

## Healthcare workforce capacity and service delivery outcomes

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### Abstract

This qualitative, literature-based study examines how healthcare workforce capacity influences quality of service delivery, drawing exclusively on published empirical and review evidence. Using a thematic synthesis of diverse sources addressing workforce availability, distribution, skill mix, supervision, organizational culture and planning, the research identifies core mechanisms linking workforce factors to service outcomes. Inadequate staffing and maldistribution, particularly in rural, Indigenous and conflict-affected settings, are consistently associated with reduced coverage and perceived lower quality of care. Strategic workforce innovations such as advanced practice roles, community health workers, capacity building initiatives and systems approach redesign, are linked to improved access, efficiency and, in many cases, clinical outcomes and patient experience when supported by adequate training, supervision and regulatory frameworks. Organizational culture, leadership and learning infrastructures strongly mediate whether existing workforce capacity translates into compassionate, safe, person-centered care. Evidence also shows that infrastructure and equipment alone are weakly correlated with adherence to evidence based care, underscoring the central role of workforce performance in determining quality. The study concludes that workforce availability is necessary but not sufficient, service quality emerges from the interaction of workforce numbers with skill mix, support systems, cultural and community alignment, and system level design. Recommendations include targeted investments in workforce numbers and distribution, support for skill mix reform and community-based cadres, institutionalized supportive supervision and capacity building, strengthened organizational culture, and integration of workforce planning within learning and systems approach frameworks.

**Keywords:** Healthcare workforce; Workforce capacity; Service delivery; Quality of care; Skill mix; Supervision; Organizational culture; Community health workers; Advanced practice nurses; Learning health systems

## 1. Introduction

### 1.1. Background of the Study

Global health systems face a persistent shortage and maldistribution of health workers, driven by underinvestment in education, recruitment, and retention, leading to high workload and burnout and undermining quality of care. In low- and middle-income countries (LMICs), ensuring adequate human resources for primary healthcare, especially in rural and public sectors, remains a major challenge. In high income settings, ageing populations and rising multimorbidity increase demand for emergency and critical care services amid physician shortages, prompting exploration of advanced practice nursing and new workforce models (Woo *et al.*, 2017).

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Workforce constraints directly affect service delivery: inadequate staffing, reliance on temporary staff, and capacity pressures are perceived by workers to compromise safety, quality, and compassionate care, even when routine performance indicators do not immediately reflect this. At the same time, evidence shows that well-designed workforce innovations (advanced practice roles, community health workers, supportive supervision, and redesigned models of care) can improve access, efficiency, and clinical outcomes.

## 1.2. Statement of Problem

Despite abundant policy discourse on human resources for health, there is fragmented understanding of how workforce availability and configuration concretely shape service quality across settings. Many systems invest in infrastructure and technology, yet evidence shows that inputs alone do not guarantee high-quality, evidence-based care (*Leslie et al., 2017*). There is a need for a qualitative synthesis focusing specifically on the relationship between workforce capacity (numbers, skill mix, distribution, and support) and observable service delivery outcomes.

## 1.3. Objectives of the Study

- To evaluate qualitatively how healthcare workforce availability and capacity influence the quality of healthcare service delivery.
- To identify workforce-related factors (e.g., staffing levels, skill mix, supervision, training, organizational culture) associated with positive or negative service delivery outcomes.
- To synthesize empirical and systematic-review evidence into a conceptual explanation of pathways linking workforce capacity and service outcomes.
- To generate evidence-based recommendations for policymakers and managers seeking to improve service quality through workforce strategies.

## 1.4. Significance of the Study

The study provides a consolidated, qualitative account of how workforce capacity affects service delivery outcomes, drawing on diverse settings such as; high-income, LMIC, Indigenous and conflict affected contexts. It informs:

- **Policy makers** considering scope of practice reform, investment in workforce, and community-based models.
- **Managers and planners** designing workforce models, supervision systems, and learning health systems.
- **Researchers** by highlighting evidence gaps around causal mechanisms, distributional equity, and long-term impacts.

