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Supplementary Tables

Table S1: Summary of the included studies (N = 6)

Study	Study setting	Interventions	Key findings
Jokhio 2005	Larkana, a rural district in Sindh, Pakistan	A team of obstetricians and female paramedics trained all traditional birth attendant. The training lasted three days and involved the use of picture cards containing advice on antepartum, intrapartum, and postpartum care; how to conduct a clean delivery; use of the disposable de- livery kit; when to refer women for emergency obstetrical care; and care of the newborn.	Training traditional birth attendants and integrating them into an improved health care system were achievable and effective in reducing perinatal mortality. This model could result in large improvements in perinatal and maternal health in developing countries.
Carlo 2010	Lusaka and Ndola (large cities) in Zambia	Research nurses underwent ENC training (5 days) by a WHO officer and 2 experienced trainers who had been involved in the development of WHO training materials. The elements of the ENC course included universal precautions and cleanliness, routine neonatal care, initiation of breathing and resuscitation (including bag-mask ventilation), prevention of hypothermia, early and exclusive breastfeeding, kangaroo (skin-to-skin) care, care of small infants, counselling on infant care and danger signs, and recognition and initial management of complications. After completion of the post–ENC training data collection, the research nurses underwent NRP training (5 days) by an experienced instructor. The elements of the NRP included in the training were in-depth basic resuscitation knowledge and skills, including initial steps of resuscitation, bag-mask ventilation, and chest compressions.	All-cause, 7-day neonatal mortality rates decreased, because of decreases in rates of deaths attributable to birth asphyxia and infection. Perinatal mortality rates but not stillbirth rates decreased. The 7-day neonatal mortality rate was decreased further after Neonatal Resuscitation Program training, after correction for loss to follow-up monitoring.

Gill 2011	Lufwanyama, a vast, sparsely populated and under-developed rural district located in Zambia's Copperbelt province	Intervention birth attendants each took part in two, one week training workshops, carried out in June and August 2006. The trainers, members of the study team, used a variety of techniques, including interactive lectures, demonstrations, small group sessions, and skills practice using infant manikins. To be judged competent, each birth attendant had to satisfactorily complete a one on one skills assessment with one of the trainers.	Mortality at day 28 after birth was 45% lower among liveborn infants delivered by intervention birth attendants than control birth attendants. The greatest reductions in mortality were in the first 24 hours after birth. Deaths due to birth asphyxia were reduced among infants and by 81% within the first two days after birth. Stillbirths and deaths from serious infection occurred at similar rates in both groups.
Garces 2012	Rural areas in Chimaltenango, Guatemala	A train-the-trainers educational program was developed using a variety of teaching methods, including clinical practice sessions and demonstrations. The goal was to train all birth attendants. Country trainers trained and certified community coordinators. In turn, the community coordinators trained the practicing birth attendants within each community in all procedures, which included evaluation of clinical condition of newborns, specifically the differentiation between stillbirths and live-born infants, and evaluation of Apgar scores. Educational materials utilizing clear drawings in lieu of most text were developed locally for the TBA training. Spanish-Cakchiquel (local dialect) translators collaborated in the training process as necessary. During the TBA training, more than 60% of the training time was devoted to practice and acquisition of skills. Additionally, study activities allowed for one-on-one monitoring and follow-up in clinical contexts in the field. This continued on an ongoing basis over a period of several months to ensure that the acquired skills were put into practice adequately.	Perinatal mortality decreased from pre- ENC to post-ENC. This reduction was attributable almost entirely to a decrease in the stillbirth rate. Seven-day neonatal mortality did not decrease.

Goudar 2013	PHCs, district hospitals, and urban hospitals in Belgaum, India	Using a train-the-trainer model and paired teaching and skills and practice exchange, experienced American Academy of Pediatrics faculty instructors initiated the training cascade by preparing 18 local master trainers using the Helping Babies Breathe (HBB) material. It is a graphically based curriculum designed for resource-limited settings, was produced by the American Academy of Pediatrics. It has a combination of best practices, simplified protocols, and teaching techniques. It focuses on achieving spontaneous respiration or when indicated, providing ventilation within the first minute after birth, called The Golden Minute, for infants who do not begin to breathe on their own.	Provider knowledge and performance systematically improved with HBB training. HBB training reduced resuscitation but increased assisted bag and mask ventilation incidence. HBB training reduced SB without increasing NMR, indicating that resuscitated infants survived the neonatal period.
Kestler 2020	Districts of Huehuetenango and Alta Verapaz, Guatemala	The intervention included (1) a social marketing campaign to increase the demand for health center deliveries; (2) outreach activities by professional midwives to improve the link between TBAs and the formal healthcare system; and (3) a simulation and team training program to improve clinical skills and team function among providers.	Health center deliveries showed an overall increase, maternal morbidity decreased, and perinatal morbidity also decreased though not statistically significant.

