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have examined a dissertation entitled

"High-Quality Primary Health Care:
User and Facility Determinants of Best-in-Class Performance"

presented by

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candidate for the degree of Doctor of Philosophy
and hereby certify that it is worthy of acceptance.

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Date: 26 August 2021

HIGH-QUALITY PRIMARY HEALTH CARE: USER AND FACILITY DETERMINANTS OF BEST-IN-CLASS PERFORMANCE

TODD LEWIS

A dissertation submitted to the faculty of the

Harvard T.H. Chan School of Public Health

in partial fulfillment of the requirements

for the degree of *Doctor of Philosophy*

in Population Health Sciences

in the Department of Global Health and Population

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HIGH-QUALITY PRIMARY HEALTH CARE: USER AND FACILITY DETERMINANTS OF BEST-IN-CLASS PERFORMANCE

Abstract

Primary care is the foundation of a high-functioning health system and is critical to addressing the growing double burden of disease facing low- and middle-income countries (LMICs). Despite this, primary care services are often of insufficient quality to optimize health. By one estimate, poor quality health systems result in more than 8 million deaths per year in LMICs, many from conditions treatable by primary care. While quality is low overall, some health facilities outperform their counterparts in similar contexts. This suggests that higher quality of care is attainable in many settings within existing resource constraints. However, more evidence is needed on the factors that distinguish best and worst performance among health facilities and how populations can extract better care from the health system.

The three chapters that follow investigate variations in primary care quality to understand how health system stakeholders can elevate performance. I used multiple methodologies to develop a rich set of insights into performance, including quantitative analysis to signal potential drivers of quality and qualitative analysis to explore how they operate. Chapter 2 used data from Demographic and Health Surveys in 16 countries in sub-Saharan Africa to show that more empowered mothers of children with fever and malaria may be able to obtain better quality care for their children. In Chapters 3 and 4, I used positive deviance analysis within an explanatory sequential mixed methods framework to understand the factors that distinguish best and worst

primary care performance. Chapter 3 is a large, multi-country quantitative analysis of Service Provision Assessment data from seven LMICs. Results identified governance, workforce, and community engagement factors that predicted best versus worst performance among hospitals and clinics. Chapter 4, a qualitative analysis that aimed for deep insight into performance in a particular health system, used primary data from interviews with leaders and clinicians to explore the mechanisms that distinguished best performance in primary health care centers in Nepal. Findings across papers showed that effective facility management, engagement of local leadership, and community accountability were key drivers of facility performance.

Together, these papers demonstrate that strong health system management and engagement of users and communities is critical for optimizing health in LMICs. Findings can be used to identify scalable practices that can empower users, elevate primary care performance, and improve service quality in resource-constrained health systems.

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Acronyms

ACT artemisinin-based combination therapy

AIRR adjusted incidence rate ratio

AOR adjusted odds ratio

CI confidence interval

DHS Demographic and Health Surveys

DRC Democratic Republic of the Congo

GMPI Good Medical Practice Index

HMIS health management information system

HQSS *The Lancet Global Health* Commission on High Quality Health Systems in the SDG Era

IQR interquartile range

LMICs low- and middle-income countries

NGO non-governmental organization

ORS oral rehydration salts

PHCC primary health care center

RDT rapid diagnostic test

SD standard deviation

SDGs Sustainable Development Goals

SPA Service Provision Assessment

ZIP zero-inflated Poisson

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TO MY PARENTS, DONNA AND PETER LEWIS, WHOSE ONLY REQUEST WAS THAT I LEARN SOMETHING.

CHAPTER 1:

INTRODUCTION

Primary care is the foundation of the health system. Primary care has been defined as: "the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community."[1] When functioning as intended, primary care provides comprehensive, continuous, coordinated care across the life course for all individuals and families and can reduce morbidity, increase patient longevity, and improve health equity.[2,3] Primary care services are particularly valuable for detecting and treating infectious diseases and managing the growing burden of chronic illness facing many low- and middle-income countries (LMICs). Primary care services and the clinicians who provide them also serve as a point of entry into the health system, helping connect users with more advanced services and ensure that limited health system resources are used efficiently.[4]

In 1978, the global community affirmed the important role of primary care in the Declaration of Alma Ata.[5] The Declaration elevated health as a fundamental human right based on principles of equity and community participation, and proposed a role for primary health care in addressing the social and environmental determinants of health.[6] The Declaration of Alma Ata established the principle of "Health in All Policies," which affirmed the role all sectors have in promoting health in communities and highlighted governments as responsible for improving the health of populations. Forty years later, the 2018 Declaration of Astana reaffirmed primary health care as a critical foundation of a strong health system and key to achieving the Sustainable Development Goals.[7,8] In particular, it emphasized the role of primary care services in achieving

universal health coverage (UHC), which will require access to affordable, high-quality primary care for all people.[9] Thus, reorienting health systems towards primary health care and strengthening the accessibility, quality, and efficiency of these services is a global priority.

