Traditional birth attendant training for improving health behaviours and pregnancy outcomes (Review)

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Traditional birth attendant training for improving health behaviours and pregnancy outcomes

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ABSTRACT

Background

Between the 1970s and 1990s, the World Health Organization promoted traditional birth attendant (TBA) training as one strategy to reduce maternal and neonatal mortality. To date, evidence in support of TBA training remains limited and conflicting.

Objectives

To assess effects of TBA training on health behaviours and pregnancy outcomes.

Search strategy

For this update, we searched the Trials Registers of the Cochrane Pregnancy and Childbirth Group and Cochrane Effective Practice and Organisation of Care Group (EPOC) (June 2008).

Selection criteria

Published and unpublished randomized controlled trials (RCT), controlled before/after and interrupted time series studies comparing trained and untrained TBAs or women cared for/living in areas served by TBAs.

Data collection and analysis

Three authors independently assessed study quality and extracted data.

Main results

Four studies, involving over 2000 TBAs and nearly 27,000 women, are included. One cluster-randomized trial found significantly lower rates in the intervention group regarding stillbirths (adjusted OR 0.69, 95% confidence interval (CI) 0.57 to 0.83, P < 0.001), perinatal death rate (adjusted OR 0.70, 95% CI 0.59 to 0.83, P < 0.001) and neonatal death rate (adjusted OR 0.71, 95% CI 0.61 to 0.82, P < 0.001). Maternal death rate was lower but not significant (adjusted OR 0.74, 95% CI 0.45 to 1.22, P = 0.24) while referral

rates were significantly higher (adjusted OR 1.50, 95% CI 1.18 to 1.90, P < 0.001). A controlled before/after study among women who were referred to a health service found perinatal deaths decreased in both intervention and control groups with no significant difference between groups (OR 1.02, 95% CI 0.59 to 1.76, P = 0.95). Similarly, the mean number of monthly referrals did not differ between groups (P = 0.321). One RCT found a significant difference in advice about introduction of complementary foods (OR 2.07, 95% CI 1.10 to 3.90, P = 0.02) but no significant difference for immediate feeding of colostrum (OR 1.37, 95% CI 0.62 to 3.03, P = 0.44). Another RCT found no significant differences in frequency of postpartum haemorrhage (OR 0.94, 95% CI 0.76 to 1.17, P = 0.60) among women cared for by trained versus TBAs.

Authors' conclusions

The potential of TBA training to reduce peri-neonatal mortality is promising when combined with improved health services. However, the number of studies meeting the inclusion criteria is insufficient to provide the evidence base needed to establish training effectiveness.

PLAIN LANGUAGE SUMMARY

Traditional birth attendant training for improving health behaviours and pregnancy outcomes

In the developing world, many women give birth at home assisted by family members or traditional birth attendants (TBAs). TBAs lack formal training and governments and other organizations have conducted training programs to improve their skills. There is disagreement that these training programs are effective. This review included four studies and examined the effect of TBA training on TBA behaviour and on pregnancy outcomes. We conclude that the potential of TBA training to decrease newborn death is promising, when combined with improved health services. The number of studies, however, is insufficient to provide the necessary evidence for TBA training effectiveness.

BACKGROUND

The World Health Organization (WHO) (WHO 1992) defines a traditional birth attendant (TBA) as a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or through an apprenticeship to other TBAs. Individual TBAs and their roles vary. However, certain characteristics are commonly seen across continents and regions (Fortney 1997a). TBAs tend to be older women, respected in the community for their knowledge and experience. They are often non-literate and have learned their skills through older more experienced TBAs. They may work independently, in collaboration with an individual provider or facility or they may be integrated into the health system. Their role may include, in addition to birth attendance, bathing and massage, domestic chores, and provision of care during the later postpartum or postnatal period. TBAs may perform other roles depending on local custom, their own interests and expertise. The number of births TBAs attend each year ranges from a few births to as many as 120 births per year. Typically, TBAs attract clients by reputation and word-of-mouth. Usually they receive some remuneration for their services. Today, TBAs remain an important provider of maternity care in developing countries. Secondary analysis of the 1995 to 1999 Demographic Health Surveys (Measure 2002) found that TBAs (trained and untrained) assisted at 24% of 200,633 live births (ranging from less than 1% to 66%) in 44 developing countries representing five regions of the world. Reporting on attendance at birth does not clearly distinguish between a TBA, a family TBA (one who has been designated by an extended family to attend births only in that family) or relative who occasionally attends birth. When these categories are combined, TBAs, relatives and others assisted at 43% of all live births, ranging from less than 1% to 89% of live births. Up to 12% of births are unassisted in some settings (Sibley 2004a).

Approximately 529,000 women die each year from causes related to childbearing, mostly in developing countries. Almost 80% of deaths are due to direct obstetric causes including severe bleeding (haemorrhage), infection, complications of unsafe abortion, eclampsia, and obstructed labour. For every woman who dies, many more women suffer from disease and disability at the height of their productivity and family responsibility (AbouZahr 1998; AbouZahr 2003). In addition, nearly four million newborns die before their first month of life from infection, asphyxia and trauma, complications of prematurity and low birthweight, as well as congenital anomalies. An equal number are stillborn (SaveChildren 2001). During the 1970s through to the 1990s, the World Health Organization promoted training of TBAs as a major public health strategy to reduce this tragic and preventable loss of life. Yet, after more than three decades of experience, the evidence to support TBA training has been limited and conflicting. The impact of

TBAs on maternal and neonatal mortality is uncertain, fuelling a continuing debate over the cost-effectiveness of TBA training in relation to the global Safe Motherhood Initiative (Bang 1994; Bang 1999; Bergstrom 2001; Fortney 1997a; Kumar 1998; Levitt 1997; Maine 1992, Maine 1993; Rahman 1982; Sibley 2004a; Starrs 1998; Tinker 1993; UNICEF1997; WHO 1992).

According to the WHO (WHO 1992), a trained TBA is any TBA who has received a short course of training through the modern health sector to upgrade her skills. The broad goals of TBA training are to reduce maternal and child morbidity and mortality and to improve the reproductive health of women. Objectives include enhancing linkages between modern healthcare services and the community, increasing the number of TBA attended births, and improving TBA skills and stature. Training programs differ considerably in the way in which they address these objectives (Fortney 1997a). TBAs are trained by individuals, non-governmental organizations and missions, as well as by local, state and national governments. The training programs range from very basic to quite elaborate and may last from several days to several months. They may, but often do not, include clinical practice at a referral facility. They may, but sometimes do not, include continued contact with trained TBAs through supervision and further education. The content of TBA training also varies but usually includes performance of hygenic deliveries and cord care and use of appropriate techniques for delivery of the placenta to prevent immediate postpartum haemorrhage. Consistent with the emphasis on extending the reach of primary health care, however, many TBAs are also trained to take on expanded functions focusing on prevention, screening and referral. Usually TBAs are not trained to provide initial management for major maternal and neonatal complications such as postpartum haemorrhage or birth asphyxia (Sibley 2004c). Moreover, TBAs typically practice in resource-poor environments where access to and availability of quality emergency obstetric care are severely constrained. Thus, their ability to impact maternal and neonatal mortality is limited.

Rigorous evaluation of TBA training is methodologically and logistically challenging. The distinction between a trained TBA and an untrained TBA may be blurred because untrained TBAs are exposed frequently to biomedical concepts and practices. Moreover, TBA training is often one component of comprehensive interventions, for example, community mobilization and upgrading of referral facilities. Both behavioural and health outcomes such as maternal and neonatal morbidity are typically based on self-report and suffer the limitations of this method (Filippi 2000; Fortney 1997b; Ronsmans 1997). Finally, measuring the magnitude of the impact of TBA training on maternal mortality requires special studies with large bio-statistical denominators. As a result, while donors, governments and non-governmental organizations have invested heavily in TBA training programs over the years, they have not invested equally in the systematic evaluation of training effectiveness (Fortney 1997b; Miller 2003).

Two of the review authors (LM Sibley, TA Sipe) conducted a meta-analysis for the period 1970 to 1999 on the effect of TBA training and a subsequent update through 2002. The original systematic review included 60 eligible studies measuring 1695 unique outcomes reflecting attributes of knowledge, attitude, behaviour, and advice (a subset of behaviour) related to maternal and child health care (MCH), as well as maternal and perinatal mortality. The sample of studies spans 30 years and three world regions. Main findings include moderate to large, positive effect sizes for MCH knowledge, attitudes, behaviour, and advice associated with training, with small effect sizes associated with perinatal health outcomes, such as the effect size for cause-specific neonatal mortality due to birth asphyxia indicate an 11% decrease from the untrained TBA baseline. The data were not sufficient to document an association between training and maternal mortality (Sibley 2002; Sibley 2004c). The update included a stratified analysis to examine the influence of methodological variables and outcomes pertaining to antenatal care service (Sibley 2004a) and emergency obstetric care (Sibley 2004b). Main findings from the updated systematic review (n = 16 studies) include a medium, positive, but non-significant association between training and knowledge of risk factors and health conditions requiring referral (danger signs); with small, positive, significant associations between training and TBA referral behaviour (a 36% increase over the untrained TBA baseline), as well as maternal service use (a 22 % increase over the untrained TBA baseline). These findings suggest that the real effects of TBA training on TBA and maternal referral behaviour are likely to be small, and emphasize the complexity of the referral process (Sibley 2004b). Unfortunately, the overall quality of studies included in this systematic review did not permit causal attribution to training. Even in the more rigorous studies, TBA training was part of an integrated package of interventions in an integrated package of interventions (Sibley 2002; Sibley 2004c). Thus, countries that are considering current and future TBA training do not have adequate evidence needed to guide sound policy and program decisions. As others have persuasively argued (Buekens 2003; Miller 2003), rigorous evaluation is both necessary and feasible. An updated, systematic review restricted to rigorous studies might provide the evidence to determine the effectiveness of TBA training. Such a review should be of interest to those responsible for the design, planning, and implementation of MCH services, especially in the developing world.

OBJECTIVES

The objective of this review is to assess the effects of traditional birth attendant (TBA) training on TBA and maternal behaviours thought to mediate positive pregnancy outcomes, as well as on maternal, perinatal, and newborn mortality and morbidity.

METHODS

Criteria for considering studies for this review

Types of studies

1. Randomized and quasi-randomized controlled trials (including cluster-randomized trials);
2. interrupted time series studies;
3. controlled before/after studies.

Types of participants

This review uses the World Health Organization (WHO 1992) definition of a traditional birth attendant (TBA), which defines a TBA as a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or through an apprenticeship to other TBAs. Eligible participants include:

1. trained and untrained TBAs (reference to target intervention);
2. mothers and neonates cared for by trained and untrained TBAs (or those who are living in areas where such TBAs attend a majority of births - a proxy for exposure of women to TBAs); or
3. areas (or communities) having #1 and #2 (in the case of cluster-randomized trials).

Where available, we provide information on the following characteristics of participants: TBA age, socio-economic status, educational attainment, number of deliveries per year and number of years of practice, as well as maternal age, parity, socio-economic status, and educational attainment.

Types of interventions

TBA training is the intervention of interest.
Where available, we provide information on the following characteristics of the intervention: training method, content, duration, contact hours, trainer/trainee ratio, supervision and continuing education after training; whether training is a single invention or a component of a complex intervention; as well as whether training was implemented in the context of an enabling environment that include elements such as advocacy, community mobilization, emergency transportation or referral sites capable of emergency obstetric and newborn care.

