Universal health coverage in the World Health Organization South-East Asia Region: how can we make it “business unusual”?
WHO South-East Asia Journal of Public Health

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Universal health coverage in the World Health Organization South-East Asia Region: how can we make it “business unusual”?

This issue of the WHO South-East Asia Journal of Public Health coincides with World Health Day, which this year focuses on universal health coverage (UHC). UHC means all people get the health care they need, without suffering financial hardship. Member States of the World Health Organization (WHO) South-East Asia Region are at very different stages along the path towards UHC, but no country is starting from zero. Even so, the challenge is formidable, and there is growing recognition that “business as usual” is not an option.

An increasing unity of purpose for universal health coverage

There is currently a “grand convergence” of global attention to accelerate progress towards UHC. Within the Sustainable Development Goal (SDG) for health, there is a strong focus on UHC, with a specific target (3.8) to “Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all”. The wide range of development actors – countries, international agencies and civil society organizations – that met in December 2017 at the UHC 2030 Forum in Japan re-emphasized the need for more collective and more urgent action. The resulting Tokyo Declaration on Universal Health Coverage underscored that UHC is not only important in its own right but also central to achieving health for all, health security, and the SDG for health. By definition, UHC is about equity and “leaving no one behind”. For WHO, it is one of three strategic priorities in its new Global Programme of Work, where there is an ambitious global target for a billion more people with UHC by 2023, the mid-point to 2030.

Ambitious targets

Available data suggest that to achieve this global target, much of the additional services coverage needs to come from the WHO South-East Asia Region, given its large population and current health service coverage: at least 300 million of the “billion more” people are in this region. In parallel, much of the global progress in reducing financial hardship because of health spending also depends on progress in this region. The most recent WHO South-East Asia Regional Office estimate, based on national household income and expenditure surveys, is that at least 56 million people in the region are impoverished as a result of health-care spending.

Regional political commitment, with progress on measurement

UHC is not a new regional priority. A regional UHC strategy was adopted in 2012, and since 2014 UHC has been a regional priority area, or “flagship”. Health services cannot be delivered without health workers and medicines, and in the region these have been judged to be particularly big obstacles to progress on UHC. The regional UHC flagship therefore has a special focus on strengthening human resources for health and improving access to quality medicines.

In 2014, WHO South-East Asia Member States committed to a Decade for Strengthening Human Resources for Health from 2015 to 2024, as they recognized that sustained support was needed to achieve changes in the health workforce. UHC is also now reflected in national health policies and strategies across the region. There is also agreement that regular tracking of progress is needed to maintain the momentum. Last year, the WHO South-East Asia Regional Committee decided to review progress on UHC, along with SDG 3, every year until 2030. Progress on the Decade for Strengthening Human Resources for Health is reviewed every 2 years: the first review took place in 2016, and there will be a new report later in 2018. All this suggests political commitment to UHC exists, with some definite priorities.

Tools for monitoring UHC have also been developed, and are being used. A preliminary assessment of the extent to which people are receiving care according to need in this region, using a new essential health services coverage index developed by WHO, was published in 2016 and will be updated annually. Analysis of the level of financial protection is available from a growing number of countries in the region. Altogether, the questions being asked today are less to do with “whether UHC”, but more how to make progress towards it, and – with the SDG target 3.8 for UHC – how to do it more quickly.
Can the region make faster progress on universal health coverage?

International experience shows that progress will be gradual, and will require hard decisions on priorities. Experience also shows that a country does not have to be rich: progress can be made from any starting point. In this region, Thailand has gradually moved towards UHC over the last three decades, starting with the launch of free medical care for the poor in 1975, when the gross domestic product (GDP) per capita was only US$ 390. In 2002, only a few years after the 1997 Asian financial crisis, full population coverage was implemented, when the GDP per capita was still relatively low at US$ 1900.10 Given that all countries face changing health needs resulting from epidemiological and demographic transitions, there are arguments that countries cannot afford to not take a more holistic approach, as health interventions all use the same limited resources, and UHC provides a platform to do this more efficiently.

It is frequently said that there will be no real and sustained progress on UHC without progress on care for noncommunicable diseases. What is increasingly clear is that today’s health systems need to adapt the way health services are staffed, organized and paid for – sometimes significantly. This is becoming more pressing with the growing numbers of people aged over 65 years, who more commonly have chronic and often multiple health conditions at the same time. Service delivery models originally designed for acute and chronic and often multiple heath conditions at the same time. Of people aged over 65 years, who more commonly have chronic and often multiple health conditions at the same time. Service delivery models originally designed for acute and time-limited health conditions are no longer sufficiently fit for purpose.

Health services in the region are already beginning to change. There is a growing focus on front-line services, recognizing that many cost-effective health interventions can be safely delivered at this level of care, and they are generally closer to vulnerable populations. The private sector is a major source of ambulatory health care – up to 70% of all consultations in some countries in this region. There is a need to explore new approaches to harness the potential of this large, diverse and growing sector, in ways that benefit public health and advance UHC.8 The history of low utilization and frequent bypassing of public front-line health services also raises many challenges, including how to revitalize these services such that they are more trusted, used by more people, and more responsive to new health needs and expectations.11

The central role of health workers in delivering progress towards universal health coverage

What do changing health service needs mean for ensuring the health workforce is fit for purpose? There are several key questions. How many health workers are needed, and with what skill-mix? What type of education do they need? What policies will improve their distribution and retention? Can we afford to pay for these changes? Can we afford not to? Whose support do we need to implement these policies? How do we manage change? What do we need to do first, second and third? Guidance on effective workforce strategies is accumulating.12 Regional priorities for strengthening the health workforce are shown in Box 1.

Box 1. Strengthening human resources for health: regional priorities

Transformative education
Today’s health workers have to adapt throughout their careers far more than earlier generations. They have to continuously update what they know. They have to change the ways they think and how they work. There is growing evidence for the need to educate health workers to work in multidisciplinary teams, and to move away from the “tribalism” of the professions. This means changing the way health workers are trained.

Rural retention
It is often difficult to keep staff in remote areas. This results in inequities in access to quality care.

Better data on human resources for health
Better data are needed so that the results of strategies can be monitored and adjusted. Many countries in the region have now made this a priority.

Human resources for health governance
Strategies to strengthen the health workforce require engagement across many sectors and stakeholders. There is a huge need for coordinated action within the health sector and with others.

Regional data show that increased numbers of health workers have been trained in recent years. However, health workers remain in short supply in many Member States of the region when compared with the WHO SDG index threshold of 4.45 physicians, nurses and midwives per 1000 population.13 There remain inefficient imbalances in skill-mix – for example, several countries still report having as many doctors as nurses. Doctors and nurses remain concentrated in urban areas in many countries, and almost all health workers are expected to carry out different tasks from those they were originally trained to do. There remain limited data and evidence from within the region on the effectiveness of human resources for health strategies. The good news is that a set of indicators on human resources for health was agreed globally in 2016, and tools to improve data have been developed.13,14 The second WHO South-East Asia review of progress on the Decade for Strengthening Human Resources for Health, to be reported later this year, uses a subset of these indicators.

Of course, a sufficient and well-performing health workforce alone is not enough to ensure all people get the care they need. They need the tools of their trade: guidelines, diagnostics, medicines, information and clean, safe workplaces. National health workforce strategies have to be linked to changing service delivery models, and backed up by effective financing strategies.

The other side of the universal health coverage coin: financial protection

Access to needed health care is one side of the UHC coin. The other side of the coin is protection from financial hardship
due to health-care costs. The main driver of financial hardship is out-of-pocket payment for care, and the main component of out-of-pocket payment is medicines.

Current evidence suggests that out-of-pocket payment below 20% of total health expenditure is a good indication of reduced risk of impoverishment from health spending.\textsuperscript{15} There has been a small but welcome downward trend in the region in the last 10 years, but out-of-pocket payments are still more than 30% in seven Member States. Inadequate public investment is largely responsible. This is unfortunate, given that evidence strongly suggests that increased public spending is a precondition for improved financial protection. Across the region, increasing health budgets is both necessary and possible, even if it is challenging. Since the year 2000, five countries have managed to do so – Bhutan, Indonesia, Maldives, Myanmar and Thailand. Though some – such as Myanmar – had a low starting point, they have made significant progress.

There are also opportunities to make better use of existing funds. The \textit{World health report} 2010 identified 10 leading causes of inefficiency, of which the top three were related to medicines management.\textsuperscript{16} This reinforces the focus on medicines within the region. Access to medicines will be the theme of an upcoming issue of the \textit{WHO South-East Asia Journal of Public Health}.

The regional agenda for universal health coverage is evolving

There are some old and sound priorities and some new ones: all will benefit from better data and evidence

There are three groups of priorities. First, we should continue to regularly track progress towards UHC as part of the SDGs, and understand who is benefiting and who is not. The increased attention by countries in the region to better monitoring of equity trends is welcome. Second, we should maintain the regional UHC focus on strengthening the health workforce and access to medicines. These are complex problems that are central to improved access to needed health care, and require both political and technical interventions. Third, we should encourage experimentation with new ways to organize, manage and pay for the increasing range of front-line services required to address today’s health needs. Policy-makers and managers can look for opportunities to make services more responsive, equitable and efficient. They can look for opportunities to make changes in health-financing strategies to support changes in service delivery, such as during the expansion of health insurance schemes. This may include the gradual introduction of more strategic purchasing of health services, and more strategic procurement of medicines. Other innovations are also needed, including in the development of new medical products and technologies for low- and middle-income countries, an area in which the region is already active.

For real progress to be made in all these priority areas, strong political commitment from heads of state is critical. The breadth of planning, funding and implementation of UHC needs a coordinated, cross-sectoral approach by governments, with finance ministries and national planning authorities working in partnership with ministries of health.

There are repeated demands from countries to learn from each other on how they have managed to make progress on UHC. There is a major “knowledge generation agenda”. As reported in this issue of the journal, it is encouraging to see research partnerships, such as the Asia Pacific Observatory on Health Systems and Policies\textsuperscript{17} and the Alliance for Health Policy and Systems Research,\textsuperscript{18} explicitly stimulate practical research on the different dimensions of UHC. More is needed.

Last, many partners can help to create demand for and maintain momentum on UHC. Evidence is needed for well-informed policy and advocacy and to promote accountability. This is hardly new but it is essential. There is much for the research community in the WHO South-East Asia Region to do in supporting all the different actors involved in driving forward the “business unusual” approach to achieving UHC in the region.

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References


A framework for comparative analysis of health systems: experiences from the Asia Pacific Observatory on Health Systems and Policies

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Abstract

Drawing on published work from the Asia Pacific Observatory on Health Systems and Policies, this paper presents a framework for undertaking comparative studies on the health systems of countries. Organized under seven types of research approaches, such as national case-studies using a common format, this framework is illustrated using studies of low- and middle-income countries published by the Asia Pacific Observatory. Such studies are important contributions, since much of the health systems research literature comes from high-income countries. No one research approach, however, can adequately analyse a health system, let alone produce a nuanced comparison of different countries. Multiple comparative studies offer a better understanding, as a health system is a complex entity to describe and analyse. Appreciation of context and culture is crucial: what works in one country may not do so in another. Further, a single research method, such as performance indicators, or a study of a particular health system function or component, produces only a partial picture. Applying a comparative framework of several study approaches helps to inform and explain progress against health system targets, to identify differences among countries, and to assess policies and programmes. Multi-method comparative research produces policy-relevant learning that can assist countries to achieve Sustainable Development Goal 3: ensure healthy lives and promoting well-being for all at all ages by 2030.

Keywords: Asia Pacific, comparative analysis, health policy analysis, health system reviews, health systems

Background

The United Nations has urged countries to set national targets for strengthening their health systems, in order to achieve Sustainable Development Goal 3 (SDG 3): ensure healthy lives and promote well-being for all at all ages by 2030.¹ Many low- and middle-income countries in the World Health Organization (WHO) South-East Asia and Western Pacific Regions will struggle to reach the SDG 3 targets by 2030, including achieving universal health coverage and responding to the increasing burden of noncommunicable diseases. Achieving universal health coverage for their populations, for example, requires financial risk protection, equitable access to health care, and effective services and medicines.² Policy-makers therefore need knowledge on what works, why, and in what settings, in order to consider what might be the best strategy for reaching their agreed SDG health targets. While the countries and areas of these two WHO regions are diverse in population, culture, size and socioeconomic status, they have in common many health system challenges.

Low- and middle-income countries encounter an information gap, since much of the research on health systems comes from high-income countries.³ A complex entity such as a health system is not easy to review. A study may cover how a country plans, manages and finances activities to improve the health of its population; identify the many different actors and key organizations; and analyse functions such as regulation, financing and delivery of services.⁴ Further, in comparing health system structures and interventions across multiple countries, a research approach must consider political and societal concerns and technical and clinical factors, as well as methodological issues.⁵,⁶

This paper proposes a framework for the analysis of health systems of multiple countries, using examples from some of the studies published by the Asia Pacific Observatory on Health Systems and Policies (hereafter referred to as the Asia Pacific Observatory). Established in 2011 in order to provide a regional resource for information and evidence on health system reforms,⁷ its partners include the WHO Regional Offices for South-East Asia and for the Western Pacific, international agencies (Asian Development Bank, World Bank),
and currently eight governments (Australia, Fiji, Hong Kong Special Administrative Region, Republic of Korea, Republic of the Philippines, Singapore, Sri Lanka and Thailand). The Asia Pacific Observatory covers the 38 countries and areas of the WHO South-East Asia and WHO Western Pacific Regions. The work is undertaken by a secretariat (currently based in the WHO Regional Office for South-East Asia) and three research centres, each with an associated network of researchers and research institutes. These observatory research centres are based at the Melbourne University Nossal Institute in Australia, Duke Kunshan University in China, and a joint programme between the Ministry of Public Health in Thailand, and the University of Tokyo in Japan. Examples in this paper are drawn from three types of reports published by the Asia Pacific Observatory:

- health system reviews, published as “Health Systems in Transition” profiles, which offer a comprehensive description and analysis of the health system of a country, using a standardized template, with reports published so far on 16 countries (as at 1 December 2017) and several others under way;
- comparative country studies, which compare two or more countries with regard to a regional health system issue, drawing on databases, literature reviews and interviews with in-country informants; published studies include topics such as strategic purchasing, hospital payment methods, the governance of public hospitals, and health system responses to noncommunicable diseases;
- policy briefs, which are short reports that synthesize evidence from the international literature and from country experiences in relation to regional policy challenges; topics so far include mortality statistics, universal health coverage for informal workers, out-of-pocket payments, purchasing from the private sector, health technology assessment, quality health care and dual professional practice.

Comparative analysis: methodological issues

Comparison is a universal research method: for example, A compared to B; before versus after; control versus experimental group. A comparative approach can test assumptions about how well a system, a policy or a procedure works in different contexts: is my way the right way? Comparing different countries can suggest new ideas and new ways of doing things: might that work in my country? Comparison increases explanatory power for inductive reasoning: would a successful policy in one country work in another? It also increases the power of a deductive explanation: are there exceptions to a generalization?

While there are good reasons to undertake comparative studies, it is wise to draw cautious conclusions. What works well in one country may not work so well in another, and any policy transplant will almost certainly require modifications. Understanding the context and culture of a country is crucial when reviewing a health system, interpreting the statistics or proposing health system reforms. This understanding is particularly important in the diverse region covered by the Asia Pacific Observatory.

Use of performance indicators is a common method for comparing health systems. The countries covered by the Asia Pacific Observatory have limited comparable statistics, however, compared to the “health for all” database of the WHO European Region and Organisation for Economic Co-operation and Development (OECD) databases. For example, the national health accounts framework used by high-income countries, is not necessarily feasible for some other countries. While it is important to know how much was spent and on what, it is also important to know whether the money was spent well in delivering quality services, which is a much harder question to answer. Sources of data available to a varying extent to support health system comparisons in the region include WHO country reports and national health management information systems, while internationally comparable sources include world health statistics, world development indicators and demographic and health surveys.

A health system profile may be based on a cross-sectional snapshot or a time-series measure, and clearly both approaches are useful. A composite “single number” assessment and ranking of national health systems, however, as produced in the seminal World health report 2000, has not been repeated. Nor is a classical “gold standard” approach to research on health systems much used, since health systems or their components cannot easily be assigned to random double-blind trials; therefore, comparative research does offer a way to control for some variables.

Criteria for evaluating a health system are also explored in some analytic studies, such as equity, effectiveness and efficiency. Such abstract concepts are contested, however, and require multiple indicators. Equity may be measured, for example, by factors such as income inequality, access to health care and health outcomes. Classifications of health systems within a typology is another common approach. For example, a study of 30 OECD health-care systems classified these according to three core dimensions (regulation, financing and service provision), and three types of actors (state, societal and private actors). This classification produced five system types: national health service, national health insurance, social health insurance, etatist social health insurance and private health systems. The diverse health systems of the countries covered by the Asia Pacific Observatory, however, mostly use mixed methods of funding and service delivery, so not all fit neatly within a specific typology.

Framework of research approaches for comparing health systems

A framework offers a way to consider different approaches for studying and comparing health systems across two or more countries. This paper proposes a framework based on seven types of study categories that use a variety of methods: for example, standardized case-studies, descriptive analysis, statistical analysis and policy analysis (see Table 1). Most of these study categories use multiple research methods, which are both quantitative and qualitative. The approaches in Table 1 are drawn from types of study categories and associated methods that are common in cross-national comparative studies. While this paper focuses on comparative research, the framework could also be used to organize a systematic
Table 1. Framework of research approaches for comparing health systems

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<td>Differences/similarities, distinctive features, benchmarking, rankings</td>
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<td>Population groups</td>
<td>People with chronic conditions or disabilities and older people</td>
<td>Statistics (define, measure, compare), performance indicators, literature review, surveys, key informants and focus groups</td>
<td>Incidence, prevalence, health status, service use, health outcomes</td>
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<tr>
<td>Health system functions and components</td>
<td>Financing, e.g. provider payments; service delivery, e.g. quality of care</td>
<td>Description, statistics, causative relationships, key informants</td>
<td>Inputs and processes, and criteria such as efficiency access</td>
</tr>
<tr>
<td>Institutions</td>
<td>Public hospital governance, health technology assessment agencies</td>
<td>Case-studies using multiple methods</td>
<td>Organizational structures, different responses to similar issues</td>
</tr>
<tr>
<td>Health policy</td>
<td>Dual professional practice</td>
<td>Literature review, policy analysis, policy dialogue workshops</td>
<td>Problem definition, values, policy development, implementation, outcomes</td>
</tr>
<tr>
<td>Programmes</td>
<td>Primary health-care responses to noncommunicable diseases</td>
<td>Description and statistics, systematic literature review, key informants</td>
<td>Structure, distribution, procedures, outcomes</td>
</tr>
<tr>
<td>Health system theory</td>
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<td>Hypothesis testing</td>
<td>Health service access, equity and effectiveness outcomes</td>
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analysis of a single country, ranging from a comprehensive health system overview down to more focused studies of a health system function, such as financing arrangements, or a component, such as a ministry of health.

National health systems: “Health Systems in Transition” reviews

Many low- and middle-income countries lack an overview report on their health system. The “Health Systems in Transition” reviews published by the Asia Pacific Observatory are often the first occasion when the components and connections of a country’s health system are comprehensively mapped and analysed. The purpose of these profiles is to unpack the elements of a health system in a way that makes clear how these resources, structures and arrangements are put together to deliver health services to the population. Case-studies with a standardized format are readily understood and also facilitate comparative research. The Commonwealth Fund based in New York, for example, regularly compares the health system in the United States of America to that of other OECD countries. Cross-national case-studies often focus on countries with somewhat similar systems and cultures, such as high-income countries in east Asia, or less frequently may compare two or more very different health systems in order to highlight distinctive aspects. Another approach compares the health systems of a particular region; for example, the Asia Pacific Observatory has begun to review the smaller Pacific Island nations (about 12 countries) such as Fiji, Tonga, Solomon Islands and Papua New Guinea (under way).

The case-study format used by the Asia Pacific Observatory was adapted from a template developed by the European Observatory on Health Systems and Policies. The accompanying guidance defines and explains the concepts and sets out the functions and components of a health system under broad headings: country context (political and economic, demographic and epidemiological, and history of health system development), organization and governance, financing, physical and human resources, delivery of services, principal health reforms, and overall health system assessment. Statistical tables include cross-sectional and time-series data, and also comparative data, such as health expenditure as a percentage of gross domestic product for selected countries. Each case-study follows the same format in describing a health system’s structure and functions. A case-study provides the “building blocks” for later in-depth comparative analyses of specific aspects, such as immunization programmes or hospital licensing. These reviews are written by in-country experts, supported by observatory researchers as co-authors and/or editors.

The observatory attaches a high priority to building the capacity of experts within a country to undertake an overview and analysis of their own health-care system. The method primarily used in producing a case-study is secondary analysis (reviews of published literature, website material, internal ministry of health reports, internal reports from international agencies such as WHO and the World Bank, and statistics and performance indicators from internal and international databases). In addition, the review draws on a key informant method whereby the in-country authors canvass the views of other experts, principally researchers and policy-makers within the country.

The health systems of countries often possess distinctive features of interest to the region and beyond. For example, after years of devastation and isolation, Cambodia is in the process of reforming its health system with the Kingdom of Cambodia health system review, written in parallel with The Third Health Strategic Plan 2016–2020. The review drew upon in-country input by a team of authors, including from the Ministry of Health, the National Institute of Public Health and development partners. Indonesia’s decentralization policies are of regional interest, as are its efforts to deliver health services across its archipelago of islands. As a country of global significance with major health reforms under way, the People’s Republic of China health system review is an
important publication.\textsuperscript{26} Thailand is also of particular interest as a regional leader in achieving universal health coverage.\textsuperscript{26}

**Population groups: people with chronic conditions or disabilities and older people**

Changing population health needs call for health systems to redirect investments and services. Two major transitions under way, for example, are an increase in noncommunicable diseases,\textsuperscript{27} and growing numbers of people aged 60 years and over.\textsuperscript{28} According to the Global Burden of Disease Study, low- and middle-income countries over the coming decade can expect a rapid rise in noncommunicable diseases, partly associated with population ageing.\textsuperscript{29} Several methods were used to produce a study of health system responses to noncommunicable diseases by middle-income and rapidly ageing countries in Asia, particularly Sri Lanka and Thailand.\textsuperscript{30} The study, a collaboration between Australian National University researchers and partners in Sri Lanka and Thailand, drew on in-country and international databases, a review of published literature and demographic and epidemiological data. The in-country authors also conducted about 20 key informant interviews with policy-makers and practitioners in each of the countries. Health services, and especially hospitals, in these countries historically were designed to respond to infectious disease and to acute and episodic care for younger patients. Beliefs and attitudes of health professionals and patients in the two countries related to ageing and illness differed somewhat. The management of people with chronic conditions and the often complex needs of older patients call for reorientation of service delivery and development of better integrated services for conditions such as diabetes and stroke. Thailand, in particular, is in the process of strengthening primary care as the level of health care best placed to respond to elderly patients, to intervene early in chronic conditions, and to provide ongoing management.