## 1.5. Scope of the Study

- **Time:** Evidence published **up to and including 2022**.
- **Content:** Qualitative and mixed methods findings from primary studies, and thematic findings from systematic/scoping reviews, focusing on:
  - Workforce numbers, mix, distribution and regulation.
  - Training, supervision, organizational culture and capacity building.
  - Service quality, access, efficiency, patient experience and outcomes.
- **Settings:** High-income countries, LMICs, conflict affected regions, Indigenous and rural/remote services, as reported in the literature.

This is a **desk-based qualitative synthesis** of existing literature; no new primary data are collected.

## 1.6. Definition of Terms

- **Healthcare workforce:** All clinical and non-clinical health professionals directly involved in delivering health services (e.g., doctors, nurses, community health workers, allied health staff).
- **Workforce capacity:** The combined **numbers, distribution, skill mix, competencies, motivation and productivity** of the health workforce available to meet population health needs.
- **Service delivery outcomes:** Measurable or perceived results of health services, including access, utilization, quality of care, patient experience, safety, efficiency and equity.
- **Skill mix:** The composition and relative proportions of different types and levels of health workers (e.g., physicians, nurses, CHWs, advanced practice roles) within teams or systems.

- **Advanced practice nurse / nurse practitioner:** A registered nurse with extended clinical training and regulatory authority to perform higher-level tasks (e.g., diagnosing, prescribing), often substituting or complementing physicians in emergency and primary care.
- **Community health worker (CHW):** A community-based health worker with limited formal clinical training who acts as a **bridge** between communities and the formal health system, extending services, facilitating cultural mediation and, at times, social change.
- **Supportive supervision:** Ongoing, structured oversight that focuses on mentoring, problem solving and performance improvement rather than inspection alone, shown to enhance service-delivery indicators.
- **Organizational culture:** Shared norms, values and practices within a health organization that shape staff behaviour, teamwork and the delivery of compassionate, person-centred care (*Edelman et al., 2020*).
- **Learning health system (LHS):** A health system that routinely collects, analyzes and feeds back data to clinicians and managers to drive continuous improvement, requiring a skilled, data-literate workforce (*Kraus et al., 2021*).

## 1.7. Research Questions

1. How does healthcare workforce availability (numbers, mix, distribution) influence **quality of healthcare service delivery**?
2. What organizational and contextual factors mediate or modify this relationship (e.g., culture, supervision, training, systems)?
3. Which workforce innovations and models are associated with improved service delivery outcomes?
4. How do workforce shortages and instability manifest in service quality problems in different contexts?

## 1.1 Hypotheses (for Qualitative Testing)

- H1: **Greater workforce availability and better distribution** are associated with improved access and quality of healthcare services.
- H2: Workforce shortages and high turnover contribute to compromised safety, reduced responsiveness, and poorer patient experience.
- H3: Workforce innovations (task-shifting, advanced practice, community health workers, redesigned teams) improve service quality when implemented with adequate training, supervision and system support.
- H4: Organizational culture, governance, and learning infrastructures mediate the impact of workforce capacity on service outcomes.

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## 2 Literature review

### 2.1 Conceptual and Theoretical Perspectives

Donabedian's **structure–process–outcome** framework underlies much on workforce research, regulations, staffing levels, and skill mix (structure) shape care processes (access, utilization, care pathways), which in turn determine quality and outcomes (*Yang et al., 2020*). Primary healthcare performance frameworks similarly treat workforce as a core system input enabling effective service delivery (*Bitton et al., 2019*).

*Agarwal et al.* propose a detailed framework for measuring **community health worker (CHW) performance**, highlighting sub-domains such as incentives, supervision, absenteeism, service delivery, quality, referral processes, and community experience of care (*Agarwal et al., 2019*). This underscores that workforce “capacity” is multidimensional: numbers, competencies, motivation, and integration into the broader system.