Types of outcome measures

(1) TBA or maternal behaviours, or both, thought to mediate positive pregnancy outcomes include:
(a) TBA advice to use or distribution of antenatal iron folic acid, or maternal use of antenatal iron folic acid supplementation;
(b) TBA advice to use or distribution of vitamin A, or maternal use of antenatal and postnatal vitamin A supplementation;
(c) TBA advice to use or distribution of malaria prophylaxis, or maternal use of malaria prophylaxis;
(d) TBA advice to be immunized against tetanus, or maternal acceptance of tetanus immunization;
(e) TBA use of hygenic delivery practices, advice to use hygienic delivery practices, or maternal use of hygienic delivery practices;
(f) TBA advice regarding or maternal initiation of early and exclusive breastfeeding, or both;
(g) TBA home-based management of selected life-threatening conditions (listed below);
(h) completed referral to health facility for emergency obstetric or neonatal care (where facilities exist and such care is available), or both;
(i) TBA advice to use or maternal use of family planning; and
(j) TBA advice to use or maternal use of antenatal and postnatal care.
(2) Measures of maternal morbidity. We included studies containing outcomes based on self-report of conditions in which a TBA's or woman's behaviour could affect the occurrence or severity of the condition, as long as the studies specify accepted case definitions or diagnostic criteria; for example, studies using or modifying the WHO verbal autopsy method (WHO 1995). The following conditions include:
(a) prolonged or obstructed labour;
(b) postpartum haemorrhage; and
(c) postpartum infection.
(3) Measure of maternal mortality:
(a) maternal death (number of maternal deaths per 100,000 live births).
(4) Measures of peri-neonatal morbidity. As with maternal morbidity, we included studies containing outcomes based on self-report of conditions in which a TBA's or woman's behaviour could affect the occurrence or severity of the condition, as long as the studies specify accepted case definitions or diagnostic criteria (Marsh 2003; WHO 1999). The following conditions include:
(a) low birthweight;
(b) birth asphyxia; and
(c) infection (systemic, acute respiratory infection, tetanus).
(5) Measures of peri-neonatal mortality:
(a) stillbirth (number per 1000 live births);
(b) early neonatal death (number 0 to 7 days per 1000 live births); and
(c) late neonatal death (number 8 to 28 days per 1000 live births).
We provide information for characteristics of outcome measures such as the timing of observation relative to the intervention, as well as data collection method and data source, where available.

Search methods for identification of studies

Electronic searches

For this update, we searched the Cochrane Pregnancy and Childbirth Group's Trials Register and the Cochrane Effective Practice and Organisation of Care Group's (EPOC) Trials Register (June 2008).
For details of the supplemental search we conducted for the first version of the review, *see* Appendix 1.

Cochrane Pregnancy and Childbirth Group's Trials Register

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Co-ordinator.
The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:

1. quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE;
3. handsearches of 30 journals and the proceedings of major conferences;
4. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

Details of the search strategies for CENTRAL and MEDLINE, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Specialized Register' section within the editorial information about the Cochrane Pregnancy and Childbirth Group.
Trials identified through the searching activities described above are each assigned to a review topic (or topics). The Trials Search Co-ordinator searches the register for each review using the topic list rather than keywords.

Cochrane Effective Practice and Organisation of Care (EPOC) Trial's Register

The EPOC register is based upon retrospective and prospective sensitive searches of key bibliographic databases (including MEDLINE and CINAHL), handsearching of key journals and reference lists of published literature reviews (*see* 'Search strategies for the identification of studies' section within the editorial information about EPOC (Cochrane Effective Practice and Organisation of Care).
We did not apply any language restrictions.

Data collection and analysis

Selection of studies

We assessed potentially eligible studies for inclusion against the following criteria:
(a) research design is a randomized controlled trial, a time series study or a controlled before/after study;
(b) intervention is traditional birth attendant (TBA) training;
(c) intervention and comparison group data are derived from trained and untrained TBAs (reference to target intervention), or mothers and neonates whose care is provided by trained and untrained TBAs, or who are living in areas where trained and untrained TBAs attend a majority of births; and
(d) dependent measures are categorical or continuous and concern TBA and maternal behaviours listed above or life-threatening conditions listed above and defined using standard case definitions, and pregnancy outcomes.
We calculated inter-coder reliability for eligibility using percentage agreement, resolved any differences by discussion and noted the reasons for excluding a particular study. We entered all studies into the Review Manager software (RevMan 2003). Details of the search procedure are provided in the 'Description of studies' section.

Data extraction and management

We used the Effective Practice and Organisation of Care (EPOC) Data Collection Checklist and Data Collection Template, as well as developed and pretested supplementary data collection forms such that we abstracted additional information pertaining to study references and authors, verification of eligibility, as well as study methods, participants, interventions, outcome measures, and results. Three co-authors independently extracted and coded the data, discussed and resolved any differences. A fourth author independently checked a portion of the abstraction. We contacted an investigator for two studies having incomplete information. In some cases the authors provided enough information for us to calculate the missing outcome data using EXCEL software and entered data into the Review Manager software for analysis (RevMan 2003).

Assessment of methodological quality of included studies

We assessed studies for methodological quality examining different sources of bias following criteria established by the Cochrane EPOC Group (www.epoc.uottawa.ca) and summarizing risk of bias as outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2005). The Cochrane EPOC Group's standard criteria for appraising the quality of studies include baseline measurement of outcomes, follow up of professionals, follow up of patients/episodes of care (protection against exclusion bias), blinded assessment of primary outcomes (protection against detection bias), reliable outcome measures, and protection against contamination. An additional criterion for randomized controlled trials and controlled clinical trials study includes concealment of allocation, while the analogous criterion for controlled before-after studies includes characteristics for studies using second site as control (protection against selection bias). To derive an overall summary assessment of how valid the results of each study are, we

used three categories in which a 'low risk' of bias exists when all criteria are met (plausible bias unlikely to seriously alter results); a 'moderate risk' of bias exists when one or more criteria are partially met (plausible bias raises some doubt about results); and a 'high risk' of bias exists when one or more criteria are not met (plausible bias seriously weakens confidence results) (Higgins 2005).

Measures of treatment effect and unit of analysis issues

We used RevMan 2003 to calculate individual effect sizes of odds ratio and 95% confidence intervals or mean difference for the individual outcomes when possible. We used descriptive statistics to report characteristics of the participants, interventions, and outcome measures detailed above. Due to the small number of studies, varied study designs and heterogeneity of the outcomes and measures, we were not able to calculate pooled summary effect sizes.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Results of search

The electronic searches yielded a total of 147 citations, including three citations from the Cochrane Pregnancy and Childbirth Group's Trials Register, 113 from the Cochrane Effective Practice and Organisation of Care (EPOC) Group's Trials Register and 43 citations from the supplemental search. We screened the studies in two stages. First, two members of the review team independently screened the titles or abstracts from these citations, reaching 99% agreement. They discussed and resolved differences of opinion, where possible, and eliminated all studies for which they agreed did not meet preset criteria for types of participants, interventions, and outcome measures. We obtained the full text documents of 18 studies. Second, two different members of the team independently read the full text and screened all 18 studies according to the preset criteria for types of studies, reaching 94% agreement. Differences of opinion were discussed and resolved in favour of including four and excluding 14 studies from the review (*see* 'Characteristics of excluded studies' table). In addition, a staff member from the Cochrane EPOC Group reviewed the studies under disagreement and provided a third opinion regarding eligibility.
The final sample of four studies (n = 4) covered a period of 16 years and included one large cluster-randomized controlled trial from Pakistan (Jokhio 2005), smaller randomized controlled trials from Malawi (Bullough 1989) and Bangladesh (Hossain 2000), and a controlled before/after study from Guatemala (O'Rourke 1994). All were conducted in rural settings. The studies include two articles published in peer reviewed journals, an unpublished dissertation, and an unpublished technical report of operations research (*see* 'Characteristics of included studies' table).

Participants

Participants included traditional birth attendants (TBAs) and lactating mothers living in the intervention and control areas (Hossain 2000), pregnant women living in the intervention and control clusters identified, recruited, and followed through the postpartum period (Jokhio 2005), and women recently delivered or referred to a health facility by TBAs, or both (Bullough 1989; O'Rourke 1994). *See* 'Characteristics of TBAs' (Table 1) and 'Characteristics of women' (Table 2) for available social and demographic information about the study populations.

Table 1. Characteristics of traditional birth attendants (participants)

Study Id (year)	Sample	Age	Educational level	Marital status	Other sources	Experience (years)	Prior training	Place of training
Bullough (1989)	Intervention n = 2104. Control n = 2123.						Intervention Yes 100%. Control Yes 100%.	

Table 1. Characteristics of traditional birth attendants (participants) (*Continued*)

Hossain (2000)	Intervention n = 85. Control n = 86.	Intervention: < 30 3.3%; 30-39 24.4%; 40-49 38.9%; 50-59 23.3%; 60+ 10.0%. Control: < 30 1.2%; 30-39 19.8%; 40-49 45.7%; 50-59 21.0%; 60+ 12.3%.	Intervention: < primary 72.2%; class 5-9 26.7%; SSC 1.1%; HSC 0.0%. Control: < primary 71.6%; class 5-9 24.7%; SSC 2.5%; HSC 1.2%.	Intervention: married 67.8%; unmarried 0.0%; widow 32.2%. Control: married 63.0%; unmarried 1.2%; widow 35.8%.	Intervention: nothing 36.7%; work in: other house 5.6%; small business 2.2%; poultry rearing 35.6%; cow rearing 3.3%; other 16.7%. Control: nothing 46.9%; work in: other house 1.2%; small business 3.7%; poultry rearing 28.4%; cow rearing 0.0%; other 19.8%.	Intervention: < 10 45.6%; 10-19 31.0%; 20-29 16.7%; 30+ 6.7%. Control: < 10 33.3%; 10-19 46.9%; 20-29 17.3%; 30+ 2.5%.	Intervention Yes 96.7%. Control Yes 70.4%.	Intervention: FWVTI 16.2%; RTC 5.7%; Hlth. Office 48.3%; THC 14.9%; other 14.9%. Control: FWVTI 3.5%; RTC 0.0%; Hlth. Office 40.4%; THC 45.6%; other 10.5%.

Table 2. Characteristics of women (participants) served by traditional birth attendants

Study Id (year)	Sample	Age	Parity	Education	Marital status	SES	Other
Bullough (1989)	Intervention n = 2104. Control n = 2123.	Not reported	Intervention: primigravida 12.0%; 1-3 40.3%; 4-6 29.4%; > 7 12.4%;	Not reported.	Not reported.	Not reported.	Not reported.

Table 2. Characteristics of women (participants) served by traditional birth attendants (*Continued*)

			unknown 6.0%. Control: primigravida 13.6%; 1-3 41.5%; 4-6 31.0%; > 7 12.2%; unknown 1.7%.				
Hossain (2000)	Intervention n = 354. Control n = 360.	Intervention: < 20 15.9%; 20-29 62.9%; 30-39 19.8%; 40-49 1.5%. Control < 20 20.7% 20-29 57.7% 30-39 19.9% 40-49 1.6%	Total children. Intervention 1-2 61.7%; 3-4 25.1%; 5-6 10.5%; 7+ 2.7%. Control: 1-2 57.5%; 3-4 31.5%; 5-6 8.7%; 7+ 2.4%.	Intervention: no school 46.7%; class 1-4 21.0%; class 5-6 27.2%; SSC 4.2%; HSC 0.9%. Control: no school 45.9%; class 1-4 15.0%; class 5-6 31.0%; SSC 6.8%; HSC 1.3%.	Not reported.	Housing structure. Intervention: jhupri 3.6%; one room of clay/bamboo/str 26.0%; more than one room of clay/bamboo/str 10.2%; tin-roofed house 55.4%; concrete 3.9%; shelter 0.9%. Control: jhupri 3.7%; one room of clay/bamboo/str 27.8%; more than one room of	Not reported.

Table 2. Characteristics of women (participants) served by traditional birth attendants (*Continued*)

						clay/bamboo/st 9.7%; tin-roofed house 52.2%; concrete 5.0%; shelter 1.6%.	
Jokhio (2005)	Intervention n = 10,114. Control n = 9443.	Intervention: mean 26.7; SD 5.9. Control: mean 26.0; SD 6.2.	Intervention: mean (no.) 3.5; SD 2.8. Control: mean (no.) 3.7; SD 2.9.	Intervention: mean (yrs.) 1.1; SD 2.8. Control: mean (yrs.) 1.4; SD 3.2.	Not reported	Not reported.	Distance to nearest health facility (km). Intervention: mean (km) 2.7; SD 3.0. Control: mean (km) 2.5; SD 3.0.
O'Rourke (1994)	Intervention n = 79. Control n = 147.	Intervention: < 18 6.3%; 18-34 83.5%; > 34 10.1%. Control < 18 9.6% 18-34 78.1% >34 12.3%	Not reported.	Intervention: none 50.6%; some primary 41.8%; primary completed 7.6%. Control: none 41.1%; some primary 44.5%; primary completed 14.4%.	Intervention: single 4.6%; married 95.4%. Control: single 1.6%; married 98.4%.	Not reported.	Race. Intervention: indigenous 78.5%; ladino 21.5%. Control: indigenous 91.8%; ladino 8.2%.

Interventions

In three studies, the authors categorized TBAs targeted by interventions as 'untrained' TBAs (Hossain 2000; Jokhio 2005; O'Rourke 1994). However, in two of these studies, the large majority of TBAs in both the intervention and control groups had received some prior biomedical training through government or non-governmental organizations, or both; for example, 71% of TBAs in the Bangladesh study (Hossain 2000) and in the Guatemala study (O'Rourke 1994) had been given government training since 1935. In the remaining study (Bullough 1989), all TBAs had received some prior biomedical training (*see* 'Characteristics of included studies' table).