Table S2: PRISMA checklist

Topic	No.	Item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Pages 5-6
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 6
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Table S2
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Table S3
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Table S3
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7-8
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 7-8
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 7-8
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 7-8
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 8
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8-9
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item 5)).	Page 8-9
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 8-9
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 8-9
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 8-9

Topic	No.	Item	Location where item is reported
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Page 8-9
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 8-9
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 8-9
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 8-9
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 10
Study characteristics	17	Cite each included study and present its characteristics.	Table S4
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Table S5 and Figure S13
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Figure 2, Figures S1-S5
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Figure 2, Figures S1-S5
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Figure 2, Figures S1-S5
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Figures S9-S12
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Figures S9-S11
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Table S5 and Figure S13
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Table S5 and Figure S13
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Pages 12-13
	23b	Discuss any limitations of the evidence included in the review.	Page 13
	23c	Discuss any limitations of the review processes used.	Page 13
	23d	Discuss implications of the results for practice, Policy, and future research.	Page 13

Topic	No.	Item	Location where item is reported
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 3
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 3
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 14
Competing interests	26	Declare any competing interests of review authors.	Page 14
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 14

PRIMSA Abstract Checklist

Topic	No.	Item	Reported?
TITLE			
Title	1	Identify the report as a systematic review.	Yes
BACKGROUND			
Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
METHODS			
Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	Yes
Information sources	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	Yes
Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	Yes
Synthesis of results	6	Specify the methods used to present and synthesize results.	Yes
RESULTS			
Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes
Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	Yes
DISCUSSION			
Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	Yes
Interpretation	10	Provide a general interpretation of the results and important implications.	Yes
OTHER			
Funding	11	Specify the primary source of funding for the review.	Yes
Registration	12	Provide the register name and registration number.	Yes

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. MetaArXiv. 2020, September 14. DOI: 10.31222/osf.io/v7gm2. For more information, visit: www.prisma-statement.org

Table S3: The research question, and detailed inclusion and exclusion criteria

Research Question: What is the impact of training traditional birth attendants on improvement in maternal and child healthcare outcomes?		
Inclusion		**Exclusion**
Participants	Mothers and childbirths attended by traditional birth attendants	Cases dealt completely in tertiary centers without involvement of traditional birth attendants Animals, in vitro, in-silico or other non-human studies
Intervention	Training of traditional birth attendants	
Comparator	Under-training or no training of traditional birth attendants. The comparator group can be traditional birth attendants before training (pre-post)	
Outcome	Primary outcome: • Risk ratio of 7-day neonatal mortality after training versus before training Secondary outcomes: • Risk ratio of stillbirth after training versus before training • Risk ratio of perinatal mortality after training versus before training • Risk ratio of 7-day neonatal mortality with trained versus untrained / under-trained traditional birth attendants • Risk ratio of stillbirth with trained versus untrained / under-trained traditional birth attendants	Training and outcome assessment of all cadres of healthcare workers without demarcation for traditional birth attendants and others

	• Risk ratio of perinatal mortality with trained versus untrained / under-trained traditional birth attendants • Other retrievable relevant and statistically homogenous outcomes	
Study Designs	Interventional studies, Randomised controlled trials	Observational studies, case reports, reviews
	Geography-Global level Date of Search- Published till August 8, 2023 Language: English	Language: Non-English

Table S4: The adjusted search terms as per searched electronic databases [as of 08.08.2023]

Database	No.	Search Query	Results
PubMed			
	#1	(traditional birth attendant[Title/Abstract]) OR (traditional birth*[Title/Abstract])	1,523
	#2	(training[Title/Abstract]) OR (train*[Title/Abstract]) OR (skill*[Title/Abstract])	908,115
	#3	((((((pregnancy[Title/Abstract]) OR (gestation[Title/Abstract])) OR (delivery[Title/Abstract])) OR (maternal[Title/Abstract])) OR (neonatal[Title/Abstract])) OR (pregnan*[Title/Abstract])) OR (gestation*[Title/Abstract])	1,498,074
	#4	#1 AND #2 AND #3	779
Cochrane			
	#1	("traditional birth attendant":ti,ab) OR (("traditional" NEXT birth*):ti,ab)	15
	#2	(training:ti,ab) OR (train*:ti,ab) OR (skill*:ti,ab)	156
	#3	((((((pregnancy:ti,ab) OR (gestation:ti,ab)) OR (delivery:ti,ab)) OR (maternal:ti,ab)) OR (neonatal:ti,ab)) OR (pregnan*:ti,ab)) OR (gestation*:ti,ab)	132140
	#4	#1 AND #2 AND #3	63

Scopus			
	#1	(TITLE-ABS-KEY(traditional birth attendant) OR TITLE-ABS-KEY(traditional birth attendant*))	2,115
	#2	(TITLE-ABS-KEY(training) OR TITLE-ABS-KEY(skill) OR TITLE-ABS-KEY(train*))	2,643,362
	#3	(((((TITLE-ABS(pregnancy)) OR (TITLE-ABS(gestation))) OR (TITLE-ABS(delivery))) OR (TITLE-ABS(maternal))) OR (TITLE-ABS(neonatal))) OR (TITLE-ABS(pregnan*))OR (TITLE-ABS(gestation*))	2,062,068
	#4	#1 AND #2 AND #3	787

Table S5: Quality assessment of pre-post studies

The quality assessment tool for before-after (pre-post) studies with no control group: scores of included studies.

