not stated), but mean inpatient charges were significantly less in the birth center at \$4,257 compared with \$5,729 in the hospital. The sensitivity analysis suggested that the birth center could be more cost-effective with a higher throughput (11).

An observational study conducted in Canada examined the cost per delivery of midwifery services in a birth center compared with medical services in Quebec (23). In 1995 to 1996, 1,000 women were recruited to midwifery care and were matched, after delivery, according to several sociodemographic characteristics, with 1,000 women delivered in hospital. Midwifery care was provided in local community services centers separate from hospitals. It was associated with significantly lower rates of cesarean section, perineal tears, and neonatal ventilation. Women also considered their care more "individualized." Resource use data were collected from medical records, questionnaires, and budget allocation supplemented by expert opinion. Unit costs were obtained from a variety of official sources. Baseline costs were Can\$2,294 per delivery for midwifery care compared with Can\$3,020 per delivery for physician care (price year not stated). The cost ranges were very

close and overlapped in the sensitivity analyses. This project was part of a series of seven pilot projects, summarized in this paper (23). Three of the pilot projects had results similar to those mentioned above, whereas four found no difference in costs. In cases where differences in cost were found, they were mainly due to differences in staffing and length of stay. A limitation of this study was that the seven pilot projects had variations in practice that evolved over time.

Two other costing studies were conducted in the U.S. (17) and U.K. (24). The first was an examination of the accounts of the Maternity Center Association, which was compared with an article in the *New York Times* reporting obstetric fees in New York hospitals. Costs in the childbearing center were approximately half those in hospital (\$1,275 in 1982 vs \$2,250–\$5,000 in 1980). However, this study had significant limitations, principally the differences in case mix, the hospitals having included more complicated cases. In addition, the costing methods were unclear with respect to the birth center and nonexistent for the hospital comparison, and they also related to different years (1980 and 1982, respectively).

The other costing study was, by contrast, a detailed bottom-up study of inpatient and postnatal costs of births in women's homes, in the Edgware Birth Center, and in Barnet Hospital and Northwick Park Hospital in London, U.K. (24). Data were extracted from the St. Mary's Maternity Information System, and most of the unit costs were from the Finance Department of Barnet Health in north London. All women (35 from the birth center, 26 from home births, 33 from Barnet Hospital, and 35 from Northwick Park Hospital) fitted the eligibility criteria for the birth center, but women delivering in hospital had higher intervention rates than those delivering at home or in the birth center. Three women who had intended to have a home birth needed to be transferred to hospital, but none of those booked at the birth center needed transfer. Costs for inpatient care were £297 at the birth center, £194 for a home birth, and £424 and £428 for the two hospitals (price year 1999–2000). Postnatal costs were £392, £217, £609, and £636, respectively. This birth center was unusual in offering induction and assisted delivery, so these results may not be directly comparable with those in other studies. As with other studies that were not based on randomized controlled trials, the results may be subject to selection bias.

Discussion

This review is limited by the pragmatic decision to include only English language–developed country lit-

erature without examining the gray literature. Nevertheless, some consistent findings have emerged.

Home Births

For women at low risk of complications, home birth is likely to be a cost-effective option because fewer resources are used, in particular, hotel costs do not arise. The literature on the costs of home birth is sparse, and difficulties in interpretation arise because of the probability of selection bias. The availability of midwives may be a constraining factor where midwives are in short supply. Whereas in hospital, a midwife may, if necessary, care for more than one woman in labor, at a home birth, this would not be possible. Similarly, a second midwife normally needs to be available at the birth in case both mother and baby need attention, whereas in hospital, the midwife could be called when the birth is imminent, this plan is less easy if the second midwife is busy some distance away. However, in the U.K., home births are often attended by community midwives on average salary scales (rather than the higher salaries that tend to be paid to midwives managing birth centers (18,21)), so the higher salary costs per individual midwife associated with birth center care may not be an important factor in explaining overall cost differences between different options for place of birth.

Birth Centers

The economic literature relating to birth center care is of mixed quality and produced somewhat contradictory results; in some studies, birth centers were dominant, producing improved outcomes at lower costs (11,19); in other studies, they were associated with equivalent outcomes at higher cost (18,21). The difficulties in summarizing the economic literature in this area fall into three categories: the differences in interventions being examined, the differences in the costs included, and the probability of selection bias in the nonrandomized studies. Some of the birth centers were freestanding (6,11,19), whereas others had dedicated rooms or wards in the hospital (17,21), some of which had been given a "homely" appearance (21). All the schemes were managed by midwives, but some also included doctors. Rates of transfer from the birth center to hospital care were not always reported.