In two studies, the interventions consisted of educational instruction in management of normal delivery, timely detection and re-

ferral of women with obstetric complications, as well as importance of linking women to essential obstetric care services (Jokhio 2005; O'Rourke 1994). In each study, TBA training was part of a package of interventions including community and improved facility-based care components. In one study (Jokhio 2005), the improvements involved staff training in essential and emergency obstetric care and clinical outreach by team physicians. In the other, improvements consisted of staff training in standard protocols for managing maternal and neonatal emergencies and sensitization to TBAs and women referred by TBAs (O'Rourke 1994). In the latter study TBAs and women in both intervention and control communities had access to the same improved referral facility. The remaining two study interventions focused on breastfeeding: one highlighted initiation of early exclusive breastfeeding and the introduction of weaning foods (Hossain 2000), while the other intervention emphasized initiation of early suckling before placental delivery to reduce postpartum blood loss (Bullough 1989). Duration of training among all studies was two to three days. Apart from content and duration, few authors reported other characteristics of the TBA training interventions (*see* 'Intervention characteristics' (Table 3)).

Table 3. Intervention characteristics of traditional birth attendant training

Author (Year)	Characterisitics	Trainer information	Training modality	Curriculum info	Training focus	Duration/intensity	Trainee information	Post-training
Bullough (1989)	Evidence base: not done (no evidence that early suckling reduces postpartum blood loss). Based on clinical practice guidelines: not done. Purpose: appropriate management . Nature of the desired change: ini-	Deliverer: not clear. Trainer qualification: not clear. Trainers had trainer training: not clear. Experience with low or non-literate trainees: not clear.	Theoretical: not clear. Practical (clinical): not clear. Format: interpersonal, audio/visual.	Curriculum source: developed by/for project, local expert body. Curriculum pretested or pilot tested: not clear.	Record keeping, physiology of 3rd stage labour, management of 3rd stage labour, causes of haemorrhage, measurement of blood loss, reason for referral of 3rd stage labour complication plus early sucking for the inter-	Duration: 2 days. Total contact hours: not clear.	Trainees per cohort: 6-7 TBAs. Total trained in program year: 69 TBAs.	Supervision: community midwives. Follow up: monthly. Continuing education: not clear.

Table 3. Intervention characteristics of traditional birth attendant training (*Continued*)

	tiation of new management. Source of funding: charitable trust (Bert Trust, Wellcome Trust). Ethical approval: done (Health Sciences Research Committee/ Malawi Ministry of Health).				vention group.			
Hossain (2000)	Evidence base: done. Purpose: appropriate management. Nature of the desired change: increase established management. Source of funding: voluntary body. Ethical approval: not clear.	Deliverer: local expert. Trainer qualification: not clear. Trainers had trainer training: not clear. Experience with low or non-literate trainees: not clear.	Theoretical: not clear. Practical (clinical): not clear. Format: not clear.	Curriculum source: developed by/for project, national expert body (Bangladesh Breast Feeding Program). Curriculum pretested or pilot tested: not clear.	Breastfeeding advice including benefits, early, exclusive feeding, introduction/types of complementary weaning foods, disadvantages of bottle feeding.	Duration: 2 days. Total contact hours: not clear.	Trainees per cohort: 15. Total trained in program year: 85.	Supervision: not clear. Follow up: not clear.

Table 3. Intervention characteristics of traditional birth attendant training (*Continued)*

Jokhio (2005)	Evidence base: not clear (generally accepted best practices). Purpose: appropriate management. Nature of the desired change: initiation of new management (new components). Source of funding: government organization for capital costs (Family Health Project of Sindh Government Health Department) and other for data entry (University of Birmingham, UK). Ethical approval: not clear (protocol discussed and approved after meeting with provincial leaders).	Deliverer: local experts. Trainer qualification: paramedics (LHW) and obstetricians. Trainers had trainer training: not clear. Experience with low or non-literate trainees: not clear.	Theoretical: not clear. Practical (clinical): not clear. Format: interpersonal, audio/visual.	Curriculum source: developed by/for project, local expert body. Curriculum pretested or pilot tested: not clear.	Advice on antepartum, intrapartum postpartum care, how to conduct clean delivery, how to use disposable delivery kit, referral for obstetric emergencies, newborn care.	Duration: 3 days. Total contact hours: not clear.	Trainees per cohort: not clear. Total trained in program year: 565.	Supervision: LHW support and data collection. Follow up: not clear.

O'Rourke (1994)	Evidence base: not clear (generally accepted best practices). Purpose: appropriate management. Nature of the desired change: increase established management. Source of funding: government organization (Guatemala Ministry of Health and US Agency for International Development, through MotherCare Project). Ethical approval: not clear.	Deliverer: local expert. Trainer qualification: not clear. Trainers had trainer training: done (but details not reported). Experience with low or non-literate trainees: yes.	Theoretical: based on principles of adult education. Practical (clinical): not clear. Format: interpersonal, audio/visual, other (role play).	Curriculum source: developed by/for project, local expert body. Curriculum pretested or pilot tested: not clear.	Antenatal care, danger signs, identification and timely referral of maternal and newborn complications, postnatal care, family planning, linkages with health services.	Duration: 5 days over 3 month period. Total contact hours: 10 (2 hours per day).	Trainees per cohort: not clear. Total trained in program year: not clear.	Supervision: not clear. Follow up: done (1 day per month. over 8 months).

Outcomes

The sample studies contained the outcomes of TBA or maternal behaviours thought to mediate positive pregnancy outcomes, maternal morbidity, maternal mortality and perinatal and neonatal mortality. The only outcomes common among the studies were referral and perinatal death. Jokhio 2005 measured frequency of reported TBA referrals and perinatal deaths among women living in intervention and control clusters served by trained and untrained TBAs; while O'Rourke 1994 measured aspects of referral and perinatal deaths observed in a health facility among a subset of women living in intervention and control communities who were referred by TBAs. Thus we could not pool these outcomes in the analysis.

Excluded studies

The two major reasons for study exclusion were ineligible study design and type of participant (*see* 'Characteristics of excluded studies' table).

Risk of bias in included studies

No study met all criteria (*see* 'Characteristics of included studies' table) thus all studies were moderate to high risk, meaning that there is some level of plausible bias in each of the studies reviewed. Assessment of key criteria is described below.

Concealment of allocation

Bullough 1989 engaged a member of the Malawi Ministry of Health Department of Statistics to randomly allocate traditional birth attendants (TBAs) into treatment and control groups within districts, after stratification for number of deliveries attended and distance from a telephone or health centre. Jokhio 2005 used a simple cluster-randomization scheme with a computer-generated procedure carried out by the University of Birmingham, United Kingdom, Department of Public Health and Epidemiology. All pregnant women in seven subdistrict areas (talukas) were eligible for inclusion. Hossain 2000 randomly selected 12 subdistrict areas (thanas), six experimental and six control. Fifteen TBAs from each thana, and all lactating mothers were eligible for inclusion. Information about randomization and concealment procedures were not reported, but baseline measures of outcomes were reported and the groups were comparable on several known potentially confounding variables. The author of the only controlled before-after study, O'Rourke 1994, identified and adjusted for important characteristics of participants in the intervention and control communities.

Exclusion bias

All included studies reported outcomes for more than 90% of participants, except one. Bullough 1989 reported that about 30% of TBAs in each group, intervention and control, were excluded from the analysis because they were "untrainable", "failed quality control check", or were "strongly suspected of fabricating results" (page 524). Among the remaining TBAs, outcomes were reported for more than 90% of women.

Performance bias and detection bias

Bullough 1989 reported that project data collectors were not blinded to the intervention status of the TBAs, but that the TBAs, who measured blood loss, were not informed that they were participating in a trial. Similarly, Jokhio 2005 reported that, while Lady Health Workers who provided follow up were not blinded to the intervention status of the women, they were not made aware of the main study objective or outcome measures for the planned comparison. O'Rourke 1994 was unable to blind the measurement of primary outcomes. Lack of blinding was partially overcome using identical interviewing techniques for all women, and hospital staff were unaware of the intervention status of the referred women. Hossain 2000 did not report on blinding of providers, recipients of care, or outcome measures. Only O'Rourke 1994 reported the reliability of outcome measures. Bullough 1989 stated, "The accuracy of blood loss measurements by TBAs who were mostly illiterate and/or innumerate may be doubted" (page 524).

A factor not related to the quality appraisal, but rather to precision of the results, is power calculation. Only two studies reported power calculation. Each had sufficient power (0.80) to detect a significant difference ($P < 0.05$) at a predetermined level of effect for primary outcomes for postpartum haemorrhage (Bullough 1989) and perinatal mortality (Jokhio 2005), but not for maternal mortality (Jokhio 2005).

Effects of interventions

Outcomes were measured in various intervals after the interventions, ranging from one to three months. One study had a second follow-up observation at seven months (Hossain 2000). Results and P values reported by the study authors are provided. We calculated effect sizes (odds ratio (OR) and mean difference) when data were available. Minor discrepancies in values reported by the original authors and those reported in the tables are due to the fact that we used an estimate for the standard error.

Traditional birth attendant (TBA) or maternal behaviours thought to mediate positive pregnancy

Advice about immediate feeding of colostrum

Hossain 2000 found an increase in percentage of intervention group TBAs who advised on immediate feeding, from 75% to 92% at three months postintervention and an increase in percentage of control group TBAs who so advised, from 87% to 92%. At seven months follow up, there was an increase in percentage of intervention group TBAs who advised immediate feeding, from 75% to 85% although there was a small decrease in percentage of control group TBAs who so advised, from 87% to 80%. However, the effect-size estimates (OR) of the difference at post-test for three months (OR 1.21, 95% CI 0.39 to 3.79, P = 0.74) and at seven months follow up (OR 1.37, 95% CI 0.62 to 3.03, P = 0.44) were not significant.

Advice about introduction of complementary foods (Hossain 2000)

Hossain 2000 found a large increase in percentage of intervention group TBAs who advised on introduction of complementary foods, from 11% at baseline to 59% at three months postintervention. There was a similar increase in percentage of control group TBAs who so advised, from 5% at baseline to 32%. At seven months follow up, there was an increase in percentage of the intervention group TBAs who advised on timing of complementary feeding, from 11% at baseline to 50% in the intervention group. There was also an increase in the percentage of control group TBAs who so advised, from 5% at baseline to 33%. Our analysis of these data demonstrates that the effect-size estimate of the post-test difference at both three months (OR 3.11 (95% CI 1.63 to 5.92, P < 0.001) and seven months follow up (OR 2.07 (95% CI 1.10 to 3.90, P = 0.02) favour the intervention group.

Frequency of referral (Jokhio 2005)

Although referral rates were low in both intervention and control clusters, Jokhio 2005 found that women living in intervention clusters were significantly more likely to have been referred to any health facility for a complication of pregnancy, delivery, or postpartum period, than women living in control clusters; 10% versus 7% respectively (adjusted OR 1.50, 95% CI 1.18 to 1.90, P < 0.001).

Mean number of referrals per month (O'Rourke 1994)

Mean number of monthly referrals increased by 313% in the intervention communities from 4.48 referrals before, 7.33 during, to 18.08 referrals after the intervention. Similarly, the mean number of referrals in the control communities increased by 245%, from 8.16 referrals before, 14.00 during, to 28.16 referrals after, respectively. A post-training increase in the mean number of monthly referrals was observed for both intervention and control communities. However, ANOVA for mean number of monthly referrals, regressed on community over the study period and showed non-significant differences between intervention and control communities both during and after the intervention (P = 0.747 and P = 0.321, respectively). Insufficient data were reported to calculate an effect size.

Timely referral (O'Rourke 1994)

Comparison of the baseline to post-intervention difference for timely referral of obstetric complications of malpresentation, prolonged labour and preterm labour among women referred by TBAs was significant for intervention communities (OR = 2.25, P = 0.007) but not control communities (OR 1.17, P = 0.510), and there was no significant difference for timely referral between the groups (Breslow-Day Test for homogeneity of OR, chi square = 2.92, df =1, P = 0.09). Similarly, our analysis shows that the effect-size estimate (OR) of the post-test difference between groups is not significant (OR = 1.09, 95% CI 0.72 to 1.66, P = 0.67).

Correct identification and referral of malpresentation (O'Rourke 1994)

Comparison of Kappa values for correct identification and referral of malpresentation postintervention for women referred by TBAs in the intervention (Kappa 0.72, 95% CI 0.59 to 0.85) and control communities (Kappa 0.70, 95% CI 0.59 to 0.80) demonstrated no significant difference (P = 0.38). Comparisons of Kappa values before and after the intervention for each group separately were not significant. Data were unavailable to calculate an effect size.