	Scale Items[a]												
	1	2	3	4	5	6	7	8	9	10	11	12	Score
Carlo et al. (2010)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	NA	Low risk of bias
Garces et al. (2012)	Y	Y	Y	Y	CD	Y	Y	N	Y	Y	N	NA	Low risk of bias
Goudar et al. (2013)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	NA	Low risk of bias

[a] Refer to table below for criteria

The quality assessment tool for before-after (pre-post) studies with no control group: criteria.

Criteria	Scale Items
Was the study question or objective clearly stated?	1
Were eligibility/selection criteria for the study population pre-specified and clearly described?	2
Were the participants in the study representative of those who would be eligible for the test/service/intervention in the general or clinical population of interest?	3
Were all eligible participants that met the pre-specified entry criteria enrolled?	4
Was the sample size sufficiently large to provide confidence in the findings?	5
Was the test/service/intervention clearly described and delivered consistently across the study population?	6
Were the outcome measures pre-specified, clearly defined, valid, reliable, and assessed consistently across all study participants?	7
Were the people assessing the outcomes blinded to the participants' exposures/interventions?	8

Criteria	Scale Items
Was the loss to follow-up after baseline 20% or less? Were those lost to follow-up accounted for in the analysis?	9
Did the statistical methods examine changes in outcome measures from before to after the intervention? Were statistical tests done that provided p values for the pre-to-post changes?	10
Were outcome measures of interest taken multiple times before the intervention and multiple times after the intervention (i.e., did they use an interrupted time-series design)?	11
If the intervention was conducted at a group level (e.g., a whole hospital, a community, etc.) did the statistical analysis take into account the use of individual-level data to determine effects at the group level? *If this question is not applicable, total score is out of 11, not 12.	12
Add scores for each criterion together and divide by 12. *Risk of bias rating (Low (75-100%), Moderate (25-75%), or High (0-25%))** OVERALL SCORE:	

*This section includes altered wording from original tool for consistency purposes

Key: The quality assessment tool for before-after (pre-post) studies with no control group: scores of included studies

Key: Y = Yes, N = No, NR = Not reported, CD = Cannot determine, NA = Not applicable, M = Moderate

This tool was adapted from the original tool found at:

National Heart Lung and Blood Institute. Quality Assessment Tool for Before-After (Pre-Post) Studies With No Control Group [National Heart Lung and Blood Institute web site]. 2014. http://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/before-after. Accessed September 13, 2015.

Table S6: Summary of findings tables

Question: Training compared to no training for Traditional birth attendants

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	training	no training	Relative (95% CI)	Absolute (95% CI)		
Neonatal mortality												
2	randomised trials	very serious[a]	not serious	not serious	not serious	none	383/11982 (3.2%)	498/10898 (4.6%)	**RR 0.70** (0.62 to 0.80)	**14 fewer per 1,000** (from 17 fewer to 9 fewer)	⨁⨁◯◯ Low	CRITICAL
Perinatal mortality												
3	randomised trials	very serious[a]	not serious	not serious	not serious	none	-/24303	-/23219	**RR 0.73** (0.67 to 0.79)	**31 fewer per 1,000** (from 40 fewer to 25 fewer)[b]	⨁⨁◯◯ Low	CRITICAL
Stillbirth												
2	randomised trials	very serious[a]	serious[c]	not serious	very serious[d]	none	521/12054 (4.3%)	666/10968 (6.1%)	**RR 0.81** (0.56 to 1.18)	**12 fewer per 1,000** (from 27 fewer to 11 more)	⨁◯◯◯ Very low	CRITICAL

CI: confidence interval; **RR:** risk ratio

Explanations

a. None of the studies are at a low risk of bias
b. The raw data for number of events and participants is not present for all the studies, hence baseline risk is calculated using one study as 11.9%
c. Point estimates point in opposite directions
d. Point estimate suggests benefit but the confidence interval includes the possibility of harm

Question: After training compared to before training for Traditional birth attendants