**Health system functions and components: financing and service delivery**

The observatory template for a health system review defines and describes the different functions and components or building blocks of a health system, such as governance, financing, staffing and service delivery arrangements.\textsuperscript{31} However, a comprehensive analysis of one of these aspects, such as financing, requires a more in-depth and nuanced study. Financing is of course a major challenge for all health systems, but particularly for low- and middle-income countries. A perennial issue is how best to fund/pay hospitals, in order to facilitate cost-effective health care. One study has shown that a number of middle-income countries covered by the Asia Pacific Observatory are considering or introducing case-based payment methods.\textsuperscript{31} This study, led by the Melbourne University Nossal Institute, engaged international experts to write review chapters on different countries and different aspects of case-based payment systems.\textsuperscript{31} The conclusions were that many countries are in transition to new provider-payment methods. A previous overreliance on fee-for-service is giving way, gradually, to capitation and case-based payment methods, including diagnosis-related groups. Implementation capacity is a limiting factor, however, as new methods must be phased in and supported by increased management and monitoring.

In order to redress limited empirical work in the region, a study aimed to critically examine purchasing arrangements in China, Indonesia and the Philippines. The study examined relationships between purchasers and providers, based on an agreed conceptual framework, which identified factors that enable or hinder effective purchasing, and produced recommendations to promote universal health coverage.\textsuperscript{32} The study used similar methods in each of the three countries, including an extensive review of documents, supplemented by informant interviews. The China case-study, undertaken by researchers at Peking University and Shandong University, examined a new mandatory insurance scheme for the entire Chinese rural population, using information collected in Qinghai and Henan provinces (six towns in each province). The methods included a review of policy documents of the central, provincial and local governments and informant interviews in each province. The Indonesia case-study on the single pool mandatory health insurance scheme for low-income groups, government and company employees, by researchers from Gadjah Mada University, examined purchaser relationships between the national social security scheme and two district health offices within each of three provinces. The methods included a document review and interviews and focus group discussions with the actors involved (government officers, provider groups, health professionals and community representatives). The Philippines case-study, by researchers from the Philippine Institute for Development Studies, examined the purchasing arrangements undertaken by the single pool mandatory national health insurance scheme (PhilHealth) that currently covers nearly 75% of the population. The study analysed the relationships between the purchaser (PhilHealth) and providers, the purchaser and citizen members, and the purchaser and government.

While much more attention is being paid to the quality of health care in high-income countries,\textsuperscript{33} less is known about low- and middle-income countries, despite the quality of health care being widely regarded as inadequate.\textsuperscript{34} Researchers from the Melbourne University Nossal Institute undertook a meta-review of systematic literature reviews on the quality of ambulatory care, and a literature review of selected strategies relevant to low- and middle-income countries. The study identified potential options for improving the quality of ambulatory care for patients in countries covered by the Asia Pacific Observatory, using approaches to improve delivery, such as contracting, social franchising and pay-for-performance.\textsuperscript{35}

**Institutions: public hospital governance, health technology assessment agencies**

The study of key institutions is a common theme in comparative research. Why does one type of organization work well in one country but flounder in another? The vexed question of how best to govern public hospitals is an important issue in countries where state agencies have limited powers. A comparative study of public hospital governance in seven countries (India, Indonesia, New Zealand, Philippines, Sri Lanka, Thailand, Viet Nam), edited by staff of the observatory and the Nossal Institute, engaged national authors from each country. Each country case-study used similar methods: a
common conceptual framework, a review of published papers and government documents, and semi-structured interviews with policy-makers and with managers of large public hospitals. A contextual analysis of the political and administrative history of each country was essential to understanding public hospital governance structures. The study found that many large hospitals were being given greater autonomy in the management of their finances and services. Fewer reforms were evident, however, in internal hospital management and clinical governance arrangements; for example, clinicians continue to predominate as hospital leaders. A comparison of health technology assessment (HTA) agencies in six countries (China, Indonesia, Republic of Korea, Malaysia, Thailand and Viet Nam) was conducted by researchers based in Thailand, with contributions from HTA practitioners in the six countries. The HTA experts discussed the political and administrative context of HTA institutions in each of their countries and reflected on five essential components identified in the literature as relevant to the establishment of HTA agencies. The study found differences between the countries in power, scope and scale, structure and procedures. HTA agencies in their early phase conducted ad hoc assessments with few links to policy-making, while countries with more mature HTA agencies used assessments more routinely.

**Health policy: dual professional practice**

Health policy analysis is a well-established field of research whose explanatory power is strengthened by comparisons across countries. Policy analysis requires a good understanding of the political context of each country, its public administration history and practice, and its policy-making processes. The observatory strategy for understanding a policy process is to partner with policy-makers and researchers within a country who engage directly in policy-making. Further, the use of policy dialogue workshops has proved a useful method across all study categories. In addition, policies developed in high-income countries need careful assessment of their relevance to other countries. For example, dual practice by doctors working in both government and private sectors, while common in high-income countries, is a controversial practice in low- and middle-income countries. Researchers at the Nossal Institute undertook a literature review on the extent of dual practice in 12 nations of south and east Asia. This overview, including case-studies on Thailand and Indonesia, identified three broad policy options (take no action, ban or limit dual practice, or allow dual practice). The study concluded that it was better to regulate than prohibit dual practice, in order to retain doctors in the public sector. More a literature and scoping review of existing policies than an analysis of the why and how of policy-making, the published policy brief notes that the formulation and implementation of any regulatory intervention within a country would require an in-depth study.

**Programmes: primary health-care responses to noncommunicable diseases**

Programme evaluation is also a large research field that is strengthened by comparative country analysis. Primary health-care programmes must respond to context and culture in preventing or reducing risk factors associated with noncommunicable diseases. Examples of risk-factor assessment studies include reducing exposure to household smoke among children in China and controlling high blood pressure among adults in rural Bangladesh. The WHO Package of essential noncommunicable disease (PEN) interventions for primary health care in low-resource settings urges countries to adapt the tools and strategies in this package to their particular circumstances. Studies that apply or adapt PEN have been done or are under way in many countries, including Bhutan and the Democratic People’s Republic of Korea. The observatory Duke Kunshan group has a study under way of PEN programmes in China, Nepal and Viet Nam, which is assessing the capacity of these primary health-care systems to prevent and control cardiovascular diseases.

Another study is assessing how best to mobilize community health workers (an important group of health workers in low- and middle-income countries) in combating noncommunicable diseases in Bangladesh, China, Nepal and Viet Nam. Both studies involve document reviews and survey questionnaires. They also engage with informants within each country, in order to obtain a contextual understanding and to provide solid evidence for policy development in the region.

Responding to noncommunicable diseases calls for baseline and trend measurements. However, some countries in the region still lack reliable mortality and cause-of-death data. A study by Queensland University researchers and the Health Metrics Network examined vital statistics systems in the 11 countries of the WHO South-East Asia Region and 27 countries and areas of the WHO Western Pacific Region. The method involved both a rapid assessment and a comprehensive assessment framework and the production of a composite indicator called a Vital Statistics Performance Index. This study identified three groups of countries with problematic civil registration and vital statistics collections and set out strategic pathways for achieving solutions. For example, one recommendation for group 2 (countries that record most deaths but many without a medically certified cause) was to introduce a verbal autopsy method into civil registration systems where deaths were not medically certified.

**Health system theory: out-of-pocket payments**

Comparative country studies offer a method for testing an explanatory theory. An example is the theory that a policy of user payment results in more responsible service use by patients and also collects needed revenue for health facilities. Many countries covered by the Asia Pacific Observatory rely heavily on out-of-pocket payments by patients and their families for goods and services, amounting to over half of the total health expenditure in some countries. An observatory study involving researchers from several countries undertook a literature review and short illustrative case-studies of countries with different contexts and varying levels of out-of-pocket payments (Cambodia, China, Fiji, Malaysia, Sri Lanka). The study concluded that out-of-pocket fees charged by health facilities in the region rarely raise substantial amounts of revenue and, crucially, have the adverse impact of preventing poor people from using health services.

There are now more opportunities for testing ideas about how to improve health system structures, arrangements and outcomes. This is made possible by the increase in published
research from low- and middle-income countries. The Cochrane Effective Practice and Organisation of Care group recently published four overviews of health system components that are relevant to low-income countries. These meta-reviews summarized 124 systematic reviews on the effects on health systems of four functions: governance, financing, delivery arrangements and implementation strategies. These systematic reviews of primary research covered varied interventions, with most research studies being on single rather multiple countries. The comparative aspect therefore emerges from an accumulation of studies. In the majority of studies, however, the evidence of impact was low or very low. While the systematic reviews uncovered large gaps in what is known, they nevertheless identified a larger volume of studies than expected, some of which can inform decisions about health systems in low-income countries. The meta-review on arrangements for service delivery found 51 systematic reviews across seven areas of delivery; for example, the question of ‘who provides care’ identified five types of interventions, such as recruiting and retaining health workers in specific areas or types of work.

Conclusion

No one approach can adequately explain and analyse the structures and workings of a complex health system, particularly since context is crucial to such explanations. Comparative studies of the health systems of low- and middle-income countries, such as those undertaken by the Asia Pacific Observatory, aim to increase health systems knowledge in the region, counter the overreliance upon learning from high-income countries, and avoid the danger of making the assumption that one size fits all. As evident from the observatory studies summarized in this paper, most of these studies, for reasons of resources and research capacity, rely more on a range of secondary research methods supplemented by the knowledge and experience of expert informants within a country.

As a key goal of the observatory is to inform policy-making, the strategy of engaging with in-country experts is crucial, as is the comparative analysis strategy of producing evidence that can be generalized across countries. The translation gaps between evidence, policy and practice are well known. However, an increasing body of knowledge now offers guidance on how evidence from research can be translated into formats and procedures to inform policy formulation and also to inform the implementation of these policies in practice.

This proposed framework for comparative analysis performs two functions: it creates a list of study categories that range from a health system overview down to a more in-depth study of a particular component. Most of these study approaches are associated with multiple methods that span case-studies, statistical analysis, descriptive analysis and limited hypothesis testing. This framework gives form and structure to the analysis of health systems in a way that offers a logical process of investigation and policy-making. For example, reviews of a health system or several health systems set the scene for building a series of in-depth studies, as done in the comparative country studies and the policy briefs published by the Asia Pacific Observatory. Within this framework, the categories of study suggest the tools needed to carry out consistent and comparative health systems analysis. The comparative nature of the analysis then provides the foundation for assessing national health systems in a way that is realistic and provides the foundation for reforms based on evidence, while accounting for the local context. The conceptual framework offers an aid to undertaking comparisons across the health systems of different countries, to enable policy-makers and researchers to test assumptions and to draw lessons on what works and why, and what does not work and why.

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References


Perspective

Pushing the boundaries of research on human resources for health: fresh approaches to understanding health worker motivation

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Abstract

A country’s health workforce plays a vital role not only in serving the health needs of the population but also in supporting economic prosperity. Moreover, a well-funded and well-supported health workforce is vital to achieving universal health coverage and Sustainable Development Goal 3 to ensure healthy lives and promote well-being for all at all ages. This perspective article highlights the potential of underutilized health policy and systems research (HPSR) approaches for developing more effective human resources for health policy. The example of health worker motivation is used to showcase four types of HPSR (exploratory, influence, explanatory and emancipatory) that move beyond describing the extent of a problem. Most of the current literature aiming to understand determinants and dynamics of motivation is descriptive in nature. While this is an important basis for all research pursuits, it often gives little information about mechanisms to improve motivation and strategies for intervention. Motivation is an essential determinant of health worker performance, particularly for those working in difficult conditions, such as those facing many health workers in low- and middle-income countries. Motivation mediates health workforce performance in multiple ways: internally governing health worker behaviour; informing decisions on becoming a health worker; workplace location and ability to perform; and influencing willingness to engage politically. The four fresh research approaches described can help policy-makers better understand why health workers behave the way they do, how interventions can improve performance, the mechanisms that lead to change, and strategies for empowering health workers to be agents of change themselves.

Keywords: health policy and systems research, human resources for health, migration, motivation, performance, supervision

Background

Human resources for health (HRH) encompass “all people engaged in actions whose primary intent is to enhance health”.¹ Human resources form the heart of health systems, whether doctors and nurses, clinic managers, sanitation workers, health information data-entry officers, or community health workers. Major reports in recent years have highlighted the vital role that the health workforce plays, not only in serving the health needs of populations but also in supporting economic prosperity, especially as a major employer of women.²–⁴ Moreover, a well-funded and well-supported health workforce is vital to achieving universal health coverage⁵ and Sustainable Development Goal 3 to ensure healthy lives and promote well-being for all at all ages.⁶

However, there are persistent HRH challenges, especially in low- and middle-income countries, that continue to frustrate progress towards universal health coverage.⁷–⁹ These challenges include a lack of stewardship; limited data and strategies to assess workforce performance; and HRH shortages, maldistribution and outward migration.¹⁰–¹² Those working in health-care roles often struggle with low pay, limited opportunities for career progression, violence, poor health system support, and, for some, lack of recognition in the health system.¹³–¹⁵ Furthermore, health systems in low- and middle-income countries are challenged to accommodate increasingly mobile populations; rapid social and technological changes; expanding private sectors; complex governance issues; increasing health system fluidity, such as across private and public sectors; multiple systems of medicine; and formal and informal health worker roles.¹⁶

Although the overall challenges are similar, a country’s unique political and social structure may make it difficult to draw lessons from research done on HRH elsewhere, especially if the research was done in a high-income setting. Thus, policy-makers need to be equipped to commission research that will directly inform their local health workforce policy-making and decision-making. Health policy and systems research (HPSR) approaches to HRH can provide the data and analytical insight...
necessary, by drawing from a multitude of disciplines (i.e. public health, sociology, psychology, anthropology, organizational sciences, public administration and management studies) and applying appropriate methodologies to answer pressing research questions.\textsuperscript{17,18} HPSR focuses on choosing a method, or mix of methods, that fits the research question asked,\textsuperscript{17,19} whether evaluating programmes to improve health worker performance and motivation, determining mechanisms to strengthen training and supervision, or assessing the factors that influence migration.

Despite the important potential contribution of HPSR approaches, there remains little guidance on how HPSR can be applied to HRH. In addition, researchers and policy-makers may not be aware of the research methods available. The purpose of this paper is to highlight some underused research approaches that could help provide this vital information for policy-makers. The examples are drawn from \textit{A health policy and systems research reader on human resources for health} (hereafter referred to as the \textit{HRH reader}),\textsuperscript{20} a compendium of examples of best-practice research for HRH. Supported by the World Health Organization’s Alliance for Health Policy and Systems Research, the \textit{HRH reader} was developed to highlight the existence of a wide range of research methods and encourage their use.\textsuperscript{20} A particular aim was to illustrate how HPSR can be applied to HRH to produce information that moves beyond describing the problem or simply assessing whether an intervention “works” or not.

This perspective article uses the example of health worker motivation to highlight how different types of HPSR can assist policy-makers in acquiring a deeper understanding of the factors influencing what motivates and demotivates health workers.

**Using health policy and systems research: the example of health worker motivation**

Motivation can be defined as the “conscious or unconscious stimulus, incentive or motives for action towards a goal resulting from psychological or social factors, the factors giving the purpose or direction to behavior”.\textsuperscript{21} Motivation influences an individual’s decision to join a profession, the effort they put into their performance in it, and their willingness to remain in it. Motivation is an essential determinant of performance, particularly for those working in difficult conditions, such as the conditions facing many health workers in low- and middle-income countries. Motivated health workers are more likely to be available, to be responsive to their patients, and to provide a better quality of care. The relationship between motivation and performance is influenced by the health workers’ organizational environment and social context. For example, a health worker who is motivated to provide high-quality patient care may face performance limitations because of resource shortages, and these resource shortages may in turn reduce health worker motivation. In fact, all inputs for improving performance — such as improving supervision, remuneration, resource availability or other supportive policies — work via the pathway of motivation. Motivation mediates health workforce performance in multiple ways, and influences, or is influenced by, where health workers work, what they do, how they are supported, and how they are governed (see Fig. 1).

Given that motivation lies at the core of health worker performance in terms of availability, responsiveness and quality of care,\textsuperscript{22} it is crucial for policy-makers, implementers and researchers alike to understand what motivates health workers to join their profession, and perform and remain in it despite difficult circumstances. Most of the current literature aiming to understand determinants and dynamics of motivation is descriptive in nature, using either qualitative interviews or self-reported responses on structured scales. While such descriptive research is an important basis for all HRH research,\textsuperscript{23,24} the results may reveal little about mechanisms to improve motivation and strategies for intervention. It is necessary to push the boundaries to understand causal pathways further, i.e. the reasons why things change, and how those mechanisms work, by using theories to guide and test these approaches. This perspective article highlights the use of underutilized research approaches — exploratory, influence, explanatory, emancipatory — showcased in the \textit{HRH reader}, for understanding health worker motivation and providing the information policy-makers need to make decisions.\textsuperscript{20}

**Exploratory research**

Exploratory research seeks to understand phenomena in order to build hypotheses, concepts and theories. For instance, exploratory research may ask what drives corrupt behaviour by health workers or about the gendered experiences of health workers in humanitarian contexts. The \textit{HRH reader} highlights some examples of exploratory research aimed at understanding what motivates health workers to join, perform and remain in their current profession.\textsuperscript{20} For example, Smith et al. used a “dictator game”, which is a standard technique in experimental economics for detecting the presence and power of altruism in decision-making, in a health setting.\textsuperscript{25} In the game, final-year nursing students in Kenya, South Africa and Thailand were asked to allocate a real financial endowment between themselves and another student, a patient or a poor person. Respondents in all three countries showed greater generosity to patients and poor individuals than to fellow students. This measurement technique allowed greater consideration of the altruistic values of the nursing students, rather than only job characteristics, for understanding determinants of their motivation.

Previous research has established that transformational leadership has a direct positive effect on health workers’ job satisfaction. An analysis by Choi et al. provided a deeper understanding of this effect.\textsuperscript{26} They found that the increased job satisfaction arising from transformative leadership for medical assistants and nurses in Malaysia was attributable to their increased empowerment. Similarly, a study by Aberese-Ako et al. exploring organizational justice showed how meeting the needs of front-line health workers as internal clients of the facilities and organizations within which they work is essential if they are to be motivated to provide quality and responsive care to patients.\textsuperscript{27} More broadly, Razee et al. explored how social context influenced the motivation of primary health workers in Papua New Guinea, expanding consideration beyond the immediate work environment to the communities within which health workers live.\textsuperscript{28} These researchers found that trust and cooperation between health workers and the community, as well as gender norms, contribute to motivating health workers to perform in difficult conditions.\textsuperscript{28} Thus, exploratory research provides an opportunity to understand associations in order to develop hypotheses. From
there, policy-makers can design and introduce interventions that can be tested using influence or impact studies.

**Influence research**

Influence research focuses on measuring the impact of one variable on another, by carrying out adequacy, plausibility and probability analyses. For example, a study may measure the extent to which an intervention or programme improved health worker motivation and performance. The *HRH reader* highlights examples of different methodologies used to measure programme effectiveness,\(^{20}\) including a study by Shen et al., which was the first to measure the impact of performance-based financing on motivation, job satisfaction and retention among hospital-based health workers.\(^ {29}\) Using an experimental design, this study concluded that performance-based financing did not improve health workers’ motivation, but did improve their job satisfaction and retention. On the other hand, Leonard et al. used clinical vignettes to measure the degree to which peer scrutiny influences the application of skills and knowledge of physicians, along with highlighting the role of intrinsic motivation in performance.\(^ {30}\) The findings from these studies reiterate the need for innovative techniques for measuring health worker motivation and performance, in order to develop effective performance-improvement interventions.

While the above-mentioned studies are able to establish linkages between intervention and outcomes, they are often not able to explain the reasons influencing why a change takes place. This requires an explanatory approach, using different research methodologies to unpack the black box of health worker performance.

**Explanatory research**

Explanatory research is a form of in-depth research for using, testing and advancing theory to explain causal mechanisms. It contributes to a deeper understanding of reasons behind the success and failure of reforms and new initiatives. For example, a mixed-methods study by Witter et al. in Pakistan demonstrated how performance-based financing programmes often make assumptions about the effect on health worker motivation and showed how traditional performance-improvement evaluations might be enhanced.\(^ {21}\) Similarly, using realist evaluation techniques, Prashanth et al. evaluated the outcomes of a capacity-
strengthening training programme for mid-level managers in India and developed an explanation for why the programme seemed to have worked in some settings and not in others.²²

Explanatory research also sets out to comprehend the multifaceted nature and dynamics of social systems, to provide a richer description and a more nuanced understanding of the context within which health workers are carrying out their tasks. For example, by triangulating information from civil service agencies and creating job histories based on interviews, Purohit et al. examined the reality of the posting and transfer system for medical officers in an Indian state.³³ They found that the guidance on posting and transfer of medical officers was not only weakly implemented but also undermined by a parallel system in which desirable posts were attained by the use of political connections and money.³³ Relatedly, a study by Rocha et al. aimed to understand and explain the organizational culture existing in a Brazilian public hospital, and how this, in turn, influences workplace functioning for nurses and midwives in particular.³⁶

Although explanatory research aims to understand the context and pathways of change that affect health worker motivation, it typically does not engage health workers to collaborate or co-produce solutions.

Emancipatory research

Emancipatory research focuses on how stakeholders jointly understand a problem, act on it, and can learn from working collaboratively to contest power relations and effect change. For example, emancipatory research could examine the root causes of disrespectful treatment within a district hospital staff team, and how staff can construct more respectful norms. The key aspect of emancipatory research is its intent to use stakeholder participation in the creation of knowledge within a process of change. Emancipatory research is centred on sharing power between the researchers and participants, thereby empowering participants to bring about change. The HRH reader highlights examples of how emancipatory research can describe life histories of health workers,²⁰,³⁵ as well as develop collaborative approaches for strengthening the support provided to them.³⁶ For example, Namakula and Witter created life histories of health workers in Uganda to understand how they experienced the 20-year conflict, and their motivation to continue working.³⁵ Hernández et al. carried out a concept-mapping exercise with public sector managers and health workers in a vulnerable region of Guatemala.³⁶ Through this exercise, health workers and managers developed a shared and context-specific understanding of the actions needed to better support auxiliary nurses' performance.

