# Mid-level health workers for delivery of essential health services

## a global systematic review and country experiences


global health workforce alliance

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Annexes to the report, including the country case studies, are available in electronic format on the GHWA website:
http://www.who.int/workforcealliance/knowledge/mlpreport_annexes/en/index.html.



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## List of Acronyms

| | |
|---|---|
| AIDS | Acquired Immuno-Deficiency Syndrome |
| AMO | Assistant Medical Officer |
| APGAR | Appearance, Pulse, Grimace, Activity, and Respiration |
| ART | Anti-Retroviral Therapy |
| BEmOC | Basic Emergency Obstetric Care Centre |
| BEmONC | Basic Emergency Obstetric and Newborn Care |
| BLDS | British Library for Development Studies |
| BMI | Body Mass Index |
| BSc | Bachelor of Science |
| CBA | Controlled Before-After |
| CC | Community Clinic |
| CEmOC | Comprehensive Emergency Obstetric Care |
| CEmONC | Comprehensive Emergency Obstetric and Newborn Care |
| CHF | Community Health Fund |
| CHW | Community health worker |
| CI | Confidence Interval |
| CINAHL | Cumulative Index to Nursing and Allied Health Literature |
| CME | Continuing Medical Education |

| | |
|---|---|
| CNS | Cuentas Nacionales de Salud |
| CO | Clinical Officer |
| DPT | Diphtheria, Pertussis, Tetanus |
| EmOC | Emergency Obstetric Care |
| EONC | Essential Obstetric and Newborn Care |
| EPOC | Effective Practice and Organisation of Care Group |
| GHWA | Global Health Workforce Alliance |
| GPA | Grade Point Average |
| HA | Health Assistant |
| HIV | Human Immunodeficiency Virus |
| IEC | Information, Education and Communication |
| IMCI | Integrated Management of Childhood Illnesses |
| IMR | Infant Mortality Rate |
| ITS | Interrupted Time Series |
| LBW | Low Birth Weight |
| LHW | Lay health worker |
| MCE of IMCI | Multi-Country Evaluation of Integrated Management of Childhood Illnesses |
| MCH | Maternal and Child Health |
| MDG | Millennium Development Goal |
| MeSH | Medical Subject Headings |
| MIS | Management Information System |
| MLHW | Mid-Level Health Worker |
| MMR | Maternal Mortality Ratio |
| MSc | Master of Science |
| NCD | Non-Communicable Disease |
| NRCT | Non-Randomized Clinical Trials |
| RCT | Randomized Controlled Trial |
| RR | Risk Ratio |
| SBA | Skilled Birth Attendant |
| STD | Sexually Transmitted Disease |
| TB | Tuberculosis |
| TBA | Traditional Birth Attendant |
| TC | Tecnico de Cirurgia |
| UHC | Universal Health Coverage |
| US | United States |
| WHO | World Health Organisation |
| WPRO | (WHO) Western Pacific Regional Office |

## Foreword

Many countries are facing critical challenges related to shortage, maldistribution and uneven performance of health workers, hindering the provision of essential health services required to achieve the health Millennium Development Goals and Universal Health Coverage. In many settings, however, finding the resources to train and employ additional health personnel is problematic; even when new health workers are trained, frequently they end up concentrating in urban areas, and all too often they migrate abroad.

Mid-level health workers (MLHWs) typically have 2-3 years of post- secondary school healthcare training and undertake tasks usually carried out by doctors, such as clinical or diagnostic functions. In developing countries, they are increasingly being used to render services autonomously, particularly in rural and remote areas, to make up for the gaps in health workers with higher qualifications. The Kampala Declaration and Agenda for Global Action adopted at the First Global Forum on Human Resources for Health in 2008 explicitly advocated the expansion of mid-level cadres.

Despite their growing role, the evidence on the efficacy of MLHWs, and on appropriate deployment and support strategies to facilitate their integration in health systems, remained fragmented. To address this knowledge gap, and in order to contribute to evidence-informed policy making in countries, the Global Health Workforce Alliance (the Alliance) has commissioned a global systematic review on the effectiveness of MLHWs in providing essential health services, complemented by 8 country case studies in Asia, Africa, Latin America.

The review of global evidence shed new light on the role and potential of these cadres: despite some limitations in the quality of available studies, evidence shows that MLHWs deliver services with quality standards comparable to traditional care models where services are rendered by doctors. And in some cases, particularly in relation to maternal health, MLHWs were actually associated to better outcomes and greater patient satisfaction. At the same time, the country case studies revealed a patchy record in creating and sustaining an adequate enabling environment for MLHWs, through appropriate regulatory and management frameworks, adequate incentives and systems support.

The evidence emerging from this analysis provides recommendations to:

- policy makers, in terms of adopting policy and investment decisions that can result in optimal use of and support to these cadres;
- researchers, who should strive to strengthen the evidence base through further trials of higher methodological quality, in particular in developing countries;
- and Alliance members and partners, who are invited to collaborate towards ensuring a wide dissemination, discussion on, and uptake of the findings of this study.

Overcoming the health workforce crisis is a daunting challenge, but one we must face if we are to achieve the health Millennium Development Goals and more broadly progress towards Universal Health Coverage: MLHWs, provided we adopt the right approaches and define their role on the basis of sound evidence, can be part of the solution.

**Mubashar Sheikh**
Executive Director
Global Health Workforce Alliance

## Summary of key findings and recommendations

### Background

Critical shortages, maldistribution, retention and performance gaps of human resources for health hinder the delivery of interventions required to attain the health Millennium Development Goals (MDGs) and advance towards universal health coverage (UHC). The objective of this analysis was to assess the effectiveness of care provided by mid-level health workers (MLHWs), a group of cadres who are trained for 2-5 years to acquire basic skills in diagnosing, managing common conditions, and preventing disease.

### Methods

A systematic review was conducted, including all experimental and observational studies identified from relevant databases, in which the outcomes of care delivered by MLHWs were compared with traditional care delivery models. GRADE criteria were applied to assess the quality of evidence. Eight country case studies, from Africa, Asia, Latin America, were also conducted to assess the health system governance and policy environment for MLHWs programmes, the type of cadres and the training requirement and contents, and relevant management and support practices.

### Findings

The review identified 52 eligible studies, mostly from high-income countries in tertiary-care facility settings. MLHWs play an important role in the delivery of maternal and child health services (including minor surgery), anti-retroviral therapy, health promotion, prevention and care for non-communicable diseases. There were lower rates of episiotomy, and use of analgesia in groups that received care from midwives compared to doctors working with midwives. The care delivered by nurses was also found to be as effective as care given by doctors, and often more responsive to patients' expectations. Lower quality prospective observational studies were also identified, largely from Africa, which compared care delivered by clinical officers, surgical technicians, or non-physician clinician with doctors, which mostly showed similar outcomes for MLHWs and traditional care.

A central problem and a common feature that emerged from the country case studies was the lack of visibility of these cadres in public policy, and therefore their virtual absence in relevant countries' information systems and databases. Similarly, documentation of the most efficient skill-mix in terms of system and health workers performance, and in terms of its impact on health indicators, was virtually absent in all the included countries. These challenges result in sub-optimal planning, management and support for these cadres.

### Interpretation

Services rendered by MLHWs were found to be as effective as routine care, however the quality of evidence was low or very low according to GRADE criteria, and therefore these results should be interpreted with caution. If appropriately deployed, MLHWs can contribute to a more efficient human resources skills mix, which can mitigate the effects of health workforce shortages and better enable countries to meet or make considerable progress towards attaining the health MDGs and UHC; this opportunity remains however under-exploited in light of policy, governance and management challenges that limit the potential of these cadres. Further trials of higher methodological quality and with longer follow-up might be needed for MLHWs, particularly in Africa – the region with the greatest shortage of health workers.