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	after training	before training	Relative (95% CI)	Absolute (95% CI)		
Stillbirth												
3	randomised trials	very serious[a]	serious[b]	not serious	very serious[c]	none	271/35082 (0.8%)	226/19303 (1.2%)	**RR 0.70** (0.39 to 1.26)	**4 fewer per 1,000** (from 7 fewer to 3 more)	⨁◯◯◯ Very low	
7-day Neonatal Mortality												
3	randomised trials	very serious[a]	serious[b]	not serious	not serious	none	201/24386 (0.8%)	169/11588 (1.5%)	**RR 0.65** (0.53 to 0.80)	**5 fewer per 1,000** (from 7 fewer to 3 fewer)	⨁◯◯◯ Very low	
Perinatal Mortality												
3	randomised trials	very serious[a]	not serious	not serious	not serious	none	557/29446 (1.9%)	541/16239 (3.3%)	**RR 0.69** (0.61 to 0.78)	**10 fewer per 1,000** (from 13 fewer to 7 fewer)	⨁⨁◯◯ Low	

CI: confidence interval; **RR:** risk ratio

Explanations

a. Concerns with risk of bias in the study
b. Point estimates suggest opposite directions of effect
c. Point estimate suggests benefit but the confidence intervals includes the possibility of harm

Supplementary Figures

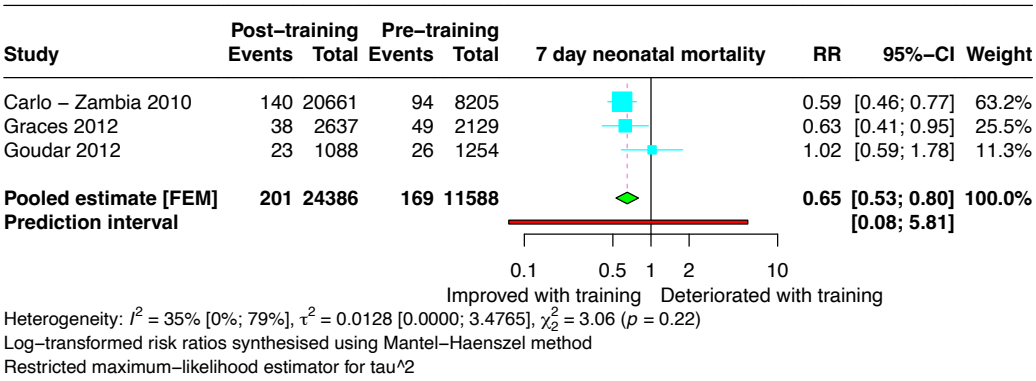


Figure S1. Forest plot showing the risk ratio of 7- day neonatal mortality with training of traditional birth attendants

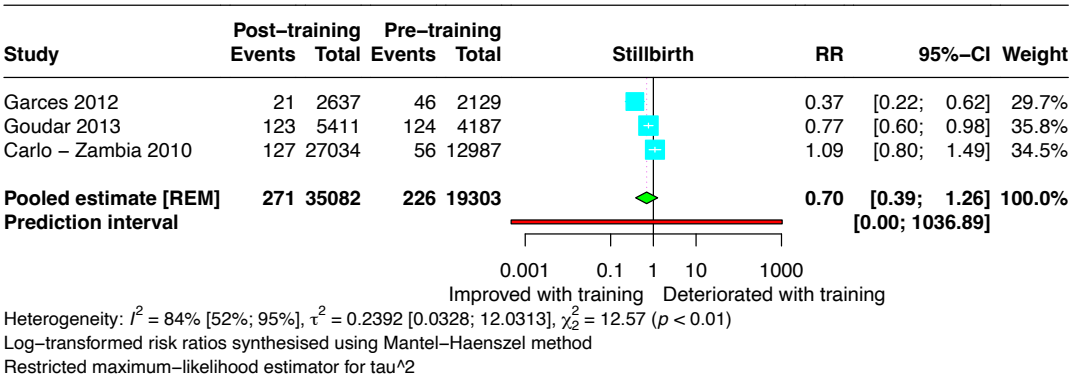


Figure S2. Forest plot showing the risk ratio of stillbirth with training of traditional birth attendants

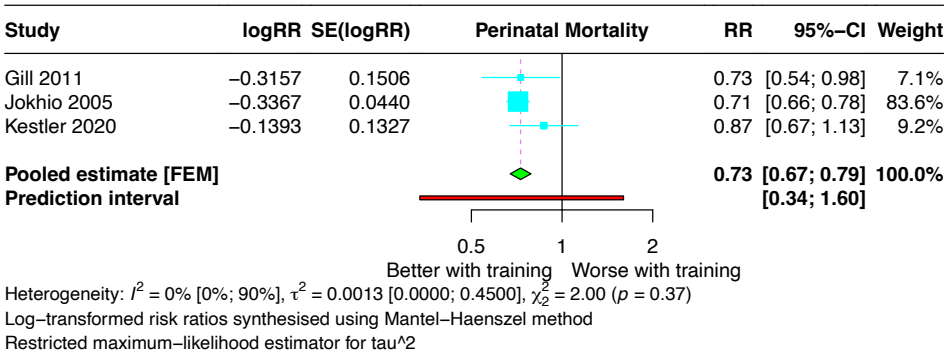


Figure S3. Forest plot showing the risk ratio of perinatal mortality in trained traditional birth attendants