Per cent correct identification and referral of prolonged labour, defined as lasting more than 12 hours (O'Rourke 1994)

Comparison of Kappa values for correct identification of prolonged labour postintervention for women referred by TBAs in the intervention (Kappa 0.45, 95% CI 0.29 to 0.62) and control communities (Kappa 0.43, 95% CI 0.29 to 0.56) demonstrated no significant difference (P = 0.40). Comparisons of Kappa values before and after the intervention for each group separately were not significant. Data were unavailable to calculate an effect size.

Per cent correct identification and referral of preterm labour, defined as less than 37 weeks' gestation (O'Rourke 1994)

Comparison of Kappa values for correct identification and referral of preterm labour postintervention for women referred by TBAs in the intervention (Kappa 0.77, 95% CI 0.59 to 0.95) and control communities (Kappa 0.61, 95% CI 0.42 to 0.75) demonstrated no significant difference (P = 0.11). Comparisons of Kappa values before and after for the intervention for each group separately were also not significant. Data were unavailable to calculate an effect size.

Maternal morbidity

Frequency of obstructed labour (Jokhio 2005)

Jokhio 2005 found that the frequency of obstructed labour was significantly higher among women living in intervention clusters compared with women living in control clusters (6% versus 5%, cluster adjusted OR 1.26, 95% CI 1.03 to 1.54, P < 0.025).

Frequency of haemorrhage (Jokhio 2005), frequency of postpartum haemorrhage and mean volume of blood loss (Bullough 1989)

On the other hand, Jokhio 2005 found that frequency of haemorrhage (antepartum, intrapartum, and postpartum combined) was significantly lower among women living in the intervention clusters, compared with women living in the control clusters (1.7% versus 2.8%, adjusted OR 0.61, 95% CI 0.47 to 0.79, P < .001). Bullough 1989, however, showed non-significant differences in frequency of postpartum haemorrhage (7.9% versus 8.4%, OR 0.94, 95% CI 0.76 to 1.17, P = 0.60) and mean blood loss (258 ml + 163 ml versus 256 ml + 148 ml) among women cared for by TBAs in the intervention and control groups (weighted mean difference 2.00, 95% CI -7.39 to 11.39, P = 0.68).

Frequency of puerperal sepsis (Jokhio 2005)

The frequency of puerperal sepsis was significantly lower among women living in intervention clusters compared with control clusters (0.8% versus 4.2%, adjusted OR 0.17, 95% CI 0.13 to 0.23, P < 001).

Maternal mortality

Jokhio 2005 measured maternal mortality and found 27 deaths in the intervention and 34 deaths in the control clusters, corresponding to a 268 and 360 deaths per 100,000 pregnancies, respectively.

This 26% difference in favour of women living in the intervention clusters was non-significant (0.27% versus 0.36%, adjusted OR 0.74, 95% CI 0.45 to 1.22, P = 0.24).

Perinatal and neonatal mortality

Perinatal death

Jokhio 2005 also measured perinatal death among singleton births and found 823 and 1077 deaths in the intervention and control clusters, respectively, corresponding to a 85 and 120 deaths per 1000 live births and stillbirths, respectively. The death rate difference was significant, 30% lower in the intervention compared with the control clusters (8.5% versus 12%, adjusted OR 0.70, 95% CI 0.59 to 0.83, P < 0.001). O'Rourke 1994, on the other hand, measured the perinatal death rate among women who had been referred to the same improved facility by TBA in intervention and control communities before and after the intervention. There were 16 deaths (n = 72 births) and 24 deaths (n = 203 births) in the intervention communities before and after the intervention, respectively, corresponding to significant decrease in death rate from 22% to 12% (OR 2.13, P = 0.032). There were 23 and 37 deaths in control communities before and after the intervention, respectively (n = 458), corresponding to a non-significant decrease in death rate from 17% to 12% (OR 1.15, P = 0.149). While perinatal death among women referred by TBAs in both intervention and control communities decreased, the decrease was greater for intervention communities. The Breslow-Day test for homogeneity of OR for perinatal death between intervention and control communities, however, was non-significant (chi square = 0.478, df = 1, P = 0.486). Our effect size estimate (OR) of the post-test difference is not significant (OR 1.02, 95% CI 0.59 to 1.76, P = 0.95).

Stillbirth

Jokhio 2005 identified 483 and 638 stillbirths in intervention and control clusters, respectively. The stillbirth rate difference was significant, 31% lower in intervention compared with control clusters (5.0% versus 7.1%, adjusted OR 0.69, 95% CI 0.57 to 0.83, P < 0.001).

Neonatal death

Jokhio 2005 also identified 340 and 349 neonatal deaths in the intervention and control clusters, respectively. The neonatal death rate difference was significant, 29% lower in the intervention compared with the control clusters (3.5% versus 4.88, adjusted OR 0.71, 95% CI 0.61 to 0.82, P < 0.001).

DISCUSSION

This systematic narrative review evaluating the effects of traditional birth attendant (TBA) training on health behaviours and pregnancy outcomes included three randomized controlled trials (Bullough 1989; Hossain 2000; Jokhio 2005) and one controlled before/after study (O'Rourke 1994). All studies were conducted in rural areas. Except for one study, (Jokhio 2005), a large majority of TBAs in both the intervention and control groups/communities had received some form of biomedical training prior to the study. In two studies (Jokhio 2005; O'Rourke 1994), TBA training was a part of a broader program of interventions designed to strengthen and link TBAs to existing health services. In one of these studies (O'Rourke 1994), TBAs and women in both the intervention and control communities had access to the same improved facility, which included staff training in standard protocols for managing maternal and neonatal emergencies and sensitization to TBAs and women referred by TBAs. These realities complicate any comparisons. There were four types of outcomes reported: TBA or maternal behaviours, or both, thought to mediate positive pregnancy outcomes; maternal morbidity; maternal mortality; and perinatal-neonatal mortality. The results together with particular strengths and weaknesses are discussed below.

Advice regarding breastfeeding

Hossain 2000 examined the effects of training TBAs and village doctors to improve knowledge and advice to pregnant and lactating women regarding different aspects of breastfeeding at three months and seven months after training. Interview data were collected for providers and lactating mothers. Although there were no significant differences in post-test levels for advice on feeding colostrum at three and seven months, there were significant differences in post-test levels for advice about the timing of complementary feeding at five months of age. Note that in this study, 92% and 95% of TBAs in both intervention and control clusters, respectively, reported that they had received instruction regarding breast milk/breastfeeding during prior training. Moreover, baseline percentages for TBAs advising a woman regarding colostrum was high for both intervention and control groups, 75% and 87%, respectively, so that extent of potential improvement was limited.

Referral and related measures

Jokhio 2005 noted that women in intervention clusters were more likely than women in control clusters to report that they were referred to a health facility for an obstetric complication. Women living in each of the three intervention clusters had access to two outreach clinics, while women living in the control clusters did not. The authors state that the Lady Health Workers (LHW) did not record who recommended referral, whether the women complied with referral or used health services, and the outcome of referral. Thus, the effects of TBA training on extent and impact of

referral are unknown. O'Rourke 1994, on the other hand, examined completed referrals of women with known obstetric complications diagnosed by referral hospital physicians. TBAs in both intervention and control communities showed a greater ability to correctly identify malpresentation and preterm labour, compared with prolonged labour. There were significant improvements in ability to correctly identify the complications for TBAs in both intervention and control communities after the intervention, but no difference between intervention and control communities. Similarly, while TBAs in the intervention communities showed a significant improvement in timeliness of referral after the intervention, the difference between TBAs in intervention and control communities approached, but did not reach, significance. Thus, the observed improvements in ability to correctly identify and to refer women with the selected complications in a timely manner could not be attributed to TBA training. Finally, mean number of monthly referrals increased substantially and significantly in both intervention and control communities (313% and 245%, respectively), but there was a non-significant difference between intervention and control communities. The author speculates that these results may be due to the fact that TBA training took place after improvements to the referral facility available to both communities (*see* also O'Rourke 1995), i.e., the hospital intervention may have obscured any effects of the TBA training intervention. An important limitation of this study is that women attended by TBAs who were not referred, or who did not comply with referral, were not included in the analysis. Again, the effects of TBA training on extent and impact of referral are unknown. Referral is a complex phenomenon to measure. While the findings of increased referral for obstetric emergencies in both studies are encouraging, neither study offers sufficient evidence that TBA training was the cause. The findings of the latter study (O'Rourke 1994), however, suggest that access to improved health services is an important factor in referral.

Maternal morbidity

Jokhio 2005 reported significantly lower frequencies of puerperal sepsis and haemorrhage, but a higher frequency of obstructed labour among women in intervention clusters compared with control clusters. LHW and TBA training included oral descriptions and pictures of each complication. LHWs asked women if they experienced any complication contained on a list, whether it occurred during pregnancy, delivery or the postpartum period. The assessments were not blinded and reliability of the self-report data are unknown. The review inclusion criteria permitted measures of morbidity based on self-report if clear-case definitions and a systematic diagnostic process such as the World Health Organization Verbal Autopsy (WHO 1995) were used. Although the method used in this study to measure obstetric complications does not qualify, we included these results to highlight the need of improved measurement in community-based studies. Bullough 1989 reported non-significant differences in frequency of postpartum haemorrhage and mean blood loss between women cared for by TBAs in intervention and control groups, irrespective of special instruction to the intervention group TBAs to encourage early suckling to reduce blood loss. All TBAs were trained to collect blood after delivery of the placenta using a special container. While direct measurement of blood loss is an improvement over self-report, the reliability of the measure is unclear in this situation. The authors, themselves, questioned the accuracy of this method when explaining the results. Alternately, it is possible that levels of endogenous oxytocin released through suckling are insufficient to stimulate uterine contraction in the event of postpartum haemorrhage. The challenges inherent to valid and reliable measurement of morbidity in the community are well known and significant (Fortney 1997b). Neither study provides sufficient evidence that TBA training is the cause of the observed effects.

Maternal mortality

The large trial by Jokhio 2005 found a promising 26% difference in maternal deaths, in favour of women in the intervention clusters, though this difference could be due to chance (i.e., if the denominator had been bigger, the difference may have been smaller). While the assessment was not blinded, reporting maternal mortality, in itself, may be more reliable than reporting of specific obstetric complications; moreover, the possibility of misreporting or under-reporting death events, should be equally distributed within and across intervention and control clusters.

Perinatal mortality, stillbirths and neonatal mortality

In the controlled before/after study, O'Rourke 1994 compared women in the intervention and control communities, who were referred by TBAs to the same improved health facility, and found a non-significant difference in perinatal mortality, though decreases of 13% and 15% before to after, respectively, are encouraging. These results are not surprising. TBAs in the intervention and control communities were similar with respect to correct identification, timeliness and mean number of monthly referrals. Moreover, all referred women presumably received the same care. As mentioned, because women attended by TBAs who were not referred or who did not comply with referral were not included in the analysis, the effect of TBA training on extent and impact of referral on perinatal mortality in the study communities is unknown.
Jokhio 2005, however, found significantly fewer perinatal deaths (30%), stillbirths (31%) and neonatal deaths (29%) among women in the intervention clusters, compared with women in the control clusters. These findings provide evidence in support of TBA training in a rural setting with a functional health system. Strengths of this study include cluster randomization and suffi-

cient statistical power to detect predetermined effect size, adequate concealment of allocation and adequate follow up of patients or episodes of care, as well as protection against contamination. Although the authors did not obtain baseline measures of pregnancy outcomes, baseline measures for potentially confounding factors were obtained, demonstrating that women in the intervention and control clusters were essentially similar in terms of site of delivery, type of delivery and birth attendant, and distance from the nearest primary healthcare facility, as well as maternal characteristics such age, parity, education, and time of recruitment into the study. The main weaknesses are lack of blinded assessments of primary outcomes and unreliable outcome measures. The effect of TBA training on perinatal mortality was consistent across the intervention clusters, and adjusting for cluster had no effect on risk reductions. The authors conclude that the findings of this study suggest that large improvements in perinatal health (and possibly maternal health) might be obtained through community-based interventions, though the mechanisms are unclear.

AUTHORS' CONCLUSIONS

Implications for practice

The potential of traditional birth attendant (TBA) training to reduce perinatal mortality is promising when combined with improved health services. However, the number of studies in this review that meet the criteria of rigorous evaluation design is insufficient to provide the necessary evidence for TBA training effectiveness. One study supports the potential of TBA training to significantly reduce perinatal,and neonatal (and possibly maternal) deaths in the context of rural homebirth where TBAs, women and families have access to an improved health system with a clinical outreach component (Jokhio 2005). While the mechanisms underlying this observed effect are not addressed in this study, the results of a second study in the review (O'Rourke 1994) suggest that appropriate referral to improved health services is a key factor.