## Recommendations to policy-makers

- Policies are needed to define at national and sub-national levels the appropriate skills mix of cadres that include MLHWs, together with identification of their roles.
- Policy actions and investment decisions are needed to improve and scale up the training, licensing, certification and re-certification, assignment of responsibilities, supportive supervision, quality of care assessment, and monitoring and evaluation of MLHWs.
- A coherent deployment and retention strategy should be planned and implemented to expand the range of incentives that may allow an improved use of MLHWs who can provide quality health care as part of health teams.
- Regulation of responsibilities should be more strongly developed and enforced.
- For the nursing workforce in particular, in addition to the need to increase numbers, there is a need to set up explicit entry requirements to nursing schools, improve training content and quality, as well as licensing and accreditation requirements.
- HRH information systems should be urgently strengthened to include also MLHWs in the majority of countries assessed.

## Recommendations to researchers

- In order to generate high quality evidence further trials and evaluations or studies with a quasi experimental design based on a higher methodological quality are required.
- In order to understand if an intervention works, how it works, for whom, and under what circumstances, formal and independent evaluation efforts should be promoted to assess the impact, cost, and effectiveness of programs focused on MLHWs in general.
- Impact evaluations needs to be complemented by evaluations aimed at disentangling the underlying mechanisms of the diverse interventions, specifically their effects on health systems, and vice versa.
- The comparative cost-effectiveness of public, private, and private-not-for-profit interventions focused on MLHWs is urgently needed to weigh the relative importance and the role of these categories of providers in attaining increased and equitable health care access, as well as their impact on health workers and health system performance.

## Recommendations to GHWA members

- The findings from this report should be disseminated to policy makers at country level, to health care delivery organizations, and to organizations in charge of developing HRH programs.
- Consultations should involve interactive debates that draw attention to key aspects of the deployment and planning process, help clarify issues, and address practical questions related to the operationalization of these findings.
- Theme-focused workshops on existing MLHW programs should be conducted to facilitate more interaction, and in the long run facilitate follow-up meetings to provide technical support and guidance for MLHW programs, including operational research.
- GHWA members should advocate for and conduct country-specific MLHW program evaluations and reports, utilizing as much as possible innovative, quasi-experimental designs to assess the impacts of such programs.

## Introduction

In the year 2000, 189 countries around the globe signed the UN Millennium Declaration, which translated into the 8 Millennium Development Goals (MDGs). Among these, goals 4, 5 and 6 are directly related to health.[1]

Progress on achieving the health MDGs targets, however, is far from expectations, especially in low-income developing countries. Despite considerable evidence from recent reviews of interventions that can positively impact maternal, newborn and child health and survival, a key obstacle is the lack of availability of trained and motivated health workers to scale up these services in population settings.[1,2,3,4,5,6,7,8,9,10,11,12] Critical shortage, maldistribution, retention, performance and motivation challenges of human resources for health (HRH) constitute a fundamental factor underlying the poor performance of health systems to deliver effective, evidence-based interventions for priority health conditions.[13]

The Global Health Workforce Alliance (the Alliance), which is hosted by WHO, is a partnership dedicated to identifying and implementing solutions to the health workforce crisis. Since its launch in 2006, the Alliance has convened experts, political leaders, civil society, and health workers to grapple with complex workforce challenges, including health worker migration from developing to more developed countries, educational obstacles to a trained workforce, financing to invest in human resources for health, and advocacy and research for long-term problem-solving.[14]

The Alliance recognizes the essential role played by physicians and other highly skilled health workers. However a range of community, outreach, and facility health workers can play a major role in community mobilization and deliver health services to mitigate health workforce shortages and other related challenges. In addition to community health workers (CHWs) and traditional birth attendants (TBAs), mid-level health workers (MLHWs), such as nurses, midwives, non-physician clinicians, medical assistants, and nurse auxiliaries, are a key component of a country health workforce. While there is some debate about the definition of MLHWs **(see table 1)**, common features according to existing definitions include that they have received less (shorter) training than physicians, but who perform aspects of their tasks. They are sometimes also categorized as 'outreach and facility health workers', and typically they are certified for their training and accredited for their work.

While these definitions are useful, they do not necessarily reflect people's existing understanding of this group of health workers. Although many MLHWs, such as nurse auxiliaries and medical assistants have less (shorter) training and a narrower scope of practice, this is not necessarily the case for all mid-level health workers. Nurses and nurse practioners spend more than five years in training and may or may not perform some of the same tasks as doctors. On the other hand,

[1] MDG 4: By 2015 reduce by two thirds from baseline levels of 1990 the mortality rate amongst children under 5;
MDG 5: By 2015 reduce by three quarters from baseline levels of 1990 the maternal mortality ratio and achieve universal access to reproductive health;
MDG 6: By 2015 halt and begin to reverse the spread of HIV/AIDS; achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it; halt and begin to reverse the incidence of malaria and other major diseases

**Table 1: Definitions of mid-level health workers**

| | |
|---|---|
| **WHO/ WPRO, 2001** | "front-line health workers in the community who are not doctors, but who have been trained to diagnose and treat common health problems, to manage emergencies, to refer appropriately, and to transfer the seriously ill or injured for further care."[15] |
| **Dovlo, 2004** | "health cadres who have been trained for shorter periods and required lower entry educational qualifications, to whom are delegated functions and tasks normally performed by more established health professionals with higher qualifications."[16] |
| **Lehman, 2008** | "mid-level workers as health care providers who are not professionals but who render health care in communities and hospitals. They have received less (shorter) training and have a more restricted scope of practice than professionals. In contrast to community or lay health workers, they have a formal certificate and accreditation through their countries' licensing bodies. Some may work under the direct or indirect supervision of professionals, while others work independently and indeed lead health care teams, particularly in primary and community care."[17] |

non-physician clinicians may have spent, in total, equal amounts of time in training as medical doctors and may perform the same amount of tasks that doctors perform, including surgeries.

Despite these differences in their roles, trainings, and continuing struggle to improve the acceptance of MLHWs, many countries today rely heavily and increasingly on them to improve the quality and equity of health care delivered and task-shifting.[18,19] MLHWs have been a part of many countries' health systems for over 100 years, but in the last 10 years there has been a newfound interest in their role as health care providers in light of the MDGs. Over the years they have performed different functions, from being used as vaccinators against small pox in India in the late 19th century to being medical assistants during World War II in Papua New Guinea. The renewed interest in training MLHWs and integrating them in the health system stems from the critical shortage of health workers in many developing countries, along with diseases like HIV/AIDS which are major challenges that African countries in particular are facing. Many African and Asian countries have invested in these cadres and successful examples are evident. Zambia started training clinical officers in 1936 to provide services at the primary care level and was involved in task-shifting in ART programs due to an increasing number of patients seeking treatment and care.[20] In Burkina Faso, a six-month special curriculum was designed to train district medical officers in emergency surgery.[21] In Niger, a similar curriculum was designed as a one-year course for general practitioners. Other similar training programs have been developed in Mali, the Democratic Republic of the Congo, Mozambique, and Tanzania.

Using mid-level cadres as substitutes for obstetricians or surgeons appears to be less costly and helps improve coverage of emergency obstetric care in rural areas.[22,23,24] An observational study performed as part of the Multi-Country Evaluation of Integrated Management of Childhood Illnesses (MCE of IMCI) showed that IMCI trained health workers with a shorter training period performed at least as well, if not better, than health workers with longer periods of training in Bangladesh, Brazil, Tanzania, and Uganda.[25] This is the most comprehensive study providing evidence that supports task-shifting for child care.[26]

There have been studies on the effectiveness[27,28] and costs[29] of semi-skilled providers (such as community health workers) in achieving MDG targets, but little has been done to assess systematically the effectiveness of MLHWs in achieving these goals.

In an attempt to better understand their effectiveness and how these cadres can be appropriately integrated into national health systems, the Alliance conducted an analysis to investigate the global experience of MLHWs in terms of their impact on the health related MDGs and other priority health services. Using a two-pronged approach, a systematic review was undertaken to assess their effectiveness in providing care compared to other cadres; and case studies were developed to assess the typology, training, impact, performance and the health system support and management practices in 8 countries around the world where MLHWs are deployed at scale – 2 in Latin America (El Salvador, Peru), 3 in Africa (Mozambique, Tanzania, and Zambia), and 3 in Asia (Indonesia, Bangladesh, and Pakistan).

## Methodology

### a) Systematic review

The study entailed a systematic search and analysis of relevant articles in both the peer-reviewed and grey literature, without language restrictions.