Conclusion

These research typologies – exploratory, influence, explanatory and emancipatory – suggest new ways to look at HRH challenges and new types of research that can be commissioned to support health systems policy-making. Descriptive research, such as the use of traditional surveys, is a valuable component of health systems research. However, it cannot tell us why health workers behave the way they do, what interventions can improve performance, the mechanisms that lead to change, and strategies for empowering health workers to be agents of change themselves. Exploratory research enables deeper understanding of motivation, through identification of the importance of intrinsic values,²⁵ relationships between health workers and their communities,²⁸ and organizational leadership and justice.²⁶,²⁷ Research studying the influence of interventions on outcomes has, for example, highlighted that performance-based financing did not improve motivation in one trial,²⁹ while explanatory research unpacked a range of reasons why performance-based financing did not influence health worker motivation.³¹ Emancipatory research, which produces knowledge about HRH issues while also engaging health workers to identify and solve their own challenges, was showcased as a tool for health workers to identify the support needed to stay motivated in challenging working environments.³⁵,³⁶ As illustrated in this paper, the HRH reader offers guidance to policy-makers and researchers when addressing the need for human resources for health to achieve universal health coverage in the SDG-era,²⁰ and demonstrates how they can use a wider range of research approaches to gain deeper understanding of HRH challenges and identify pathways for innovative and effective HRH solutions.

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References


The burden of iron-deficiency anaemia among women in India: how have iron and folic acid interventions fared?

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Abstract
Iron-deficiency anaemia (IDA) among women in India is a problem of major public health significance. Using data from three waves of the National Family Health Survey, this article discusses the burden of and trend in IDA among women in India, and discusses the level of iron and folic acid (IFA) supplementation and its potential role in reducing the burden of IDA. Between 2005–2006 and 2015–2016, IDA in India decreased by only 3.5 percentage points (from 56.5% in 2005–2006 to 53.0% in 2015–2016) for women aged 15–49 years. However, during the same period, of 27 states compared, IDA increased in eight: Delhi, Haryana, Himachal Pradesh, Kerala, Meghalaya, Tamil Nadu, Punjab and Uttar Pradesh; furthermore, some of these (e.g. Kerala) are states that rank among the highest on the state Human Development Index but had failed to contain the burden of IDA. Although there is a standard guideline for IFA supplementation in place, the IFA intervention appears to be ineffective in reducing the burden of IDA in India (nationally only 30.3% of mothers consumed IFA for 100 days or more when they were pregnant), probably due to irregular consumption of IFA where the provision of screening under the National Iron+ Initiative scheme appears to be unsuccessful. To strengthen the IFA intervention and its uptake, a concerted effort of community-level health workers (accredited social health activists, auxiliary nurse midwives and anganwadi workers) is urgently needed. In addition, food-based strategies (dietary diversification and food fortification), food supplementation and improvement of health services are required to reduce the burden of anaemia among women in India.

Keywords: India, iron and folic acid, iron-deficiency anaemia, pregnancy

Background
Anaemia, defined as a reduction in haemoglobin concentration, red-cell count, or packed-cell volume below established cut-off levels, is a widely discussed public health challenge that India is facing.1 According to the World Health Organization (WHO), anaemia among women is defined as a haemoglobin concentration of <120 g/L for non-pregnant women aged 15 years and above, and a haemoglobin concentration of <110 g/L for pregnant women.2 In particular, a persistently high level of anaemia among women in India (53% of all women have anaemia as per the National Family Health Survey 2015–2016) is of great concern, and the 2017 National Health Policy tabled by the Ministry of Health and Family Welfare, Government of India, acknowledges this high burden.4 Iron-deficiency anaemia (IDA) is a common problem among women, primarily due to their recurrent menstrual loss. Demand for iron is higher among pregnant women, and women with anaemia in combination with early onset of childbearing, a high number of births, short intervals between births and poor access to antenatal care and supplementation are likely to experience poor pregnancy outcome.1 Prevention and management of IDA demands adequate iron intake and provision of bioavailable iron.5 The most recent estimates reflect an unacceptably low consumption of iron (median: 13.7 mg/day per person) among women in India aged ≥18 years and 51–83% of pregnant women in India are deprived of the recommended daily allowance of iron of 15–18 mg/day.6 Women in India largely derive iron from non-haem, inorganic sources, including grains, plants, cereals, lentils and vegetables; and, to a small extent, from iron supplements, such as iron or iron and folic acid (IFA) tablets for pregnant women, and iron-fortified foods, as compared to sources of haem iron such as meat and fish, which have a higher rate of absorption.7,8 Thus, it is not surprising that India has the highest number of women with anaemia globally, which increases the probability of maternal and child mortality and has significant economic implications.
for the nation’s development.9 A recently published study on the burden of disease in India concluded that the burden of IDA is 3.0 times higher than the average globally for other geographies at a similar level of development, and that women are disproportionately affected. The report also highlighted that between 1990 and 2016, the burden of IDA improved little and was the top cause of the years lived with disability (11% of all disability) in 2016.10,11 With this background, using three consecutive waves of published reports of the National Family Health Survey (NFHS, equivalent to a demographic and health survey) conducted during 1998–1999 (NFHS2),12 2005–2006 (NFHS3)13 and 2015–2016 (NFHS4),3 this article discusses the changes in the burden of anaemia and the extent to which the levels of IFA intervention may have contributed to addressing this challenge for women of reproductive age (15–49 years), especially pregnant women.

Initiatives to control iron-deficiency anaemia in India

To tackle IDA, India was the first country to launch a National Nutritional Anaemia Prophylaxis Programme in 1970.14,15 The National Nutrition Policy was launched in 199316 and this formed the basis for the National Plan of Action on Nutrition 1995,17 which laid out the sectoral Plan of Action to tackle anaemia.9 In light of the high burden of anaemia in India, one of the goals of the 12th Five Year Plan (2012–2017) of the Government of India was to reduce anaemia in girls and women by 50% – that is to 28% by 2017.5,18 In 2013, the Ministry of Health and Family Welfare developed an intervention guideline – the National Iron+ Initiative – to mitigate the burden of IDA.9 On 1 December 2017, the Union Cabinet approved setting up of the National Nutrition Mission under the oversight of the Ministry of Women and Child Development. Among many targets, the National Nutrition Mission aims to reduce anaemia among young children, adolescent girls and women of reproductive age (15–49 years) by one third of NFHS4 levels by 2022.19

The aim of the National Iron+ Initiative was to target IDA across all life stages, thus expanding existing guidance for children, pregnant women and lactating mothers, to include adolescents (both boys and girls aged 10–19 years) and women of reproductive age (15–49 years).9 With respect to adolescents, the National Iron+ Initiative expanded on the 2012 Weekly Iron and Folic Acid Supplementation programmes for girls in and out of school,20 to include boys as well.9 Interventions with women of reproductive age are a recent endeavour under the National Iron+ initiative approved by the Ministry.9 According to the guideline, the primary intervention to tackle IDA is to administer IFA supplementation with elemental iron and folic acid, using a regimen that varies according to the intervention group (see Table 1).9 WHO has developed guidelines for daily iron supplementation for pregnant women and girls,21 infants and children22 and non-pregnant women and adolescent girls.23 However, in some cases, iron doses prescribed in the National Iron+ Initiative differ from the WHO recommendation.

Trend in anaemia among women in India

Data from the NFHS in India have been widely used to make national and state-level policy decisions.24 Estimates from the NFHS indicate that during the period 1998–2016, over 50% of women aged 15–49 years had IDA (see Table 2). Of all the states and union territories, data for 27 were available for comparison between 2005–2006 and 2015–2016. There was an average decrease of only 3.5 percentage points in IDA among all women in India, varying by states (see Fig. 1). In addition, NFHS4 (2015–2016) indicates that the National Iron+ Initiative did not yield the desired reduction in IDA nationally. This suboptimum reduction in IDA is highly concerning. However, during the same period, of the 27 states compared in Fig. 1, IDA in eight states increased: Delhi-National Capital Territory, Haryana, Himachal Pradesh, Kerala, Meghalaya, and children20 and non-pregnant women and adolescent girls.23

Table 1. National Iron+ Initiative IFA supplementation programme and service delivery

<table>
<thead>
<tr>
<th>Age group</th>
<th>Intervention/dose</th>
<th>Regime</th>
<th>Service delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>6–60 months</td>
<td>1 mL of IFA syrup containing 20 mg elemental iron and 100 µg folic acid</td>
<td>Biweekly throughout the period 6–60 months of age and biannual deworming for children aged 12 months and above</td>
<td>● Through ASHA&lt;br&gt;● Inclusion in MCP card</td>
</tr>
<tr>
<td>5–10 years</td>
<td>45 mg elemental iron and 400 µg folic acid</td>
<td>Weekly throughout the period 5–10 years of age and biannual deworming</td>
<td>● In school through teachers and for children who are out of school through anganwadi centre&lt;br&gt;● Mobilization by ASHA</td>
</tr>
<tr>
<td>10–19 years</td>
<td>100 mg elemental iron and 500 µg folic acid</td>
<td>Weekly throughout the period 10–19 years of age and biannual deworming</td>
<td>● In school through teachers and for those out of school through anganwadi centre&lt;br&gt;● Mobilization by ASHA</td>
</tr>
<tr>
<td>Pregnant and lactating women</td>
<td>100 mg elemental iron and 500 µg folic acid</td>
<td>1 tablet daily for 100 days, starting after the first trimester, at 14–16 weeks of gestation; repeated for 100 days postpartum</td>
<td>● ANC/ANM/ASHA&lt;br&gt;● Inclusion in MCP card</td>
</tr>
<tr>
<td>Women of reproductive age (15–49 years)</td>
<td>100 mg elemental iron and 500 µg folic acid</td>
<td>Weekly throughout the reproductive period</td>
<td>● Through ASHA during house visit for distribution of contraception</td>
</tr>
</tbody>
</table>

ANC: antenatal care; ANM: auxiliary nurse midwife; ASHA: accredited social health activist; MCP: mother–child protection.

Tamil Nadu, Punjab and Uttar Pradesh. This raises an alarming question – how did some states in India such as Delhi-National Capital Territory, Himachal Pradesh, Kerala and Punjab, which rank among the highest on the state Human Development Index (HDI), fail to contain IDA and instead join Uttar Pradesh, one of the lower-ranked HDI states? This question demands further investigation.

Iron and folic acid intervention

As the standard national guideline is in place, the next question is whether girls and women were receiving the recommended supplementation of IFA that is to be distributed through school teachers/anganwadi workers to adolescent girls; through auxiliary nurse midwives/accredited social health activists to pregnant and lactating mothers; and through accredited social health activists to women of reproductive age (15–49 years; see Table 1). Although no evaluation study has yet been conducted to measure the effect of IFA supplementation, some observational studies have indicated that IFA intervention has helped to improve haemoglobin levels in adolescent girls in India.25,26 However, poor uptake and adherence remains a challenge to India’s public health system.27

Nationally in the NFHS4 2015–2016 survey, over 50% of pregnant women were diagnosed with IDA and an average of only 30.3% of mothers consumed IFA for 100 days or more when they were pregnant in the 5 years preceding the survey; this ranged from the lowest in Nagaland (4.4%) to the highest in Lakshadweep (82.1%; see Table 2). The national policy of India dictates that pregnant and lactating mothers should be given 100 mg elemental iron and 500 µg folic acid daily, which is a much higher dose than that recommended by WHO (30–60 mg elemental iron).21 Irregular consumption of IFA during pregnancy may be due to its side-effects and its unacceptable metallic taste; there are significant gastrointestinal side-effects associated with the higher iron dose, which are likely to explain the poor adherence. Furthermore, stock-outs due to limited supply chains and suboptimum monitoring at the community level where poor socioeconomic conditions prevail are likely to compound the situation. A recent Cochrane systematic review concluded that pregnant women who intermittently receive iron supplementation are less likely to report side-effects (such as constipation and nausea), as compared to those who receive a daily regimen.28 Another systematic review suggests that compliance with IFA supplementation could be higher among those who have been counselled by health workers, especially when forgetfulness is the primary reason for low uptake of IFA in India.29

In 2013, the Ministry of Health and Family Welfare designed a guideline, the National Iron+ Initiative, that gave specific direction for screening and therapeutic management of anaemia among women of reproductive age (15–49 years).9 Although this initiative is in place, generalized practice of the guideline at facility and clinical level seems lacking. Non-pregnant women, especially in rural India, whose anaemia remains undiagnosed for various reasons, follow a different path of treatment from that recommended. The expectation is that if a woman is sick (owing to anaemia or any other reason) and she goes to a health facility, blood tests including a haemoglobin test are only recommended...
Table 2. Iron-deficiency anaemia among ever-married/pregnant/all women aged 15–49 years and women who received iron and folic acid for 100 days or more, National Family Health Survey, 1998–2016

<table>
<thead>
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<td>53.0</td>
<td>50.3</td>
<td>30.3</td>
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<td>62.5</td>
<td>53.6</td>
<td>28.1</td>
</tr>
</tbody>
</table>

IFA: iron and folic acid supplements; na: data not available from the National Family Health Survey report; NFHS: National Family Health Survey.

\(^{1a}\) Estimates are for ever-married women aged 15–49 years.
\(^{1b}\) Estimates are for all women aged 15–49 years.
\(^{2a}\) Pregnant women aged 15–49 years who have iron-deficiency anaemia.
\(^{2b}\) Mothers who consumed IFA for 100 days or more while pregnant.

Note: Caution in comparing some estimates is advised. For example, in 2005–2006 and 2015–2016, nearly 62.9% and 60.0% women, respectively, were diagnosed with anaemia in Andhra Pradesh, but these estimates are not comparable as they represent two different administrative boundaries. Telangana was a part of Andhra Pradesh in 2005–2006, but by 2015–2016, Telangana was separated from Andhra Pradesh.

if the attending physician has enough time to examine the patient, and accordingly iron tablets may be prescribed. Alternatively, if anaemia is suspected through physical examination, the physician will recommend IFA supplementation as part of her daily regimen. This means that, in general in India, a woman must already be sick to be diagnosed with anaemia.\(^{14}\)

In addition, the guidance is to distribute IFA tablets to all pregnant women, irrespective of their haemoglobin level.\(^{9}\) Prior to the National Iron+ Initiative, the guidance was that pregnant women should be given IFA in prophylactic doses, with a double dose if they had IDA.\(^{30}\) Also, irrespective of pregnancy status, for those with severe IDA there is a provision to administer blood transfusions if recommended by the physician.\(^{30}\) This implies that the treatment of IDA (by administering either a prophylactic dose or a higher dose in the case of severe anaemia) depends on the haemoglobin level of pregnant women.\(^{9}\) A common error
in this IFA distribution system is to put all women in the same bracket and administer the same dose. Women with anaemia therefore continue to be anaemic, thus increasing the burden to the nation. These dynamics of anaemia need to be understood before a “one size fits all” strategy is applied. The situation is even worse for individuals in underserved groups, including those who are poor or uneducated, or who belong to historically underprivileged social groups (women from scheduled castes and scheduled tribes), and those living in rural areas; these groups are all likely to experience reduced access to diagnosis.31

Data collection

The accuracy of data on access to, and compliance with, IFA supplementation during pregnancy is problematic because of the way questions are asked and reported in the NFHS. In the women’s questionnaire for the survey, eligible women are asked about their intake of IFA during their last pregnancy (in NFHS4, 2015–2016, women were asked about their most recent pregnancy since January 2010).32 If a woman confirms any incidence of pregnancy, she is asked by the interviewer, “During this pregnancy, were you given or did you buy any iron and folic acid tablets or syrup?”. If the answer is affirmative, the follow-up question is, “During the whole pregnancy, for how many days did you take the tablets or syrup?”.32 If the response is not numeric, the respondent is probed for an approximate number of days, by asking how many months pregnant she was when she began taking the tablets and whether she took the tablets every day after that.33 It is difficult to assess the reliability of answers on all possible measures for a 5-year reference period. As data on the proportion of women who require probing are not available, it would not be appropriate to offer a figure on the extent of distortion in the reporting of IFA consumed. Secondly, even if a respondent comes up with a figure in response to the probe, there is no guarantee that the count of IFA is correct, as there may be recall errors and a propensity to inflated reporting, owing to social desirability bias. The protocol for data collection in the NFHS is not designed to capture this methodological gap.

An alternative source of data is available if a woman’s pregnancy is registered with a subcentre (the lowest level of health-care facility in India). In these circumstances, the pregnant woman is provided with a mother–child protection card, where the number of IFA supplements delivered to her by the community health workers is recorded.9 However, owing to challenges to the performance of community health workers in pregnancy management and maternal care in different states, these data are also likely to be unreliable records of the actual number of IFA supplements either delivered or consumed.34 Therefore, while data on IFA consumed must be approached with caution, the failure of IFA interventions to date to address the challenge of IDA is apparent and requires greater scrutiny for future programming.

Conclusion

From the above discussion, a high burden of IDA is evident in India and the data on IFA supplements consumed are discouraging. Trends in anaemia since 1998–1999 give reason for scepticism about the future impact of an IFA intervention alone on IDA in India. WHO recommends that, to reduce the level of IDA, India should strengthen its strategy along three pillars – food-based strategies (dietary diversification and food fortification), food supplementation and improvement of health services.2 Among these three, food fortification together with dietary diversification is deemed a more sustainable alternative, but better implementation strategies are required to increase uptake.35 With the advent of The National Food Security Act, 2013,36 legal commitments have been made to supplement nutrition for adolescent girls and pregnant and lactating mothers. However, the latest round of NFHS data calls for a reality check and reflection on schemes and policies that have been developed to tackle IDA among women. The National Health Policy 2017 offers some hope,4 with a recommendation for community-based screening for IDA and its treatment.

The present study calls for introduction of a nutrition-awareness intervention with intense monitoring of IFA distribution and uptake, especially among prospective mothers and pregnant women. Intensified action of community-level health workers (such as accredited social health activists and auxiliary nurse midwives) could help to target women with severe IDA, who need urgent attention, to reduce the rate of anaemia more quickly. Above all, strengthening the health system, and monitoring and evaluation of interventions for the prevention and treatment of anaemia are the most urgent needs, but are clearly not being done rigorously at present.

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Authorship: RKR conceived and designed the study, performed the analysis and prepared the first draft. WWF, AB and AC reviewed the results and contributed to finalizing the report. All authors approved the study.

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References


Perspective

Social autopsy: a potential health-promotion tool for preventing maternal mortality in low-income countries

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Abstract

Despite significant global improvements, maternal mortality in low-income countries remains unacceptably high. Increasing attention in recent years has focused on how social factors, such as family and peer influences, the community context, health services, legal and policy environments, and cultural and social values, can shape and influence maternal outcomes. Whereas verbal autopsy is used to attribute a clinical cause to a maternal death, the aim of social autopsy is to determine the non-clinical contributing factors. A social autopsy of a maternal death is a group interaction with the family of the deceased woman and her wider local community, where facilitators explore the social causes of the death and identify improvements needed. Although still relatively new, the process has proved useful to capture data for policy-makers on the social determinants of maternal deaths. This article highlights a second aspect of social autopsy – its potential role in health promotion. A social autopsy facilitates “community self-diagnosis” and identification of modifiable social and cultural factors that are attributable to the death. Social autopsy therefore has the potential not only for increasing awareness among community members, but also for promoting behavioural change at the individual and community level. There has been little formal assessment of social autopsy as a tool for health promotion. Rigorous research is now needed to assess the effectiveness and cost effectiveness of social autopsy as a preventive community-based intervention, especially with respect to effects on social determinants. There is also a need to document how communities can take ownership of such activities and achieve a sustainable impact on preventable maternal deaths.

Keywords: health promotion, low-income countries, maternal death, prevention, social autopsy

Social autopsy and the social determinants of maternal death

Despite significant reductions worldwide between 1990 and 2015, hundreds of thousands of women are still dying due to complications of pregnancy and/or childbirth each year, and 99% of these deaths occur in low-income countries.1 The estimated lifetime risk of maternal mortality in high-income countries is 1 in 3300 and 1 in 41 in low-income countries.1 On 1 January 2016, the 2030 Agenda for Sustainable Development officially came into force.2 The first target of Sustainable Development Goal 3 is to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030.3 The leading clinical causes of maternal death during 2003–2009 were haemorrhage, hypertensive disorders and sepsis.4 In line with increased focus on the social determinants of health overall, the importance of social factors associated with maternal health outcomes has received wider attention. Family and peer influences, the community context, health services, legal and policy environments, and cultural and social values have all been shown to shape and influence maternal outcomes (see Fig. 1).5

For years, in countries where vital registration systems are suboptimal, verbal autopsy has been a standard method for attributing a clinical cause to maternal deaths that have occurred in the community.6 Social autopsy is similar to verbal autopsy, in that it aims to identify factors related to maternal deaths through a structured interview process. However, it differs in that the main aim is to determine the non-biological causes of death, encompassing social, behavioural and intrinsic health system contributors.7–9

To date, most studies of social autopsy have investigated the use of the process to identify the non-clinical factors involved in maternal, newborn and child deaths and, although still relatively new, the process has been highlighted as being useful to capture data on the social determinants of maternal death, in order to inform policy-makers on attributable health system factors.7 Less discussed, however, is the potential
The role of social autopsy as a tool for health promotion. A social autopsy of a maternal death is a group interaction with the family of the deceased woman and her wider local community, where facilitators explore the social causes of the death, identify improvements needed, and communicate them within the community to aid future prevention. The process therefore facilitates “community self-diagnosis” and identification of modifiable social and cultural factors that are attributable to the death. Therefore, social autopsy has the potential not only for increasing awareness among community members, but also for promoting behavioural change at the individual and community level. This article explores the potential of social autopsy as a tool for preventing maternal deaths in low-income countries, thereby helping to address the first target of Sustainable Development Goal 3.