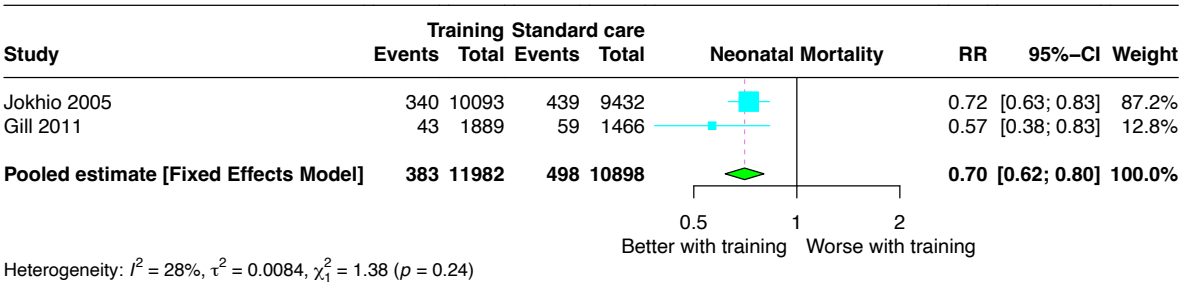
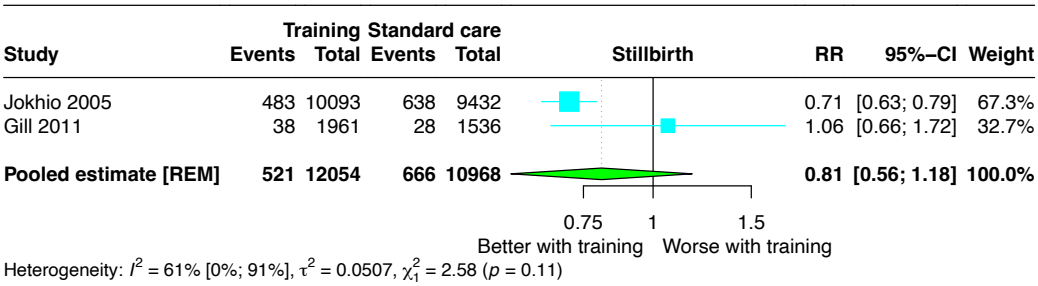


Figure S4. Forest plot showing the risk ratio of neonatal mortality in trained traditional birth attendants



Heterogeneity: I^2 = 61% [0%; 91%], τ^2 = 0.0507, χ^2_1 = 2.58 (p = 0.11)
Log–transformed risk ratios synthesised using Mantel–Haenszel method
Restricted maximum–likelihood estimator for tau^2

Figure S5. Forest plot showing the risk ratio of stillbirth in trained traditional birth attendants