Learning health system (LHS) theory also emphasizes a **skilled, data literate workforce** as a prerequisite for continuous, data driven improvement in service delivery (*Enticott et al., 2020*). Similarly, systems approach frameworks in service design view workforce as a central component in iterative cycles of redesign and outcome monitoring (*Komashie et al., 2021*).

### 2.2 Health Workforce Capacity: Global and Regional Overviews

Global analysis estimates large need-based shortages of healthcare workers, driven by chronic underinvestment and poor working conditions, leading to burnout and attrition and threatening service quality. In LMICs, rural and public sector primary care posts are particularly hard to staff; task shifting and CHWs are widely used to address gaps, with varying impact depending on supervision and resources (*Bitton et al., 2019*).

In northern Australia, a scoping review shows a **fragmented health sector** with many actors but limited workforce stability and poorly targeted resources. Health systems struggle to meet needs of highly distributed populations, and workforce instability undermines comprehensive primary care despite local innovations and training strengths (Edelman *et al.*, 2020). African health systems similarly identify **inadequate human resources** as the leading challenge, with training and capacity building as top ranked solutions for improving service delivery (Oleribe *et al.*, 2019).

## 2.3 Empirical Evidence on Workforce and Quality of Care

### 2.3.1 Staffing Adequacy and Service Perceptions

Qualitative work with healthcare staff shows that adequate staffing levels across all groups are perceived as essential for safe, person-centered, compassionate care (Beardsmore & Mcsherry, 2017). Staff report that covering unfilled shifts and extensive use of agency staff increase fatigue, turnover and perceived safety risks, even when routine performance metrics do not yet show deterioration (Beardsmore & Mcsherry, 2017). In conflict affected Pakistan, unavailability of health workforce, especially female workers, is identified as a major barrier to reproductive, maternal, newborn, child and adolescent health services, contributing to poor service coverage and quality (Das *et al.*, 2020).

### 2.3.2 Skill Mix and Advanced Practice Roles

A systematic review of advanced practice nurses in emergency and critical care finds that expanding nurses' roles and autonomy improves length of stay, time to treatment, mortality, patient satisfaction, and costs (Woo *et al.*, 2017). In the United States, more expanded nurse practitioner (NP) practice regulations are associated with greater NP supply and improved access for rural and underserved populations, without reductions in quality (Yang *et al.*, 2020). These findings suggest that strategic skill mix changes and regulatory support can enhance service delivery where physician shortages exist.

### 2.3.3 Community Health Workers and Community-Based Workforce

Community-based PHC systems with CHWs, supported by appropriate policies and financing, are consistently associated with better outcomes and equity in LMICs (Bitton *et al.*, 2019). However, CHWs require adequate training, supervision, incentives, and integration into facility-based systems to deliver high-quality services. Agarwal *et al.* highlight performance domains (e.g., absenteeism, service quality, community trust) that directly influence service effectiveness (Agarwal *et al.*, 2019).

### 2.3.4 Supervision, Support and Organizational Culture

Supportive supervision can enhance performance and motivation, a dose response study shows that approximately **five supportive supervisory visits** spaced 6–9 months apart significantly improve service delivery indicators at health-center level (Desta *et al.*, 2020). Organizational culture and support for professional development strongly shape staff perceptions of their capacity to deliver **compassionate, dignified care**, failure to honour development commitments leaves staff feeling undervalued and may impact culture and care over time (Beardsmore & Mcsherry, 2017). Learning health systems research emphasize that a **skilled, data literate workforce** and capacity building are critical to sustain continuous service improvement (Enticott *et al.*, 2020).