The origins of social autopsy

Health-facility-based confidential inquiries into maternal deaths started as early as 1952 in the United Kingdom of Great Britain and Northern Ireland; these recognized the importance of social factors and examined them by constructing illustrative vignettes, or case-studies, of individual maternal deaths. The “three delays” model of maternal mortality introduced by Thaddeus and Maine provided a framework for the development of maternal social autopsy tools, by highlighting the social and behavioural chain linking the household, community and health system. The World Health Organization (WHO) developed several methods for reviewing maternal mortality, including verbal autopsy, which highlighted the importance of social factors in its “beyond the numbers” campaign. The strategies to improve child survival in the 1990s also began to recognize the importance of household and community factors in health promotion, disease prevention and treatment. This led to development of the Pathway to Survival Framework in 1995, which acknowledged that management of most childhood illness occurs outside of health facilities and that caregiver recognition of illness and provision of care are critical components. It also paved way for social autopsy in children. These advances in social autopsy played a crucial part in its development to its current state. The usefulness of social autopsy in modern health-care systems lies in its ability to: (i) increase knowledge and awareness regarding maternal and child mortality; (ii) empower community participation; (iii) increase the responsiveness and accountability of health programmes and provide large-scale population-level data; (iv) help policy-makers and health-care programmers to...

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**Fig. 1. Social determinants of maternal health**

**Structural determinants of health inequities**

- Governance and policies
  - Education
  - Health finance and infrastructure
  - Social protection
  - Laws (gender equality, anti-violence, etc.)
  - Reproductive health and rights

- Culture and social values
  - Women’s status
  - Gender norms
  - Religion
  - Health beliefs
  - Social cohesion

**Intermediary determinants of health**

- Health services
  - Availability of relevant services (antenatal care, skilled delivery, referrals for emergency obstetric care)
  - Staff skills and technical competence
  - Acceptability to the community
  - Fees and related costs

- Community context
  - Rural/urban residence
  - Social position (class, wealth, ethnicity)
  - Awareness of care
  - Perceptions of quality
  - Distance to facilities
  - Social capital

- Family and peer influences
  - Family structure and decision-making
  - Marital relationship
  - Spousal communication
  - Income
  - Access to resources
  - Support networks

**Individual attributes**

- Age
- Number of children
- Knowledge
- Self-efficacy

identify strategies for increasing health-promotive behaviours; and (v) improve access to and uptake of health services.20

**Social autopsy to identify factors associated with maternal death**

A recent systematic review on the use of social autopsy to understand maternal, newborn and child mortality in low-resource settings noted that, of the 17 articles included, five focused on maternal mortality.9 The authors also identified five social autopsy research tools, with the two most commonly used instruments being the Child Health Epidemiology Research Group’s social autopsy tool21 and the combined verbal and social autopsy tool developed by the International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH Network) for neonatal and child deaths in Africa.22 The four main gaps in the literature identified by the systematic review were the need for: (i) harmonized tools and analytical methods that allow for cross-study comparisons; (ii) discussions of the complexity of decision-making for care-seeking; (iii) qualitative narratives that address inconsistencies in responses between studies; and (iv) the explicit inclusion of perspectives from husbands and fathers.9 The systematic review also showed that cost, distance and transportation, although common barriers, are not the only obstacles to pregnant women and children receiving life-saving care. The reviewers emphasized the need to understand better these barriers and address them through locally appropriate means.9

**Social autopsy in health promotion**

Whereas social autopsy is used in the type of research described above to provide information to improve service delivery, to date, there have been no formal studies assessing the use of social autopsy as a health-promotion tool. However, there are examples where social autopsy is being used to support dialogue and health promotion in the community. This paper presents the procedures for social autopsy as part of the Maternal and Perinatal Death Surveillance and Response (MPDSR) system in Bangladesh.

This use of social autopsy was piloted in one district in 2010,23 and has expanded countrywide since then. A facilitator (first-line supervisor, health inspector, assistant health inspector or family planning inspector from the Ministry of Health and Family Welfare) conducts a social autopsy session in the community after each verbal autopsy has been completed for a maternal or neonatal death or stillbirth in the community.10 The discussion focuses on the social factors, issues and barriers surrounding that death that could have been avoided.24 The session takes around one hour and is timed to enable the attendance of men, since they are usually the family decision-makers. The social autopsy is conducted in the presence of neighbours and relatives of the deceased. The facilitator also invites community leaders and local elected government leaders to participate, which creates a positive environment for collective community commitment to improving health-seeking behaviour.

Before conducting a social autopsy session, the time and place is fixed by the grass-roots-level government health worker (health assistant or family welfare assistant) who initially performed the death notification. He or she informs the community and sets a suitable date, time and preferred venue, based on the availability of neighbours. On the day of the social autopsy, the grass-roots-level health worker gathers the neighbours, community leaders and bereaved family members in the agreed location where the facilitator will conduct the session. Prior to the social autopsy session, the bereaved family is briefed on the process and their verbal consent is taken. In addition, before conducting a social autopsy session, the facilitator obtains verbal consent from all additional participants.

The facilitator, who will have received 2 days’ training on social autopsy, including facilitation skills, conducts the session. Before starting the session, he or she describes the objectives of and expected outcome of the social autopsy. A non-blaming approach is maintained throughout the session and the facilitator ensures that discussion focuses on factors surrounding relevant social stigmas, barriers and challenges, without apportioning blame on any person, provider or institution. The facilitator who conducts the social autopsy usually works routinely in the area where the death has occurred, therefore he or she is very familiar with and to the community. This enables participants to feel confident in discussing these issues in front of government health workers. Following the social autopsy meeting, the health workers report back to the local administrative unit (upazila) and conduct regular follow-up in the course of their routine work with the community. Within the MPDSR system, there is a functional quality improvement committee at each administrative stage, i.e. at upazila, district, division and national level. The quality improvement committee is responsible for conducting regular follow-up on the response to a death and ensuring improvement.

A typical group comprises around 30–50 people. The session starts with family and neighbours describing in detail what happened before the death. From the description, a discussion evolves where participants are encouraged to explore and identify the social factors, issues and barriers surrounding the death that could have been avoided.23 The facilitator presents information, education and communication materials to show the community what they need to do if similar maternal or neonatal complications arise again. For example, during one social autopsy of a maternal death, the community learnt about the need for a skilled birth attendant, the dangers of postpartum haemorrhage and the need for rapid transfer to a health facility in these circumstances. A teenager who had attended that social autopsy commented:

> Nobody can stop me [choosing to] deliver by a trained birth attendant, now I clearly know about maternal complication. If I do any mistakes, me or my child may die. I know and understand from today’s meeting, photos were displayed, it’s now clear to me what I have to do in my case.10

**Social autopsy and community health education**

Promoting preventative messages during social autopsy of a maternal death helps participants to devise appropriate and achievable strategies for their communities in line with the social causes that they have identified to have been associated with the death.25 Social autopsy may thus encourage health
promotion, as it makes people think of applying preventive strategies against such tragedies in the future, as a result of health education conducted by health workers. The cardinal principle of health promotion is empowerment of people by providing the necessary information and helping them to develop skills so that they feel control over, rather than shattered by, external forces outside their sphere of influence.26 A case-study that outlined the experiences of social autopsy as a community intervention tool in Bangladesh found that these sessions resulted in an increase in health-care seeking among women in pregnancy and after childbirth.10 This indicates the potential effectiveness of social autopsy sessions as a health-promotion tool. The potential value of social autopsies in health promotion has been summarized as the ability to deliver effective health education sessions through:

- **knowledge building**: social autopsy forums provide an opportunity for health workers to interact with the community to promote optimal maternal and child health, including discussions about access to health-care services. These sessions are designed to address the learning needs of all community members, including those with poor literacy. Therefore, health workers utilize a range of teaching techniques such as pictorial presentations and role play, to maximize understanding;

- **community/self-reflection**: the open discussion nature of social autopsy promotes an opportunity for community as well as individual reflections on the actions or inactions that potentially contributed to a maternal and/or child death;

- **community empowerment**: social autopsy provides an opportunity to promote empowerment, with knowledge to improve attitudes and practices that promote health outcomes. The sessions provide community members an opportunity to interact and learn alongside different stakeholders and thus gain holistic knowledge for positive action in the future;

- **commitment generation**: a common practice in social autopsy fora is to provide an opportunity for participants to express their commitment to preventing future poor (fetal) health outcomes. Often, local community leaders, including government staff, have their commitments witnessed by the attending community participants.10

**Conclusion and ways forward**

Social autopsy provides a platform to bring people together in their community to build knowledge, and generate new ideas and open thinking for best planning, based on the tragedy that has occurred. Communities themselves decide what to do, how to do it and when to act when such tragedies occur. Community leadership and empowerment also trigger the entire process and build a shared responsibility for each other. Above all, the findings not only identify the underlying problems but can also identify potential solutions. Such interventions may be more successful, since they are derived from the observations and experiences of social autopsy participants and thus have ready-made community ownership.

Owing to differences in the environmental, socioeconomic and cultural contexts in which people live, the circumstances of deaths beyond their clinical manifestations may vary. Social autopsy shows promise as a tool, not only for elucidating these non-clinical factors but also for promoting community behaviour change to prevent recurrence. Rigorous research is now needed to assess the effectiveness and cost effectiveness of social autopsy as a preventive community-based intervention, especially with respect to the effects on social determinants. Similarly, there is also a need to document how a community can take ownership of such activities and achieve a sustainable impact on preventable maternal deaths.

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**References**


Current status of Master of Public Health programmes in India: a scoping review

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Abstract

There is a recognized need to improve training in public health in India. Currently, several Indian institutions and universities offer the Master of Public Health (MPH) programme. However, in the absence of any formal body or council for regulating public health education in the country, there is limited information available on these programmes. This scoping review was therefore undertaken to review the current status of MPH programmes in India. Information on MPH programmes was obtained using a two-step process. First, a list of all institutions offering MPH programmes in India was compiled by use of an internet and literature search. Second, detailed information on each programme was collected via an internet and literature search and through direct contact with the institutions and recognized experts in public health education. Between 1997 and 2016–2017, the number of institutions offering MPH programmes increased from 2 to 44. The eligibility criteria for the MPH programmes are variable. All programmes include some field experience. The ratio of faculty number to students enrolled ranged from 1:0.1 to 1:42. In the 2016–2017 academic year, 1190 places were being offered on MPH programmes but only 704 students were enrolled. MPH programmes being offered in India have witnessed a rapid expansion in the past two decades. This growth in supply of public health graduates is not yet matched by an increased demand. Despite the recognized need to strengthen the public health workforce in India, there is no clearly defined career pathway for MPH graduates in the national public health infrastructure. Institutions and public health bodies must collaborate to design and deliver MPH programmes to overcome the shortage of public health professionals, such that the development goals for India might be met.

Keywords: India, Master of Public Health, MPH, public health, public health courses, public health education, public health professional

Background

The combined rise in chronic, noncommunicable diseases and continuing burden of infectious diseases has highlighted the need for strengthened health systems in low- and middle-income countries. A robust health system is necessary if the Sustainable Development Goals (SDGs) are to be achieved; it is also central to designing, implementing and monitoring health programmes; delivering quality health services; and ensuring universal health coverage. Strong health systems will need adequate and well-trained health professionals, and a shortage of health workforce can often be a crucial limiting factor in the delivery of quality health services in low- and middle-income countries.

Public health is a vital part of any health system and is ultimately responsible for reducing health risks and maintaining and improving health status. Consequently, as noted in a United States of America (USA) Institute of Medicine report, public health professionals play a pivotal role in the creation and maintenance of a healthy community. This report defined a public health professional as “a person educated in public health or a related discipline who is employed to improve health through a population focus”. Public health is a fusion of many cross-cutting disciplines, including but not limited to: medicine, behavioural and social sciences, statistics, management, communication, environment, nutrition, law, and public policy.

India’s public health workforce

An emerging economy like that of India has to plan for adequate access to quality health care for its large population. There is a recognized need to initiate and appropriately strengthen public health education in the country. Considerable investment in public health training is needed to create effective public health professionals. In 2012, the High Level Expert Group for Universal Health Coverage for India recommended strengthening health-sector management by supporting postgraduate courses in public health and hospital management for health professionals, and reiterated that health curricula in the country have not kept pace
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with the changing dynamics of public health, health policies and demographics.\(^7\) It recommended establishment of new public health management institutions in three phases: 2012–2015, 2015–2017 and 2017–2022.\(^7\) The High Level Expert Group also emphasized the immediate need to establish public health training institutions and strong partnerships with public health management training institutions.\(^7\) The National Health Policy 2017 built on this theme, by explicitly proposing creation of a public health management cadre in all states.\(^8\) The policy also advocates an appropriate career structure and recruitment policy to attract young and talented multidisciplinary professionals. Medical professionals would be expected to form a major part of this workforce, but professionals from diverse backgrounds, including sociology, economics, anthropology, nursing, hospital management, and communications, who have public health management training, should also be considered. The policy notes that states could decide to locate these public health managers, with medical and non-medical qualifications, in the same or different cadre streams within their directorates of health.\(^9\)

Traditionally in India, medical colleges were the centres for creating public health professionals.\(^5\) In the last two decades, there has been a significant change in the way public health professionals are trained in the country. There has been a conscious shift towards the creation of schools of public health outside medical colleges, allowing non-medical personnel to acquire academic competencies in public health disciplines.\(^6\) Currently the Master of Public Health (MPH) programme is being offered by various institutions and universities under the minimum standards for a masters degree laid down by University Grants Commission regulations, 2003.\(^10\) In the absence of a formal body or council for regulating public health education, to date, there has been limited information on evolution, development and issues related to MPH programmes in India.

To remedy this situation, a Task Force for Public Health Education of Sub-Group on Health Education and Training of UK–India Joint Working Group on Cooperation in the Field of Health has been constituted at the level of the Government of India, to work on developing a model MPH curriculum.\(^11\) The model programme of study will focus on skills related to analysis and assessment, policy planning and development, communication skills, financial planning, management and leadership. Two authors of the present paper (SZ and HN) are members of this taskforce.

This paper reviews the current status of MPH programmes in India.

Methodology

Data regarding the existing MPH programmes were obtained using a two-step process originally used by Zodpey et al.,\(^12\) and subsequently replicated in several research studies related to public health education.\(^13\) In the first step, a list of institutions offering MPH programmes in India was constructed. An internet search was conducted, using the Google search engine and keywords including “public health programmes”, “public health courses”, “Master of Public Health”, “MPH” and “schools of public health”. The search was limited to programmes offered in India and to collaborations between Indian and foreign institutions, if any. Only master’s-level programmes of a minimum of 2 years’ duration were included. For example, the Post Graduate Diploma in Health Science (Public Health) offered by Annamalai University, which is equivalent to a MPH of 1 year’s duration,\(^16\) was not included, since the University Grants Commission regulations stipulate that a master’s degree programme should be a minimum of 2 years’ duration.\(^17\) The websites of the All India Council of Technical Education, University Grants Commission, and universities and institutions were also searched. In addition, education supplements of leading newspapers and education-based websites, including shiksha.com,\(^18\) targetstudy.com,\(^19\) getmyuni.com\(^20\) and career.webindia123.com\(^21\) were searched. Experts in the field of public health education were also contacted and related literature was also identified through Google Scholar and PubMed.

In the second step, detailed information about the MPH programmes was collected from the institutions and their websites. The admissions office, relevant departments and faculty of these institutions were contacted by telephone and email, to request information on the fee structures, number of student places, eligibility criteria, duration of the programme and programme details. Any other salient features of relevance to the programmes, such as the ownership, affiliation and geographical location of the institution, specializations offered (if any), or number of faculty for the MPH programme, were also collected. The information was incorporated into a matrix and the findings were triangulated wherever possible.

The collated data were then analysed based on the year of launch of the MPH programme, the ownership, affiliation and geographical location of institutions, eligibility criteria, duration, specializations offered, number of faculty, intake capacity and enrolled numbers, and the accreditation/curriculum of courses.

Results

This scoping review identified 46 institutions that have ever offered a MPH programme in India. However, out of these 46, two institutions discontinued their MPH programmes from 2013 onwards. In the academic year 2016–2017, 44 institutions offered 46 MPH programmes (two institutions offered two different types of MPH programmes). Thus, for India in 2016–2017, there was one MPH programme in existence per 28.7 million population. Of these 44 institutions, 42 had at least one student enrolment in 2016–2017, whereas, two institutions had no enrolments. Findings on these 44 institutions and the 46 MPH programmes offered in 2016–2017 are summarized next.

Evolution and growth

The first MPH programme in India was launched at Mahatma Gandhi University, Kottayam, Kerala, in 1995. This was followed by the Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Kerala in 1997. During the decade from 1997 to 2006, four institutions commenced MPH programmes – Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad in 2000; the National Centre for Disease Control, New Delhi in 2005; and both Jawaharlal Nehru University, New Delhi and the Interdisciplinary School of Health Sciences, University of Pune, Pune in 2007. In the decade from 2007 to 2016, MPH programmes were launched by 40 institutions, including an upsurge in the number of private institutions offering MPH programmes (see Fig. 1). MPH programmes offered at Birla...
Institute of Technology and Sciences, Pilani, Rajasthan and Chitkara University, Punjab were discontinued in 2013.

Ownership and geographical coverage
Of the 44 institutions currently offering MPH programmes (see Box 1), 26 are privately owned and 18 are in the public sector. Tata Institute of Social Sciences offers two MPH programmes, one in social epidemiology and the other in health policy, economics and finance. Sri Ramaswamy Memorial University also offers two programmes: a MPH and a Master of Business Administration (MBA)/MPH dual degree.

In terms of geographical location, eight institutions are situated in Karnataka; six in Delhi-National Capital Region; five in Maharashtra; four each in Uttar Pradesh and Tamil Nadu; three in Kerala; two each in Chandigarh, Gujarat, Rajasthan, Telangana and West Bengal; and one each in Himachal Pradesh, Nagaland, Odisha and Puducherry. The concentration of institutions offering the MPH is therefore mostly outside the Empowered Action Group states that are targeted for special government health and development assistance.

Eligibility
MPH programmes in India are postgraduate-level courses aimed at building the human resources capacity in public health. Most of the MPH programmes provide opportunity to graduates from multidisciplinary medical backgrounds such as medicine, dentistry, physiotherapy, occupational therapy, AYUSH (ayurveda, yoga and naturopathy, unani, siddha and homoeopathy), nursing, veterinary sciences or pharmacy; and non-medical backgrounds such as engineering, statistics/biostatistics, demography, population studies, nutrition, sociology, economics, psychology, anthropology, social work, management, life sciences, social sciences, management, law, arts, etc., to enrol for the programme. In addition to these eligibility criteria, some institutions give preference to candidates with a prior health background, i.e. of working in health services. The eligibility criteria for MPH programmes are variable; for example, some institutions enrol AYUSH graduates in their MPH programmes, while some do not allow them to enrol, even though they are trained in health sciences.

Duration
Of the 46 MPH programmes offered, 44 are of 2 years' duration. In addition, there are two 3-year programmes: Rajiv Gandhi University of Health Sciences, Karnataka's MPH (Honours) and Sri Ramaswamy Memorial University’s MBA/MPH programme.

Specializations offered
Thirty institutions do not offer any specialization as part of their MPH programme, whereas 14 offer specialization in domains such as epidemiology, nutrition, health promotion and health management, maternal and child health, field epidemiology, community nutrition, health economics, financing and policy, health systems, and occupational and environmental health.

Pedagogy
All MPH programmes are taught on-campus, apart from the programme offered by the Global Open University, Nagaland, which is a distance-learning course. Course work covers standard fields of public health, including epidemiology, biostatistics, environmental health and health policy. Most on-campus programmes include teaching with practical/field experience.

Faculty
The faculty in most of the institutions have a multidisciplinary background. However, MPH programmes offered through medical colleges are predominantly taught by faculty with a...

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Fig. 1. Evolution of institutes offering Master of Public Health (MPH) programmes in India (n = 46*)

* Includes two MPH programmes that were discontinued in 2013.
Box 1. List of institutions offering Master of Public Health programmes in 2016–2017 (in alphabetical order; n = 44)

- Achutha Menon Centre for Health Science Studies, Sree Chirita Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, Kerala
- Akal School of Public Health, Eternal University, Sirmour, Himachal Pradesh
- All India Institute of Hygiene and Public Health, Kolkata, West Bengal
- Amity University, Noida, Uttar Pradesh
- Amrita Institute of Medical Sciences and Research Centre, Kochi, Kerala
- Asian Institute of Public Health, Bhubaneswar, Odisha
- Athar Institute of Health and Management Studies, Gautam Nagar, New Delhi
- Centre for Emerging Areas in Science and Technology, Panjab University, Chandigarh
- Christian Medical College, Vellore, Tamil Nadu
- Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra
- Delhi Pharmaceutical Sciences and Research University, Pusp Vihar, New Delhi
- Global Institute of Healthcare Management, Najafgarh, Delhi-National Capital Region
- Indian Institute of Public Health – Delhi, Gurgaon, Delhi-National Capital Region
- Indian Institute of Public Health – Hyderabad, Hyderabad, Telangana
- Indian Institute of Public Health – Gandhinagar, Gandhinagar, Gujarat
- Institute of Health Management Research, Jaipur, Rajasthan
- Institute of Public Health, Kalyani, West Bengal
- Interdisciplinary School of Health Sciences, University of Pune, Pune, Maharashtra
- Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, Puducherry
- Jawaharlal Nehru University, Munirka, New Delhi
- Jodhpur School of Public Health, Jodhpur, Rajasthan
- Jagadguru Sri Shivarathreeswara University, Mysuru, Karnataka
- Karnataka Lingayat Education University, Belgaum, Karnataka
- Maharashtra University of Health Sciences, Nashik, Maharashtra
- Mahatma Gandhi University, Kottayam, Kerala
- National Centre for Disease Control, Sham Nath Marg, New Delhi
- National Institute of Epidemiology, Chennai, Tamil Nadu
- National Institute of Mental Health and Neuro Sciences, Bengaluru, Karnataka
- Nitte University, Mangaluru, Karnataka
- Noida International University, Gautam Budh Nagar, Uttar Pradesh
- Padmashree School of Public Health, Bengaluru, Karnataka
- Parul University, Ahmedabad, Gujarat
- Post Graduate Institute of Medical Education and Research, Chandigarh, Punjab
- Pravara Institute of Medical Sciences, Ahmednagar, Maharashtra
- Rajiv Gandhi Institute of Public Health and Centre for Disease Control, Bengaluru, Karnataka
- Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh
- Sri Ramaswamy Memorial Institute of Science and Technology, Chennai, Tamil Nadu
- Sri Ramachandra Medical College and Research Institute, Chennai, Tamil Nadu
- Tata Institute of Social Sciences, Mumbai, Maharashtra
- Manipal University, Manipal, Karnataka
- The Global Open University, Dimapur, Nagaland
- University of Hyderabad, Hyderabad, Telangana
- University of Lucknow, Lucknow, Uttar Pradesh
- Yenepoya University, Mangaluru, Karnataka

Medical background. Faculty numbers for MPH teaching were available for 41 institutions and ranged from 1 to 25, with a median of 6. The ratio of faculty number to student enrolments in 2016–2017 of these 41 institutions ranged between 1:0.1 and 1:42. Institutions with very minimal faculty, for example one, bring external faculty from other institutions to teach their programme.