Types of participants: MLHWs were defined for the purpose of this study as "health care providers who are not medical doctors or physicians but who deliver clinical care in communities, primary care facilities, and hospitals. They may be authorized and regulated to work autonomously, to diagnose, manage, and treat illness, disease, and impairments, as well as to engage in preventive and promotive care at primary and secondary health care levels."

Different types of MLHWs receive different lengths of training. While most have less (shorter) training than medical doctors, this is not always the case. In contrast to community-based or lay health workers, MLHWs usually have a formal certificate and accreditation through their countries' licensing bodies.

The working definition of MLHW adopted for this review included the following range of providers: midwives, nurses, auxiliary nurses, nurse assistants, non-physician clinicians, and surgical technicians (table 1). Other cadres who are not specifically named here but who meet the definition of MLHW outlined above were also included. Workers who specialize in health administration and/or are only involved in performing administrative tasks, who provide rehabilitative and dentistry services were however excluded.

Types of recipient: In the systematic review and in the case studies there were no restrictions on the types of patients or recipients of health services.

Type of studies: The systematic review included studies in which MLHWs undertook activities for achieving health (maternal and child health and other infectious diseases such as HIV/AIDS,

**Table 2: Categories of MLHW**

| Broad category | Definition[30,31] | Different names |
|---|---|---|
| Nurse | A graduate nurse who has been legally authorized (registered) to practice after examination by a state board of nurse examiners or similar regulatory authority. Education includes three, four or more years in nursing school, and leads to a university or postgraduate university degree or the equivalent. | Registered nurse, nurse practioners, clinical nurse specialist, advance practice nurse clinician practice nurse, practice nurse, licensed nurses, diploma nurse, BS nurses |
| Midwife | Person who has been assessed and registered by a state midwifery regulatory authority or similar regulatory authority. They offer care to childbearing women during pregnancy, labor and birth, and during the postpartum period. They also care for the new born and assist the mother with breastfeeding. Their education lasts three, four, or more years in nursing school, and leads to a university or postgraduate university degree, or the equivalent. A registered midwife has the full range of midwifery skills. | Registered midwife, midwife, community midwife |
| Auxiliary nurse / auxiliary nurse midwife | Have some training in secondary school. A period of on the- job training may be included and sometimes formalized in apprenticeships. An auxiliary nurse has basic nursing skills but no training in nursing decision-making. Auxiliary nurse midwives have an additional role in providing care to women during prenatal, intrapartum, and postpartum periods and to the new-borns as well.[30] | Auxiliary nurse, auxiliary nurse midwife, auxiliary midwife, nurse assistant |
| Non-physician clinician | Non-clinical physician is a health worker who is not trained as a physician but who is capable of many of the diagnostic and clinical functions of a medical doctor and who has more clinical skills than a nurse. They usually provide advanced advisory, diagnostic, curative (including minor surgeries but, in relation to the definition adopted in this report, do not perform caesarean section – except in Mozambique), and preventive medical services. The requisites and training can be different from country to country, but often include three or four years of post-secondary education in clinical medicine, surgery and community health. | Clinical officer, medical assistant, physician assistant |
| Surgical technician | They perform all the roles that non-physician clinicians perform; however, their predominant responsibility is to perform caesarean section.[31] | Medical and surgical technician |

malaria, tuberculsosis) and nutrition MDGs. Studies in which MLHWs undertook activities for mental health and non-communicable diseases/conditions were also considered.
The first level of evidence was derived from experimental designs and evaluations of MLHWs in various settings. All randomized, non-randomized controlled trials, controlled before-after trials, and interrupted time series studies were included. In addition, other less rigorous study designs like observational (cohort and case-control) and descriptive studies were also reviewed to understand the context within which they are implemented, the typology of health care providers, the types of intervention delivered, and the reported results. Studies were included if: (a) they had detailed the role of MLHWs and (b) if the outcomes considered were those related to reaching the health and nutrition MDGs, including child mortality, maternal mortality, combating HIV/AIDS, malaria, and TB, among others.

The following three types of comparative analyses were included in the systematic review:

1. one type of MLHW compared to another type of MLHW
2. MLHW compared to doctors or lay health workers (LHWs)
3. MLHW + doctors or LHW versus doctors or LHW.

Types of outcome measures: Data pertaining to the following outcomes were pooled:

1. Improvement or change in health behaviors, such as adherence to treatment plans (medication, dietary, or supplementation)
2. Improvement in mortality, morbidity, and other care-related outcomes
3. Improvement in symptom resolution (self-reported)
4. Improvement in quality of life
5. Changes in utilization of services or coverage of services

Data extraction: Two review authors independently extracted all outcome information. Data relating to the participants (mid-level health worker and care recipient), health care settings (home, primary care facility, secondary health care, or other), and study design were integrated, the outcomes assessed, and the results pooled.

The statistical analysis was performed using the Review Manager software. For dichotomous data, the summary risk ratio with 95% confidence intervals is presented. For continuous data, the mean difference between trials was used if outcomes were measured comparably. Two review authors independently assessed each included study's risk of bias using a form with the standard criteria described by the EPOC Group. We performed quality analysis of evidence for outcomes using the GRADE approach.[32,33] Using this approach, we rated the quality of the body of evidence for each key outcome as 'High', 'Moderate', 'Low', or 'Very Low'.

Annex 1 provides further details on the systematic review methodology, including databases searched, search strategy, approach adopted to asses methodological quality, and strategies to deal with missing data and heterogeneity.[34,35]

### b) Country case studies

Country case studies were conducted to assess the health system governance and policy environment for MLHWs programmes, the type of cadres and the training requirement and contents, and relevant management and support practices.

Each case study consists of the collection, collation, and analysis of secondary data, through the review of published and unpublished reports, government policy documents, government, university/college and professional association/council websites, peer-reviewed journal articles, and program evaluations.

Countries were selected on the basis of having existing MLHWs programs at scale, a regulatory framework allowing task-shifting, past or current implementation experience, and having identifiable focal points at WHO regional or national offices.

By highlighting common problems in attempts to respond to HRH challenges in different countries, the WHO provides a comprehensive framework within which the scaling up of HRH can be grounded. It sums these up in recommendations to countries in a generic Human Resources Capacity Building Plan, presented in the table below.

This provides an appropriate analytical model to consider the MLHW programs operating in the 8 case study countries, and could explain why some have been more successful than others. It also offers a way in which to assess which aspects are still missing in each country's MLHW programs, and what kinds of aspects need to be addressed in order to ensure better success and to maximize the positive potential impact that these programs can have on the relevant MDGs.

Based on the systematic review and the country case studies, an analytical summary and draft recommendations were developed for recruitment, training, and supervision criteria for MLHW programs to increase front-line HRH (especially at district and community levels) working to achieve increased coverage and accelerate progress towards attainment of HIV/AIDS, health, and nutrition MDGs and NCD targets.

## Results

### a) Systematic review

The search strategy formulated identified 24,246 hits. 327 studies were retrieved for the review of the full text; of these, 60 met the eligibility criteria and were included in the review (Figure 1). 4 on-going trials[37,38,39,40] were excluded (annex 2). Finally, 56 studies that met all eligibility criteria were included in the analysis (figure 1).