Although Bullough 1989 examined the effect of early suckling on the frequency of postpartum haemorrhage and mean volume of postpartum blood loss and failed to demonstrate an effect, possibly due in part to methodological issues, this study is important from the perspective of conduct of third stage labour, and need for research on prevention and low cost and low technological home-based management (first aid and stabilization) of postpartum haemorrhage, a leading cause of maternal death.

Rural settings in the developing world vary in terms of the role of TBAs, the proportion of TBA-attended births, cultural norms and values regarding childbirth and childcare practices, general health of young girls and women, local causes of maternal and perinatal mortality and morbidity, and the social standing, functional status and resources of the health services. The relationships among poverty, women's health status, access to quality health care are especially important. Each is relevant to any discussion and practical decision regarding the feasibility and potential of TBA training to contribute to improved pregnancy outcomes in a given setting.

Implications for research

The small number of studies in this review reflects, in part, the challenges associated with conducting large randomized controlled trials on the outcomes of complex public health interventions. Further research to examine the mechanisms underlying the effects of this promising program is warranted. This raises important questions about what constitutes sufficient evidence for informed policy and programming decisions; and about appropriate use, and how to maximize the validity, of non-randomized controlled trial study designs.

This review, nonetheless, provides a foundation upon which to incorporate future studies of the effect of TBA training for improved health behaviours and pregnancy outcomes, building towards a quantitative synthesis. The design and methods of future studies must include adequate sample size and protection against common sources of bias. To accurately measure a reduction of 25% in maternal mortality ratio from a baseline of 850 deaths per 100,000 live births with a 95% confidence interval and statistical power of 80% for a one-sided test, an adequately controlled trial would need 20,120 postpartum women or their survivors in both the intervention and comparison groups, respectively. If the effect size is expected to be smaller, much larger sample sizes are required (Miller 2003). A focus on TBA training in relation to reducing perinatal death, potential mechanisms, and costs holds the most promise. In addition, future studies should include at least the following information on participants, the intervention and outcomes, to permit subgroup analyses: (1) TBA age, socio-economic status, educational attainment, experience (number of deliveries per year and number of years of practice), and proportion of all births attended in the study area; (2) maternal age, parity, socio-economic status, and educational attainment; (3) training method, content, duration, contact hours, trainer/trainee ratio, supportive supervision and education after training, context, e.g., whether training is a single invention or part of complex intervention, whether it is situated within an enabling environment that includes elements such as advocacy, community mobilization, emergency transportation or adequate accessible referral sites; and lastly (4) timing of measurement (observations) relative to the intervention, as well as data collection method and source.

There is also need for research that seeks to improve family and community-based interventions, in relation to TBA training, and the links to skilled facility-based clinical care to reduce maternal and neonatal mortality and morbidity. Key knowledge gaps exist in these regards. Examples include:

1. more effective approaches for promotion of care seeking

for life-threatening complications by improving problem recognition, increasing demand for quality care, and overcoming cultural barriers to referral;

2. methods to improve prevention or initial home-based management (first aid stabilization), or both, and safe referral care;

3. best combinations of providers for family and community service delivery and the phasing of their roles or skills during the transition to skilled birth attendance; and

4. better ways to monitor and evaluate health outcomes of community-based interventions, including vital registration, community-based surveillance, improved verbal autopsy methods to assess specific medical causes and contributing factors to maternal and neonatal mortality and morbidity.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Bullough 1989

Methods	RCT. Concealment of allocation: not clear (unit of allocation provider/TBA, randomization process not reported, conducted by MOH, Department of Statistics). Baseline measurement of outcomes: not clear (not reported, but groups compared for potential confounding factors). Follow up of professionals: not done (29% of TBAs excluded from follow up). Follow up of participants or episodes of care: done. Blinded assessment of primary outcomes: done. Reliable primary outcome measures: not clear (TBAs trained to measure all blood lost using transparent plastic jug, trainers conducted quality control checks for accuracy, authors questioned accuracy of method). Protection against contamination: not clear (allocation by TBAs within study area). Power calculation: done. Consumer involvement: not clear.
Participants	Malawi, rural setting. TBA. Level of training: some biomedical (all TBAs had received prior training). Clinical specialty: obstetrics (limited). Episodes of care: 4385 births; intervention = 2184 women; control = 2201 women. Providers: intervention = 33 TBAs; control = 35 TBAs (decreased to 23 and 26 TBAs, respectively). Hospitals: not clear ("a few" hospitals). Communities or regions: 3 regions.
Interventions	Professional intervention: (1) educational meetings; (2) educational outreach; (3) distribution of educational materials. TBAs in both intervention and control groups attended a 2-day refresher course, the intervention group received additional instruction on immediate suckling before placental delivery. Targeted behaviour: patient education/advice, clinical preventive services, general management of a problem, referral, procedures, patient outcome. Control: no additional instruction of TBAs on immediate suckling before placental delivery. Intervention based upon implementation of clinical practice guidelines: not done (clinical practice guidelines indicate oxytocic drugs are effective in the management of PPH but these are not available to TBAs). Clinical practice guidelines developed through formal consensus process: not clear. Economic variables: not done.

Bullough 1989 (*Continued*)

Outcomes	Unit of analysis: individual women cared for by TBAs. (1) PPH (> 500 ml blood during the third stage of labour or within 24 hours after delivery); (2) mean blood loss; (3) transfer to hospital for 3rd stage labour complications. Intervention based upon implementation of clinical practice guidelines: not done (clinical practice guidelines indicate oxytocic drugs are effective in the management of PPH but these are not available to TBAs). Clinical practice guidelines developed through formal consensus process: not clear. Economic variables: not done.
Notes	Follow up: 3-4 weeks after training, then every 5 weeks over 6-9 months, not specified who conducted follow up although community midwives also attended 1 follow-up visit.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Hossain 2000

Methods	RCT. Concealment of allocation: not clear (unit of allocation subdistrict/thana, process of and party responsible for randomization not reported, unclear if all TBAs in thana included). Baseline measurement of outcomes: not clear (reported, but not clear if significant difference between intervention and control groups). Follow up of professionals: done. Follow up of patients or episodes of care: N/A (cross-sectional survey, target number reached). Blinded assessment of primary outcomes: not clear (not stated who collected outcome data or whether aware of intervention/control group status). Reliable primary outcome measures: not clear. Protection against contamination: not clear (allocation by thana, 1 per division, but question of contamination). Power calculation: not clear. Consumer involvement: not clear.
Participants	Bangladesh, rural setting. TBAs and village doctors. Level of training: some biomedical (71% of all TBAs had received prior training, most of which included breastfeeding). Clinical specialty: obstetrics (limited). Episodes of care: N/A. Participants: lactating mothers surveyed at baseline, 3 months, and 7 months. Intervention = 1065 women. Control = 1067 women. Providers: intervention = 249 TBAs, control = 249 TBAs. Hospitals: N/A.

Hossain 2000 (*Continued*)

	Communities or regions: 12 thanas. Intervention = 6. Control = 6.
Interventions	Professional intervention: (1) educational meetings. TBAs and village doctors received 2-day training with a developed module on knowledge and advice related to breastfeeding. Targeted behaviour: patient education/advice, procedure (breastfeeding). Control: no training of TBAs and village doctors. Intervention based upon implementation of clinical practice guidelines: done (based on International Conference on Population and Development). Clinical practice guidelines developed through formal consensus process: not clear. Economic variables: not done.
Outcomes	Unit of analysis: individual TBAs and women living in areas served by TBAs. TBA outcomes: (1) whether/types of advice on breastfeeding; (2) knowledge and benefits of colostrum; (3) knowledge about initiation of breastfeeding and weaning foods; (4) knowledge and benefits of exclusive breastfeeding; (5) knowledge about breast milk substitutes. Maternal outcomes: (1) feeding practices at birth; (2) timing/benefits of breastfeeding; (3) whether, what, who provided information about breastfeeding; (4) disadvantages of bottle feeding; (5) other: place of delivery, use of antenatal care; (6) village doctor outcomes (content same as TBA).
Notes	Follow up: survey at 3 months, 7 months, survey at 7-8 months after training, (not specified who conducted follow up).

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Jokhio 2005

Methods	RCT, cluster. Concealment of allocation: done. Baseline measurement of outcomes: not done (but groups compared for potential confounding factors). Follow up of professionals: N/A. Follow up of patients or episodes of care: done. Blinded assessment of primary outcomes: not done (LHW unaware of comparative nature of study). Reliable primary outcome measures: not clear (not reported, complications defined, pictures provided, LHW asked women if had any complications on list of complications, data not verifiable). Protection against contamination: done. Power calculation: done (sufficient to detect a 23% reduction in perinatal mortality but only a 90% reduction in maternal mortality). Consumer involvement: not done.
Participants	Pakistan, rural setting. TBAs and LHW. Level of training: untrained TBAs, LHWs some biomedical. Clinical specialty: obstetrics (limited). Episodes of care: 19557 pregnant women. Participants: intervention = 10114 women (9710 singleton births); control = 9443 women (8989 singleton births). Providers: intervention = 565 TBAs; control = unknown number of TBAs. Intervention = 811 LHW; control = 819 LHW. Hospitals: 2 (outreach clinics offered in 1 hospital and 1 rural health center to intervention clusters). Communities or regions: 7 talukas; intervention =3. Control = 4.
Interventions	Professional intervention: (1) educational meetings; (2) educational outreach visits; (3) distribution of educational materials. Provider oriented intervention: (1) clinical multidisciplinary teams; (2) continuity of care. Structural intervention: (1) changes in equipment; (2) change in scope and nature of benefits and services. TBAs received 3-day training on clean delivery, detection of complications and referral, delivery kits provided; LHWs trained to support TBAs; OB teams provided consultation; outreach clinics. Targeted behaviour: patient education/advice, clinical prevention services, general management of a problem, procedures, referral, patient outcome, record keeping, other: LHW support. Control: no training of TBAs or LHWs; no kits distributed to TBAs; no outreach clinics. Intervention based upon implementation of clinical practice guidelines: not clear. Clinical practice guidelines developed through formal consensus process: not clear. Economic variables: not done.

Jokhio 2005 (*Continued*)

Outcomes	Unit of analysis: individual women living in areas served by TBAs. (1) Perinatal death; (2) stillbirth; (3) neonatal death; (4) maternal death; (5) major obstetric complications; (6) referral by TBA for emergency obstetric care.
Notes	Follow up: pregnant women recruited 1 month after TBA training over 6 months, followed by LHW until 42 days postpartum.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

O'Rourke 1994

Methods	CBA. Characteristics of studies using second site as control: done. Baseline measurement of outcomes: done. Follow up of professionals: N/A. Follow up of patients: done. Blind assessment of primary outcomes: not done (but outcome measures were objective). Reliable primary outcome measures: done. Protection against contamination: done. Power calculation: not clear. Consumer involvement: not clear.
Participants	Guatemala study, rural setting. TBAs. Level of training: TBAs, some biomedical, MOH Guatemala had been training TBAs since 1935). Clinical specialty: obstetrics (limited). Episodes of care: 845 women referred by TBAs. Participants: baseline: intervention = 79, control = 146 women. During intervention > intervention = 22, control = 42 women. Postintervention: intervention = 217, control = 339 women. Providers: intervention = approximately 400 TBAs. Control = approximately 600 TBAs. Hospitals: 1. Communities or regions: 10 health districts; intervention = 4, control = 6.