### 2.3.5 Workforce Capacity Building and Service Outcomes

Participatory action research in Indian cancer centers shows that building palliative care capacity (training staff, establishing infrastructure, ensuring opioid availability) led to development of palliative services in most centers, improved pain management (as indicated by morphine use), and ongoing education activities, demonstrating how workforce and organizational investment translate into new service capabilities (Rao *et al.*, 2022). In Indigenous primary healthcare, a **culturally appropriate and skilled workforce** is a key characteristic of effective service models, culture supports workforce, accessibility, holistic care, and community participation (Harfield *et al.*, 2018). Training for **cultural competence** among staff tends to improve knowledge, skills, and attitudes, but evidence for impacts on clinical and health outcomes remains limited and heterogeneous (Jongen *et al.*, 2018).

### 2.3.6 Workforce Planning and Redesign

Regional workforce planning models estimate service capacity by accounting for provider stocks, inflows/outflows, activity rates and productivity, then align this capacity with population health needs and service requirements (Simkin *et al.*, 2020). These models highlight gaps between service requirements and workforce capacity and guide skill mix and task shifting strategies. The CLEAR program in the NHS combines qualitative engagement with data analysis to redesign services and workforce models. It supports **skills-based staffing** aligned with demand patterns and shows potential

cost savings, improved staff retention and better alignment of workforce models with patient needs (*Corner et al., 2022*). Systems approach interventions more broadly are associated with significant improvements in both patient and service outcomes, though most evidence comes from before and after designs.

### 2.3.7 Service Delivery Outcomes and Quality Metrics

A broad scoping review of alternative service delivery arrangements finds that many interventions involving **changes to who provides care and workforce management** assess outcomes such as patient health, quality of care, access, provider outcomes and resource use, although economic evaluation remains limited (*Jessup et al., 2020*). Importantly, a large multi-country study demonstrates that physical infrastructure and equipment are **poorly correlated** with adherence to evidence-based clinical care, facilities with similar infrastructure can deliver very different quality of care (*Leslie et al., 2017*). This emphasizes that workforce performance and processes, not just inputs, drive quality.

### 2.3.8 Patient and Caregiver Perspectives

Caregivers in Malawian urban slums prioritize **availability of medicines and supplies**, thorough examination, and positive attitude of health workers when choosing facilities, and are willing to pay more for these attributes (*Lungu et al., 2018*). This indicates that both technical quality (thorough assessment) and interpersonal care (attitude) linked to workforce behaviour strongly influence utilization and perceived quality.

## 2.4 Systematic / Scoping Review Synthesis

Several systematic and scoping reviews directly or indirectly address workforce and service delivery:

- **Primary Care Performance in LMICs:** Workforce and payment systems are well studied, task shifting and CHW-based systems show promise but require supportive systems (*Bitton et al., 2019*).
- **Cultural Competence Training:** Workforce focused interventions improve practitioner knowledge and attitudes, but robust evidence on service and health outcomes is limited (*Jongen et al., 2018*).
- **Alternative Delivery Arrangements:** Numerous reviews examine interventions involving workforce changes, many report positive patient outcomes, but economic and provider outcome data remain underreported (*Jessup et al., 2020*).
- **Systems Approach to Service Design:** Meta-analysis supports systems approach interventions (often including workforce and process redesign) improving both patient and service outcomes (*Komashie et al., 2021*).
- **Indigenous Primary Health care (PHC) Models:** Effective models rely on culturally grounded, skilled workforces and continuous quality improvement (*Harfield et al., 2018*).
- **Northern Australia and African Systems:** Scoping and consensus work identify fragmented systems, inadequate human resources and capacity building needs as central barriers to service quality.

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## 3 Methodology

### 3.1 Study Design

A **qualitative, literature-based study design** is adopted, using secondary data from peer-reviewed and grey literatures. The approach resembles a qualitative evidence synthesis, drawing thematically on both qualitative studies and qualitative components of mixed methods and review articles.