Most of the studies identified reported the comparisons of care delivered by midwives versus doctor in a team of midwives; and nurses versus doctors. These studies were experimental in

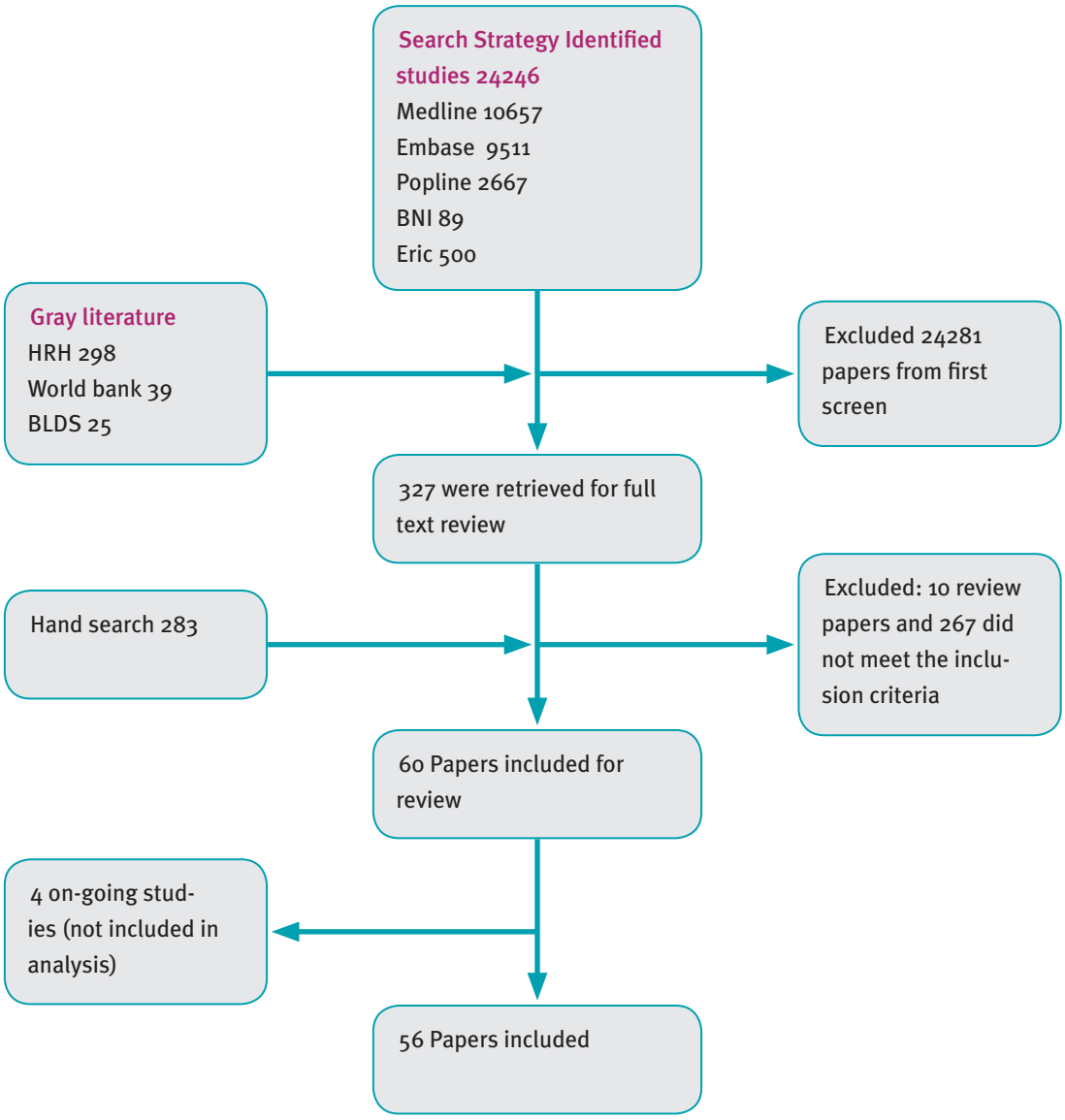
**Table 3: Elements of WHO capacity building plan**[36]

| | Countries | Regional | Global |
|---|---|---|---|
| **Human Resource Planning** | Support development of one country human resource and training plan | Technical resource networks and regional guidance for human resource assessment and planning | Shared understanding of tools and guidelines for HR planning amongst key technical, donor and academic institutions; development of core guidance |
| **Training Material Development** | Training material appropriate to national scale up approach for all key cadres involved in scaling up, or, in case of HIV, with a focus on facility level training based on Integrated Management of Adult Illness (IMAI) approach | Technical assistance to national training material development through regional technical resource networks and knowledge hubs, including IMAI technical networks. | Partner consensus on training packages outline core competencies, curricula and annotated training material for different cadres of health workers, with a focus on facility based interventions. |
| **Training Provider Capacity** | Appropriate pre- and in-service training capacity with a focus on district and first level training | Provision of training of trainers (TOT) opportunities and in-country support to capacitate training providers based on training packages (including HIV IMAI based training). Through resource networks and knowledge hubs. | Development of global partnerships in support of formation of technical resource networks at regional level. |
| **Certification and quality control** | National systems for certification of health workers involved in scaling up. | Technical assistance to establishment of certification systems through technical resource networks. | Recommendations and partner consensus on process, content and outcome verification criteria for development of national certification systems. |
| **Financial Resources** | Training and human resource needs appropriately reflected in national and international funding plans/ proposals. | Regional backup to development of national funding plans and proposals. | Facilitation of access to global finance through guiding notes and assistance on case by case. |

design and therefore the results were pooled to generate meta-analyses. Lower quality prospective observational studies were also identified, largely from Africa, and compared care delivered by clinical officers, surgical technicians, or non-physician clinicians with doctors. The results from such studies could not be pooled together.

The sections below present synthetically the findings of this analysis. Annex 3 presents in detail the results of the meta-analyses of the systematic review, while annex 4 presents the detailed description of all included studies and their risk bias assessment.

**Figure 1: Search flow diagram**




The outcomes reported by studies were pooled in meta analyses, which showed that for the majority of outcome measures identified, care provided by MLHWs was not inferior to standard care provided by physicians or by physicians-led teams (table 1).

## Maternal and child health

This literature review came across different comparisons in delivery of maternal and child health services, including midwives vs. team of doctors and midwives, nurses vs. doctors, clinical officers vs. doctors.

**Table 4: Summary findings systematic review**

| Service delivery areas and outcome measures | Results of systematic review: summary risk ratio (RR) and 95% confidence intervals (CI) | Interpretation |
|---|---|---|
| **Maternal and child health** | | |
| rate of performing caesarean sections | RR 0.92; 95% CI: 0.81 to 1.15 | = |
| postpartum haemorrhage | RR 1.03; 95% CI: 0.82 to 1.29 | = |
| overall fetal or neonatal deaths | RR 0.95; 95% CI: 0.69 to 1.30 | = |
| preterm births | RR 0.87; 95% CI: 0.73-1.04 | = |
| admission to neonatal intensive care | RR 1.03; 95% CI: 0.77 to 1.38 | = |
| use of intrapartum regional analgesia | RR 0.88; 95% CI: 0.81-0.96 | MLHWs + |
| episiotomies | RR 0.83; 95% CI: 0.77-0.90 | MLHWs + |
| complications of abortion | RR 1.74; 95% CI: 0.82 to 3.70 | = |
| Abortion adverse events | RR 1.15; 95% CI: 0.84-1.56 | = |
| General satisfaction with care | RR 1.23; 95% CI: 1.10-1.37 | MLHWs + |
| **Infectious diseases** | | |
| ART failure | RR 1.08; 95% CI: 0.39-2.14. | = |
| **Non-communicable diseases** | | |
| Management of depression | RR 1.28; 95% CI:0.83-1.98 | = |
| Repeat consultation for NCD | RR 0.90; 95% CI: 0.35 to 2.32 | = |
| attendance follow-up visit chronic conditions | RR 1.26; 95% CI: 0.95 to 1.67 | = |
| Satisfaction with NCD care | RR 0.20; 95% CI: 0.14 to 0.26 | MLHWs + |
| compliance with drugs | RR 1.24; 95% CI 1.03-1.48 | MLHWs + |
| deaths for chronic conditions at 12 months follow-up | RR 0.36; 95% CI 0.17-0.79 | MLHWs + |

Key

"=" : no statistically significant difference in performance among MLHWs and standard treatment (physicians-led care)

"MLHWs +" : statistically significantly better outcomes reported in MLHWs group

**Midwives versus doctors + midwives:** 10 studies[41,42,43,44,45,46,47,48,49,50,51] that compared the care delivered by midwives versus doctors in a team with midwives were found. All of these studies were from developed countries and were conducted in tertiary care hospital settings. Among these, 8 studies were specifically on care delivered to women during antenatal, natal, and postnatal periods.