O'Rourke 1994 (*Continued*)

Interventions	Professional intervention: (1) educational meetings. Provider-oriented intervention: (1) formal integration of services. TBAs trained to detect, manage, refer women with obstetric complications (malpresentation, prolonged labour, preterm labour, multiple pregnancy, excessive bleeding) to hospital. The 5-day training included 11 modules covered over 3-month period, 1-day refresher provided over 8 months. Control: no additional training of TBAs (note: project included referral hospital staff training, conducted 4 months prior to TBA training, on management of complicated deliveries, importance of being supportive of TBAs. This component affected both the intervention and control groups equally). Targeted behaviour: general management of problem, patient education/ advise, patient outcome. Intervention based upon implementation of clinical practice guidelines: not clear. Clinical practice guidelines developed through formal consensus process: not clear. Economic variables: not done.
Outcomes	Unit of analysis: individual women referred by TBAs to health facility. (1) Correct identification of complications by TBA, by type of complication: malposition; prolonged labour; preterm labour. (2) Timely referral by TBA, overall and by type of complication: malposition; prolonged labour; preterm labour. (3) Mean number of referrals/month. (4) Perinatal mortality among women referred by TBA overall, and by type of complication: malposition; prolonged labour; preterm labour.
Notes	Follow up: beginning 1 month post-training for 8-month period, data collected within 48 hours of birth, by trained physicians.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	D - Not used

CBA: controlled before/after study
LHW: lady health workers
MOH: ministry of health
OB: obstetric
PPH: postpartum haemorrhage
RCT: randomized controlled trial
TBA: traditional birth attendant

Characteristics of excluded studies *[ordered by study ID]*

Alisjahbana 1995	Study design CBA but does not include randomization or baseline assessment of outcomes.
Bailey 2002	Relevant data are not presented nor obtainable from author.
Bang 1999	Intervention targeted training village health workers. Trained TBAs assisted the trained village health workers.
Gloyd 2001	Study design is an observational cross-sectional design.
Greenwood 1999	Intervention and control groups are not comparable.
John 2002	Study design is time series but does not contain at least 3 data points both before and after the intervention.
Menendez 1994a	Population is trained TBAs only. No comparison to untrained TBAs. Comparison is iron supplement vs placebo.
Menendez 1994b	Population is trained TBAs only. No comparison to untrained TBAs. Comparison is maloprim (chemoprophylaxis for malaria) vs placebo.
Nyamwaya 1993	Intervention and control groups are not comparable. Control site is not untrained TBAs only.
Prata 2005	Study design is an observational cross-sectional design.
Rahman 1982	Study design included random selection but not random assignment to groups.
Singhal 2001	Population is trained TBAs only. Comparison is TBAs trained by lecture vs TBAs trained by interaction problem-based method.
Theron 1999	Population is professional midwives and not TBAs. Training is not TBA training.
Theron 2000	Population is professional midwives and not TBAs. Training is not TBA training.

CBA: controlled before/after study
TBA: traditional birth attendants
vs: versus

DATA AND ANALYSES

Comparison 1. Trained versus untrained traditional birth attendants (TBAs)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Perinatal deaths (number per 1000 live births and stillbirths)	1	18699	OR, cluster adjusted (Fixed, 95% CI)	0.70 [0.59, 0.83]
2 Stillbirths (number per 1000 live births and stillbirths)	1	18699	OR, cluster adjusted (Fixed, 95% CI)	0.69 [0.57, 0.83]
3 Neonatal deaths (number per 1000 live births)	1	18699	OR, cluster adjusted (Fixed, 95% CI)	0.71 [0.61, 0.82]
4 Maternal deaths (number per 100,000 pregnancies)	1	19525	OR, cluster adjusted (Fixed, 95% CI)	0.74 [0.45, 1.22]
5 Postpartum haemorrhage	1	19525	OR, cluster adjusted (Fixed, 95% CI)	0.61 [0.47, 0.79]
6 Prolonged or obstructed labour	1	19525	OR, cluster adjusted (Fixed, 95% CI)	1.26 [1.03, 1.54]
7 Puerperal sepsis	1	19525	OR, cluster adjusted (Fixed, 95% CI)	0.17 [0.13, 0.23]
8 Referral to emergency obstetrical care	1	19525	OR, cluster adjusted (Fixed, 95% CI)	1.50 [1.18, 1.90]

Comparison 2. Additional training versus basic training

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Postpartum haemorrhage (frequency)	1	4227	Odds Ratio (M-H, Fixed, 95% CI)	0.94 [0.76, 1.17]
2 Mean blood loss (ml)	1	4227	Mean Difference (IV, Fixed, 95% CI)	2.0 [-7.39, 11.39]
3 Traditional birth attendants advised to feed colostrum immediately after birth	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 3 months post-test	1	162	Odds Ratio (M-H, Fixed, 95% CI)	1.21 [0.39, 3.79]
3.2 7 months follow up	1	165	Odds Ratio (M-H, Fixed, 95% CI)	1.37 [0.62, 3.03]
4 Traditional birth attendants advised to give complementary food along with breast milk after 5 months of age	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 3 months post-test	1	162	Odds Ratio (M-H, Fixed, 95% CI)	3.11 [1.63, 5.92]
4.2 7 months follow up	1	165	Odds Ratio (M-H, Fixed, 95% CI)	2.07 [1.10, 3.90]
5 Correct referral for malpresentation (Kappa)			Other data	No numeric data
6 Correct referral for prolonged labour (Kappa)			Other data	No numeric data
7 Correct referral for preterm labour (Kappa)			Other data	No numeric data

8 Timely referral for malpresentation, prolonged labour, preterm labour	1	358	Odds Ratio (M-H, Fixed, 95% CI)	1.09 [0.72, 1.66]
9 Timely referral for malpresentation	1	89	Odds Ratio (M-H, Fixed, 95% CI)	1.02 [0.41, 2.55]
10 Timely referral for prolonged labour	1	119	Odds Ratio (M-H, Fixed, 95% CI)	0.92 [0.43, 1.97]
11 Timely referral for preterm labour	1	119	Odds Ratio (M-H, Fixed, 95% CI)	0.92 [0.43, 1.97]
12 Perinatal mortality	1	521	Odds Ratio (M-H, Fixed, 95% CI)	1.02 [0.59, 1.76]

Analysis 1.1. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 1 Perinatal deaths (number per 1000 live births and stillbirths).

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 1 Perinatal deaths (number per 1000 live births and stillbirths)

Study or subgroup	Trained TBAs N	Untrained TBAs N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	9710	8989	-0.3567 (0.0839)		100.0 %	0.70 [0.59, 0.83]
Total (95% CI)					**100.0 %**	**0.70 [0.59, 0.83]**
Heterogeneity: not applicable						
Test for overall effect: Z = 4.25 (P = 0.000021)						

Analysis 1.2. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 2 Stillbirths (number per 1000 live births and stillbirths).

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

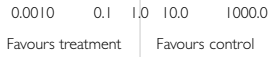
Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 2 Stillbirths (number per 1000 live births and stillbirths)

Study or subgroup	Trained TBAs N	Untrained TBAs N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	9710	8989	-0.3712 (0.0959)		100.0 %	0.69 [0.57, 0.83]
Total (95% CI)					**100.0 %**	**0.69 [0.57, 0.83]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.87 (P = 0.00011)



Analysis 1.3. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 3 Neonatal deaths (number per 1000 live births).

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

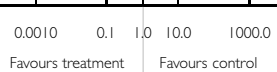
Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 3 Neonatal deaths (number per 1000 live births)

Study or subgroup	Trained TBAs N	Untrained TBAs N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	9710	8989	-0.3425 (0.0744)		100.0 %	0.71 [0.61, 0.82]
Total (95% CI)					**100.0 %**	**0.71 [0.61, 0.82]**

Heterogeneity: not applicable

Test for overall effect: Z = 4.60 (P < 0.00001)



Analysis 1.4. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 4 Maternal deaths (number per 100,000 pregnancies).

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

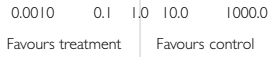
Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 4 Maternal deaths (number per 100,000 pregnancies)

Study or subgroup	Trained TBAs N	Untrained TBAs N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	10093	9432	-0.3011 (0.2565)		100.0 %	0.74 [0.45, 1.22]
Total (95% CI)					**100.0 %**	**0.74 [0.45, 1.22]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.17 (P = 0.24)



Analysis 1.5. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 5 Postpartum haemorrhage.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

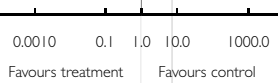
Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 5 Postpartum haemorrhage

Study or subgroup	Trained N	Untrained N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	10093	9432	-0.4943 (0.1325)		100.0 %	0.61 [0.47, 0.79]
Total (95% CI)					**100.0 %**	**0.61 [0.47, 0.79]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.73 (P = 0.00019)



Analysis 1.6. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 6 Prolonged or obstructed labour.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

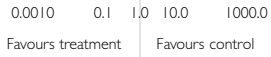
Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 6 Prolonged or obstructed labour

Study or subgroup	Trained TBAs N	Untrained TBAs N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	10093	9432	0.2311 (0.1026)		100.0 %	1.26 [1.03, 1.54]
Total (95% CI)					**100.0 %**	**1.26 [1.03, 1.54]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.25 (P = 0.024)



Analysis 1.7. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 7 Puerperal sepsis.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

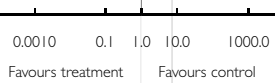
Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 7 Puerperal sepsis

Study or subgroup	Trained N	Untrained N	log [OR, cluster adjusted] (SE)	OR, cluster adjusted IV,Fixed,95% CI	Weight	OR, cluster adjusted IV,Fixed,95% CI
Jokhio 2005	10093	9432	-1.772 (0.1456)		100.0 %	0.17 [0.13, 0.23]
Total (95% CI)					**100.0 %**	**0.17 [0.13, 0.23]**

Heterogeneity: not applicable

Test for overall effect: Z = 12.17 (P < 0.00001)

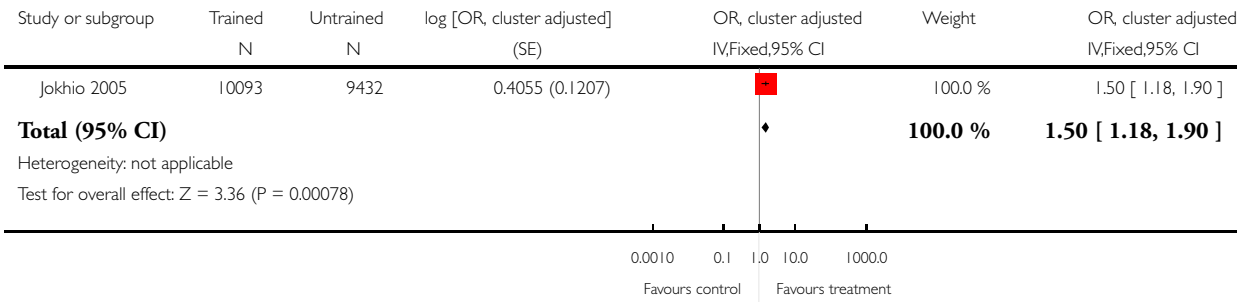


Analysis 1.8. Comparison 1 Trained versus untrained traditional birth attendants (TBAs), Outcome 8 Referral to emergency obstetrical care.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 1 Trained versus untrained traditional birth attendants (TBAs)

Outcome: 8 Referral to emergency obstetrical care

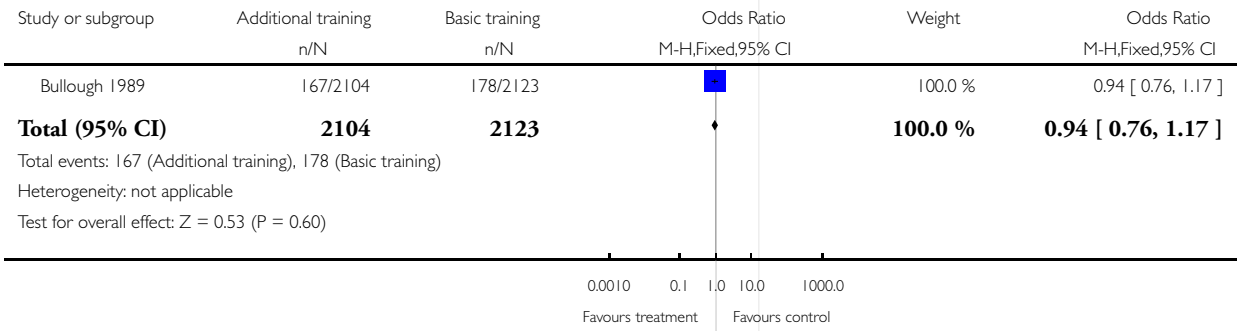


Analysis 2.1. Comparison 2 Additional training versus basic training, Outcome 1 Postpartum haemorrhage (frequency).