Intake capacity versus enrolments
In the 2016–2017 academic year, out of 44 institutions, 1190 places were being offered on MPH programmes but only 704 students were enrolled. Two institutions had zero enrolments, 16 had fewer than 10 enrolments, 13 had 10–20 enrolments and 13 had more than 20 enrolments. At 59%, the place occupancy for MPH programmes in India compares poorly with that for the Bachelor of Medicine and Bachelor of Surgery (MBBS) qualification, which is anecdotally 95%. However, place occupancy for the Bachelor of Dental Surgery programme has recently reduced to around 50%.27

The number of students graduating from an Indian institution with a MPH degree can only be estimated. During 2007–2016,
more than 4300 enrolments took place in MPH programmes in India. Assuming 95% of students successfully graduated from these MPH programmes, there have been around 4100 MPH graduates. Information on employment of MPH graduates was available for three institutions; 93% of MPH graduates were in some form of employment.

**Accreditation and Curriculum**

Currently, no formal regulatory mechanism exists in the country for the accreditation of public health courses, including MPH programmes. In 2011, the National Commission for Human Resources for Health Bill was introduced, which included formation of a National Council for Human Resource in Health for the regulation and accreditation of health education. However, the bill has not yet been enacted. The curriculum of the MPH programmes is therefore variable, as these programmes are offered by different universities and institutions and no standard curriculum exists in the country.

**Discussion**

India is ranked in the bottom quarter worldwide in terms of overall SDG health index and needs a well-trained public health workforce. Traditionally, in India, medical colleges were the centres for training public health professionals. However, this training has been criticized as failing to provide exposure and develop expertise in health management, administration and national health programmes. Of late, in public health education, there has been a shift from medical schools to public health schools. This is also occurring in high-income countries, such as the United Kingdom of Great Britain and Northern Ireland, where the need to develop a multidisciplinary public health specialist workforce has been recognized.

Across the world, the number of schools offering public health programmes is growing, although some regions are less well supplied with higher education in public health disciplines than others. Brazil, an emerging economy with more than 40 schools of public health, probably now has one of the greatest concentrations of public health training programmes in the world, at one course per 5 million population. Although the situation in Brazil is not necessarily a “gold standard”, it is striking that in in India there was only one course per 28.7 million population in 2016–2017.

The Association of Schools of Public Health of the United State of America (US ASPH) requires MPH programmes to include five core areas, namely, epidemiology, biostatistics, health management, behavioural and social sciences, and environmental and occupational health, together with other modules that are integral for acquiring public health competencies. Faculty qualified to teach these core and supplementary areas are essential for MPH programmes in India. The first step for some institutions will be to recruit the appropriate number of appropriately qualified faculty. The University Grants Commission of India recommends that the faculty:student ratio should be between 1:15 and 1:10 for postgraduate-level programmes, to ensure teaching quality and rigour. The faculty:student ratio in MPH institutions in India for 2016–2017 ranged between 1:0.1 and 1:42. Thus, for MPH programmes there is a need to maintain a faculty:student ratio of at least 1:15. In turn, there is a need to generate a faculty pipeline by, for example, starting PhD and DrPH programmes in public health.

Similar to the finding of this study of the low occupancy of places on MPH programmes in 2016–2017, prior work undertaken by the Public Health Foundation of India found that in 2011, 23 institutions in India offered MPH programmes with 5–15 enrolments per academic year. In 2010, out of 573 places, only 430 candidates enrolled in a MPH programme, which indicates a place occupancy of around 75%. Currently the enrolment into MPH programmes is lower in percentage terms than the enrolments in 2011. The number of MPH places available has already doubled from approximately 573 (23 institutions in 2011) to 1190 (44 institutions in 2016–2017). It would therefore be more appropriate to focus on enhancing enrolments to existing MPH programmes rather than launching new MPH programmes.

Currently, the Medical Council of India (MCI) and Indian Nursing Council (INC) regulate only those courses that are offered through medical and nursing schools respectively. The current MPH programmes are regulated by the university that grants the master’s qualification. As with the MCI and INC, a council or professional body for public health courses is needed for accreditation of MPH programmes in India. This professional body would develop a system for determining and certifying minimum standards of education for the different occupations and professions in the health system. Accreditation of public health programmes will lay standards for regulation for high-quality academic standards, responsiveness and ethical practices for public health education in India.

In 2006, the US ASPH identified core competencies for the MPH programmes in the USA. Similarly, the public health community in India needs to develop and adopt a MPH competency framework tailored to the public health needs of India. In 2010, Sharma et al. proposed that MPH graduates in India must have competencies such as: monitoring of health problems and epidemics in the community, applying biostatistics in public health, conducting action research, understanding social and community influences on public health, developing indicators and instruments to monitor and evaluate community health programmes, developing proposals, and involving the community in planning, delivery, and monitoring of health programmes. Professionals with skills in monitoring and evaluation (M&E) are essential in public health systems, yet M&E capacity in many low- and middle-income countries is lacking. In 2013, Negandhi et al. used a group consultation involving institutions from Bangladesh, India, Nepal and Sri Lanka to identify a set of 15 core competencies for M&E training relevant to the south Asian context. Work on a public health competency framework has also been undertaken by Pandav et al., to standardize the core and cross-cutting public health training needs of medical undergraduates in India.

There are no imperatives or incentives for institutions that offer MPH programmes in India to collaborate or share resources. Each individual institution effectively functions alone. A culture of collaboration among these institutions would encourage a sharing of best practices in tuition and development of teaching materials, and widen the faculty resource pool. For example, in the past the Indian Public Health
Association, with support from the World Health Organization Country Office for India convened an expert group to draft a competency framework for public health professionals in India.\textsuperscript{41}

Currently, MPH graduates in India are employed in the public, private and nongovernmental sectors, in teaching, research and implementation roles. However, there are no well-defined career pathways, which is a significant barrier for MPH graduates who wish to work in the public health sector.\textsuperscript{42}

As noted earlier, the National Health Policy 2017 has proposed creation of a public health management cadre in all states, with a qualification in public health or related discipline as an entry criterion.\textsuperscript{9} The policy also advocates an appropriate career structure and recruitment policy to attract young and talented multidisciplinary professionals.\textsuperscript{8}

The number of MPH programmes in India has expanded rapidly in the past two decades. This growth on the supply side is not yet matched by an increased demand for these graduates. Advertisements for managerial positions in the National Health Mission, such as state programme managers, district programme managers and block programme managers, should list a public health qualification like MPH as an essential or desirable qualification. Opportunities are slowly emerging for MPH graduates in the private sector, which has witnessed a growth in public health activities through corporate social responsibility programmes. Opportunities for MPH graduates in sectors such as pharmaceuticals and information technology are also increasing. MPH graduates with strong quantitative skills will be ideally suited to work in health-related “big data” initiatives. In addition, more graduates with public health qualifications and skills are needed within the development sector, which is increasingly involved in the public health arena.

Conclusion

Despite the overwhelming need to strengthen India’s public health workforce, MPH programmes are currently undersubscribed. Enrolled MPH students are not currently trained according to an explicitly stated, standardized competency framework that is tailored to the Indian context. Increased clarity on the role of MPH graduates in India’s public health infrastructure would help institutions to adjust their programmes and ensure graduates are equipped with the required skill-sets. These, and other activities discussed in this paper, are essential to overcoming the shortage of public health professionals and meeting the development goals for India.

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Authorship: All authors were involved in the overall study design. RT conducted the literature review and collected and analysed the data. RT also wrote the first draft of the manuscript; this was reviewed and commented upon by HN and SZ, who reviewed it critically for important intellectual content.


References


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Factors associated with delivery at home in Bhutan: findings from the National Health Survey 2012

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Abstract

Background Despite Bhutan’s remarkable progress in the area of maternal and child health during the era of the Millennium Development Goals, a large proportion of pregnant women are still delivering at home with no skilled attendant. Limited empirical studies have been carried out to understand the factors associated with delivery at home in Bhutan.

Methods This cross-sectional analytical study used secondary data collected in the nationally representative National Health Survey 2012. The survey included a total of 2213 women aged 15–49 years who had a live birth in the 2 years preceding the survey and were selected using multistage stratified cluster sampling. Weighted analysis was done to evaluate determinants for the place of delivery. Unadjusted and adjusted prevalence ratios with 95% confidence intervals (CIs) were calculated to assess the possible association of factors with home delivery.

Results Out of 2213 women aged 15–49 years who had a live birth in the 2 years preceding the survey, 73.7% had an institutional delivery. Coverage of institutional delivery ranged from 49.4% in Zhemgang district to 96.1% in Paro district. Women in the poorest wealth quintile were 7.35 times more likely to have a birth at home compared to women in the richest quintile (adjusted prevalence ratio [aPR]: 7.35, 95% CI: 2.59–20.9). The older mothers aged 30–49 years were 0.79 times (aPR: 0.79, 95% CI: 0.70–0.88) less likely to have a home delivery than mothers aged 15–19 years. Women who had fewer than four antenatal care visits were 1.50 times (aPR: 1.50, 95% CI: 1.35–1.66) more likely to give birth at home compared to those who had four or more visits. The mothers giving birth for a third or more time were 1.88 times (aPR: 1.88, 95% CI: 1.60–2.22) more likely to give birth at home compared to those giving birth for the first time. Women living in rural areas were 2.87 times (aPR: 2.87, 95% CI: 1.42–5.77) more likely to deliver at home compared to those living in urban areas and women living in the eastern region of the country were 1.35 times (aPR: 1.35, 95% CI: 1.17–1.55) more likely to have a home delivery compared to those living in the western region.

Conclusion Lower socioeconomic status, rural location, eastern location, non-first birth, and having fewer than four antenatal visits were significant factors associated with home delivery. These findings should inform further research and policy to build on Bhutan’s progress in promoting institutional delivery as the key strategy towards improving maternal and child health and achieving the relevant targets of Sustainable Development Goal 3.

Keywords: Bhutan, childbirth, home delivery, institutional delivery, place of delivery

Background

Ensuring the presence of a skilled attendant at delivery for every birth was a key strategy for the Millennium Development Goals (MDGs) of reducing maternal as well as child mortality. As a result, there was a modest increase, at the global level, in the proportion of births assisted by skilled health personnel – it increased from 59% in 1990 to 71% in 2014.1 In Bhutan, coverage of institutional delivery in 2000 was 19.8%, while the infant mortality rate and maternal mortality ratio were 60.5 per 1000 live births and 255 per 100,000 live births respectively.2 Therefore, Bhutan started to promote institutional delivery as the key strategy towards improving maternal and child health. As a result, remarkable progress in the area of maternal and child health has been achieved over recent years. Despite this achievement, more than a quarter of deliveries still take place...
in homes, exposing mothers and neonates to a greater risk of morbidity and mortality. Furthermore, preventable causes, such as postpartum haemorrhage, continue to be a major cause of maternal death, especially among home deliveries. Over 70% of neonatal deaths occur during the first 3 days of life. All this evidence underscores the need to encourage institutional delivery to ensure proper medical care and attention during the birth of every child and critical periods after delivery. Therefore, the “proportion of births attended by skilled health personnel” is one of the two indicators adopted by the Royal Government of Bhutan for monitoring target 3.1 of the Sustainable Development Goals – “By 2030, reduce the global maternal mortality ratio to less than 70 per 100 000 live births”. Similarly, the “proportion of births attended by skilled health personnel” has a direct impact on target 3.2 – “By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least 25 per 1000 live births.”

While institutional delivery or the presence of a skilled birth attendant at delivery is one of the critical interventions for safe motherhood and neonatal care, lack of satisfactory empirical studies in the Bhutanese context leads to difficulty in understanding the determinants of institutional delivery, which is needed to inform appropriate policy on intervention. According to a study from one of the districts of Bhutan, and studies from neighbouring or similar countries, the most common potential explanatory factors for pregnant women using a skilled birth attendant or institutional delivery were the place of residence (urban versus rural), the distance from a health centre, socioeconomic status, the age of the mother, the education level of the mother, the number of antenatal check-ups, religion, and obstetric history. In this light, this study aimed to explore factors associated with home delivery in Bhutan. In this paper, home delivery is defined as delivery at home without a skilled birth attendant.

**Methods**

**Study setting**

Bhutan, with an estimated population of 720 679 in 2012, is a small landlocked country nestled in the eastern Himalayas between India and China. Health-care services in the country are provided by the government, through its three-tiered health-care system comprising outreach clinics, sub-posts, and basic health units at the primary tier; hospitals at secondary level; and two regional referral hospitals and one national referral hospital at tertiary level at the apex of the system. All facilities, starting from basic health units, are equipped for institutional delivery. Lower-level health facilities refer cases to higher-level facilities through either ambulance or helicopter services, whenever necessary as per the referral guidelines. Given the paucity of skilled health-care providers in the country, all expectant mothers are encouraged to visit a health facility for delivery. A home visit by health-care providers for skilled birth attendance is discouraged by policy except in emergency situations. As a result, almost all home deliveries in Bhutan take place without a skilled birth attendant. Usually the elder women of the family are the traditional attendants during home deliveries. However, to the knowledge of the authors, there is no published study on practices related to traditional attendance and birth preparedness among women who deliver at home in Bhutan.

**Study design, population and sample**

This study was a secondary analysis of the most recent data available, the National Health Survey (NHS) 2012 data set. The NHS 2012 covered 13256 sampled households with urban–rural disaggregation and with representative samples from all 20 districts of Bhutan. The survey instruments consisted of five main questionnaires – the household questionnaire, the individual questionnaire, the women’s questionnaire, the immunization questionnaire and the violence against women questionnaire. The women’s module collected data related to reproductive and maternal health from children and women aged 10–49 years. The NHS 2012 reported that 2213 women aged 15–49 years had a live birth in the 2 years preceding the survey. All these women were included in this study.

**Analysis**

Since the NHS 2012 involved multistage sampling, a weighted analysis of data sets was carried out to calculate proportions and to estimate the unadjusted and adjusted prevalence ratios. The sample weights were calculated and appended to all data sets by the NHS 2012 team. Details about the calculations of sample weights are provided in the NHS 2012 report. The analyses for the present study were performed by using these sample weights already appended to the data sets. The proportions of coverage of institutional delivery were calculated up to district level. The associations between place of delivery and the potential explanatory factors such as the age of the mother, wealth quintile, education, residence (urban/rural), region, distance from a health centre, parity, frequency of antenatal care, marital status, controlling behaviour of a husband, and intimate partner violence were examined. Further, a log-binomial regression was fitted, with home delivery as an outcome variable and the age of mothers, wealth quintile, education level of mothers and their husbands, residence, region, distance to the health facility, parity and having four or more antenatal care visits as the potential explanatory factors. Although it was planned that only those factors that were significant in a bivariate model at \( P < 0.1 \) would be included to calculate adjusted prevalence ratios (aPRs), all factors were significant in a bivariate model at \( P < 0.05 \). In the log-binomial regression model, all statistical associations were considered to be significant at \( P < 0.05 \). STATA/IC 15 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC) was used for analysis.

The distance to health facilities was defined as the time taken to reach the nearest health facility, on foot, through another mode of transport or using a combination of both. The respondents were asked to give the time taken when household members usually go to health facility. The wealth index constructed and appended to data sets by the NHS 2012 team was used for the analyses in this paper. Details about the steps in the construction of the wealth index are provided in the NHS 2012 report.

**Ethical considerations**

Administrative clearance for conducting the study was provided by the Ministry of Health and ethical approval was obtained from the Ministry of Health Research Ethics Board of Health. All personal identifiers were removed to ensure confidentiality.
and the need for informed consent was waived by the Research Ethics Board of Health, as the study involved only secondary analysis of a data set that had already been collected.

**Results**

Out of 2213 women aged 15–49 years who had a live birth in the 2 years preceding the survey, 73.7% had an institutional delivery. Coverage of institutional delivery ranged from 49.4% in Zhemgang district to 96.1% in Paro district.

**Sociodemographic factors contributing to women’s choice of place of delivery**

About 59.6% of women did not have any formal schooling and 40.4% had formal education (see Table 1). Almost three quarters of the women resided in a rural area, and there was almost equal distribution of women in the three regions of the country. About 40.6% of women lived within half an hour’s distance from the nearest health facility, while 26.1% lived more than an hour away from the nearest health facility. Of women who had a live birth in the 2 years preceding the survey, 33.7% had their first live birth, 29.6% had their second live birth, and 36.6% had their third or subsequent live birth.

Only 4.5% of women in the richest quintile gave birth at home, while more than half of women in the poorest quintile did so (see Table 1). Similarly, women with a formal education level (primary and secondary or higher) were more likely to give birth at a health facility (86.8%) compared to women with no formal education/no education (65.2%). The older mothers aged 30–49 years were less likely (aPR: 0.79, 95% confidence interval [CI]: 0.70–0.88) to have a home delivery as compared to younger mothers aged 15–19 years; 95.4% of women living in urban areas and 66.1% of women living in rural areas gave birth at a health facility. While 86.7% of women living in western Bhutan gave birth at a health facility, only 56.6% gave birth at a health facility in the eastern part of the country. In addition to this, distance to the health facility also influenced where the women gave birth; 87.7% of women living within half an hour gave birth at a health facility, and this proportion decreased as the distance increased. Most women who gave birth for the first time chose a health facility (85.9%), while 75.4% of women with a second birth chose a health facility, and 59.9% of women delivering their third or subsequent child gave birth at a health facility.

**Frequency of antenatal and postnatal care**

While 79.0% of pregnant women, who had had four or more antenatal care visits had an institutional delivery, only 51.4% of pregnant women who had not had four or more antenatal care visits gave birth at a health facility. On the other hand, 83.0% of women who had had an institutional delivery had received postnatal care; only 46.3% of women who had a home delivery had received postnatal care.

Impressively, 97.9% of women had received at least one antenatal care session from health-care providers during their most recent pregnancy. However, only 74.6% had received postnatal care.

**Fig. 1. Weighted percentage of women aged 15–49 years who had a home delivery in the 2 years preceding the survey, 2012**

*Details about the calculations of sample weights are provided in the National Health Survey 2012 report.*

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*a* Details about the calculations of sample weights are provided in the National Health Survey 2012 report.*
Home delivery rate for 20 districts of Bhutan

Districts in the eastern and central regions of the country had a higher rate of home delivery compared to districts in the western side of the country (see Fig. 1). The district with the highest rate of home delivery was Zhemgang with 50.6%, and the district with the lowest rate was Paro with 3.9%.

Table 1. Sociodemographic characteristics and place of delivery of women who had a live birth in the 2 years preceding the survey

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Place of delivery</th>
<th>Place of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total 2213 (100)</td>
<td>Home, n (weighted %a)</td>
</tr>
<tr>
<td></td>
<td>n (unweighted %)</td>
<td>600 (26.3)</td>
</tr>
<tr>
<td>Age of mother, yearsb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15–29</td>
<td>1558 (70.4)</td>
<td>401 (25.0)</td>
</tr>
<tr>
<td>30–49</td>
<td>654 (29.6)</td>
<td>199 (30.2)</td>
</tr>
<tr>
<td>Wealth quintilec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (richest)</td>
<td>389 (18.3)</td>
<td>21 (4.5)</td>
</tr>
<tr>
<td>4</td>
<td>449 (21.2)</td>
<td>42 (7.0)</td>
</tr>
<tr>
<td>3</td>
<td>410 (19.3)</td>
<td>107 (28.8)</td>
</tr>
<tr>
<td>2</td>
<td>459 (21.6)</td>
<td>178 (39.4)</td>
</tr>
<tr>
<td>1 (poorest)</td>
<td>415 (19.6)</td>
<td>229 (53.9)</td>
</tr>
<tr>
<td>Education of the motherd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary and secondary or higher</td>
<td>889 (40.4)</td>
<td>125 (13.3)</td>
</tr>
<tr>
<td>None/non-formal education</td>
<td>1311 (59.6)</td>
<td>471 (34.8)</td>
</tr>
<tr>
<td>Education of husbande,i</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary and secondary or higher</td>
<td>1084 (52.7)</td>
<td>161 (17.1)</td>
</tr>
<tr>
<td>None/non-formal education</td>
<td>974 (47.3)</td>
<td>365 (35.4)</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>563 (25.4)</td>
<td>37 (4.6)</td>
</tr>
<tr>
<td>Rural</td>
<td>1650 (74.6)</td>
<td>563 (33.9)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>674 (30.5)</td>
<td>81 (13.3)</td>
</tr>
<tr>
<td>Central</td>
<td>809 (36.6)</td>
<td>221 (28.8)</td>
</tr>
<tr>
<td>East</td>
<td>730 (33.0)</td>
<td>298 (43.4)</td>
</tr>
<tr>
<td>Distance to health facility, hoursf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;0.5</td>
<td>893 (40.6)</td>
<td>130 (12.3)</td>
</tr>
<tr>
<td>0.5–1</td>
<td>731 (33.3)</td>
<td>218 (29.8)</td>
</tr>
<tr>
<td>&gt;1–3</td>
<td>494 (22.5)</td>
<td>209 (41.3)</td>
</tr>
<tr>
<td>&gt;3</td>
<td>79 (3.6)</td>
<td>38 (52.8)</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First live birth</td>
<td>746 (33.7)</td>
<td>113 (14.1)</td>
</tr>
<tr>
<td>Second live birth</td>
<td>656 (29.6)</td>
<td>164 (24.6)</td>
</tr>
<tr>
<td>Third or subsequent live birth</td>
<td>811 (36.6)</td>
<td>323 (40.2)</td>
</tr>
<tr>
<td>4 or more antenatal care visitsg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1720 (79.9)</td>
<td>364 (21.0)</td>
</tr>
<tr>
<td>No</td>
<td>434 (20.1)</td>
<td>214 (48.6)</td>
</tr>
<tr>
<td>Marital statush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/living together</td>
<td>2058 (93.0)</td>
<td>554 (26.2)</td>
</tr>
<tr>
<td>Single/divorced/widowed</td>
<td>154 (7.0)</td>
<td>46 (29.6)</td>
</tr>
<tr>
<td>Controlling behaviour of husbandh,i</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>680 (33.1)</td>
<td>170 (25.3)</td>
</tr>
<tr>
<td>Yes</td>
<td>1376 (66.9)</td>
<td>384 (26.7)</td>
</tr>
<tr>
<td>Intimate partner violencea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1951 (94.8)</td>
<td>533 (26.3)</td>
</tr>
<tr>
<td>Yes</td>
<td>107 (5.2)</td>
<td>21 (23.1)</td>
</tr>
</tbody>
</table>

*a Details about the calculations of sample weights are provided in the National Health Survey 2012 report.\b 1 missing observation.\c 91 missing observations.\d 13 missing observations.\e Data only for women who are currently married/living together (15–49 years).\f 16 missing observations.\g 59 missing observations.\h 1 missing observation.\i 2 missing observations.
Log-binomial regression of determinants of home delivery

As shown in Table 2, women in the poorest quintile were 7.35 times more likely to have a birth at home compared to women in the richest quintile (aPR: 7.35, 95% CI: 2.59–20.9).