However, primary care services are often suboptimal. By one estimate, poor quality health systems result in more than 8 million deaths per year in LMICs, many with conditions treatable in primary care services.[10] Analysis of basic services such as antenatal care and sick child care indicate poor adherence to clinical guidelines among health care workers, who perform on average just over half of recommended care actions during observed visits.[11] Diagnoses are frequently incorrect for serious conditions such as pneumonia, malaria, and newborn asphyxia.[10] In surveys of 30 countries in sub-Saharan Africa, only 59% of children with a fever received a diagnostic test to confirm malaria diagnosis, and appropriate use of suitable antimalarial drugs remains low.[12] Low patient safety, limited detection and prevention mechanisms, and poor user experience also undermine the potential of primary care services to improve population health outcomes.[10] In some settings, poor health system quality has eroded trust and confidence in health services. Quality tends to be worst for marginalized populations, such as poorer, less educated, and disempowered people.[10]

Despite performance deficits, changing health needs and rising user expectations place health systems under increasing pressure to satisfy users and produce better health. For several years, governments, multinational organizations, and funders have taken a vertical, disease-specific approach to health programming, especially in LMICs.[13] This has focused attention and resources on specific key diseases, but drawn attention away from efforts to develop primary health care systems. In recent years, there has been a shift towards health system strengthening and integrated programs.[14] Much of this shift has focused on increasing health coverage and

improving care accessibility.[15] These are critical advances for health systems. However, the global movement towards universal health coverage means populations will increasingly use and rely upon their health systems. Without a commensurate focus on quality, health systems will be ill-equipped to rise to the challenge.

This leaves researchers and policymakers with a critical question: How can we get more health from our health systems?

In 2018, *The Lancet Global Health* Commission on High Quality Health Systems in the Sustainable Development Goals (SDG) Era (HQSS) proposed a new definition for a high-quality health system as "one that optimizes health care in a given context by consistently delivering care that improves or maintains health outcomes, by being valued and trusted by all people, and by responding to changing population needs."[10] The HQSS Commission found that knowledge of cost-effective, scalable interventions that yield sustained improvements in quality are limited.[10] At the facility level, governments tend to over-emphasize the role of inputs, such as new buildings, supplies, and equipment, and focus on the accessibility rather than quality of services. At the workforce level, improvement efforts are often ad hoc point-of-care interventions, such as in-service training, and large-scale overhauls to clinical practice are overlooked. At the user level, a growing literature explores the role of community members in holding health systems accountable, though evidence for these mechanisms is inconclusive, especially for improving health outcomes.[10]

The HQSS Commission also identified variation in quality between and within countries. The authors found that some health workers and facilities outperformed others in almost every setting, identifying large intranational gaps in provider adherence to guidelines in antenatal and sick child care.[10,16] Understanding these differences and how they manifest is critical to

designing policies that will support the delivery of high quality care. Accordingly, the HQSS Commission's research agenda calls for research into the extent and causes of variation in quality by investigating best performing countries, regions, and facilities.

However, more evidence is needed regarding the drivers that differentiate best and worst performing health facilities.[17,18] Available studies that investigate variation tend to focus on hospitals, especially in high-income settings, rather than lower level facilities where the majority of primary care takes place.[19] Further, evidence in this area is often qualitative with little quantitative analysis of the factors that explain variation. Additionally, the literature emphasizes how high-performing facilities achieve success, though less is known about low-performing facilities and why they struggle.

Overview

In the three chapters that follow, I investigated how governments can improve the performance of their health systems at the user and facility levels. I sought to understand the factors that determine 1) a user's ability to obtain high quality care and 2) a facility's capacity to provide it. To address this complex set of topics, I used quantitative, qualitative, and mixed methodologies from econometrics and implementation science. While quantitative analysis is beneficial for signaling which factors may drive performance, qualitative methods are critical for elaborating the motivations and mechanisms that underlie good performance. Thus, this dissertation used an explanatory sequential mixed methods approach to leverage the strengths of both quantitative and qualitative methodologies.

In Chapter 2, which focuses on the user role, I applied a hurdle regression technique, a statistical model that mimics the way in which users move through health systems. I also

demonstrated novel use of a multi-dimensional index of women's empowerment to explain variation in clinical quality beyond usual measures such as education and wealth.