The costing studies based on observational or quasi-experimental designs that were carried out in the U.S. and Canada all examined the economic implications of freestanding birth centers (11,17,19,20,22,23). The Scottish and Australian randomized controlled trials (6,18,21) focused on birth centers or delivery rooms in

hospital. The studies with nonrandomized designs generally reported improved outcomes with birth center care, whereas the midwife-managed delivery rooms in the three randomized controlled trials reported no differences in major outcomes. Despite matching in one study (23), the observational studies were likely to be affected by selection bias. Women who opt for care in a birth center are not likely to be representative of the wider population. The difference in results may therefore be due to differences in experimental design (randomized controlled trial or observational), differences in intervention (freestanding or nonfreestanding birth center), or differences in costing methods.

In one study, it was not at all clear what features were included in the costs (17), and where they were reported, what was included varied. Most of the studies appeared to include direct resource use and staff time, but some also included equipment costs, and in one, building conversion costs (18). All the U.S. studies were based on hospital or birth center charges, fees, or diagnosis-related group reimbursement rates (11,14,17,19,20). However, charges may not be an accurate reflection of opportunity costs because costs in one area may be used to offset costs in another area, or may include elements arising from corporate financial decisions. Studies that costed the alternative services in greatest detail reported higher costs associated with birth centers than hospital care (18,21,24). In the studies from the U.S. that reported birth center costs as lower than hospital costs, care in birth centers staffed by certified nurse-midwives was compared with hospital care by obstetricians (11,13,16,18,19). In other countries, such as the U.K., hospital care is primarily delivered by midwives, with obstetricians available for women with complex needs (18,21,24).

Economic Evaluation

Economic evaluation has developed as an approach within health care, with the purpose of maximizing health benefits or other measures of social welfare with the finite resources available (26). Economic evaluations should be based on robust data; have clarity of purpose, perspective, and time horizon; and include rigorous costing methods and accurate reporting (26). Many of the studies included in this review purported to report cost-effectiveness results. However, the term tended to be used very loosely with the studies generally only reporting cost per delivery without reference to the outcomes of care (17–19,22). Several alternative outcome measures could be considered within an economic evaluation framework, including clinical morbidity outcomes and psychosocial measures for the purposes of cost-effectiveness

analysis, health utilities for the purposes of cost-utility analysis, or values derived from the willingness-to-pay approach and stated preference discrete choice experiments for the purpose of cost-benefit analysis (26). A review of alternative approaches to outcomes measurement that have developed from economic theory and that can be applied in this clinical context has been published elsewhere (27).

Perspective

Almost all the studies took a narrow health service or health insurance perspective without considering the wider costs to women and their families or wider costs to society. In one of the studies of the economic implications of home births (13), the partners of women having a home birth took more time off work than partners of those having a hospital birth. Now that paternity leave is more widely available in the U.K. and in other industrialized countries, differences in time off work may no longer occur, but little evidence is available on this issue. Similarly, after an uncomplicated birth, women are generally discharged earlier from birth centers than from hospital (24), suggesting that cost shifting from the health care practitioner to the family may be occurring.

Other Factors

It is likely that where midwife-led schemes have been successful, key enthusiastic individuals have been important factors. If such schemes were widely adopted, this level of innovative enthusiasm may become diluted. Furthermore, some evidence shows that midwives working in new schemes experience higher rates of occupational burnout (28).

Both home birth and midwife-managed schemes require more midwives, higher grade midwives, or both. With midwives already in short supply in the U.K. and other developed nations, it may be difficult to make home births and birth center care more widely available. Transfer of midwives from hospital to community care may be possible on a small scale, but, generally, only low-risk women are considered eligible for these forms of care, so hospital maternity care would have to be maintained on a substantial scale. Nevertheless, incrementally, home and birth center care could increasingly be made available, given the lack of adverse effect clinically and improved satisfaction with care.

Future Research

A new research study, Birthplace, funded by the Department of Health in England, is designed to

compare outcomes of birth in different settings. Comparisons will be made among planned home births, different types of midwifery unit, and hospital units with obstetric services. The program of research will focus on well-being, safety, and quality; women's experience of care; and the process of transfer from planned place of birth. In addition, an economic component of the Birthplace study will use decision analytic modeling techniques to synthesize evidence from primary and secondary sources using the most recently developed techniques (29) with the view to estimating the cost-effectiveness of alternative forms of care. Results of the study will become available from 2010 (see <http://www.npeu.ox.ac.uk/birthplace>).

Conclusions

This review highlights the paucity of economic literature relating to home births and birth centers. For women at low risk of complications, home birth is likely to be a cost-effective option because fewer resources are used; in particular, hotel costs do not arise. However, only two studies were found that examined the economic implications of home birth. Economic studies relating to birth centers produced mixed results. Some reported that outcomes in birth centers were better than in hospitals and costs were lower, whereas other studies reported that outcomes in birth centers were not significantly different from standard hospital care and costs were higher. Differences in results among studies may be attributed to differences in health care systems, differences in methods used, and differences in costs included. Further economic research that involves detailed bottom-up costing of alternative options for place of birth and measures multiple outcomes, including women's preferences, would help address the question of whether out-of-hospital birth is beneficial in economic terms.