With pooled analyses no differences in outcomes were found when care was delivered by midwives alone vs. midwives with doctors in relation to the rate of performing caesarean sections (RR 0.92; 95% CI: 0.81 to 1.15), postpartum haemorrhage (RR 1.03; 95% CI: 0.82 to 1.29), overall fetal or neonatal deaths (RR 0.95; 95% CI: 0.69 to 1.30), preterm births (RR 0.87; 95% CI: 0.73-1.04), admission to neonatal intensive care (RR 1.03; 95% CI: 0.77 to 1.38). However, the use of intrapartum regional analgesia (RR 0.88; 95% CI: 0.81-0.96), and episiotomies (RR 0.83; 95% CI: 0.77-0.90) were lower among the group receiving care by midwives compared to group who received care by doctors/midwives.

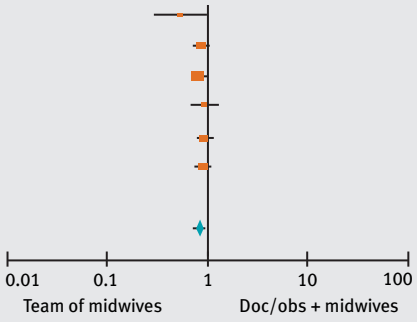
On the other hand, comparing outcomes of complete abortion between groups of patients managed by MLHWs with those managed by doctors the result was insignificant - RR 1.01 (95% CI: 0.99-1.04). The rates of complication (RR 1.74; 95% CI: 0.82 to 3.70) and adverse events (RR 1.15; 95% CI: 0.84-1.56) were also similar across the two groups.

**Figure 2: Lower use of regional anesthesia in MLHWs group compared to physicians.**

| Study or Subgroup | Experimental Events | Experimental Total | Control Events | Control Total | Weight | Risk Ratio M-H, Fixed, 95% CI |
|---|---|---|---|---|---|---|
| Harvey 1996 | 13 | 105 | 22 | 97 | 2.5% | 0.55 [0.29, 1.02] |
| Hundley 1994 | 246 | 1819 | 140 | 915 | 20.0% | 0.88 [0.73, 1.07] |
| MacVicar 1993 | 326 | 2304 | 208 | 1206 | 29.3% | 0.82 [0.70, 0.96] |
| Rowley 1995 | 69 | 405 | 73 | 409 | 7.8% | 0.95 [0.71, 1.29] |
| Turnbull 1996 | 194 | 594 | 198 | 581 | 21.5% | 0.96 [0.82, 1.13] |
| Waldenstrom 2001 | 158 | 484 | 178 | 496 | 18.9% | 0.91 [0.76, 1.08] |
| **Total (95% CI)** | | **5711** | | **3704** | **100.0%** | **0.88 [0.81, 0.96]** |
| Total events | 1006 | | 819 | | | |

Heterogeneity: $Chi^2 = 4.43$, df = 5 (P = 0.49); $I^2 = 0\%$

Test for overall effect: Z = 2.98 (P = 0.003)




In Waldenstrom et al. patients' satisfaction with team of midwives' care was greater in relation to antenatal care, less significantly so with intrapartum and postpartum care. Shields et al. also reported higher satisfaction of women with the care received by midwives compared with doctor and midwives. The relationship with staff, information transfer, choices given and decisions acceptance, and social support of women in the midwives group were all statistically higher than the group who received care from physicians and midwives. Wolke et al. compared the general satisfaction with health worker between groups of patients managed by midwives with those managed by physicians. The results showed that the care provided by midwives was significantly better than that provided by physicians (RR 1.23 (95% CI: 1.10-1.37).

### NURSES +MIDWIVES VERSUS OBSTETRICIAN AND GYNECOLOGIST

In 2 studies, nurses and midwives were compared with obstetricians and gynecologists in terms of how they perform abortions. No statistically different results were reported among the groups in relation to outcomes of complete abortion (RR 1.01 - 95% CI: 0.99-1.04), complication during manual vacuum aspiration (RR 1.74- C.I. 0.82-3.70), and adverse symptoms (RR 1.15_ C.I: 0.84-1.56).[52,53]

### CLINICAL OFFICERS VERSUS MEDICAL OFFICERS

A total of 6 studies were identified that reported the effectiveness of care delivered by clinical officers and surgical technicians compared to doctors.[54,55,56,57,58,59,60] Those studies were not experimental in design, and varied in objectives, outcomes reported and methodology, therefore data could not be pooled for analyses, but they provide nevertheless useful information on typology of health workers, training programmes they underwent, and observed results.

The Malawi study by Chilopora et al. compared the surgical procedures carried out by clinical officer as compared to medical officer, reporting insignificant differences in most outcome measures, including the live newborn rate and morbidity rate, and need for re-operation. However, maternal deaths were numerically higher (n=22/1875) in the clinical officer arm compared to the medical officer arm (n=1/256), even though this difference was not statistically significant.

The prospective cohort study referring to Mozambique by da Luz Vaz et al investigated post-operative complications after caesarean operation performed by MLHWs, reporting that post-surgical hematomas were significantly higher among the surgical technician group (n=335/958) compared to surgeries performed by obstetricians (n=56/1115).

The analysis from Tanzania by McCord et al is a retrospective cohort study that compared the care delivered by MLHWs and medical officers, finding no statistically significant differences in maternal mortality (16/941 for MLHWs vs. 5/143 for physicians), nor in perinatal mortality.

## Infectious Diseases

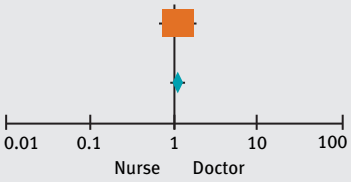
One study (by Sanne et al.)[61] was found where anti-retroviral treatment between 2 groups has been compared. No difference in mortality, viral failure, or immune recovery was noted between the study groups.

## ART Failure rates

Comparing ART failure between groups of patients managed by nurses with those managed by doctors, the result was insignificant. Risk ratio was 1.08(0.39-2.14) at 95% CI.

**Figure 3: No difference in ART failure rates in MLHWs vs physicians**

| Study or Subgroup | Nurse Events | Nurse Total | Doctor Events | Doctor Total | Weight | Risk Ratio M-H, Fixed, 95% CI |
|---|---|---|---|---|---|---|
| Sanne 2010 | 192 | 404 | 179 | 408 | 100.0% | 1.08 [0.93, 1.26] |
| **Total (95% CI)** | | **404** | | **408** | **100.0%** | **1.08 [0.93, 1.26]** |
| Total events | 192 | | 179 | | | |
| Heterogeneity: Not applicable | | | | | | |
| Test for overall effect: Z = 1.04 (P = 0.30) | | | | | | |

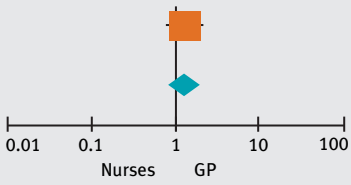



## Mental Health

The review identified a single article which compared nursing care of depression in general population to standard care, showing no significant differences in the outcomes of patients managed by nurses compared with those managed by physicians (RR was 1.28 - 0.83-1.98 at 95% CI).[62]

**Figure 4: No difference in outcomes of patients managed by nurses vs physicians**

| Study or Subgroup | Nurse Events | Nurse Total | Doctor Events | Doctor Total | Weight | Risk Ratio M-H, Fixed, 95% CI |
|---|---|---|---|---|---|---|
| Mann 1998 | 27 | 65 | 24 | 74 | 100.0% | 1.28 [0.83, 1.98] |
| **Total (95% CI)** | | **65** | | **74** | **100.0%** | **1.28 [0.83, 1.98]** |
| Total events | 27 | | 24 | | | |
| Heterogeneity: Not applicable | | | | | | |
| Test for overall effect: Z = 1.11 (P = 0.27) | | | | | | |



## Chronic diseases

Chronic diseases are a leading cause of mortality globally.[63,64] MLHWs can play an important role in managing these conditions. The review identified a number of studies comparing chronic disease care given by MLHWs (mostly nurses) and standard care provided by physicians. In most of the comparisons the MLHW provided care was equally effective. The outcomes this review has analyzed and pooled are repeat consultation for the same condition, patient satisfaction, improved physical function, coming for a follow-up visit, attendance to emergency department after their treatment, hospital referrals provided, compliance with the drugs prescribed, quality of life, and death at 12 months follow-up.