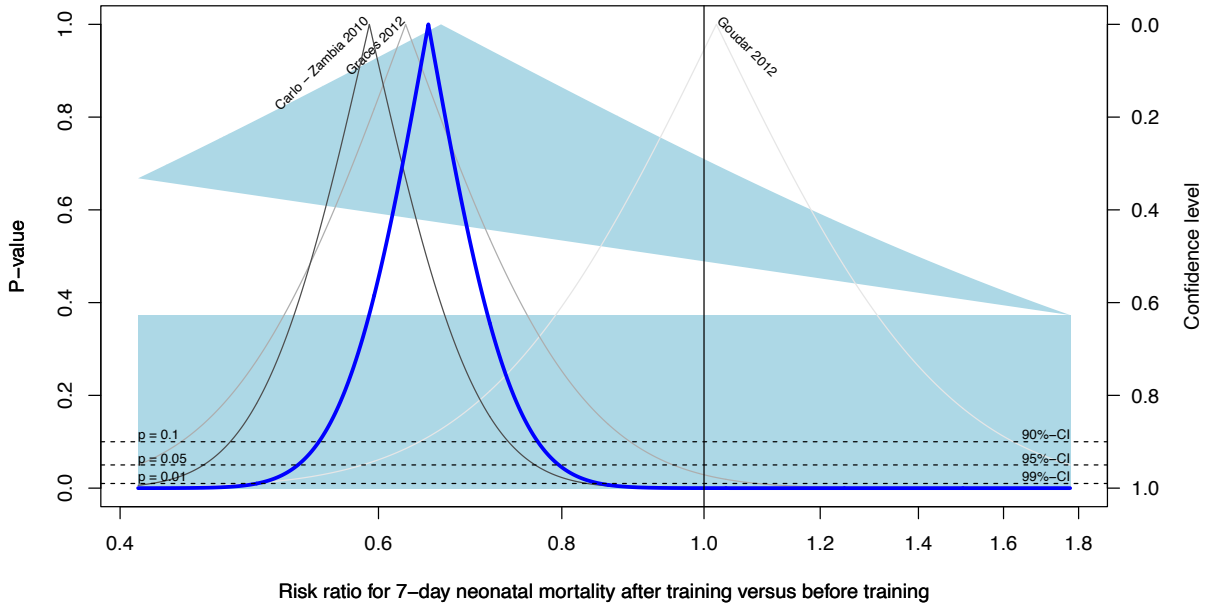


Figure S6. Drapery plot showing the 'level of significance' – dependent variation in the risk ratio of 7-day neonatal mortality with training of traditional birth attendants

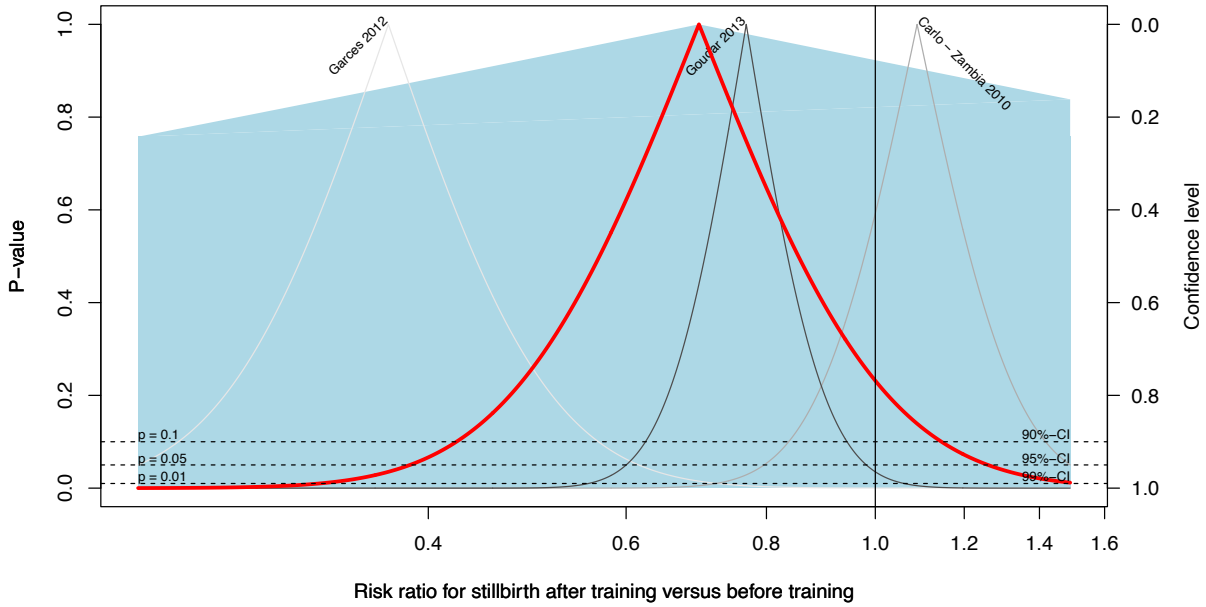


Figure S7. Drapery plot showing the 'level of significance' – dependent variation in the risk ratio of stillbirth with training of traditional birth attendants