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 1 Postpartum haemorrhage (frequency)

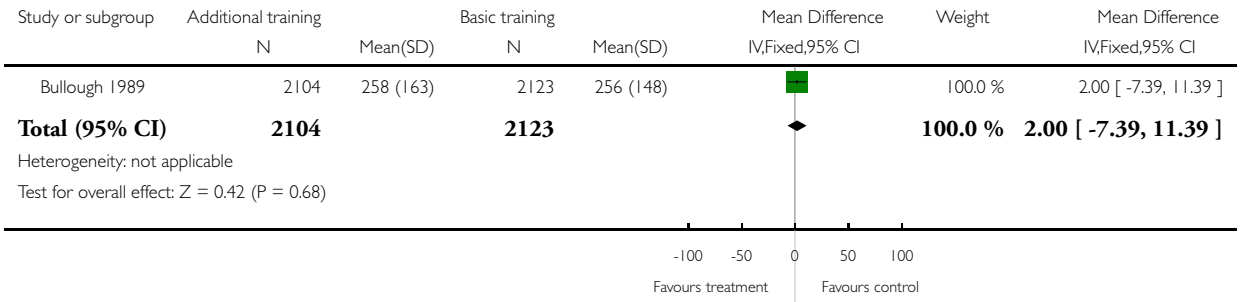


Analysis 2.2. Comparison 2 Additional training versus basic training, Outcome 2 Mean blood loss (ml).

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 2 Mean blood loss (ml)

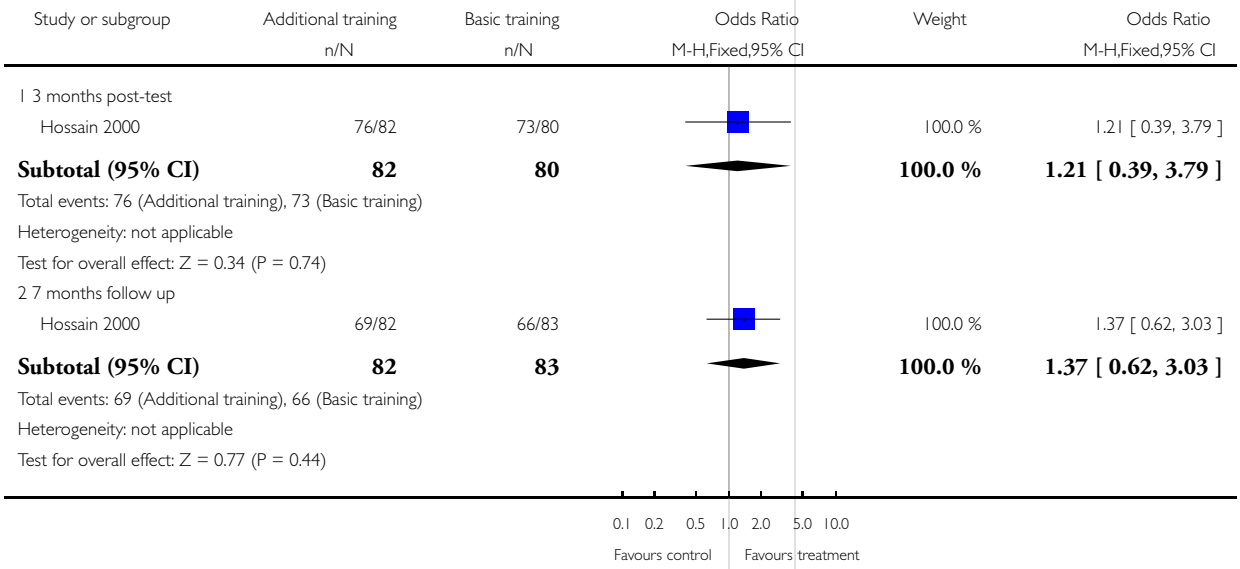


Analysis 2.3. Comparison 2 Additional training versus basic training, Outcome 3 Traditional birth attendants advised to feed colostrum immediately after birth.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

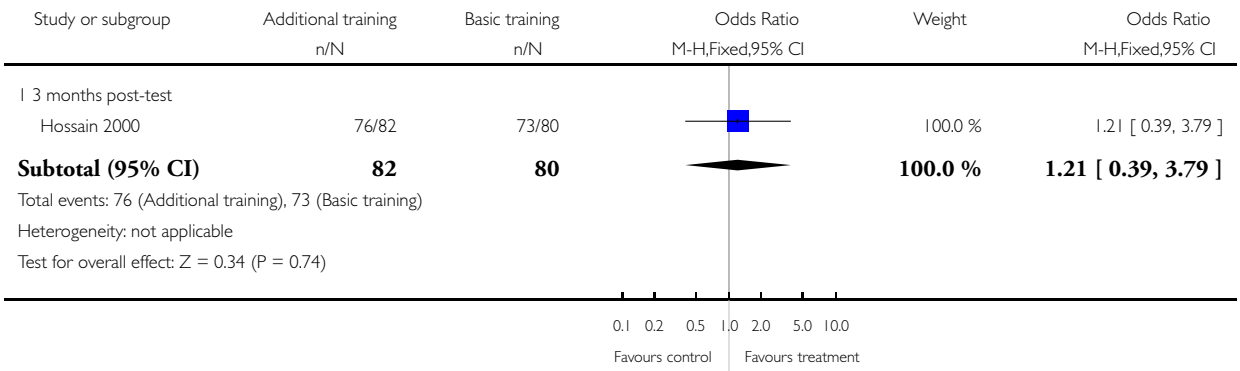
Outcome: 3 Traditional birth attendants advised to feed colostrum immediately after birth



Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

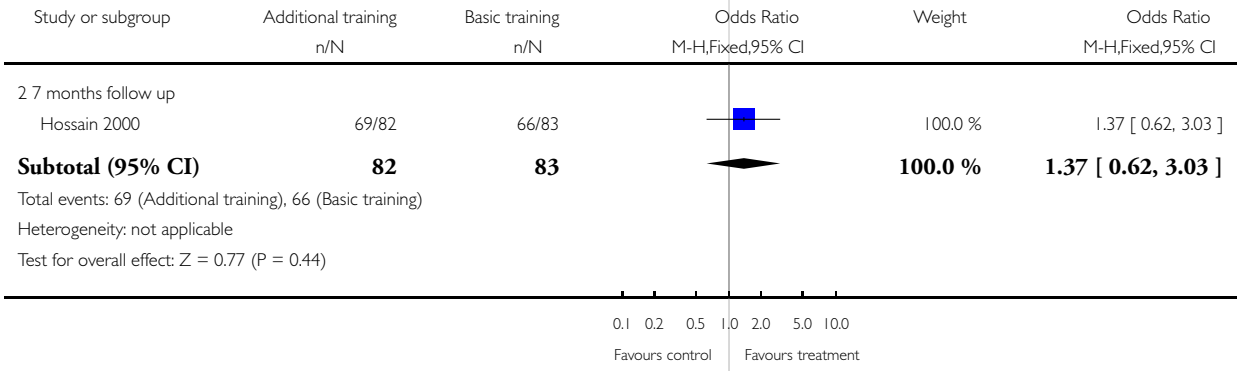
Outcome: 3 Traditional birth attendants advised to feed colostrum immediately after birth



Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 3 Traditional birth attendants advised to feed colostrum immediately after birth

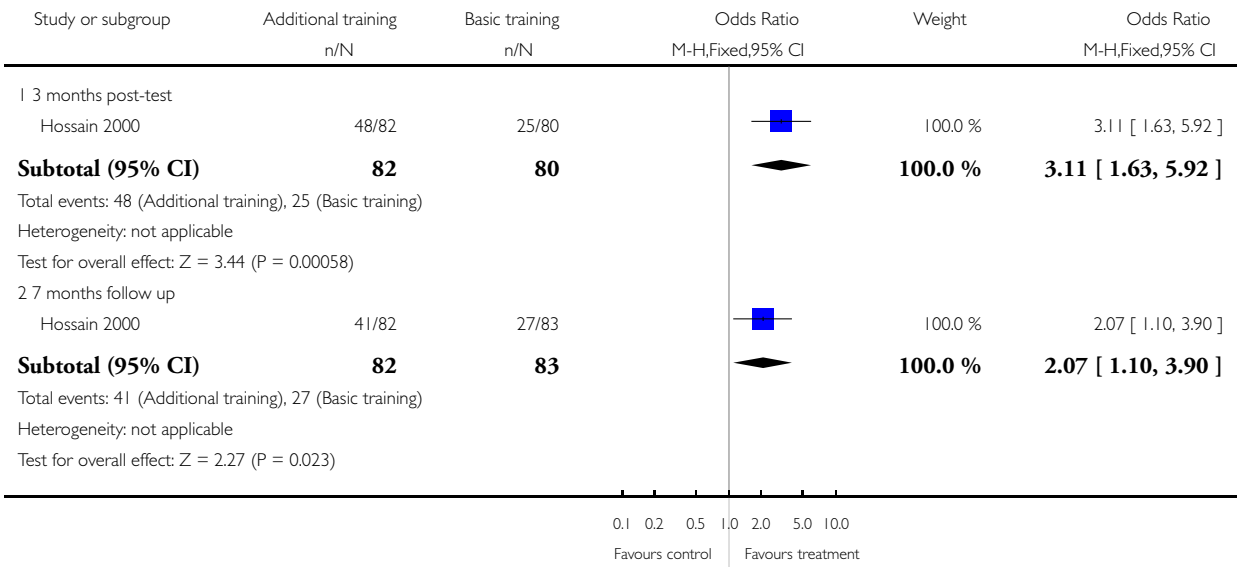


Analysis 2.4. Comparison 2 Additional training versus basic training, Outcome 4 Traditional birth attendants advised to give complementary food along with breast milk after 5 months of age.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

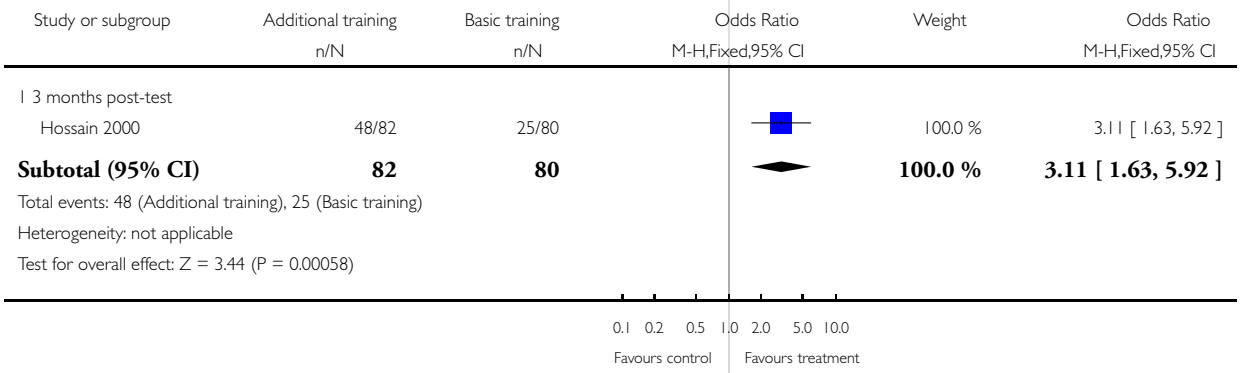
Outcome: 4 Traditional birth attendants advised to give complementary food along with breast milk after 5 months of age



Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

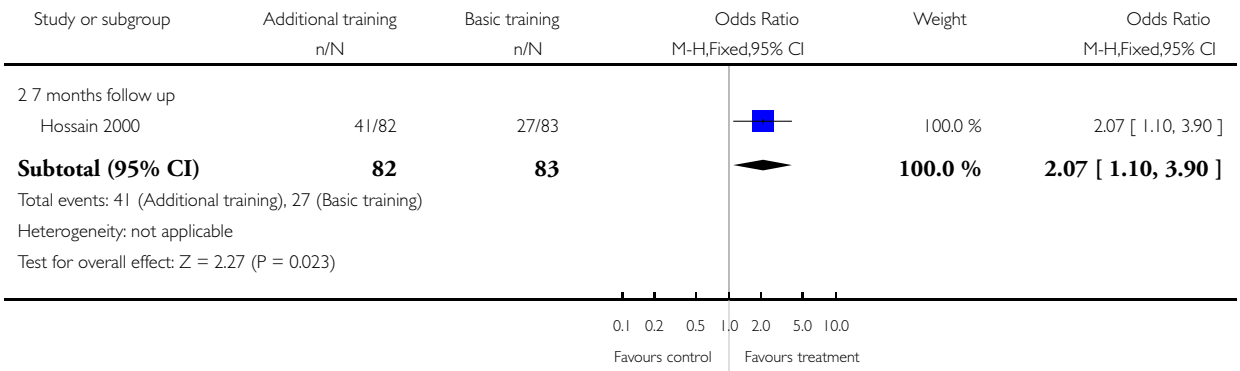
Outcome: 4 Traditional birth attendants advised to give complementary food along with breast milk after 5 months of age



Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 4 Traditional birth attendants advised to give complementary food along with breast milk after 5 months of age



Analysis 2.5. Comparison 2 Additional training versus basic training, Outcome 5 Correct referral for malpresentation (Kappa).