References

- Campbell R, Macfarlane AJ. *Where to Be Born? The Debate and the Evidence*. 2nd ed. Oxford, UK: National Perinatal Epidemiology Unit, 1994.
- Hall J. Free standing maternity units in England. In: Kirkham M, ed. *Birth Centres*. Cheshire, UK: Books for Midwives Press, 2003: 3–10.
- Department of Health. *Maternity Matters: Choice, Access and Continuity of Care in a Safe Service*. Accessed February 8, 2007. Available at: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_073312.
- Department of Health. *National Service Framework for Children, Young People and Maternity Services. Standard 11: Maternity Services*. London, UK: TSO, 2004.
- Chamberlain G, Wraight A, Crowley P. *Home Births: The Report of the 1994 Confidential Enquiry by the National Birthday Trust Fund*. London, UK: Parthenon, 1997.
- Byrne JP, Crowther CA, Moss JR. A randomised controlled trial comparing birthing centre care with delivery suite care in Adelaide, Australia. *Aust NZ J Obstet Gynaecol* 2000;40: 268–274.
- Walsh D, Downe SM. Outcomes of free-standing, midwife-led birth centres: A structured review. *Birth* 2004;31:222–229.
- Hodnett ED, Downe S, Edwards N, Walsh D. Home-like versus conventional institutional settings for birth (Cochrane Review). In: *The Cochrane Library*, Issue 3. Oxford, UK: Update Software, 2005.
- Tracy SK, Dahlin H, Caplice S, et al. Birth centers in Australia: A national population-based study of perinatal mortality associated with giving birth in a birth center. *Birth* 2007;34:194–201.
- Spitzer MC. Birth centers. Economy, safety and empowerment. *J Nurse Midwifery* 1995;40:371–375.
- Stone PW, Zwangziger J, Hinton PH, Buenting J. Economic analysis of two models of low risk maternity care: A freestanding birth center compared to traditional care. *Res Nurs Health* 2000;23:279–289.
- Smith LF, Jewell D. Roles of midwives and general practitioners in hospital intrapartum care, England and Wales, 1988. *BMJ* 1991;303(6815):1443–1444.
- Henderson J, Mugford M. An economic evaluation of home births. In: Chamberlain G, Wraight A, Crowley P, eds. *Home Births: The Report of the 1994 Confidential Enquiry by the National Birthday Trust Fund*. London, UK: Parthenon, 1997:191–211.
- Anderson RE, Anderson DA. The cost-effectiveness of home birth. *J Nurse Midwifery* 1999;44:30–35.
- Mushinski M. Average charges for uncomplicated vaginal, caesarean and VBAC deliveries: Regional variations, United States, 1996. *Stat Bull Metrop Insur Co* 1998;79(3):17–28.
- Health Insurance Association of America. *Source Book of Health Insurance Data*. Washington, DC: HIAA, 1991.
- Lubic RW. Childbirthing centers: Delivering more for less. *Am J Nurs* 1983;293:1053–1057.
- Hundley V, Donaldson C, Lang GD, et al. Costs of intrapartum care in a midwife-managed delivery unit and a consultant-led labour ward. *Midwifery* 1995;11(3):103–109.
- Stone PW, Walker PH. Cost-effectiveness analysis: Birth center vs. hospital care. *Nurs Economics* 1995;13(5):299–308.
- Walker P, Stone P. Exploring cost and quality: Community based versus traditional hospital delivery. *J Health Care Finance* 1996;23:23–41.
- Young D, Lees A, Twaddle S. The costs to the NHS of maternity care: midwife-managed vs. shared. *Br J Midwifery* 1997;5(8):465–471.
- Stone PW. Maternity care outcomes: Assessing a nursing model of care for low risk pregnancy. *Outcomes Manag Nurs Pract* 1998;2:71–75.
- Reinharz D, Blais R, Fraser WD, Contandriopoulos AP. Cost-effectiveness of midwifery services vs. medical services in Quebec. *Can J Public Health* 2000;91(1):1–13.
- Ratcliffe J. The economic implications of the Edgware birth centre. In: Kirkham M, ed. *Birth Centres*. Cheshire, UK: Books for Midwives Press, 2003:131–139.
- Rooks J, Weatherby N, Ernst E, et al. Outcomes of care in birth centers: The National Birth Center Study. *N Engl J Med* 1989;21:1804–1811.
- Drummond MF, Sculpher MJ, Torrance GW, et al. *Methods for the Economic Evaluation of Health Care Programmes*. 3rd ed. Oxford, UK: Oxford University Press, 2005.

27. Petrou S, Henderson J. Preference-based approaches to measuring the benefits of perinatal care. *Birth* 2003;30(4): 217–226.
28. Sandall J. Occupational burnout in midwives: New ways of working and the relationship between organisational factors and psychological health and wellbeing. *Risk Decision Policy* 1998;3:213–232.
29. National Institute for Health and Clinical Excellence. Guide to the Methods of Technology Appraisal. London, UK: Author, 2004. Accessed June 2007. Available at: <http://www.nice.nhs.uk>.