18 studies were found that provided evidence of the effectiveness of chronic disease care delivered by nurses as compared to doctors.[65,66,67,68,69,70,71,72,73,74,75] The majority of these studies were from developed countries and secondary and tertiary care setups. The results found that the care delivered by nurses was as effective as care given by doctors. No differences were found in the outcomes of: repeat consultation (RR 0.90; 95% CI: 0.35 to 2.32), better physical function (RR 1.06; 95% CI: 0.97 to 1.15), attendance of follow-up visit (RR 1.26; 95% CI: 0.95 to 1.67), attendance at emergency after receiving care (RR 1.02; 95% CI: 0.87 to 1.14). However, satisfaction with the care received by nurses was significantly higher compared to doctors (RR 0.20; 95% CI: 0.14 to 0.26), and so was compliance with drugs (RR 1.24- (1.03-1.48 at 95% CI), and deaths at 12 months follow-up (RR 0.36 (0.17-0.79) at 95% CI), even though the last two findings are based on the results of only one study.

**Figure 5: Higher patient satisfaction with nurses than with physicians for management of chronic conditions**

| Study or Subgroup | Nurse Mean | Nurse SD | Nurse Total | Doctor Mean | Doctor SD | Doctor Total | Weight | Std. Mean Difference IV, Fixed, 95% CI |
|---|---|---|---|---|---|---|---|---|
| Daele 2009 | 8.19 | 1.18 | 683 | 8.2 | 1.26 | 609 | 26.5% | -0.01 [-0.12, 0.10] |
| Kinnersley 2000 | 77.9 | 10.72 | 544 | 74.05 | 10.78 | 596 | 23.1% | 0.36 [0.24, 0.48] |
| Shum 2000 | 78.6 | 16 | 635 | 76.4 | 17.8 | 657 | 26.5% | 0.13 [0.02, 0.24] |
| Venning 2000 | 4.4 | 0.46 | 608 | 4.22 | 0.54 | 571 | 23.9% | 0.36 [0.24, 0.47] |
| **Total (95% CI)** | | | **2470** | | | **2433** | **100.0%** | **0.20 [0.14, 0.26]** |

Heterogeneity: Chi² = 29.89, df = 3 (P < 0.00001); I² = 90%

Test for overall effect: Z = 6.99 (P < 0.00001)

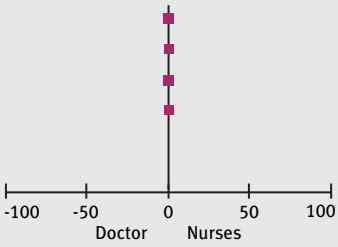
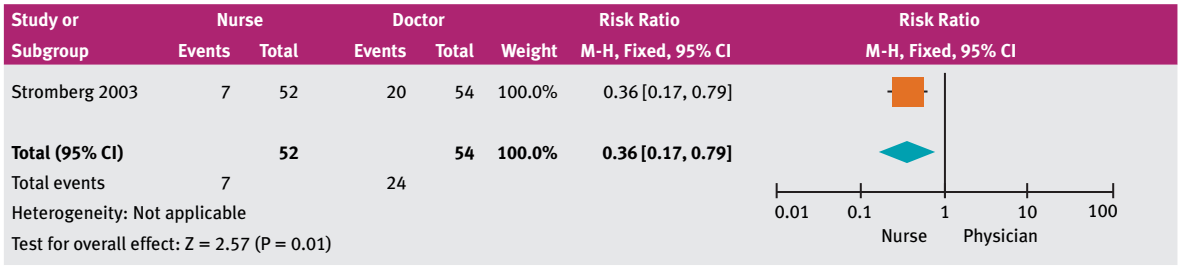


**Figure 6: Lower death rate at 12 months for MLHW group in management of chronic conditions.**




A significant number of other studies met the inclusion criteria of the systematic review, however the outcomes investigated were not reported, or lacked the actual numbers or standard deviations, which prevented pooling their results with other studies.[76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121] On application of GRADE criteria, evidence was found to be low or very low quality. Therefore, results should be interpreted with caution. Also the findings of these studies are summarized in annex 4.

## b) Country case studies

Through the country case studies, information was gathered on MLHWs programmes implemented at national level, including on aspects such as:

1. Program description (duration, scope, target population, and overall budget)
2. Linkages to specific MDG targets and indicators
3. Role and specific responsibilities of MLHWs in the program
4. Educational levels and training requirements for MLHWs
5. Supervision, mentoring, and evaluation experience (both internal and external)
6. Linkages of MLHW programs to overall health system
7. Salary and remuneration levels, including performance-based incentives, if any
8. Career pathways for MLHWs
9. Any in-country evaluations done on MLHW, and if so, summary of key findings

The case studies specifically evaluated available information on: training materials, content, length of training, exit certification, supervision and monitoring of MLHWs, and linkages to the health system and communities.

**Table 5:** Summary overview of the key findings in relation to the main typology of cadres

**Nurses**

| | Degree | Accreditation | Recruitment | Selection | Training | Roles and Responsibilities | Supervision | Salary | Professional Accreditation |
|---|---|---|---|---|---|---|---|---|---|
| **Bangladesh** | Diploma in Nursing Science and Midwifery | Bangladesh Nursing Council | • Bangladeshi nationals,<br>• older than 18 years of age,<br>• education till the 12th grade preferably in science subjects with a GPA of more than 2.50, they should be single, and a medical certificate must indicate that the candidate is healthy and physically fit | Written test and they need 2 letters of recommendation. | 3 years | care for clients with common and simple health problems across the life span and across health illness continuum in order to promote, maintain and restore health | Director of Nursing | 10,000 Taka (147 USD) a month | B.Sc. and M.Sc. degrees, diplomas and certificates course in specialized areas |
| **Pakistan** | Diploma<br>BSc<br>MSc | Pakistan Nursing Council | • 16 to 35 years<br>• secondary school (10th grade) | Based on Admission test and interview | 3 years (diploma)<br>2 yrs (BSc)<br>2 yrs (MSc) | Provide health care to patients by promoting maintaining and restoring health, prevent illnesses, injury or disability | Director of Nursing | 15-20 thousand (150-200 USD) a month | Promotion to head nurse. Can enroll in other degree programs |
| **Indonesia** | Graduate Nurse | Surat Izin Bidan-SIB and Surat Izin Perawat-SIP | • high school | | | Perform health care activities | Senior nurses | | |
| **El Salvador** | Bachelors of Nursing | Public Health Superior Council | | | 5 yrs (Bachelors) | To provide all phases of nursing intervention, at individual, family and community level. | Family Health Community Teams (ECOS Familiares) and the Specialized Family Health Community Teams | Nurses working in first level health facilities US$ 220 to 772.34; and those working at secondary and tertiary level US$ 285.75 to 502.29 | Specialist diplomas, or they can follow courses leading to a magister degree |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Peru** | Diploma | Peruvian Nursing College | pre-graduate students | Examinations include questions on general knowledge and science field | 5 years | To provide integral nursing care based on the Process of Nursing Care that includes assessment, diagnosis, planning, execution, and evaluation. | | | specialization training |
| **Tanzania** | | | | | | | | | |
| **Mozambique** | Diploma | the Mozambican Nursing Association | Educated to the 7th grade level and have eight months of additional training, roughly 15-17 years old, practicing primarily in rural settings, in health centers or health posts (out-patient clinics). | | 3 years | trained to perform Caesarean sections recognize, offer, provide and refer maternal and reproductive health problems | | Basic nursing: US $100 per month | are recruited into the tech-nicos de medicine/technical de chirurgic programs |
| **Zambia** | | | | | | | | | |