Correct referral for malpresentation (Kappa)

O'Rourke 1994	Trained TBAs with additional training. Post-test Kappa 0.72 (95% CI 0.59 to 0.85).	Trained TBAs with no additional training. Post-test Kappa 0.70 (95% CI 0.59 to 0.80).	P = 0.38

Analysis 2.6. Comparison 2 Additional training versus basic training, Outcome 6 Correct referral for prolonged labour (Kappa).

Correct referral for prolonged labour (Kappa)

O'Rourke 1994	Trained TBAs with additional training. Post-test Kappa 0.45 (95% CI 0.29 to 0.62).	Trained TBAs with no additional training. Post-test Kappa 0.43 (95% CI 0.29 to 0.56).	P = 0.40

Analysis 2.7. Comparison 2 Additional training versus basic training, Outcome 7 Correct referral for preterm labour (Kappa).

Correct referral for preterm labour (Kappa)

O'Rourke 1994	Trained TBAs with additional training. Post-test Kappa 0.77 (95% CI 0.59 to 0.95).	Trained TBAs with no additional training. Post-test Kappa 0.61 (95% CI 0.42 to 0.75).	P = 0.11

Analysis 2.8. Comparison 2 Additional training versus basic training, Outcome 8 Timely referral for malpresentation, prolonged labour, preterm labour.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 8 Timely referral for malpresentation, prolonged labour, preterm labour

Study or subgroup	Additional training n/N	Basic training n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
O'Rourke 1994	78/168	84/190		100.0 %	1.09 [0.72, 1.66]
Total (95% CI)	**168**	**190**		**100.0 %**	**1.09 [0.72, 1.66]**

Total events: 78 (Additional training), 84 (Basic training)

Heterogeneity: not applicable

Test for overall effect: Z = 0.42 (P = 0.67)

Analysis 2.9. Comparison 2 Additional training versus basic training, Outcome 9 Timely referral for malpresentation.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 9 Timely referral for malpresentation

Study or subgroup	Additional training n/N	Basic training n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
O'Rourke 1994	11/36	16/53		100.0 %	1.02 [0.41, 2.55]
Total (95% CI)	**36**	**53**		**100.0 %**	**1.02 [0.41, 2.55]**

Total events: 11 (Additional training), 16 (Basic training)

Heterogeneity: not applicable

Test for overall effect: Z = 0.04 (P = 0.97)

Analysis 2.10. Comparison 2 Additional training versus basic training, Outcome 10 Timely referral for prolonged labour.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 10 Timely referral for prolonged labour

Study or subgroup	Additional training n/N	Basic training n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
O'Rourke 1994	18/49	27/70		100.0 %	0.92 [0.43, 1.97]
Total (95% CI)	**49**	**70**		**100.0 %**	**0.92 [0.43, 1.97]**

Total events: 18 (Additional training), 27 (Basic training)

Heterogeneity: not applicable

Test for overall effect: Z = 0.20 (P = 0.84)

Analysis 2.11. Comparison 2 Additional training versus basic training, Outcome 11 Timely referral for preterm labour.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 11 Timely referral for preterm labour

Study or subgroup	Additional training n/N	Basic training n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
O'Rourke 1994	18/49	27/70		100.0 %	0.92 [0.43, 1.97]
Total (95% CI)	**49**	**70**		**100.0 %**	**0.92 [0.43, 1.97]**
Total events: 18 (Additional training), 27 (Basic training)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.20 (P = 0.84)					

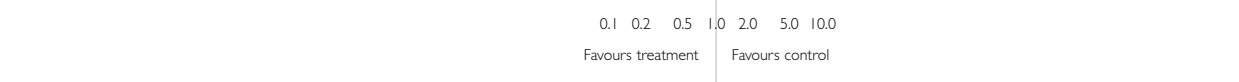
Analysis 2.12. Comparison 2 Additional training versus basic training, Outcome 12 Perinatal mortality.

Review: Traditional birth attendant training for improving health behaviours and pregnancy outcomes

Comparison: 2 Additional training versus basic training

Outcome: 12 Perinatal mortality

Study or subgroup	Additional training n/N	Basic training n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
O'Rourke 1994	24/203	37/318		100.0 %	1.02 [0.59, 1.76]
Total (95% CI)	**203**	**318**		**100.0 %**	**1.02 [0.59, 1.76]**
Total events: 24 (Additional training), 37 (Basic training)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.06 (P = 0.95)					



APPENDICES

Appendix 1. Supplemental Search

Supplemental Search

The supplemental search included the following electronic databases representing the fields of education, social, and health sciences:

1. African Index Medicus;
2. Anthropological PLUS (Anthropological Literature and Anthropological Index);
3. BIOSIS Previews;
4. Cambridge Scientific Biological Sciences Set;
5. CINAHL;
6. Current Contents Connect;
7. Database of Abstracts of Reviews of Effectiveness (DARE);
8. Dissertation Abstracts;
9. EMBASE;
10. Education Abstracts;
11. ERIC;
12. History of Science and Technology;
13. LILACS;
14. MEDLINE;
15. OCLC First Search Contents First;
16. PAIS International (Public Affaires Information Service);
17. POPLINE;
18. RLIN Bibliographic File;
19. Sociological Abstracts; and
20. Web of Science.

These databases were searched from inception to June 2006 using the search strategy (modified for each database, as necessary) in Appendix 2.

We also contacted agencies involved in global reproductive health for unpublished literature. We retrieved and screened the references of published studies for additional potentially relevant documents, and retrieved copies of the published articles. We searched the internet for reports of training projects implemented and evaluated by international organizations, United Nations organizations such as United Nations Fund for Population Activities and the World Health Organization, as well as other non-governmental organizations engaged in community-based work such as CARE, Save the Children Foundation, and World Vision. Finally, we contacted experts in the field for information and collection of unpublished material.

Appendix 2. Search strategy

1. TRADITIONAL BIRTH ATTENDANT*
2. TBA*
3. TRADITIONAL MIDWIFE OR TRADITIONAL MIDWIVES
4. LAY MIDWIFE/
5. LAY MIDWIFE OR LAY MIDWIVES
6. TRADITIONAL FAMILY BIRTH ATTENDANT*
7. TRADITIONAL HOME BIRTH ATTENDANT*
8. FAMILY BIRTH ATTENDANT*
9. OR/1-8
10. TRAIN* or TEACH or EDUCAT* or INSTRUCT*
11. EVALUAT*
12. COMPAR*
13. EFFECT*
14. IMPACT*

15. OUTCOME*
16. PERFORM*
17. KNOWLEDGE/ATTITUDES AND PRACTICE/
18. TEACHING/
19. OR/10-18
20. 9 AND 19

(*Note:*
* by the term denotes truncating the term and searching it as a text word;
/ at the end of a search statement means subject heading;
search statement with nothing at the end means text word search

F E E D B A C K

Abba, 14 April 2008

Summary

This review was selected for presentation at one of our regular journal clubs. A number of comments arose from our discussions, and we thought we would like to share them with you.

Title and inclusion criteria

The title of the review and inclusion criteria do not best reflect the scope of this review, which is not simply training for traditional birth attendants, but also more complex intervention packages. The more complex interventions include improvements to facility based care and community interventions, supply of materials, liaison with the formal health sector, and supervision. We suggest the title refers to 'traditional birth attendants programmes' or 'traditional birth attendant training and support programmes'.

Background

It would be useful to include a short general description of the varied social contexts in which traditional birth attendants work, how their relationships with formal health services were initiated and developed, and whose agenda the relationships were fulfilling. Also, it would be helpful to mention the strategy of including traditional birth attendants in biomedically orientated training and service improvement programmes.

Description of included studies

The interventions are complex and contextually bound, so it is important to describe the context and intervention used in each study as fully as possible. Also, when evaluating such a complex intervention, it is important to take account of the content and delivery of the training provided, if these are available. The authors describe the review as a 'systematic narrative review'. In which case more detail is required, in the included studies table and the additional tables, on the components of the training programmes/ interventions, including any improvements to the health system. In the case of the training for example, where did the training take place? How long was the training? What was the mix of theory and practice? What pedagogic approach was used? Were the trainers trained themselves to teach?

Conclusions

One large study showed significant reductions in stillbirths, perinatal and neonatal deaths, and serious maternal complications, plus a reduction in maternal mortality that, while not significant, at 26% is certainly encouraging. This suggests that traditional birth attendant training programmes, in conjunction with improved health systems, have the potential to significantly improve outcome for mothers and babies. It is worth looking more closely into how this programme achieved such remarkable results. It suggests that some further research should concentrate on evaluating whether this model of provision might be effective in other contexts, and even how it might be improved on.

(Summary of feedback from Katharine Abba, on behalf of the International Health Group Journal Club at the Liverpool School of Tropical Medicine, April 2008)

Reply

In response, to each section of the feedback:

Title and inclusion criteria

The inclusion criteria state that the intervention is traditional birth attendant training. Like most interventions, traditional birth attendant training is nested within health systems and settings with a variety of interrelated components. Only two of the four included studies described traditional birth attendant training as a component of a more complex program or health service (Jokhio 2005 and O'Rourke 1994). For this reason, we do not agree that changing the title of the review would improve the fit between title and scope of review; in fact it might be misleading. In the review we do discuss the challenge of evaluating complex program interventions. Training is a key activity in any traditional birth attendant program. Adding the term 'program', and changing the title to read 'Traditional birth attendant training programs for improving health behaviours and pregnancy outcomes' might be appropriate, though we are not sure this is an improvement.

Background

The background does describe the typical work arrangements, payment agreements and settings for traditional birth attendants. We are not sure what additional information is being requested, and would welcome specific examples. We agree traditional birth attendant training reflects a biomedical agenda. We do not address the implications of this for traditional birth attendant training because we did not see the review as the appropriate place for such a discussion.

Description of included studies

We agree with the feedback. In the Criteria for considering studies for this review we state that *where available* we provide information on characteristics of participants and of the intervention. Information in the main body of the review, in the included studies table, and in the additional tables reflects what was reported for each included studies. Where information is missing it is because it was not reported. The lack of sufficient descriptive information about participants and the intervention is a major limitation of most reports. In the conclusions to the review we urge future trials to provide complete descriptions. For future updates we will contact trial authors to ask for this additional information.

We used the term 'systematic narrative review' because we were unable to pool the study findings in a quantitative synthesis due to heterogeneity in the outcomes reported.

Conclusions

We agree with the feedback, and state this in the conclusion. We note that potential mechanisms underlying these promising effects were not addressed in this trial, and that another trial suggests appropriate referral to improved health services is a key factor. In implications for research, we will add the phrase 'further research to examine the mechanisms underlying the effects of this promising program is warranted'.

(Response from Lynn Sibley, July 2008)

Contributors

Lynn Sibley

WHAT'S NEW

Last assessed as up-to-date: 29 June 2008.

30 June 2008	New search has been performed	Search updated. No new trial reports identified.
24 June 2008	Feedback has been incorporated	Feedback and reply from author added.
19 June 2008	Amended	Converted to new review format. Added sentence to Implications for research in response to feedback.

HISTORY

Protocol first published: Issue 3, 2005

Review first published: Issue 3, 2007

CONTRIBUTIONS OF AUTHORS

LM Sibley (contact author and guarantor for the review) conceived, designed and coordinated the review; developed study screening and abstraction forms; conducted second stage screening of studies for inclusion into review; interpreted results; and drafted the final review.

TA Sipe (co-author) provided feedback on the draft protocol; developed study screening and abstraction forms; conducted second stage of screening of the studies for inclusion into the review; coordinated and conducted data extraction; conducted data entry into Review Manager and data analysis; and provided feedback on the content of the draft review.

CM Brown (co-author) provided feedback on the draft protocol; coordinated and conducted the supplemental literature search; and provided feedback on the content of the draft review.

MM Diallo (co-author) conducted first stage of screening of studies for inclusion into the review; and participated in data extraction.

K McNatt (co-author) coordinated the search for grey literature; conducted first stage of screening of studies for inclusion into the review; and participated in data extraction.

N Habarta (co-author) participated in data extraction; and developed data tables.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Nell Hodgson Woodruff School of Nursing, Center for Research on Maternal and Newborn Survival, Emory University, Atlanta, GA, USA.
- Woodruff Health Sciences Center Library, Emory University, Atlanta, GA, USA.

External sources

- No sources of support supplied

INDEX TERMS

Medical Subject Headings (MeSH)

*Health Behavior; Infant, Newborn; *Infant Mortality; Maternal Mortality; Midwifery [*education]; *Pregnancy Outcome; Randomized Controlled Trials as Topic

MeSH check words

Female; Humans; Pregnancy