### 3.2 Data Sources and Identification

Papers were identified via academic databases accessing human resources for health, service delivery, and systems design literatures. For the purposes of this synthesis, only the studies and reviews provided are used. These cover a range of methodologies: scoping reviews, systematic reviews, cross-sectional studies, discrete choice experiment, participatory action research, qualitative interviews, and mixed methods evaluations.

### 3.3 Inclusion Criteria

- **Focus:** Evidence addressing at least one of:
  - Workforce numbers, distribution, or shortages.
  - Workforce training, supervision, regulation, or cultural competence.
  - Workforce planning or redesign.

- Associations between workforce factors and **healthcare service delivery outcomes** (access, utilization, quality, patient outcomes, costs, or provider outcomes).
- **Study type:** Qualitative, mixed methods, or systematic/scoping reviews with extractable qualitative or thematic insights.
- **Setting:** Any national income level and service type (primary care, hospitals, emergency/critical care, palliative care, Indigenous services, etc.).

### 3.4 Exclusion Criteria

- Studies not addressing workforce issues or not linking workforce to service delivery outcomes.
- Purely technical/infrastructure studies without workforce implications.
- Opinion pieces without empirical or systematically synthesized evidence.

### 3.5 Data Extraction

From each included paper, the following were extracted:

- Context and setting.
- Workforce elements discussed (availability, distribution, skill mix, training, supervision, culture, planning).
- Reported or inferred **service delivery outcomes** (access, utilization, quality of care, patient experience, costs, provider outcomes, equity).
- Key qualitative themes and mechanisms linking workforce to outcomes.

### 3.6 Qualitative Analysis Approach

A **thematic synthesis** approach was used:

- **Coding:** Text segments related to workforce and service outcomes were coded (e.g., “staffing adequacy,” “task shifting,” “cultural competence,” “supervision,” “capacity-building,” “organizational culture,” “patient utilization”).
- **Theme development:** Codes were grouped into analytical themes capturing mechanisms linking workforce capacity to service delivery (e.g., “availability and access,” “skill mix and task shifting,” “supportive environment,” “cultural and community alignment,” “systems and planning”).
- **Cross-study comparison:** Themes were compared across contexts and study types to identify convergent and divergent findings.
- **Interpretive synthesis:** Themes were integrated into a conceptual narrative addressing the research questions and qualitatively testing the hypotheses.

### 3.7 Trustworthiness and Limitations

- **Triangulation** across multiple systematic reviews and empirical studies strengthens credibility.
- However, many primary studies use before and after or observational designs, causality is often inferred rather than experimentally demonstrated.
- Geographic and thematic gaps exist (e.g., few rigorous evaluations of large-scale cultural competence interventions or long-term workforce reforms).
- As a secondary synthesis, this study is limited by reporting quality and conceptual frames used in original research.

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## 4 Data analysis

### 4.1 Thematic Findings

#### 4.1.1 Workforce Availability, Distribution and Access to Care

Across contexts, inadequate numbers and poor distribution of health workers reduce physical access to services, particularly for rural, Indigenous, and conflict affected populations. In LMICs, staffing shortages in rural and public sectors hinder primary care provision and necessitate task shifting and CHWs (*Bitton et al., 2019*). In conflict affected Pakistan, unavailability of health workers, especially female staff, severely hampers reproductive and child health

service coverage and quality (*Das et al., 2020*). In Africa, inadequate human resources are identified by experts as the **top challenge** facing health systems, prioritized above even budget constraints (*Oleribe et al., 2019*).

Conversely, expanded Nurse Practitioner (NP) practice authority in the US is associated with **greater NP supply and improved access** in rural and underserved areas, without compromising quality (*Yang et al., 2020*). This supports **H1** that increasing and better deploying workforce capacity improves access and can maintain or enhance quality.