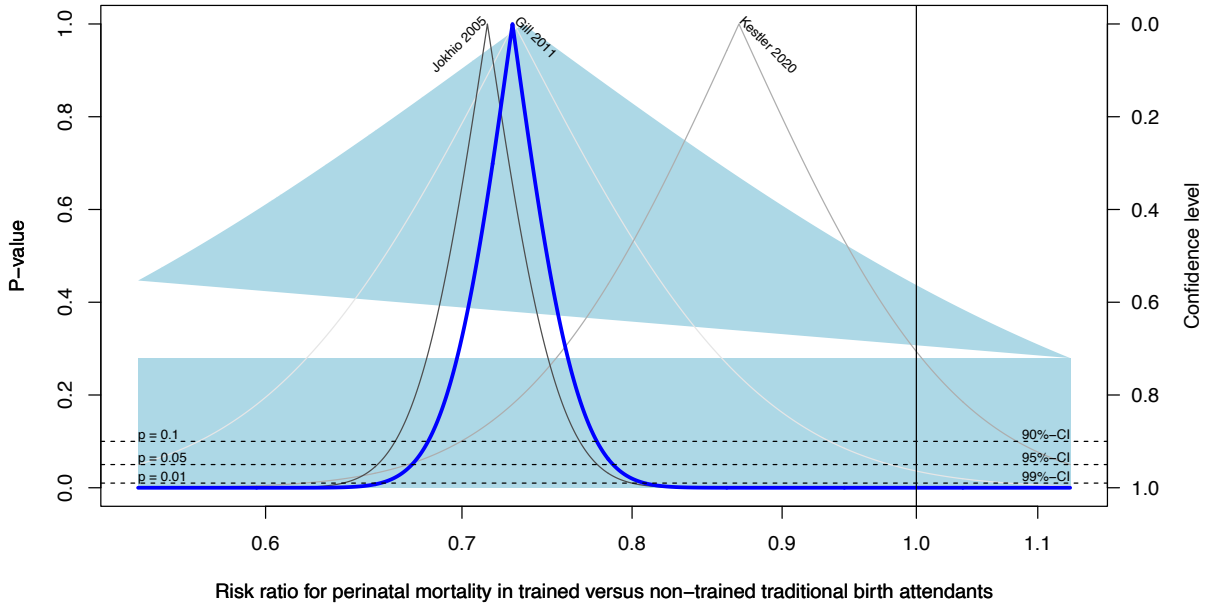


Figure S8. Drapery plot showing the 'level of significance' – dependent variation in the risk ratio of perinatal mortality in trained traditional birth attendants

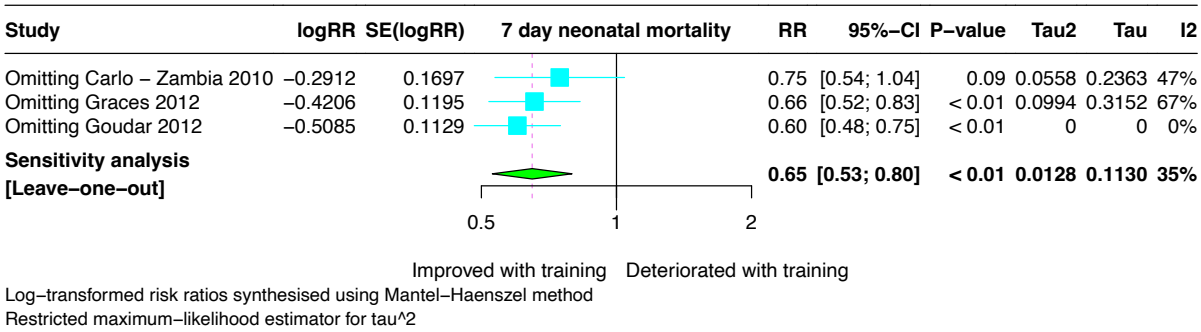


Figure S9. Leave-one-out meta-analysis for the risk ratio of 7-day neonatal mortality with training of traditional birth attendants

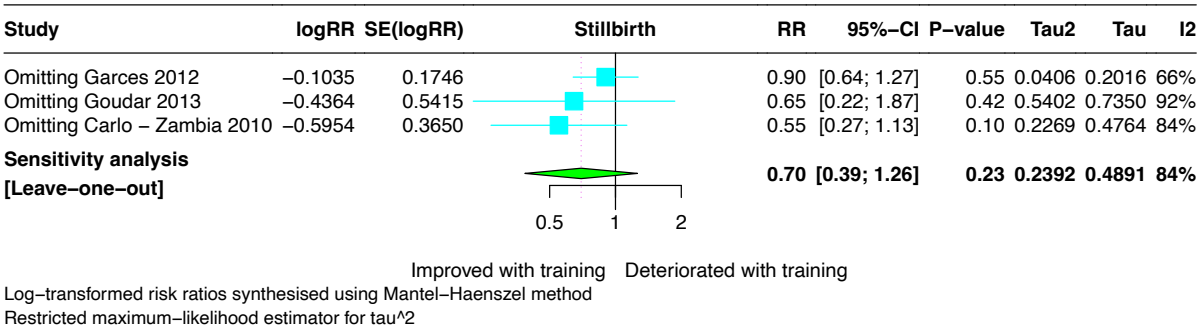


Figure S10. Leave-one-out meta-analysis for the risk ratio of stillbirth with training of traditional birth attendants

Figure S11. Leave-one-out meta-analysis for the risk ratio of perinatal mortality in trained traditional birth attendants