Another significant difference was between the locations of residence; women in rural areas were 2.87 times (aPR: 2.87, 95% CI: 1.42–5.77) more likely to give birth at home compared to women in urban areas. Similarly, women in the eastern region were 1.35 times (aPR: 1.35, 95% CI: 1.17–1.55) more likely to have a home delivery compared to women living in the western region.

The other factors that seem to influence place of delivery are the parity and the number of antenatal care visits, especially four or more visits. The mothers giving birth for a third or subsequent time were 1.88 times (aPR: 1.88, 95% CI: 1.60–2.22) more likely to give birth at home compared to mothers giving birth for the first time. Women who had fewer than four antenatal care visits were 1.5 times (aPR: 1.50, 95% CI: 1.35–1.66) more likely to give birth at home compared to those who had four or more antenatal care visits.

Discussion

About one third of women in Bhutan still deliver at home, without a skilled birth attendant, despite the efforts of the Ministry of
Health towards achieving an institutional delivery rate of 100%. In some districts, around half of women were found to be delivering at home. Nonetheless, the rate of institutional delivery in Bhutan is equivalent to the global rate of skilled birth attendance or institutional delivery, which was 78% in 2016. The rate was much higher than that of neighbouring countries. For example, the Bangladesh Demographic and Health Survey 2014 reports 37% institutional delivery and 42% of births with a skilled birth attendant and Nepal had 35% institutional delivery as per the Nepal Demographic and Health Survey data sets of 2011.

The analysis in this study showed that several factors were independently associated with women delivering at home. These were: the age of mothers, lower socioeconomic status, rural location, eastern location, non-first birth, and not having four or more antenatal visits.

The distance to a health facility was not significant in the final model; however, the unadjusted prevalence ratio shows that women living at a longer distance from a health facility are more likely to give birth at home. The insignificance in the final model may be because this variable “distance to health facility” in the NHS 2012 survey did not take into account the road accessibility and the mode of transportation the mothers have to use to get to the health facility.

The findings of the current study are similar to those of a district-level study carried out in Chukha, Bhutan, as well as the findings of other studies carried out elsewhere. For instance, the study from Chukha found that women from rural areas were 1.65 times more likely to deliver at home; the women who were delivering for the third or subsequent time were 2.42 times more likely to deliver at home. Similarly, studies from neighbouring as well as other developing countries show an association between the place of delivery and lower socioeconomic status, rural location, non-first birth, and not having four or more antenatal visits.

The capital city of Bhutan is located in the western region of the country and the districts of the western region are generally more developed than the eastern and central regions. As a result, almost all the development indicators are much better in the western region. For instance, the prevalence of stunting in 2015 was highest (29.1%) in eastern Bhutan, as compared to 16.2% in western and 18.5% in central Bhutan. Therefore, the observation that more women from the eastern region have a home delivery is in line with the trends in other development indicators of the country. Hence, focusing on the eastern region needs to be one of the priorities for improving the coverage of institutional delivery in particular, and improving all other indicators in general.

The coverage of institutional delivery in Bhutan has increased from 19.8% in 2000 to 73.7% in 2012. This achievement in turn shows an association between the place of delivery and factors, such as language and cultural group, which may be important. Nonetheless, the data are nationally representative and robust data analysis was carried out. Therefore, it is hoped that the findings will be useful for changes of policy and practice, both within and beyond Bhutan.

The study has several implications. First, considering that the overall rate of home delivery of 26.3% is still high for a country that has been aiming for 100% institutional delivery ever since 2005, targeted interventions should be initiated and strengthened. The interventions should be focused on women of low socioeconomic status, the eastern region of the country, rural areas, and those delivering for the third or subsequent time. Second, the public or high-risk groups identified by this study should be educated on institutional delivery through conventional and folk media. Third, efforts should also be made to ensure that every pregnant woman receives at least four antenatal visits. Fourth, given that almost all women attend a health-care centre for at least one antenatal care visit, health-care providers should make extra efforts at the first antenatal contact to convince women of the advisability of institutional delivery, as well as subsequent antenatal care visits. Finally, considering that the coverage of postnatal care was found to be low in Bhutan and the majority of maternal and neonatal deaths occur within 48 hours of delivery, efforts need to be strengthened for coverage of postnatal care.

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Conflict of interest: None declared.

Authorship: MSG contributed to the conception and design, acquisition, analysis and interpretation of data, and drafting and revision of the manuscript. DP contributed to acquisition, analysis and interpretation of data, and critical revision of the manuscript. TT contributed to the conception and design, interpretation of data, and critical revision of the manuscript. SW contributed to acquisition and interpretation of data, and critical revision of the manuscript. PL contributed to interpretation of data, and critical revision of the manuscript. TD contributed to interpretation of data, and revision of the manuscript.


References


Changes in neonatal mortality and newborn health-care practices: descriptive data from the Bangladesh Demographic and Health Surveys 2011 and 2014

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Abstract

Background Bangladesh has made major improvements in health outcomes over the past two decades, with falls in mortality rates in mothers and in infants and young children aged under 5 years. Despite these improvements, neonatal mortality rates (NMRs) are high in Bangladesh. This paper describes recent changes in NMRs and health-care practices, disaggregated by demographic and socioeconomic characteristics.

Methods Summary statistics from the reports of the Bangladesh Demographic and Health Survey (BDHS) were examined. The BDHS is a nationally representative cross-sectional survey and the two most recent rounds of surveys, 2007–2011 and 2010–2014, were included in the analysis. The variables considered in this study were neonatal deaths and related health-care practices, including antenatal care visits, facility-based delivery, assistance from a medically trained provider during delivery, postnatal care from a trained provider and essential newborn care.

Results Between the two survey periods, NMRs increased in Chittagong (average increase 4.5% per year) and Khulna (8.3% per year), remained unchanged in Rangpur, and decreased in Barisal (average decrease 19.8% per year), Dhaka (12.2% per year), Rajshahi (7.7% per year) and Sylhet (4.8% per year). A larger average annual reduction in the NMR was observed in urban areas than in rural areas (14.0% versus 2.1%). There was also a large average annual reduction in NMR in the fourth and fifth richest quintiles for socioeconomic status (SES quintiles; 12.0% and 16.5% per year, respectively). Differences according to neonatal sex were also noted: the NMR for female neonates remained unchanged and that for male neonates reduced by an annual average of 7.7%. General improvements were observed in all health-care practices across all demographic and socioeconomic groups. However, the urban–rural gap in the uptake of antenatal care services, facility-based delivery, assistance from a medically trained provider during delivery, and postnatal care from a trained provider was roughly similar in both surveys. A similar unchanging gap was also seen between the poorest and richest SES quintiles.

Conclusion The study analysis indicates that improvements in NMRs between the two survey periods are mixed. Further attention is required to improve the rate of reduction of neonatal mortality in some divisions in Bangladesh, and it may be useful to investigate whether the higher NMR in rural areas and for households with lower socioeconomic status can be reduced by strengthening the uptake of antenatal care services, facility-based delivery, assistance from a medically trained provider during delivery, and postnatal care from a trained provider. The static NMR for female neonates may encourage policy-makers to focus not only on ensuring standard essential newborn care practices for both sexes but also on ensuring adequate and appropriate care-seeking for illness in female neonates.

Keywords: antenatal care, Bangladesh, essential newborn care, facility-based delivery, health-care practices, neonatal mortality, postnatal care

Background

Bangladesh is the eighth most populous country in the world, with a density of 1070 persons/km².1,2 Over the last 47 years since independence in 1971, the country has developed an extensive health infrastructure and made remarkable progress in providing important health-care and service inputs. These include antenatal care services, delivery in a health facility,
assistance from a medically trained provider during delivery, childhood immunization, vitamin A supplementation, uptake of oral rehydration therapy for diarrhoea, and treatment success rates for tuberculosis.\textsuperscript{1,3} For example, between 1996–1997 and 2014, antenatal care from a medically trained provider and assistance from a medically trained provider during delivery increased from 26% to 64% and 8% to 42%, respectively.\textsuperscript{2,4} These improvements may be attributed to the way Bangladesh has managed to deliver health services, specifically its widespread deployment of community-based strategies to serve every household in the country.\textsuperscript{1,3,5}

Improvements in health-care and service inputs have been translated into exceptional achievements across different health outcomes in Bangladesh. The total fertility rate has decreased from 6.3 births per women in 1975 to 2.3 births per woman in 2014, while between 2001 and 2016 the maternal mortality ratio declined from 322 to 196 per 100 000 live births.\textsuperscript{6,7} Bangladesh has also made important progress in child survival over the last two decades. Between 1989–1993 and 2010–2014, the mortality rate in children aged under 5 years declined from 133 to 46 per 1000 live births.\textsuperscript{2} Improvements in health-care services, together with community-based initiatives to tackle the demand-side of service use and other secular trends beyond the health sector, assisted Bangladesh to achieve the target of Millennium Development Goal 4 of an under-5 mortality rate of 48 per 1000 live births.\textsuperscript{2,3}

Despite the considerable improvement in health outcomes in Bangladesh, the achievement remains vulnerable. For example, the risk of dying in the first month of life, which accounts for 61% of all deaths in children aged under 5 years, is still high (28 deaths per 1000 live births in 2014).\textsuperscript{2} This may be related to the scarcity of skilled health personnel — Bangladesh is included in a list of 57 countries facing a critical shortage of human resources for health.\textsuperscript{6,8} The situation is further aggravated by the disproportionate distribution of human resources for health between rural and urban areas and skewing towards physicians. In 2007, the ratio of physicians to nurses in urban areas was 1:3 and 1:0.7 in rural areas.\textsuperscript{8} Such barriers may affect the country’s ability to maintain momentum and achieve the target of Sustainable Development Goal (SDG) 3 of reducing the neonatal mortality rate (NMR) to 12 per 1000 live births and under-5 mortality to 25 per 1000 live births by 2030.\textsuperscript{10}

In this context, it may be helpful to look beyond aggregated data to examine recent changes and differences in NMRs and the uptake of related health-care practices among the socioeconomic groups in Bangladesh. This study therefore aims to examine recent changes in NMRs alongside health-care practices in the country, by demographic and socioeconomic characteristics.

Methods

Data source
Summary data from the Bangladesh Demographic and Health Survey (BDHS) 2011 and 2014 survey reports were used for this research. The BDHS is a cross-sectional survey and collects nationally representative demographic and health information every 3–4 years.\textsuperscript{2} This study compared data from the latest two BDHS reports, 2011 and 2014.\textsuperscript{2,11} The reference periods for these surveys were 2007–2011 for the BDHS 2011 and 2010–2014 for the BDHS 2014. The surveys involved two-stage stratified random sampling and collected information by interviewing ever-married men (aged 15–54 years) and ever-married women of reproductive age (15–49 years). The sampling approach aimed to produce data that were representative for the country as a whole, for urban and rural areas separately, and for each of the seven administrative divisions.\textsuperscript{2,11} All survey information was self-reported and was gathered using separate questionnaires for households, women and the community. An additional questionnaire for men was used for the 2011 round only. The design and data-collection procedures are described in detail elsewhere.\textsuperscript{5,11}

Ethical approval
The ICF Institutional Review Board approves demographic and health surveys,\textsuperscript{12} and informed consent was obtained from participants at the time of the interviews conducted for the original surveys. This research involves human participants but is based on secondary data analyses and so no further consent was required. This study was also approved by the Human Research Ethics Committee of the University of Technology, Sydney, Australia.

Study participants
This analysis relied on statistics for live-born infants in the BDHS 2011 and 2014. The analysis was restricted to the most recent births in the last 3 years preceding the survey, as detailed information on perinatal health-care practices was available only for these births. Information on essential newborn care services was available for home births only. Mothers were the respondents for information collected on essential newborn care and health-care practices.

Neonatal mortality
The BDHS studies defined neonatal mortality as death of a baby within the first month of life.\textsuperscript{2,11} The standard definition of neonatal mortality, as employed by the World Health Organization (WHO) and United Nations Children’s Fund (UNICEF), is deaths occurring within the first 28 days of life.\textsuperscript{13} As a result, the BDHS definition may show slightly higher NMRs compared with the standard definition. Neonatal deaths were determined from the complete birth history from mothers, which included information on the baby’s sex, date of birth, survival status (alive/dead) and age at death (if dead). Methodology used to estimate NMRs in the BDHS relied on the life-table approach.\textsuperscript{2,11,14}

Health-care practices
Previous research and the recommendations of WHO, UNICEF and the Government of Bangladesh were followed in selecting the health-care practices relevant to NMR.\textsuperscript{15–17} These practices included whether women received at least four antenatal care visits during the pregnancy preceding the most recent birth before the survey; whether delivery was at a health facility; whether there was assistance during delivery from a medically trained provider (defined as a qualified doctor, nurse, midwife, paramedic, family welfare visitor or community skilled birth assistant); and whether postnatal check-ups were with a trained provider (which, in addition to the previous list,
included medical assistants and sub-assistant community medical officers) and occurred within 2 days after birth.\textsuperscript{2,11} Four individual components of essential newborn care were also included in the list of health-care practices – the use of sterile/boiled instruments for cutting the umbilical cord; drying of the neonate within 0–4 min of birth; delayed bathing of the neonate to at least 72 h after birth; and the initiation of breastfeeding within 1 h after delivery.\textsuperscript{15,18} Two other recommended essential newborn care practices, umbilical cord care and immediate wrapping of the neonate, were not included in the study analysis, as the related government guideline had been changed after 2011.\textsuperscript{2,15}

Demographic and socioeconomic variables

Data on NMRs and related health-care practices were extracted for selected demographic and socioeconomic groups, including sex of the child, administrative division, urban/rural location, usual place of residence, and socioeconomic status of the participant. At the time of the two surveys, there were seven administrative divisions in Bangladesh: Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur and Sylhet.\textsuperscript{2,11} The quintiles for socioeconomic status (SES quintiles) in the BDHS data were created using household asset information and principal components analysis; the methods are described elsewhere.\textsuperscript{2,11,19} The annual average rate of change by demographic and socioeconomic characteristics for the 3 years between the two BDHS surveys was calculated as the mean exponential growth rate.\textsuperscript{20}

Results

The BDHS 2011 collected information from 17,141 households, with an individual interview of 17,842 ever-married women aged 15–49 years and a response rate of 98%. The distribution of women respondents among divisions was 6%, 18%, 32%, 12%, 15%, 12% and 5% for Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur and Sylhet, respectively. The majority of women (74%) were residing in rural areas and 28% of women had received no education. The BDHS 2014 collected information from 17,300 households, with an individual interview of 17,863 ever-married women aged 15–49 years and a response rate of 98%. The distribution of women respondents across divisions was similar to the previous round of the survey. In the BDHS 2014, 72% of women respondents were from rural areas and around 25% of women had no education.

The NMR in Bangladesh was 32 per 1000 live births in the 2011 round of the survey and 28 per 1000 live births in the 2014 round. Thus, the NMR in the country had declined, with an annual average rate of reduction of 4.5% between the two survey periods (see Table 1). A comparison of NMRs among divisions indicated a decreasing mortality rate for Barisal, Dhaka, Rajshahi and Sylhet, with an annual average rate of reduction of 19.8%, 12.2%, 7.7% and 4.8%, respectively. While the mortality rate remained unchanged in Rangpur, it increased in Chittagong and Khulna by 4.5% and 8.3% per year, respectively. A larger average annual reduction in

Table 1. Neonatal mortality rates by demographic and socioeconomic characteristics in the Bangladesh Demographic and Health Surveys 2011 and 2014\textsuperscript{2,11}

<table>
<thead>
<tr>
<th>Background characteristics</th>
<th>NMR (per 1000 live births)</th>
<th>Annual average change between the BDHS 2011 and BDHS 2014\textsuperscript{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Division</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barisal</td>
<td>38.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Chittagong</td>
<td>21.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Dhaka</td>
<td>36.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Khulna</td>
<td>32.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Rajshahi</td>
<td>39.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Rangpur</td>
<td>27.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Sylhet</td>
<td>45.0</td>
<td>39.0</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>32.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Rural</td>
<td>33.0</td>
<td>31.0</td>
</tr>
<tr>
<td><strong>Socioeconomic status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poorest</td>
<td>34.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Second</td>
<td>38.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Middle</td>
<td>32.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Fourth</td>
<td>33.0</td>
<td>23.0</td>
</tr>
<tr>
<td>Richest</td>
<td>23.0</td>
<td>14.0</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Female</td>
<td>26.0</td>
<td>26.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>32.0</td>
<td>28.0</td>
</tr>
</tbody>
</table>

BDHS: Bangladesh Demographic and Health Survey; NMR: neonatal mortality rate.

\textsuperscript{a} Reference period.

\textsuperscript{b} Data reported in the BDHS 2011 and 2014.\textsuperscript{2,11}

\textsuperscript{c} Annual average rate of change by demographic and socioeconomic characteristics for the 3 years between the two BDHS surveys was calculated as the exponential growth rate:\textsuperscript{20} average annual rate of change = \frac{\ln(NMR_{2014}/NMR_{2011})}{3}.
the NMR was observed in urban areas than in rural areas (14.0% versus 2.1% per year). A considerable difference in the reduction of NMRs was also observed among neonates of mothers with different socioeconomic status, with a large reduction seen in the fourth and fifth richest SES quintiles (12.0% and 16.5% per year, respectively). Finally, the gap in NMR between male and female neonates narrowed between the two survey periods. However, the average annual NMR reduced by 7.7% for male neonates, while that for female neonates remained unchanged.

Data on neonatal health-care practices by division are presented in Table 2. Three practices – facility-based delivery, assistance from a medically trained provider at delivery, and drying within 4 min of birth – were improved in the BDHS 2014 compared with the BDHS 2011 in all divisions. Improvements in receiving at least four antenatal care visits, as well as delayed bathing of neonates, were observed in all divisions except Barisal. No improvement in the use of sterile/boiled instruments for cutting the umbilical cord was observed in Barisal, Rajshahi, Rangpur or Sylhet. Initiation of breastfeeding within 1 h after delivery improved in all divisions except Chittagong.

An examination of the urban–rural dimension in the use of selected health-care practices for neonates indicated an improvement in all components except the use of sterile/boiled instruments for cutting the umbilical cord (see Table 3). There was only a minor urban–rural gap in the use of health-care practices related to essential newborn care, in either 2011 or 2014. However, the lower use of other selected health-care services in rural areas – receipt of at least four antenatal care visits, facility-based delivery, assistance from a medically trained provider during delivery, and postnatal care services from a trained provider – remained roughly constant between the two surveys.

Table 4 compares the changes in neonatal health-care practices by socioeconomic status. Except for the use of sterile/boiled instruments for cutting the umbilical cord, all selected practices improved between the BDHS 2011 and BDHS 2014 across all SES quintiles. However, a major gap between the poorest and the richest quintiles in the use of antenatal care, facility-based delivery, assistance from a medically trained provider at delivery, and postnatal care services from a trained provider were evident in both 2011 and 2014.

Table 5 presents data on selected neonatal health-care practice by sex. Between the 2011 and 2014 surveys, improvements were observed for almost all practices for both male and female neonates.

### Table 2. Neonatal health-care practices (%) in the Bangladesh Demographic and Health Surveys 2011 and 2014, by administrative division

<table>
<thead>
<tr>
<th>Health-care practice</th>
<th>Division, year (number)</th>
<th>Barisal</th>
<th>Chittagong</th>
<th>Dhaka</th>
<th>Khulna</th>
<th>Rajshahi</th>
<th>Rangpur</th>
<th>Sylhet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received at least 4 antenatal care visits</td>
<td>2011 (260) 2014 (268)</td>
<td>27.0</td>
<td>24.6</td>
<td>20.3</td>
<td>25.5</td>
<td>26.6</td>
<td>35.5</td>
<td>33.3</td>
</tr>
<tr>
<td>Delivered in a health facility</td>
<td>2011 (1083) 2014 (1011)</td>
<td>22.3</td>
<td>29.9</td>
<td>24.8</td>
<td>35.2</td>
<td>29.9</td>
<td>40.5</td>
<td>45.8</td>
</tr>
<tr>
<td>Assisted by a medically trained provider during delivery</td>
<td>2011 (1418) 2014 (1634)</td>
<td>28.4</td>
<td>36.7</td>
<td>29.7</td>
<td>43.9</td>
<td>31.5</td>
<td>43.5</td>
<td>49.0</td>
</tr>
<tr>
<td>Used sterile/boiled instruments for cutting the umbilical cord</td>
<td>2011 (1418) 2014 (1634)</td>
<td>80.0</td>
<td>78.5</td>
<td>84.9</td>
<td>85.6</td>
<td>82.1</td>
<td>83.1</td>
<td>84.2</td>
</tr>
<tr>
<td>Dried within 0–4 min after birth*</td>
<td>2011 (1083) 2014 (1011)</td>
<td>47.7</td>
<td>56.2</td>
<td>51.9</td>
<td>65.6</td>
<td>52.0</td>
<td>63.7</td>
<td>50.3</td>
</tr>
<tr>
<td>Delayed bathing (&gt;72 h after delivery)*</td>
<td>2011 (1083) 2014 (1011)</td>
<td>37.3</td>
<td>33.2</td>
<td>23.3</td>
<td>28.2</td>
<td>23.6</td>
<td>33.8</td>
<td>24.0</td>
</tr>
<tr>
<td>Breastfeeding (within 1 h after birth)*</td>
<td>2011 (1083) 2014 (1011)</td>
<td>46.9</td>
<td>56.4</td>
<td>50.3</td>
<td>50.1</td>
<td>45.5</td>
<td>58.0</td>
<td>50.2</td>
</tr>
<tr>
<td>Postnatal care within 2 days after birth from a trained provider</td>
<td>2011 (1083) 2014 (1011)</td>
<td>26.3</td>
<td>30.6</td>
<td>26.0</td>
<td>33.0</td>
<td>31.5</td>
<td>30.5</td>
<td>46.6</td>
</tr>
</tbody>
</table>

* Sample excludes facility births.