#### 4.1.2 Skill Mix, Task Shifting and Expanded Roles

Task shifting, CHWs, and advanced practice roles are widely used to address workforce shortages. Evidence suggests that:

- **Advanced practice nurses** in emergency and critical care improve length of stay, time to consultation/treatment, mortality, satisfaction, and costs (*Woo et al., 2017*).
- Community-based PHC systems with integrated CHWs under supportive policies and financing promote better outcomes and equity (*Bitton et al., 2019*).
- Regional planning models show that adjusting skill mix and reallocating tasks can help align service capacity with population needs, especially where scopes of practice overlap (*Simkin et al., 2020*).

These findings support **H3**, that well supported skill mix innovations can enhance service delivery outcomes, especially when combined with appropriate training, supervision, and integration.

#### 4.1.3 Supervision, Support and Organizational Culture

Supervision and organizational support shape whether existing workforce capacity translates into high quality care. A dose response analysis in Ethiopia demonstrates that around **five supportive supervisory visits**, spaced 6-9 months apart, lead to significant improvements in service delivery indicators at health-center level (*Desta et al., 2020*).

Qualitative research in hospital wards shows that staff perceive chronic understaffing, cancelled development opportunities, and heavy reliance on agency workers as undermining morale and potentially compromising safety and compassionate care. Even when incident data or patient surveys do not immediately reveal deterioration, staff describe “working longer and harder” to meet rising complexity, suggesting risk of hidden quality deficits (*Beardsmore & Mcsherry, 2017*).

Learning health system research emphasizes that a **skilled, data literate workforce with ongoing capacity building** is essential for continuous improvement (*Enticott et al., 2020*), without such investment, digital and analytic initiatives may not translate into better service delivery.

#### 4.1.4 Cultural and Community Alignment of the Workforce

Workforce cultural competence and community alignment influence both utilization and perceived quality. Indigenous PHC models emphasize a **culturally appropriate and skilled workforce**, community participation, and self determination as key characteristics associated with better engagement and outcomes (*Harfield et al., 2018*).

Cultural competence interventions targeting health workers typically improve knowledge, skills, and attitudes, but clear evidence of impact on clinical and health outcomes is limited, partly due to methodological heterogeneity (*Jongen et al., 2018*).

Caregivers in Malawian urban slums strongly value health worker **attitude** and thorough examination, alongside availability of medicines, and are willing to pay more for these attributes (*Lungu et al., 2018*). This highlights how workforce responsiveness and interpersonal skills directly influence service uptake and perceived quality.

#### 4.1.5 Capacity Building, Training and New Service Capabilities

Participatory capacity building in Indian cancer centers shows that targeted training and organizational commitment (e.g., providing dedicated staff and infrastructure) lead to the establishment of new palliative care services in most participating centers, improved pain management, and sustained education and advocacy activities (*Rao et al., 2022*).

In northern Australia, despite expertise in training and supporting a fit for purpose workforce, systems still struggle to meet needs of dispersed populations due to fragmented governance and funding, showing that workforce capacity must be embedded within coherent system design (*Edelman et al., 2020*).

#### 4.1.6 Systems Design, Planning and Workforce Optimization

A systems approach to health services, which often includes workforce redesign, is associated with significant improvements in both patient and service outcomes, although high quality randomized controlled trial (RCT) evidence remains limited.

The CLEAR program demonstrates that clinically led, data driven workforce redesign can produce locally tailored models that better match staffing to patient demand and may improve staff retention and yield cost savings (*Corner et al., 2022*). Quantitative workforce planning models further highlight the importance of aligning workforce service capacity with population health needs and using skill-mix and task shifting to minimize gaps (*Simkin et al., 2020*).

These findings support H1 and H3, this means that workforce capacity and configuration are critical levers in systems level service improvement.

#### 4.1.7 Limits of Infrastructure-Only Approaches

A multi-country analysis of 4,300 facilities finds only weak correlation between structural inputs (infrastructure, equipment, medicines) and **actual adherence to evidence-based care**, with facilities of similar infrastructure delivering widely varying quality (*Leslie et al., 2017*). This suggests that **workforce performance and processes** (training, supervision, culture, motivation) are central determinants of clinical quality, confirming that workforce investments cannot be substituted by infrastructure alone.