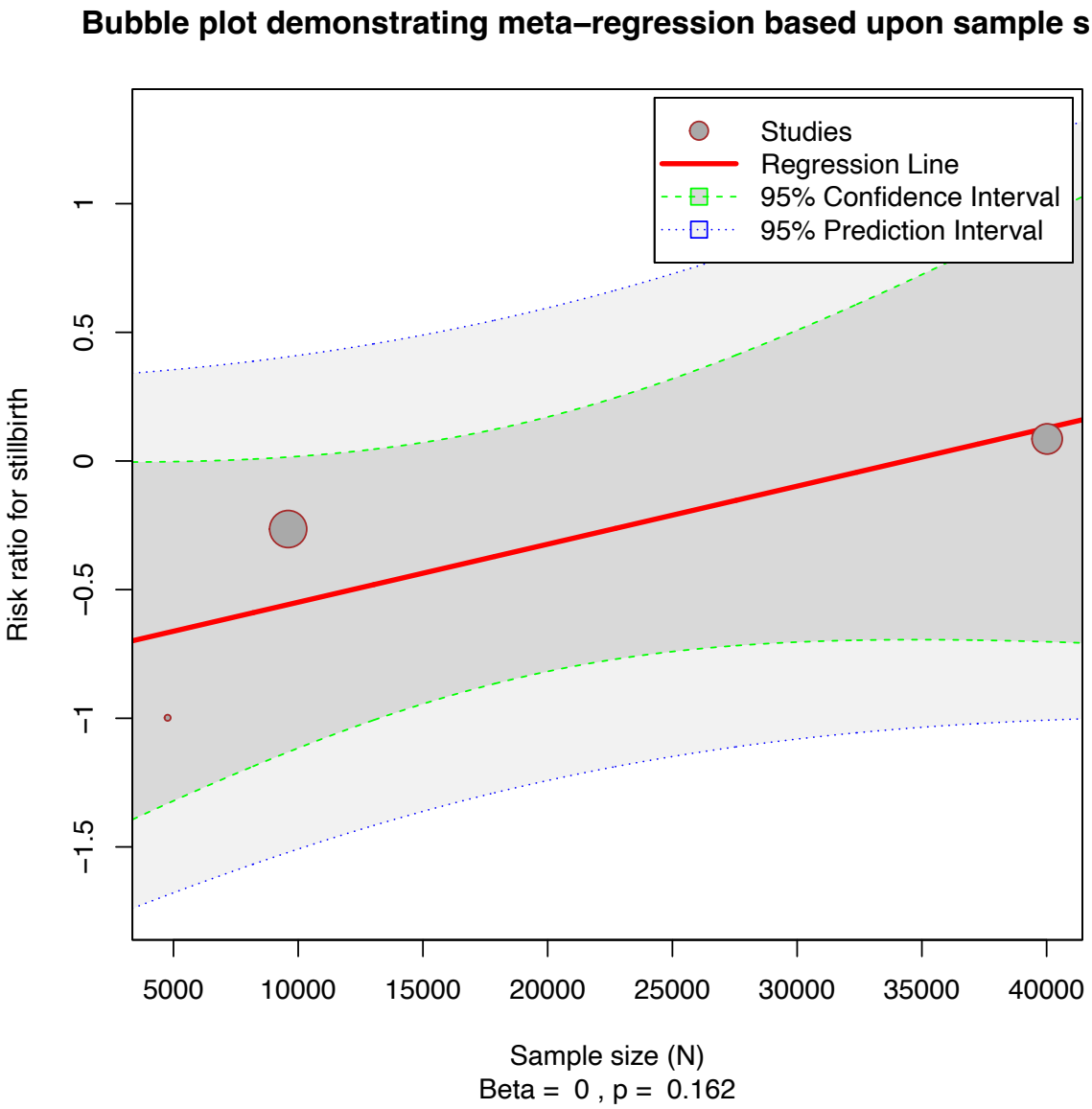


Figure S12. Bubble plot demonstrating meta-regression for risk of stillbirth based upon sample size

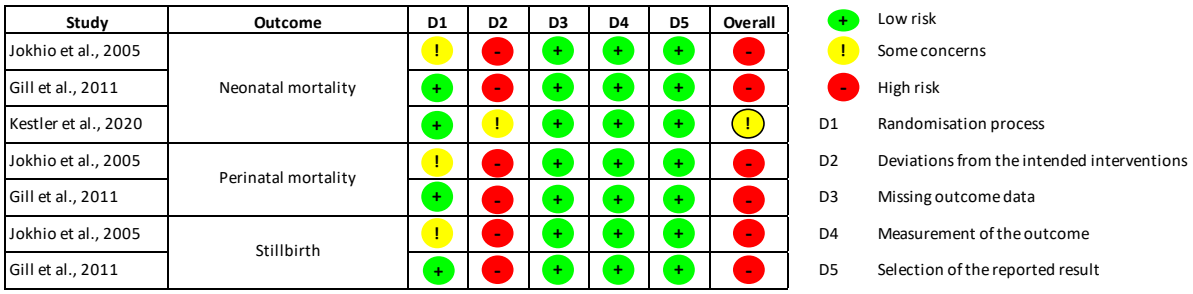


Figure S13. Domain-wise and overall risk of bias assessments of the included randomised controlled trials using Cochrane RoBv2.0 tool