## Midwives

| | Degree | Accreditation | Recruitment | Training | Roles and Responsibilities | Professional Accreditation |
|---|---|---|---|---|---|---|
| **Bangladesh** | | | | | | |
| **Pakistan** | Midwifery Community midwifery | Pakistan Nursing council | • 16 to 35 years of age<br>• secondary school (10th grade) | 1 year | Proper management of pregnant women, mothers and infants under her care, identify abnormal conditions and refer such cases to the appropriate facility/specialist, after providing emergency first aid care to stabilize the condition of the patient. | |
| **Indonesia** | Diploma in midwifery | Indonesian Midwives' Association | | | (I) practices for antenatal care; (ii) treatment of obstetric complications; (iii) delivery with a skilled provider; (iv) postnatal care; (v) family planning; and (vi) coverage of costs for poor families | |
| **El Salvador** | | | | | | |
| **Peru** | Diploma | Peruvian Midwifery College | pre-graduate students | 5 years | Protect the life and health of individuals, particularly those of pregnant women and fetus | continuous training for personal growth |
| **Tanzania** | | | | | | |
| **Mozambique** | | | | | | |
| **Zambia** | | | | | | |

## Lady Health Visitor

| | Accreditation | Recruitment | Training | Roles and Responsibilities |
|---|---|---|---|---|
| **Bangladesh** | | | | |
| **Pakistan** | Pakistan Nursing council | • Secondary School (10th grade)<br>• 16 to 35 yrs. of age | 53 weeks of training | Prevention of disease and promotion and maintenance of health theory, reducing morbidity and mortality of mother and children |
| **Indonesia** | | | | |
| **El Salvador** | | | | |
| **Peru** | | | | |
| **Tanzania** | | | | |
| **Mozambique** | | | | |
| **Zambia** | | | | |

## Nurse Technician

| | Degree | Accreditation | Recruitment | Training | Roles and Responsibilities | Supervision | Salary |
|---|---|---|---|---|---|---|---|
| **Bangladesh** | | | | | | | |
| **Pakistan** | | | | | | | |
| **Indonesia** | | | | | | | |
| **El Salvador** | Diploma | Public Health Superior Council | institutions establish the entry quotas | 4 years | Nurse technicians ensures that family and individual patient records are available as needed, and also to check out permanently that equipment, drugs and supplies stock are in order and report any disruption. | Supervised by members of Family health Teams | primary health level their salaries range from US$ 220 to 772.34, and at second and third level they range from US$ 285.75 to 502.29 |
| **Peru** | | | | | | | |
| **Tanzania** | | | | | | | |
| **Mozambique** | | | | | | | |
| **Zambia** | | | | | | | |

## Clinical Officer

| | Degree | Accreditation | Recruitment | Selection | Training | Roles and Responsibilities | Salary | Professional Accreditation |
|---|---|---|---|---|---|---|---|---|
| **Bangladesh** | | | | | | | | |
| **Pakistan** | | | | | | | | |
| **Indonesia** | | | | | | | | |
| **El Salvador** | | | | | | | | |
| **Peru** | | | | | | | | |
| **Tanzania** | Diploma | Medical Council of Tanganyika | The age limit 18-25 years and they have to be medically fit. They are required to have at least a Grade 10, with good credits in science subjects. Can also be recruited from already qualified nurses. | | 3 years | COs are skilled to be able to manage common, medical, reproductive health and simple surgical problems. They are legally prohibited to perform caesarean sections. | US $500/ month | They can apply to do the STI module to upgrade and extend their diploma training in basic applied medicine and this will elevate them to the level of Assistant Medical Officer (AMO). |
| **Mozambique** | Diploma | Ministry of Health | have 2 or 3 years of basic mid-level medical training (e.g. nurse or medical assistance) and several years of rural experience | Undergo examination and are interviewed. | | ensuring particularly maternal or child health | | specialized mid-level technicians |
| **Zambia** | Diploma | The Medical Council of Zambia | grade 12 school leavers and non-school leavers who have minimum entry requirements | | 2 years | Clinical Officers can dispense specifically general medicine and obstetric care, although they are not permitted to do caesarean sections. | 1,141,770 Zambian Kwacha = $349 (2005) | A Clinical Officer, with enough experience and having completed an additional 2 year advanced surgical and clinical medicine training program can become a Medical Licentiate |

### Assistant Medical Officer

| | Degree | Accreditation | Recruitment | Training | Roles and Responsibilities | Supervision | Professional Accreditation |
|---|---|---|---|---|---|---|---|
| **Bangladesh** | | | | | | | |
| **Pakistan** | | | | | | | |
| **Indonesia** | | | | | | | |
| **El Salvador** | | | | | | | |
| **Peru** | | | | | | | |
| **Tanzania** | Diploma | Tanganyika Medical Training Board | An applicant must have a Diploma in Clinical Medicine from the Tanganyika Medical Training Board | 3 years | trained and regulated to practice general medicine, basic and emergency surgeries, obstetrics, dermatology and anesthesia | Clinical Tutors are responsible for supervision and monitoring | they can apply to become an AMO at specialist level |
| **Mozambique** | | | | | | | |
| **Zambia** | | | | | | | |

### Tecnicos de Cirurgia (TC)

| | Degree | Accreditation | Recruitment | Selection | Training | Roles and Responsibilities | Salary | Professional Accreditation |
|---|---|---|---|---|---|---|---|---|
| **Bangladesh** | | | | | | | | |
| **Pakistan** | | | | | | | | |
| **Indonesia** | | | | | | | | |
| **El Salvador** | | | | | | | | |
| **Peru** | | | | | | | | |
| **Tanzania** | | | | | | | | |
| **Mozambique** | Specialized Diploma | Ministry of Health | The most promising and skilled technicos de medicina are recruited to enter the technicos de cirurgia program | Undergo examination and are interviewed | Experienced clinical officers that undergo further residential training (2 years) in surgery under the supervision of experienced surgeons, as well as undergoing one year of internship. | They are skilled to perform a range of obstetric, general and orthopedic surgery health services (Caesarean section and obstetric, craniotomies, bowel resection and colostomies, skin transplant, splenectomies, war surgery). | TCs earn roughly $39 per major obstetric surgery. | A TC can become a specialist by completing an additional 3-4 years of education. |
| **Zambia** | | | | | | | | |

The results, in terms of key policy challenges and issues emerging, are highly-country specific; these are reported in greater detail in annexes 5 to 12.

## Discussion

### Interpretation

Through the systematic review, no difference was found in most of the reported outcomes of care delivered by MLHWs compared with doctors – and in a few outcome measures MLHW outperformed doctors. This analysis therefore lends support to the strategy of task-shifting, and suggests that care delivered by MLHWs can be safe and effective. However, on GRADE application, the evidence was low and very low quality suggests interpretation of these results with caution. Therefore, further studies of higher methodological quality and with longer follow-up might be needed, particularly for clinical officers and surgical technicians working in Africa – the region with the greatest shortage of health workers.

MLHWs' role in relation to maternal care has been immense: midwives are the primary health care providers in multiple settings. The evidence emerging from our review showed that where a team of midwives provided antenatal care, there were comparable results across most outcome measures, a high level of maternal satisfaction, along with a lower rate of episiotomies and use of intrapartum anesthesia. When midwives performed neonatal examinations themselves, mothers were more satisfied. Midwives also provided continuity of care following birth and advised the mothers on other health care issues regarding their neonates, for example breast feeding. Midwives have a significant role to play during delivery where they provide better perineal care and care after episiotomies.

MLHWs also can play a significant role in providing care for chronic conditions (such as diabetes mellitus and hypertension). They are associated to a higher level of satisfaction among clients, and consulting them is more cost-effective for patients. In addition, the level of health care that MLHWs provide is shown to be comparable to that provided by internists – although the evidence was of low quality.

While reviewing the studies included in the systematic review, it was noted that most of them failed to specify training content and duration, as well as the supervision of the MLHWs. If these specifics had been mentioned in detail it would have given another dimension to the comparisons with other health workers. It would also help in devising new policies regarding the training and education of mid-level health workers in countries where they are not yet a substantive component in the health system workforce.

A central problem that emerged throughout all the country case studies conducted to supplement the findings of the systematic review is the lack of visibility of these cadres in public policy, and therefore their virtual absence in relevant countries' information systems and databases. Some information is available through the routine health management information system and professional bodies, but these data are very limited for the purposes of informing decision-making and proper planning. This is made worse by the lack of HR information specifically from the private sector and the limited ability and skills to analyse supply and demand to inform forecasting.