## 4.2 Tabular Summary of Key Evidence

### 4.2.1 Workforce Capacity and Service Delivery Outcomes

**Table 1** Summary of key workforce related interventions and associated service outcomes.

| Workforce Aspect / Intervention                         | Reported service delivery outcome                                                             | Context/notes                         | Citations                                            |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------|
| Advanced practice nurses in emergency & critical care   | ↓ Length of stay, ↓ time to treatment, ↓ mortality, ↑ patient satisfaction, cost savings      | Systematic review of 15 studies       | ( <i>Woo et al., 2017</i> )                          |
| Expanded NP practice regulations                        | ↑ NP supply, ↑ access in rural/underserved areas, no ↓ in quality                             | US, 2000–2019                         | ( <i>Yang et al., 2020</i> )                         |
| Community-based PHC with CHWs                           | Better outcomes and equity, improved PHC performance when supported                           | LMICs, 2010–2017                      | ( <i>Bitton et al., 2019; Agarwal et al., 2019</i> ) |
| Supportive supervisory visits                           | Significant improvement in service delivery indicator, optimal ~5 visits, 6-9 months apart    | Health centers, Ethiopia              | ( <i>Desta et al., 2020</i> )                        |
| Palliative care capacity-building in cancer centers     | Establishment of services in 23/31 centers, improved pain management, ongoing training        | Indian cancer institutes              | ( <i>Rao et al., 2022</i> )                          |
| Organizational culture & staffing adequacy              | Perceived impact on safety, compassionate care, concerns with agency reliance & understaffing | Acute care wards, high-income         | ( <i>Beardsmore &amp; Mcsherry, 2017</i> )           |
| Indigenous PHC models with culturally skilled workforce | Enhanced engagement, comprehensive care, better alignment with community needs                | Indigenous services, several settings | ( <i>Harfield et al., 2018</i> )                     |

|                                               |                                                                                                       |                                                          |                                              |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------|
| Systems approach service & workforce redesign | Overall improvement in patient and service outcomes (OR ~0.4–0.5)                                     | Various services; mostly before and after designs        | (Komashie et al., 2021; Corner et al., 2022) |
| Workforce shortages in conflict & Africa      | Reduced coverage/quality, prioritized as top challenge, training & capacity building as key solutions | Pakistan conflict zones; multi-country African consensus | (Das et al., 2020; Oleribe et al., 2019)     |
| Infrastructure (inputs) vs clinical quality   | Weak correlation, high inputs do not guarantee evidence-based care                                    | 8 LMICs, 4,300 facilities                                | (Leslie et al., 2017)                        |

## 5 Discussion and Qualitative Testing of Hypotheses

### 5.1 H1 (Availability & distribution → quality/access): Supported.

Across LMICs, conflict affected areas, rural and Indigenous settings, inadequate workforce numbers and maldistribution are consistently linked to limited service coverage and perceived lower quality. Conversely, increased nurse practitioner (NP) availability under expanded practice regulations and community-based primary health care (PHC) workforces are associated with improved access and maintained quality.

### 5.2 H2 (Shortages results in compromised safety/experience): Partially supported.

Staff in under-resourced hospitals report concerns about safety, compassionate care, and rising incidents with chronic understaffing and reliance on temporary staff (Beardsmore & Mcsherry, 2017). In conflict contexts, inadequate workforce and insecurity clearly hamper quality service delivery (Das et al., 2020). However, direct quantitative links between staffing ratios and hard outcome measures are less prominent in the provided literature, indicating a need for more rigorous longitudinal studies.

### 5.3 H3 (Innovations & task shifting results in improved outcomes with support): Strongly supported.

Evidence from advanced practice nursing, CHW systems, palliative care capacity building, and systems approach redesign shows that **when workforce innovations are well-supported**, with training, supervision, integration and appropriate regulation, they improve access, efficiency, and in many cases clinical outcomes and costs. Poorly supported or isolated training (e.g., stand alone cultural competence workshops) shows more limited or unclear impact on service outcomes (Jongen et al., 2018).