### Table 3. Neonatal health-care practices (%) in the Bangladesh Demographic and Health Surveys 2011 and 2014, by urban/rural location

<table>
<thead>
<tr>
<th>Health-care practice</th>
<th>Location, year (number)</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received at least 4 antenatal care visits</td>
<td>2011 (1068) 2014 (1209)</td>
<td>44.7</td>
<td>19.8</td>
</tr>
<tr>
<td>Delivered in a health facility</td>
<td>2011 (1068) 2014 (1209)</td>
<td>49.3</td>
<td>22.8</td>
</tr>
<tr>
<td>Assisted by a medically trained provider during delivery</td>
<td>2011 (1068) 2014 (1209)</td>
<td>53.7</td>
<td>25.2</td>
</tr>
<tr>
<td>Used sterile/boiled instruments for cutting the umbilical cord</td>
<td>2011 (1068) 2014 (1209)</td>
<td>87.8</td>
<td>82.8</td>
</tr>
<tr>
<td>Dried within 0–4 min after birth*</td>
<td>2011 (1068) 2014 (1209)</td>
<td>50.6</td>
<td>51.6</td>
</tr>
<tr>
<td>Delayed bathing (&gt;72 h after delivery)*</td>
<td>2011 (1068) 2014 (1209)</td>
<td>28.5</td>
<td>28.4</td>
</tr>
<tr>
<td>Breastfeeding (within 1 h after birth)*</td>
<td>2011 (1068) 2014 (1209)</td>
<td>51.6</td>
<td>49.4</td>
</tr>
<tr>
<td>Postnatal care within 2 days after birth from a trained provider</td>
<td>2011 (1068) 2014 (1209)</td>
<td>50.3</td>
<td>23.4</td>
</tr>
</tbody>
</table>

* Sample excludes facility births.
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Table 4. Neonatal health-care health practices (%) in the Bangladesh Demographic and Health Surveys 2011 and 2014, by socioeconomic status\textsuperscript{2,11}

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Received at least 4 antenatal care visits</td>
<td>10.6</td>
<td>15.4</td>
<td>14.9</td>
<td>20.0</td>
<td>21.0</td>
<td>27.2</td>
<td>32.7</td>
<td>38.7</td>
<td>53.2</td>
<td>55.1</td>
</tr>
<tr>
<td>Delivered in a health facility</td>
<td>9.9</td>
<td>14.9</td>
<td>17.5</td>
<td>24.1</td>
<td>24.1</td>
<td>34.0</td>
<td>39.4</td>
<td>46.3</td>
<td>59.8</td>
<td>70.2</td>
</tr>
<tr>
<td>Assisted by a medically trained provider during delivery</td>
<td>11.5</td>
<td>17.9</td>
<td>18.6</td>
<td>29.9</td>
<td>28.2</td>
<td>38.8</td>
<td>43.2</td>
<td>52.0</td>
<td>63.8</td>
<td>74.4</td>
</tr>
<tr>
<td>Used sterile/boiled instruments for cutting the umbilical cord\textsuperscript{a}</td>
<td>81.4</td>
<td>81.4</td>
<td>81.8</td>
<td>83.5</td>
<td>83.9</td>
<td>81.8</td>
<td>86.7</td>
<td>86.2</td>
<td>88.6</td>
<td>84.6</td>
</tr>
<tr>
<td>Dried within 0–4 min after birth\textsuperscript{a}</td>
<td>48.4</td>
<td>66.3</td>
<td>51.8</td>
<td>65.4</td>
<td>54.1</td>
<td>61.3</td>
<td>49.4</td>
<td>72.5</td>
<td>56.9</td>
<td>75.1</td>
</tr>
<tr>
<td>Delayed bathing (&gt;72 h after delivery)\textsuperscript{a}</td>
<td>26.3</td>
<td>28.7</td>
<td>28.6</td>
<td>35.7</td>
<td>26.3</td>
<td>38.9</td>
<td>33.2</td>
<td>37.0</td>
<td>30.0</td>
<td>34.4</td>
</tr>
<tr>
<td>Breastfeeding (within 1 h after birth)\textsuperscript{a}</td>
<td>47.5</td>
<td>60.8</td>
<td>47.8</td>
<td>53.0</td>
<td>54.1</td>
<td>55.2</td>
<td>52.1</td>
<td>59.4</td>
<td>48.6</td>
<td>56.0</td>
</tr>
<tr>
<td>Postnatal care within 2 days after birth from a trained provider</td>
<td>11.4</td>
<td>13.1</td>
<td>16.1</td>
<td>17.2</td>
<td>24.9</td>
<td>26.7</td>
<td>39.9</td>
<td>38.1</td>
<td>61.4</td>
<td>63.1</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Sample excludes facility births.

Table 5. Neonatal health-care practices (%) in the Bangladesh Demographic and Health Surveys 2011 and 2014, by sex\textsuperscript{2,11}

<table>
<thead>
<tr>
<th>Health-care practice</th>
<th>Male 2011 (2352)</th>
<th>2014 (2439)</th>
<th>Female 2011 (2300)</th>
<th>2014 (2188)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received at least 4 antenatal care visits</td>
<td>26.5</td>
<td>32.1</td>
<td>24.5</td>
<td>30.2</td>
</tr>
<tr>
<td>Delivered in a health facility</td>
<td>29.1</td>
<td>39.1</td>
<td>28.6</td>
<td>35.9</td>
</tr>
<tr>
<td>Assisted by a medically trained provider during delivery</td>
<td>32.2</td>
<td>43.7</td>
<td>31.1</td>
<td>40.2</td>
</tr>
<tr>
<td>Used sterile/boiled instruments for cutting the umbilical cord\textsuperscript{a}</td>
<td>83.5</td>
<td>82.2</td>
<td>83.8</td>
<td>84.0</td>
</tr>
<tr>
<td>Dried within 0–4 min after birth\textsuperscript{a}</td>
<td>51.4</td>
<td>66.3</td>
<td>51.4</td>
<td>67.7</td>
</tr>
<tr>
<td>Delayed bathing (&gt;72 h after delivery)\textsuperscript{a}</td>
<td>28.9</td>
<td>38.2</td>
<td>27.8</td>
<td>30.3</td>
</tr>
<tr>
<td>Breastfeeding (within 1 h after birth)\textsuperscript{a}</td>
<td>50.8</td>
<td>56.3</td>
<td>48.8</td>
<td>56.1</td>
</tr>
<tr>
<td>Postnatal care within 2 days after birth from a trained provider</td>
<td>30.4</td>
<td>32.1</td>
<td>28.8</td>
<td>30.8</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Sample excludes facility births.

Discussion

This study examined the changes over time in NMRs and health-care practices by demographic and socioeconomic groups between the 2011 and 2014 rounds of BDHS data. No reduction of NMR was observed for three divisions – Chittagong, Khulna and Rangpur. A minimal decline of NMR was observed for rural areas, with a large improvement in the two richest SES quintiles; no reduction in NMR was found for female neonates. Conversely, improvements were largely seen in health-care practices across all divisions. Improvements in all health-care services, except essential newborn care, were also observed in both urban and rural areas, while the urban–rural gap in the uptake of these services remained roughly similar over time. A similar situation was found across the SES quintiles. Considerable progress in all types of practice was observed for both sexes.

Neonatal mortality rate and health-care practices by division

An unchanged NMR was observed in Rangpur and an increased NMR in Chittagong and Khulna, despite an improvement over time in the uptake of different neonatal health-care practices. The highest poverty rate in Bangladesh is observed in Rangpur, where famine-like situations (monga) are regularly experienced by the population.\textsuperscript{2,21,22} Research has also found an association between famine and child mortality.\textsuperscript{22}

Neonatal mortality rate and health-care practices by urban/rural areas

High-quality health care during pregnancy, delivered under the supervision of health professionals, is required to reduce the risk of complications and infections that can cause neonatal deaths. Postnatal check-ups are also essential for monitoring neonatal complications, especially during the first 2 days after delivery, when a large proportion of neonatal deaths occur from...
Neonatal mortality rate and health-care practices by socioeconomic status

The sustained reduction in the NMR in Bangladesh has not occurred equitably, as can be seen by the differences across various socioeconomic groups. Like the urban versus rural case, the use of antenatal care services, facility-based delivery, assistance from a medically trained provider at delivery, and postnatal care from a trained provider were also observed to improve least for the poorest three quintiles. An important point in this connection is that the majority of the rural population exists in the bottom three SES quintiles, with only 9% in the highest wealth quintile. The ratio of delivery in a health facility between women in the lowest and the highest quintiles was 1:6 in the 2011 survey, which slightly improved to 1:5 in 2014. The reduction in this ratio did not reach the government target of 1:4 by 2016.

Neonatal mortality rate and health-care practices by neonates’ sex

This study found a reduction in NMR for male neonates between the BDHS 2011 and BDHS 2014 but not for female neonates, despite considerable improvements in selected health-care practices. This may point towards a strong preference for male offspring, which is particularly common in South Asia and may influence women/carers care of a girl child. This is in line with some previous studies that have observed gender biases in neonatal care or for seeking health care in sickness, in favour of male infants.

Overall challenges in the health system in Bangladesh

The density, skill-mix and distribution of health professionals are closely associated with neonatal survival. Although the availability of health workers is increasing over time in Bangladesh, the density (per 10,000 population) of physicians and nurses in the country in 2014 was 3.8 and 1.2 respectively. The health workforce is skewed towards doctors, with a ratio of doctors to nurses of 1:0.4, compared with the WHO-recommended ratio of 1:3.

The inequitable distribution of the health workforce is another challenge in Bangladesh. One study observed a substantial variation in the ratios of physicians to nurses in 2007 among

the divisions – Barisal (1:0.5), Chittagong (1:0.7), Dhaka (1:0.2), Khulna (1:1.4), Rajshahi (1:0.5) and Sylhet (1:0.1). Note that Rangpur was part of Rajshahi at the time the study was conducted. In addition, although 70% of the population of Bangladesh lives in rural areas, the health workforce is mainly concentrated in urban areas. This may result in rural facilities becoming overburdened and insufficiently equipped to deal with demand. Thus, not only the shortage of health workers but also the inappropriate skill-mix and inequitable distribution of human resources for health in Bangladesh could be a major factor impeding the improvement of health outcomes, including neonatal mortality.

Limitations of this study

The present study cannot draw conclusions about the impact of health-care practices as well as demographic and socioeconomic variables on NMRs. However, the data presented are a useful starting point for further in-depth research on NMRs to achieve SDG 3 in Bangladesh. It is important to note that previous studies have also attempted to carry out a similar investigation of achievement of health-related goals. Also, the survey relies on self-reported information in which recall bias can be an important issue, as interviewees are required to recollect events as far back as 3 years. This may affect the responses of some demographic and socioeconomic groups differently and, consequently, responses for some groups may be more imprecise than for others. Furthermore, the surveys excluded women who died before the survey and so data relating to their birth practices are missing; data on essential newborn care and neonatal survival for these women could be systematically different from those for women who survived and were therefore included in the surveys. In addition, it was not possible in this study to provide comprehensive information, as detailed statistics were unavailable in the BDHS reports. Importantly, the BDHS 2014 notes that the findings for the selected socioeconomic and demographic differentials must be interpreted with caution, given the low precision of mortality estimates due to sampling error.

Conclusion

This study on differences between the BDHS 2011 and BDHS 2014 in NMRs and health-care practices across selected demographic and socioeconomic groups is a useful starting point for further in-depth research. The study analysis found three main issues that need to be investigated further to inform policy and programmes in Bangladesh. First, the analysis indicates that it can be useful to investigate whether the higher NMRs in rural areas and for households with lower socioeconomic status can be reduced by emphasizing the importance of uptake of antenatal care services, facility-based delivery, assistance from a medically trained provider during delivery, and postnatal care from a trained provider. Second, the findings of an unchanged NMR in female neonates may encourage policy-makers to focus not only on ensuring standard essential newborn care practices for both male and female neonates but also on ensuring adequate and appropriate care-seeking for illness for female neonates. Finally, no observed improvement in the NMR in some selected divisions may indicate that NMR-related programmes in these areas need to be given special attention. Such measures would also be useful for improving NMRs in low- and middle-income countries with similar health infrastructures.
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Authorship: TA processed and analysed the data and drafted the paper. AD supervised and contributed to drafting the paper. DS supervised and contributed to the data analysis and drafting the paper. All the authors contributed to the study conception and approved the final version to be published.


References


Policy and practice

Large-scale mHealth professional support for health workers in rural Maharashtra, India

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Abstract
Expanding mobile telephony in India has prompted interest in the potential of mobile-telephone health (mHealth) in linking health workers in rural areas with specialist medical advice and other professional services. In 2012, a toll-free helpline offering specialist medical advice to community-based health workers throughout Maharashtra was launched. Calls are handled via a 24 h centre in Pune, staffed by health advisory officers and medical specialists. Health advisory officers handle general queries, which include medical advice via validated algorithms; blood on-call services; grievance issues; and mental health support – the latter calls are transferred to a qualified counsellor. Calls requiring more specialist advice are transferred to the appropriate medical specialist. This paper describes the experience of the first 4 years of this helpline, in terms of the services used, callers, nature of calls, types of queries serviced and lessons learnt. In the first 4 years of the helpline, 669,265 calls were serviced. Of these calls, 453,373 (67.74%) needed medical advice and were handled by health advisory officers. Specialist services were required to address 199,226 (29.77%) calls. Blood-bank-related services accounted for 7,919 (1.18%) calls, while 2,462 (0.37%) were grievance calls. Counselling for mental health issues accounted for 6,285 (0.94%) calls. The large-scale mHealth professional support provided by this helpline in Maharashtra has reached many health workers serving rural communities. Future work is required to explore ways to expand the reach of the helpline further and to measure its effectiveness in improving health outcomes.

Keywords: call centre, health advisory support, health information, India, mHealth

Background
India is a large country with vast disparities between the urban and rural areas, in both the distribution of health resources and health-care outcomes. In 2011, of the 1.4 million medical practitioners in India, 74% lived in urban areas serving about 30% of the population, while the remaining 26% served the 70% of the population residing in rural areas.1 The deficiency in specialists in various states has been well documented.2–4 Overall, for the rural public health-care system in 2012, the average shortfall of specialists was 77.2% in the Empowered Action Group (EAG) states, 56.1% in the non-EAG states, and 69.7% in India overall.5 This disparity in health resources contributes to skewed health outcomes and health services coverage.6,7 For example, for 2016, the estimated infant mortality rate in urban India was 23.0 per 1000 live births compared to 38.0 per 1000 live births in rural India. Similarly, the crude death rate was 5.4 per 1000 population in urban India compared to 6.9 per 1000 population in rural India during the same time period.8

Measures to address the shortage of skilled health workers in rural India include monetary compensation, workforce management, education and continuous professional development, and alternative service providers. Considerable success has also been achieved with education-related innovations and the community health worker programme.1 Community health workers are central to primary health-care service delivery in rural India but often lack support in handling complicated cases in the field, requiring consultation and opinions from specialist doctors. Similarly, medical officers working in remote areas may also need specialist advice at times.

Expanding mobile telephony and low-cost internet services in India has enabled easy people-to-people communication and information exchange.9 Tapping into the combined potential of mobile technology and health communication, widely known as electronic health (eHealth), can play a significant role in linking health workers in underserved areas with specialist medical advice and other professional services. The World Health Organization defines eHealth as “the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research”.10 Specifically, the rapid spread of mobile technologies, as well as advances in their innovative application to address health priorities, has evolved
into a new field of eHealth, known as mHealth.\textsuperscript{11} The Global Observatory for eHealth has defined mHealth, or mobile health, as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices”.\textsuperscript{12} mHealth involves the use and capitalization of a mobile phone’s core utility of voice and short messaging services. It also utilizes more complex functionalities and applications, including general packet radio service, third- and fourth-generation mobile telecommunications (3G and 4G systems), global positioning systems and Bluetooth technology.\textsuperscript{12}

Among health workers in low- and middle-income countries, mHealth interventions have shown improved communication, better access to health-care information and increased likelihood of receiving specialist advice.\textsuperscript{13–15} Although the use of mHealth shows promise, findings from the Global Observatory for eHealth survey in 2011 highlighted that most mHealth initiatives were only small-scale pilot projects, mainly addressing single issues in information sharing and access; there were few examples of large-scale mHealth implementations.\textsuperscript{15} This paper reports the preliminary findings from the first 4 years of a large-scale mHealth intervention supporting rural health workers throughout the state of Maharashtra in India.

The initiative arose because the Government of Maharashtra identified a need to support its existing health-care professionals while they are working in the field. Pioneered and initiated by Piramal Swasthya Management and Research Institute, in collaboration with the state government and the National Rural Health Mission, Maharashtra, a technology-based platform known as the Health Information Helpline was launched in 2012 at Pune, Maharashtra. The helpline offers specialist medical advice to community-based health workers. This paper describes the services, with special emphasis on the callers, the nature of calls, and the types of queries serviced from the time of inception up to December 2015.

The National Health Mission, Government of Maharashtra and Naithika Independent Ethics Committee approved the study (registration number: ECR/42/Indt/AP/2013).

**Setting**

The state of Maharashtra is located in the west-central part of India, along the coastline of the Arabian Sea. It is the second largest state in India in terms of population (112 million) and the third largest state by area (0.308 million km\(^2\)). The population of the state contributes 9.3\% of the total population of India.\textsuperscript{16} Over the decade 2001–2011, the state recorded a population growth rate (16\%) that was marginally lower than the national average (17.7\%).\textsuperscript{17} The state has a population density of 365 per km\(^2\) and is among the highly urbanized Indian states, with 45.2\% of the total population residing in urban areas.\textsuperscript{17} It is one of the wealthiest and most developed states in India, contributing 25\% of India’s industrial output and over 20\% of the country’s gross domestic product.\textsuperscript{16} In the National Family Health Survey 4 (2015–2016), the sex ratio at birth (924 females per 1000 males) and literacy rate (83\%) were well above the national average of 919 females per 1000 males and 74\% respectively.\textsuperscript{18} In terms of health indicators, the state has a better infant mortality rate (IMR; 19 per 1000 live births) and maternal mortality ratio (MMR; 68 per 100000 live births) when compared to India as a whole (IMR: 34 per 1000 live births; MMR: 167 per 100000 live births).\textsuperscript{8}

**The public health-care system in Maharashtra and in India**

India has a mixed health-care system; Maharashtra is no different. It comprises both public and private health-care service providers. However, most of the private health-care providers are concentrated in urban India, providing secondary and tertiary care services. The public health-care infrastructure in rural areas has been developed as a three-tier system based on the population norms, and is described next.\textsuperscript{19}

**Subcentres**

A subcentre is the most peripheral and first contact point between the primary health-care system and the community, and is established in plain areas with a population of 5000 people and in hilly/difficult-to-reach/tribal areas with a population of 3000. Each subcentre is staffed by one auxiliary nurse midwife (ANM)/female health worker and one male health worker. The subcentres are assigned tasks in order to bring about behavioural change in the community and to provide services in relation to maternal and child health, family welfare, nutrition, immunization, diarrhoea control and control of communicable diseases.

**Primary health centres**

A primary health centre is established in plain areas with a population of 30 000 people and in hilly/difficult-to-reach/tribal areas with a population of 20 000, and is the first contact point between the village community and the medical officer. The primary health centres were envisaged to provide integrated curative and preventive health care to the rural population, with emphasis on the preventive and promotive aspects of health care. Primary health centres are established and maintained by the state governments. As per minimum requirement, a primary health centre is to be staffed by a medical officer supported by 14 paramedical and other staff. Under the National Rural Health Mission, there is also a provision for an additional ANM, depending on local needs. The primary health centre acts as a referral unit for 5–6 subcentres and has 4–6 beds for inpatients.

**Community health centres**

Community health centres are established and maintained by the state government in areas with a population of 120 000 people and in hilly/difficult-to-reach/tribal areas with a population of 80 000. As per minimum norms, a community health centre is required to be staffed by four medical specialists, namely a surgeon, a physician, an obstetrician gynaecologist and a paediatrician, supported by 21 paramedical and other staff. It has 30 beds and serves as a referral centre for primary health centres within the block and also provides facilities for obstetric care and specialist consultations.

In addition to the above, under the National Rural Health Mission, every village has a minimum of one accredited social health activist (ASHA). These are village-level incentivized health functionaries, whose role is to act as the link between the community and the health system. An ASHA is now an integral part of India’s public health-care system, in the form of a health catalyst.\textsuperscript{20}
Components and functioning of the call centre

Health workers eligible to use the helpline
The population eligible to use the helpline comprises ASHAs, ANMs, health assistants (male and female), multipurpose health workers (male and female), pharmacists and laboratory technicians, as well as medical officers working in public health facilities.

At the time the helpline service was launched, in the public health-care sector in the state of Maharashtra, there was a total of 96,431 health professionals, of whom 58,508 (60.70%) were ASHAs, 12,627 (13.10%) were ANMs (including the additional auxiliary nurse midwives), 3,709 (3.84%) were medical officers, 7,284 (7.56%) were health assistants, 10,780 (11.18%) were multipurpose health workers, 2,238 (2.32%) were pharmacists and 1,285 (1.33%) were laboratory technicians. Although published data are not available regarding the availability and use of mobile phones among the health-care professionals in Maharashtra, the Government of Maharashtra communicates many key messages to the health-care professionals via mobile phone.

The set-up and staffing pattern
The service is made available through a toll-free phone call to a three-digit number (104) from any landline or mobile phone. The set-up comprises a 22-seat capacity call centre that is functional 24×7 throughout the year. The staff comprise health advisory officers (34), service improvement officers (16), gynaecologists (5), paediatricians (3), a general physician (1), a general surgeon (1), a public health specialist (1), counsellors (5) and supervisors and administrative officers (6). Specialist doctors include gynaecologists, paediatricians, a general physician, a general surgeon and a public health specialist. Twenty-two paramedical staff and specialist doctors, namely a gynaecologist and a paediatrician, work in rotational shifts. There are three shifts, 07:00 to 14:00; 14:00 to 21:00 and 21:00 to 07:00. Depending on call volumes, the numbers of staff are adjusted for the night services. Calls for a gynaecologist or paediatrician are handled 24×7, as these professionals work in three shifts. Most of the calls for specialists directed towards the general physician, general surgeon and public health specialist are during the daytime and hence these specialists’ working hours are from 09:00 to 18:00. If a caller wants to speak to a physician, general surgeon or public health specialist in their absence, and if the call is for an emergency, then the call is connected to the respective specialist, through a conference call (any time of the day). If such a call is a non-emergency, then it is handled by the gynaecologist/paediatrician on duty. If they are unable to address the query, the caller is asked to call back the next day.