Although it appears that supervision and monitoring of the training of these cadres is quite extensive, this does not seem to filter through to the employment situation.

The main obstacle in ensuring that the potential of these cadres in improving health outcomes is that despite their widespread use, they are virtually invisible in government policies and often neglected in terms of health workforce strategies and health system support measures. Until these cadres are more comprehensively considered, counted, monitored, and supported by the health system, the positive impact that they can have on reaching the health related MDGs will not be fully understood and realized.

Through the case studies several country-specific challenges have been identified that need to be addressed by the individual national health sector. Only in this way efforts to provide effective public health interventions based on MLHW will reach a measurable impact on performance of the health system (including an improved deployment of capable and motivated MLHWs), and ultimately on health indicators at national and sub-national levels.

In trying to meet the health-related MDGs, it has been recognized that health systems strengthening needs to be the focus so that more countries are able to deliver a wider range of health services on a much larger scale. Amidst claims that ensuring better quality service from current workforce stocks could achieve this objective, there has been compelling evidence showing a direct correlation between the numbers of people that have access to health care services and the numbers of health service providers in a specified area.[cxii] Furthermore, there is also a correlation between the levels of health of people and the density of qualified health care workers situated in that area. [cxiii]

Thus, not only do greater numbers of health workers positively affect access, but also health outcomes. It is recognized that any strategy which intends to increase health services in terms of either its scope or reach will need to consider long-, medium-, and short-term initiatives that will assist in the increased skilling, re-skilling, up-skilling, and retention of health workers.

Despite the great successes achieved in various contexts through the use of MLHWs instead of medical doctors to perform surgery, provide clinical health services, health promotion and education, and to provide anti-retroviral therapy (ARTit has also been shown that in contexts where MLHWs receive little supervision and insufficient training in specific health care services, the quality of care can be sub-optimal and negatively impact on retention.[cxxiv] Moving the debate away from a perspective that less qualified health care workers necessarily will render a service of lesser quality, the focus should instead be on how to ensure a more efficient human resources skills mix, which can mitigate the effect of health workforce shortages and better enable countries to meet or make considerable progress towards attaining the Millennium Development Goals.

The potential positive impact that task-sharing and a more efficient skills mix can have on making quicker progress towards attaining the health related MDGs has been widely acknowledged, and is reinforced by the findings of this analysis. In addition, the training and remuneration of

these cadres is less costly in comparison to doctors, and MLHWs are more easily retained in rural areas. The possible successes to be attained through implementing this strategy have to be however, grounded in a sober consideration that task-shifting alone cannot produce large-scale changes within a context of critical HRH shortages. Any strategy or program involving task-shifting "should be implemented alongside other strategies designed to increase the total numbers of health workers in all cadres."[cxxv]

## Limitations

This analysis has a number of limitations:
Firstly, most of the reviewed studies neglected to document the complete description and characteristics of MLHWs deployed, especially the level and amount of training and supervision provided to those workers. This information could have helped in identifying the importance of these factors and their association with other outcomes. Additional information on the initial level of education of MLHWs, provision of refresher training, and mode of training (i.e. balance between practical and theoretical sessions) would have been useful in understanding the threshold effect, if any, of these factors on MLHW performance in community settings.

Secondly, studies related to the role of MLHWs in HIV/AIDS prevention and care, mental health, food security and nutrition were scarce.

Finally, few evaluation studies/reports were at scale, and none had followed an a priori experimental design or impact assessment process, and therefore the evidence was found to be low and very low quality.

## Knowledge gaps requiring further study

- There is a paucity of experimental design studies in primary health care settings and in developing countries.
- The majority of the non-physician clinician and clinical officer studies from Africa failed to employ an experimental design. These studies therefore could not be pooled to generate evidence on their effectiveness.
- There is a remarkable dearth of information on the cost-effectiveness of MLHW programs.
- Studies are needed to assess whether MLHW programs promote equity and access to care.
- Given the global burden of HIV/ AIDS, specific studies are needed on the potential role of MLHWs in its prevention and care, as there is very limited empirical information on this.
- Further research is needed on how MLHWs - particularly community midwives, non-physician clinicians, clinical officers, and surgical technicians – are linked to the wider health system (e.g. in terms of referrals and supervision) and the impacts of the cadre on the health system.
- Further research is required to look for the effectiveness of MLHWs in low- and middle-income settings, where the challenges of access to essential health services are most severe.

- Further systematic reviews are required on factors affecting the sustainability of MLHWs interventions when scaled up.

## Conclusions: key recommendations and policy implications

Implementing the recommendations below will strengthen efforts to reduce the HRH gap. Countries that are already off-track from achieving the health-related MDGs should continue their efforts to scale-up interventions through CHWs and MLHWs, which has the potential to improve progress toward the MDGs.

### Recommendations to policy-makers

- Policies are needed to define at national and sub-national levels the appropriate skills mix of cadres that include MLHWs, together with identification of their roles, taking into consideration demands from the community level and the country's changing disease patterns.
- Policy actions and investment decisions are needed to improve and scale up the training, licensing, certification and re-certification, assignment of responsibilities, supportive supervision, quality of care assessment, and monitoring and evaluation of MLHWs. Policies should be designed on the basis of good available evidence and then be adequately implemented at scale.
- A coherent deployment and retention strategy should be planned and implemented to expand the range of incentives that may allow an improved use of MLHWs who can provide quality health care as part of health teams. Such strategy should be country-specific, based on population needs, and be adaptable in its individual components down to the sub-national level.
- Regulation of responsibilities should be more strongly developed and enforced. This needs to occur together with stimulating well-planned task-shifting and task-sharing efforts to allow nurses to deliver health care services not usually assigned to them, but which are critical to increase coverage of effective interventions with real potential to improve health indicators, such as maternal, neonatal, and child survival.
- For the nursing workforce in particular, there is a need to set up explicit entry requirements to nursing schools, improve training content and quality, as well as licensing and accreditation requirements. Particular attention should be paid to the private sector and to rural and remote areas, where the quality of training and continuous education needs more clear and sustained actions.
- HRH information systems should be urgently strengthened to include also MLHWs in the majority of countries assessed.

### Recommendations to researchers

- In order to generate high quality evidence further trials designed based on a higher methodological quality are required
- In order to understand if an intervention works, how it works, for whom, and under what

circumstances, formal and independent evaluation efforts should be promoted to assess the impact, cost, and effectiveness of programs focused on MLHWs in general.

- Impact evaluations needs to be complemented by evaluations aimed at disentangling the underlying mechanisms of the diverse interventions, specifically their effects on health systems, and vice versa. Evaluations should aim at understanding intended and unintended consequences in order to be in a better position to make real improvements in the design, implementation, and evaluation phases of the policy cycle.
- The comparative cost-effectiveness of public, private, and private-not-for-profit interventions focused on MLHWs is urgently needed to weigh the relative importance and the role of these categories of providers in attaining increased and equitable health care access, as well as their impact on health workers and health system performance.

### Recommendations to GHWA members

- The findings from this report should be disseminated to policy makers at country level, to health care delivery organizations, and to organizations in charge of developing HRH programs.
- Consultations should involve interactive debates that draw attention to key aspects of the deployment and planning process, help clarify issues, and address practical questions related to the operationalization of these findings.
- Theme-focused workshops on existing MLHW programs should be conducted to facilitate more interaction, generate quality output, and in the long run facilitate follow-up meetings to provide technical support and guidance for MLHW programs, including operational research.
- GHWA members should advocate for and conduct country-specific MLHW program evaluations and reports, utilizing as much as possible innovative, quasi-experimental designs to assess the impacts of such programs.

### Annexes

Annexes to the report, including the country case studies,
are available in electronic format on the GHWA website:
http://www.who.int/workforcealliance/knowledge/mlpreport_annexes/en/index.html.

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Launched in 2006, the Global Health Workforce Alliance is a partnership dedicated to identifying and coordinating solutions to the health workforce crisis. It brings together a variety of actors, including national governments, civil society, finance institutions, workers, international agencies, academic institutions and professional associations. The Alliance is hosted by the World Health Organization.

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