### 5.4 H4 (Culture, governance, learning systems mediate impact): Supported.

Organizational culture, leadership, and governance shape whether workforce capacity translates into high-quality care. Learning health systems require sustained investment in skilled, data literate staff and supportive infrastructure to realize improvements (Enticott et al., 2020). Systems approach interventions and programs like CLEAR illustrate that governance, data use, and clinician engagement are essential to harness workforce potential.

Overall, the qualitative synthesis suggests that **workforce availability is necessary but not sufficient**, quality of service delivery also depends on skill mix, training, supervision, culture, and integration into coherent, learning oriented systems. Infrastructure and technology amplify, but do not replace, an adequately supported workforce.

## 6 Conclusion

The qualitative evidence gathered demonstrates a clear relationship between healthcare workforce capacity and service delivery outcomes. Insufficient numbers and poor distribution of health workers limit access and strain remaining staff, with perceived risks to safety and compassionate care in many settings. At the same time, strategic workforce innovations, expanded advanced practice roles, CHWs, participatory capacity building, and systems-based workforce redesign, have repeatedly improved access, efficiency, patient outcomes, and sometimes costs when implemented with robust training, supervision, governance, and data systems.

Workforce capacity emerges as a central determinant of service quality, though its effects are heavily mediated by organizational culture, regulatory environment, and broader system design.

## *Recommendations*

### 1. **Invest in Workforce Numbers and Distribution**

- Prioritize recruitment and retention in underserved and rural areas using incentives, career pathways, and supportive working conditions.
- Use regional workforce planning models to align service capacity with population needs and identify gaps.

### 2. **Support Skill Mix and Scope of Practice Reforms**

- Expand and appropriately regulate advanced practice roles (e.g., NPs, advanced practice nurses) where evidence shows improved outcomes and safety.
- Design and support CHW program with clear roles, adequate training, supervision, and compensation.

### 3. **Strengthen Supervision, Training and Capacity-Building**

- Institutionalize **supportive supervision** with evidence informed frequency and content (e.g., regular visits with feedback).
- Embed continuous professional development and capacity building programs, particularly in emerging areas such as palliative care and data literacy.

### 4. **Foster Positive Organizational Culture and Staff Well-Being**

- Reduce chronic reliance on temporary staff and ensure predictable staffing levels.
- Honour commitments to professional development and involve staff in service redesign to enhance engagement and retention.

### 5. **Integrate Workforce into Systems and Learning Approaches**

- Implement systems-approach methodologies for service design and improvement, ensuring workforce considerations are central.
- Build learning health systems where routine data are used by skilled staff to iteratively improve care.

### 6. **Expand Research on Workforce Quality Pathways**

- Conduct rigorous, mixed-methods evaluations of workforce interventions, including long-term outcomes, provider well-being and economic impacts.
- Address gaps in evidence on cultural competence, large-scale regulatory changes, and workforce impacts in fragile and conflict-affected settings.

These recommendations emphasize that improving healthcare service quality requires **deliberate, sustained investment in the health workforce**, combined with supportive systems, governance, and culture.

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## **Compliance with ethical standards**

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

The authors declare that there is no conflict of interest regarding the publication of this article. The research was conducted without any financial, commercial, or personal relationships that could be perceived as influencing the study outcomes.

### *Statement of Ethical Approval*

Ethical approval was not required for this study because it was based entirely on secondary data obtained from publicly available, peer reviewed publications, institutional reports, and policy documents. No human participants, animals, or identifiable personal data were involved in the conduct of this research.

### *Statement of Consent*

Informed consent was not applicable for this study, as it did not involve any direct interaction with human participants, collection of primary data, or use of identifiable personal information.

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