The services are provided in three languages, namely Marathi, English and Hindi. Specifically designed algorithms and theme-based documents are used as tools to deliver these services. Information on government-run schemes and facilities is also available and updated periodically.

An algorithm consists of an orderly sequence of steps, with each step depending on the outcome of the previous one. Based on this step-by-step sequence, the queries posed by callers are answered. This step-by-step sequence helps to provide comprehensive information regarding a disease, or in clarifying any other health-related query, to the caller. Theme-based documents are used while dealing with mental health issues. The algorithms and theme-based documents were specifically developed for the service and were validated both internally and externally by expert doctors from different medical institutions and hospitals appointed by the Government of Maharashtra.

The process involved
When a patient approaches a health worker or a medical officer, the required care is offered by the relevant health professional. However, if the health professional requires further guidance or some clarification, he or she can call 104 from any mobile phone or landline in Maharashtra. The call is attended to by a health advisory officer at the call centre. The trained health advisory officer registers the call by asking a set of preliminary questions about the caller and the query (see Box 1). After this set of preliminary questions, a unique beneficiary identification number is generated. Depending on the caller type, medical officers’ and specialists’ calls are directly transferred to the specialist requested and the calls from ASHAs and ANMs are then handled by the health advisory officer. The officer probes the query to identify the correct algorithm. Once the algorithm is identified, there are three possible scenarios:

Scenario 1: general query
A health advisory officer handles general queries himself or herself. He or she uses the algorithms to resolve the query and closes the call. A general query can be of the following types:

- **medical advice**: the health professional calling requires advice pertaining to a particular medical condition; validated algorithms are used to provide the medical advice;
- **blood on-call services**: callers may request information regarding blood or a specific blood group. The details are registered and shared with the blood banks affiliated with this process. The caller is informed about the availability as well as about non-availability of the blood. In addition, after 4 h of noting their requirement, a call is made to the caller to cross-check whether his or her request has been taken care of;
- **mental health issues**: in some cases, health workers call specifically about issues related to the mental health of their patients. This is given special care and transferred to a counsellor (MA in psychology), who then uses theme-based documents to counsel the patient directly.

**Box 1. Initial set of questions for classifying patients**
- General questions: age, sex, phone number, taluk, village, district
- Caller type: whether the call is from an ASHA, ANM, medical officer or specialist
- Unit type: whether the call is from a subcentre, primary health centre or community health centre
- Repeat call: whether the caller has called 104 before, for the same condition
Scenario 2: specialist advice
A caller requiring a specialist consultation is transferred to the respective specialist doctor, who then attends to the call, interacts with the health worker, listens to his/her query, offers advice and finally closes the call.

Scenario 3: emergency response
If emergency medical services are needed, the caller is requested to call the 108 emergency service, since the two services are not yet interconnected.

A call that is attended to and completed by the health advisory officer or one of the specialists at the Health Information Helpline is called a serviced call.

Recruitment and training of call centre staff
The recruitment process is stringent and the traits of a successful call taker are observed before selecting candidates. In order to be eligible, candidates applying for the post of health advisory officer must have completed either Bachelor of Pharmacy or Bachelor of Ayurveda, Medicine or Surgery, or be a life sciences graduate. He or she must be proficient in all three languages, namely, Marathi, English and Hindi. After selection, they undergo a 10-day training programme focusing on technical aspects, algorithms, communication skills, language skills, probing skills, data-entry skills and professional customer care service skills, including call handling, call disposition, reporting, quality assurance and monitoring. Quarterly training programmes are conducted to ensure service quality. In addition, monthly review sessions are conducted, followed by short training sessions focusing on individual shortcomings. The performance of staff is continuously assessed by a transaction monitoring process, to generate a quality score based on their communication skills; data-entry skills; and ability to interpret needs and articulate the best responses, to deliver rebuttal if a caller creates a nuisance, and to mirror the caller’s style.

Development, user feedback and promotion of the service

Content testing
System design began after the success of a programme that Piramal Swasthya Management and Research Institute established and implemented in partnership with the Government of Andhra Pradesh during 2007 and 2012. This service was available for the general public and received over 53 million calls during this period. The experience of establishing the service in Andhra Pradesh was used to develop the Maharashtra service but with the addition of new algorithms and disease summaries, since the intended end-users were health-care professionals rather than the general public. The new algorithms and disease summaries were developed and then validated by experts in the specialty, by the Government of Maharashtra. These are updated regularly, each year.

User feedback
Customer satisfaction is assessed via a feedback survey using a “Customer Delight Index”. The service user is contacted by staff members dedicated for this purpose (outside of the regular staff – a different department altogether) to get their feedback regarding their experience with the service, in terms of user satisfaction, utility and quality of service, and the call is rated on a scale of 0–5. The following questions are used for the feedback survey:

- was the service provider empathetic and polite throughout the call?
- did you feel the agent understood and handled your health concern appropriately?
- did the advice give you relief for your problem?
- will you use the services of 104 again?
- would you like to refer the 104 service to your relatives, friends and others?
- which facility would you have visited if 104 was not available?
- how much money would you have spent approximately for your problem if you had availed the services of a doctor?
- what was your overall experience when you last called 104?

Access of individual participants
Initially there was a challenge for health-care professionals, many of whom felt that calling up an invisible stranger and trusting that stranger was a barrier. However, this barrier has slowly been overcome. As the specialists provided by the service have mostly remained the same, they have been able to develop a rapport with the health-care professionals using the service and an element of trust has developed over time. More and more health-care professionals have started calling the helpline. News has spread by word of mouth and perceptions regarding the service have changed. In addition, the Government of Maharashtra has carried out information, education and communication activities within the government hospitals, spreading the word about the services.

Another challenge is that of long waiting periods. The call reaches the service provider and is then transferred to the server, where it is allotted according to the availability of a registration officer. Sometimes, if there is a long wait, the caller disconnects the call. For such cases, a system of making outbound calls to these callers has been developed, to provide the required service. However, some of these callers may be lost, owing to connectivity issues or failure to pick up the call.

Service promotion
Promotion of the service is carried out in many ways:

- display boards with information about the service are put up in all government health facilities in Maharashtra;
- information regarding this service is provided in all monthly review meetings with health-care professionals;
• advertisements are regularly given out on radio and in newspapers.

Data extraction and analysis

A secure web-based application is used to capture real-time data. Once calls are received, three kinds of data are captured. First, demographic data are collected as part of the electronic medical record. Then there are data pertaining to the algorithms and theme-based documents that are used to deliver the necessary advice. These form the primary data, which have been used for the purpose of this article. The voice recordings are secondary data. All call data are stored on the main server and a scheduler is run to upload these data daily onto the reporting server, central reporting or dashboard server, as well as an external back-up disk. Voice recordings are not used for any kind of data analyses, but are used only for quality checks, as per the government regulations.

In order to extract the data into Excel, an authorized administrator is logged in to the central reporting application. The application then executes preset Structured Query Language queries based on the data model, to generate Excel reports.

Observations made on calls and callers

During the first 4 years of its activity from January 2012 to December 2015, the helpline received a total of 839108 calls, of which 669265 (79.76%) were serviced calls. Disconnected calls (101336, 12.08%), calls with noise disturbances that were terminated (7573, 0.90%), nuisance calls (30999, 3.69%), and silent or wrong calls (29935, 3.57%) contributed to the remaining unserviced calls. Since a serviced call is one that is attended to and completed by an official at the call centre, detailed information regarding the profile of the calls is available only for the serviced calls. Hence, this paper will focus only on those calls (n = 669265).

Table 1 gives a breakdown of the serviced calls (100%). Of the total number of serviced calls, 453373 (67.74%) needed medical advice and were handled by non-specialists (health advisory officers). Specialist services were required to address 199226 (29.77%) calls that needed specialist medical advice. Of the service-provided calls, 7919 (1.18%) required blood-bank-related services, while 2462 (0.37%) were made to lodge a grievance by the health functionary. Additionally, a total of 6285 (0.94%) calls seeking counselling for mental health issues were handled by the call centre. Table 2 presents the distribution of calls by professional cadre and type of service sought. It was found that the highest proportion of calls were from ASHAs (67.66%), followed by ANMs (17.62%) and medical officers (9.06%). It is important to note that a single individual may have made more than one call.

Of all the calls made by ASHAs, 74.58% were made to seek non-specialist medical advice, while 23.19% were made to seek specialist medical advice. Similarly, 54.43% of the calls made by ANMs, 64.38% of the calls made by health assistants and 62.66% of the calls made by multipurpose workers were made to seek non-specialist medical advice, while 44.32% of the calls made by ANMs, 33.60% of the calls made by health assistants and 35.67% of the calls made by multipurpose workers were made to seek specialist medical advice. A little less than half the calls by medical officers were made to seek specialist medical advice (47.74%). More than one third of the calls made by pharmacists were made to seek advice from a specialist (38.40%) and these calls were mostly related to prescriptions and drug dosages.

Table 3 presents the distribution of the study population and the type of specialist service they sought. Of the 199226 calls that were handled by a specialist at the call centre, most required the service of a gynaecologist (48.08%), followed by a general physician (27.34%), a paediatrician (10.69%), a general surgeon (7.44%) or a public health specialist (6.44%). Of all those who sought specialist service, more than half were ASHAs (52.70%), followed by ANMs (26.23%).

Table 1. Breakdown of the serviced calls handled by the call centre, n = 669265

<table>
<thead>
<tr>
<th>Type of call</th>
<th>Number (%) of calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-specialist medical advice</td>
<td>453373 (67.74)</td>
</tr>
<tr>
<td>Specialist medical advice</td>
<td>199226 (29.77)</td>
</tr>
<tr>
<td>Grievance</td>
<td>7919 (1.18)</td>
</tr>
<tr>
<td>Calls pertaining to blood-bank-related services</td>
<td>6285 (0.94)</td>
</tr>
<tr>
<td>Calls seeking counselling for mental health issues</td>
<td>6285 (0.94)</td>
</tr>
<tr>
<td>Total number of service-provided calls</td>
<td>669265 (100)</td>
</tr>
</tbody>
</table>

Table 2. Distribution of calls by the study population and type of service sought

<table>
<thead>
<tr>
<th>Type of caller</th>
<th>Medical advice: non-specialist</th>
<th>Medical advice: specialist</th>
<th>Grievance calls</th>
<th>Blood bank services</th>
<th>Mental health counselling</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accredited social health activist</td>
<td>337707 (74.58)</td>
<td>105001 (23.19)</td>
<td>1377 (0.30)</td>
<td>3180 (0.70)</td>
<td>5566 (1.23)</td>
<td>452831 (67.66)</td>
</tr>
<tr>
<td>Auxiliary nurse midwife*</td>
<td>64177 (54.43)</td>
<td>52260 (44.32)</td>
<td>286 (0.24)</td>
<td>812 (0.69)</td>
<td>376 (0.32)</td>
<td>117911 (17.62)</td>
</tr>
<tr>
<td>Medical officer</td>
<td>27878 (45.82)</td>
<td>28949 (47.74)</td>
<td>653 (1.08)</td>
<td>3132 (5.16)</td>
<td>119 (0.20)</td>
<td>60640 (9.06)</td>
</tr>
<tr>
<td>Health assistant (male or female)*</td>
<td>10554 (64.38)</td>
<td>5509 (33.60)</td>
<td>73 (0.45)</td>
<td>149 (0.91)</td>
<td>109 (0.66)</td>
<td>16394 (2.45)</td>
</tr>
<tr>
<td>Multipurpose worker (male or female)*</td>
<td>10169 (62.66)</td>
<td>5790 (35.67)</td>
<td>38 (0.23)</td>
<td>142 (0.87)</td>
<td>91 (0.56)</td>
<td>16230 (2.43)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>2244 (59.27)</td>
<td>1454 (38.40)</td>
<td>29 (0.77)</td>
<td>37 (0.98)</td>
<td>22 (0.58)</td>
<td>3786 (0.57)</td>
</tr>
<tr>
<td>Laboratory technician</td>
<td>735 (49.90)</td>
<td>263 (17.85)</td>
<td>6 (0.41)</td>
<td>467 (31.70)</td>
<td>2 (0.14)</td>
<td>1473 (0.22)</td>
</tr>
<tr>
<td>Total</td>
<td>453373 (67.74)</td>
<td>199226 (29.77)</td>
<td>2462 (0.37)</td>
<td>7919 (1.18)</td>
<td>6285 (0.94)</td>
<td>669265 (100)</td>
</tr>
</tbody>
</table>

* Auxiliary nurse midwives and additional auxiliary nurse midwives, male and female multipurpose workers, and male and female health assistants have been grouped together.
reducing this to some extent, but it is probable that nuisance calls the 104 number is toll-free. Targeted advertising might help in attributed to network-related issues. Nuisance calls accounted about their concerns or felt shy or apprehensive about discussing number, or that they were silent as they were not yet ready to talk. Probable reasons are that the caller dialled a wrong helpline disconnected midway during the interactions. Disconnected nuisance calls, or calls with noises and disturbances or that got serviced, since they were either silent or wrong calls, or. The remaining 20.24% of calls could not be used it routinely during their working hours, 23 but the study study conducted in Karnataka on the role of mobile phones to improve the range and quality of services provided by the people they serve. There is a lack of published data on the availability of infrastructure to support technology operations in the study location. However, the government itself shared a database of contact numbers of all ASHAs, ANMs and medical officers working in the state of Maharashtra. The authors therefore believe that all these health professionals either possess or have access to mobile phones to utilize the service line whenever necessary. However, inclusion of a few additional questions is being considered; these would be used after the queries of the caller are answered satisfactorily, and would pertain to the professionals’ ownership of mobile phones, data connectivity and availability of technical support in their locations, to understand their challenges at the field level. A study conducted in Karnataka on the role of mobile phones in female health workers’ work routine, revealed that 100% of ASHAs and health workers possessed a mobile phone and used it routinely during their working hours, 23 but the study failed to capture information pertaining to data connectivity and the availability of technical support in their locations. Out of the total calls received on the server, 79.76% were serviced calls. The remaining 20.24% of calls could not be serviced, since they were either silent or wrong calls, or nuisance calls, or calls with noises and disturbances or that got disconnected midway during the interactions. Disconnected calls were given a call back; 3.57% were silent or wrong calls. Probable reasons are that the caller dialled a wrong helpline number, or that they were silent as they were not yet ready to talk about their concerns or felt shy or apprehensive about discussing their health concerns over the telephone. Silent calls can also be attributed to network-related issues. Nuisance calls accounted for 3.69% of calls; many of these may be attributed to the fact that the 104 number is toll-free. Targeted advertising might help in reducing this to some extent, but it is probable that nuisance calls can neither be eliminated nor reduced significantly. It is important to simply be aware that about 4% of calls will be nuisance calls. Over a period of 4 years, 839 108 calls from 96 431 health-care professionals resulted in an average of 2.18 calls per person per year. This is a relatively low number and there is scope for improvement in the number of calls received. On a daily basis, the helpline makes about 300 outbound calls to ASHAs and ANMs in the state, using the database shared by the government, to promote the call centre and explain the available services and new government incentives and schemes. One round of calls to all the ASHAs and ANMs in the state is completed in about 6 months, and the process is then repeated. It was observed that the maximum number of calls was made by ASHAs, followed by ANMs and medical officers. This is as expected, as there are more ASHAs than the other two cadres. Most calls that sought specialist medical advice sought the advice of a gynaecologist (48.08%) or a paediatrician (10.69%). This is probably due to the fact that most ASHAs are trained in, and receive performance-based incentives for, promoting universal immunization, referral and escort services for reproductive and child health and other health-care programmes in the community. ASHAs are usually the first contact for any health-related demands of underserved sections of the population, especially women and children, who might have difficulty in accessing health services. Only a small proportion of the calls resulted in counselling for patients with issues related to mental health (0.94%). As the service is mainly utilized by health workers in the community and not by the patients themselves, most of the queries and support needed are for medical advice. Most community health workers are not trained in identifying issues related to mental health, indicating that there is scope for improvement; with training on aspects of mental health and increasing awareness about the availability of counselling services, the utilization might be higher. The authors’ experience in Maharashtra provides preliminary data demonstrating that mHealth is an easily accessible professional support system for community health workers. A recent systematic review suggests that mHealth interventions directed at health workers in low-resource settings has the potential for widespread health system improvements using technology. Another review by Braun and colleagues provides evidence that mobile technology offers promising opportunities to improve the range and quality of services provided by community health workers.

### Lessons learnt

The Health Information Helpline offering specialist medical advice to community-based health workers in rural Maharashtra is one of the largest mHealth initiatives in India to date. Over a period of 48 months, the helpline serviced a total of 669 265 calls. It is important that community health workers, who form an important part of health-care delivery in India, are adequately supported by the government. This large-scale Health Information Helpline was set up to provide professional support to health workers and empower them in providing effective and high-quality health care to the population they serve.

### Table 3. Distribution of the calls seeking specialist service by the study population and service sought

<table>
<thead>
<tr>
<th>Type of caller</th>
<th>Gynaecologist</th>
<th>Paediatrician</th>
<th>General physician</th>
<th>Public health officer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accredited social health activist</td>
<td>45 293 (43.14)</td>
<td>10 613 (10.11)</td>
<td>32 700 (31.14)</td>
<td>8 136 (7.75)</td>
<td>105 001 (52.70)</td>
</tr>
<tr>
<td>Auxiliary nurse midwife</td>
<td>33 054 (63.25)</td>
<td>4 954 (9.48)</td>
<td>10 865 (20.79)</td>
<td>1 888 (3.61)</td>
<td>52 260 (26.23)</td>
</tr>
<tr>
<td>Medical officer</td>
<td>13 224 (45.68)</td>
<td>2 915 (10.07)</td>
<td>7 073 (24.43)</td>
<td>3 542 (12.24)</td>
<td>28 949 (14.53)</td>
</tr>
<tr>
<td>Health assistant (male or female)</td>
<td>2 013 (36.54)</td>
<td>1 245 (22.60)</td>
<td>1 576 (28.61)</td>
<td>386 (7.01)</td>
<td>5 289 (2.77)</td>
</tr>
<tr>
<td>Multipurpose worker (male or female)</td>
<td>1 753 (30.28)</td>
<td>1 245 (21.50)</td>
<td>1 754 (30.29)</td>
<td>588 (10.16)</td>
<td>5 790 (2.91)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>389 (26.75)</td>
<td>253 (17.40)</td>
<td>446 (30.67)</td>
<td>240 (16.51)</td>
<td>1 454 (0.73)</td>
</tr>
<tr>
<td>Laboratory technician</td>
<td>68 (25.86)</td>
<td>75 (28.52)</td>
<td>48 (18.25)</td>
<td>44 (16.73)</td>
<td>263 (0.13)</td>
</tr>
<tr>
<td>Total</td>
<td>95 794 (48.08)</td>
<td>21 307 (10.69)</td>
<td>54 462 (27.34)</td>
<td>14 824 (7.44)</td>
<td>199 226 (100)</td>
</tr>
</tbody>
</table>

* Auxiliary nurse midwives and additional auxiliary nurse midwives, male and female multipurpose workers, and male and female health assistants have been grouped together.

### Table 3. Distribution of the calls seeking specialist service by the study population and service sought

Out of the total calls received on the server, 79.76% were serviced calls. The remaining 20.24% of calls could not be serviced, since they were either silent or wrong calls, or nuisance calls, or calls with noises and disturbances or that got disconnected midway during the interactions. Disconnected calls were given a call back; 3.57% were silent or wrong calls. Probable reasons are that the caller dialled a wrong helpline number, or that they were silent as they were not yet ready to talk about their concerns or felt shy or apprehensive about discussing their health concerns over the telephone. Silent calls can also be attributed to network-related issues. Nuisance calls accounted for 3.69% of calls; many of these may be attributed to the fact that the 104 number is toll-free. Targeted advertising might help in reducing this to some extent, but it is probable that nuisance calls can neither be eliminated nor reduced significantly. It is important to simply be aware that about 4% of calls will be nuisance calls. Over a period of 4 years, 839 108 calls from 96 431 health-care professionals resulted in an average of 2.18 calls per person per year. This is a relatively low number and there is scope for improvement in the number of calls received. On a daily basis, the helpline makes about 300 outbound calls to ASHAs and ANMs in the state, using the database shared by the government, to promote the call centre and explain the available services and new government incentives and schemes. One round of calls to all the ASHAs and ANMs in the state is completed in about 6 months, and the process is then repeated. It was observed that the maximum number of calls was made by ASHAs, followed by ANMs and medical officers. This is as expected, as there are more ASHAs than the other two cadres. Most calls that sought specialist medical advice sought the advice of a gynaecologist (48.08%) or a paediatrician (10.69%). This is probably due to the fact that most ASHAs are trained in, and receive performance-based incentives for, promoting universal immunization, referral and escort services for reproductive and child health and other health-care programmes in the community. ASHAs are usually the first contact for any health-related demands of underserved sections of the population, especially women and children, who might have difficulty in accessing health services. Only a small proportion of the calls resulted in counselling for patients with issues related to mental health (0.94%). As the service is mainly utilized by health workers in the community and not by the patients themselves, most of the queries and support needed are for medical advice. Most community health workers are not trained in identifying issues related to mental health, indicating that there is scope for improvement; with training on aspects of mental health and increasing awareness about the availability of counselling services, the utilization might be higher. The authors’ experience in Maharashtra provides preliminary data demonstrating that mHealth is an easily accessible professional support system for community health workers. A recent systematic review suggests that mHealth interventions directed at health workers in low-resource settings has the potential for widespread health system improvements using technology. Another review by Braun and colleagues provides evidence that mobile technology offers promising opportunities to improve the range and quality of services provided by community health workers.
Future directions

To the best of the authors' knowledge, no other study from India has explored these aspects of mHealth among community health workers. There is some literature that suggests that mHealth interventions are acceptable among patients for receiving health information and supporting health care in the rural Indian context. However, further research into the acceptability and usability of this service at the community level among patients and health workers needs to be undertaken.

Surveys on the health outcomes due to this intervention, cost effectiveness and patient satisfaction are necessary to understand the effectiveness of this helpline. In addition, efforts towards understanding the utility of the helpline in improving health workers' knowledge, practice, motivation and work efficiency need to be explored in more detail.

Conclusion

The large-scale mHealth professional support provided by this helpline has reached a large number of health workers in the community in rural Maharashtra. Future work is required to explore ways to reach a greater number of health workers and to measure the effectiveness of the helpline in improving health outcomes.

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