Chapters 3 and 4 used positive deviance analysis to jointly understand what drives variation in primary care performance among health facilities. Positive deviance analysis identifies and learns from best practices in organizations that demonstrate exceptional performance.[20–22] It is typically a multi-step process in which qualitative methods are used to generate hypotheses about practices that lead to best performance that are then tested using quantitative methods.[20] Despite its usefulness, positive deviance analysis has been little applied in LMICs and to issues of health system quality in resource-constrained settings.[17,21,23] Most positive deviance analyses are qualitative in nature, providing deep insight on a small number of facilities with limited generalizability within and between countries.[19]

Building and expanding on gold-standard approaches in this field, I adapted the positive deviance approach by first quantitatively identifying factors that predicted excellent performance using large, nationally-representative health system surveys in seven LMICs (Chapter 3).[20,22] I then used qualitative methods to develop a rich understanding of how these factors applied in a decentralized health system context (Chapter 4). While Chapter 3 investigated the manifestation of health system structures to identify what differentiates facilities, Chapter 4 elaborated the mechanisms that underlie these structures and explores how differences were generated. Chapter 4 also describes successful remote data collection using a video conferencing platform in the context of the COVID-19 pandemic.

Together, these complementary studies identified and explored demand- and supply-side approaches to getting good quality from health systems and from primary care in particular. They aimed to generate better understanding of the determinants of primary care quality that

policymakers should consider for further evaluation. The following specific areas were investigated:

Chapter 2

Fever and malaria are highly prevalent among children under five across sub-Saharan Africa, but utilization and quality of care for febrile illness remain insufficient. Many studies examine socioeconomic and demographic determinants of care seeking; however, few assess how women's empowerment influences care seeking and quality. In this study, we examined associations of women's empowerment with a) care utilization for children with fever and malaria and b) the quality of that care in 16 sub-Saharan African countries. We attempted to understand whether women's empowerment is associated with utilization and, separately, quality of care for children, and whether more empowered users are able to obtain better care by identifying higher quality facilities, demanding quality care from providers, or other mechanisms.

To conduct this analysis, we used data from Demographic and Health Surveys conducted between 2010 and 2018. We constructed indices for economic, educational, sociocultural, and health-related empowerment based on existing indices in the literature and calculated the proportion of children with fever and malaria who sought care and received a range of recommended clinical actions. We used multivariable Poisson hurdle models to assess associations between empowerment, utilization, and number of components of quality care, controlling for socioeconomic and demographic factors. This work builds upon an evidence base that focuses largely on how demographic and socioeconomic predictors drive utilization of care. Results can inform interventions to ignite demand for quality among health system users.

Chapter 3

Primary care, a core platform for service delivery, is of insufficient quality in many low- and middle income countries. However, some health facilities perform better than others despite similar resource constraints. The determinants of differences in facility performance have not been well studied. We conducted a quantitative, cross-national best performer analysis and aim to identify the potential drivers of facility performance in best versus worst performing facilities in seven countries.

Data were obtained from Service Provision Assessments, nationally-representative samples of a nation's public and private health facilities, from Democratic Republic of Congo, Haiti, Kenya, Malawi, Nepal, Senegal, and Tanzania. We constructed a Good Medical Practice Index (GMPI) that assesses completion of essential clinical actions using direct observations of care (range 0-1) across antenatal, family planning, and sick child care. We calculated GMPI scores by country and identified the best (top decile) and worst (bottom decile) performing hospitals and clinics. We identified potential drivers of performance and assessed gaps between best and worst performers. We used multivariable logistic regression models to identify associations between potential drivers and best performance. This work extends the literature on variations in quality by identifying the factors that differentiate best versus worst performance among hospitals and clinics in large, nationally-representative surveys.

Chapter 4

Primary care services are on average of low quality in Nepal. However, there is variation in performance of basic clinical and managerial functions between primary health care centers

within the country. The determinants of variation in primary care performance in low- and middle-income countries have been little studied. We used the positive deviance approach to identify best and worst performing primary health care centers in Nepal. We investigated drivers of best performance and attempted to understand the mechanisms by which these drivers generated success.

We conducted a mixed methods positive deviance analysis of eight primary health care centers in Province 1, Nepal. We created a six-item index of basic clinical and managerial activities using routinely-collected health management information system data and used the index to identify four best and four worst performing primary health care centers. We conducted semi-structured, in-depth interviews with managers and clinical staff from each of the eight primary health care centers for a total of 32 interviews. Using a combined deductive and inductive approach, we applied the constant comparison method to identify the key factors that distinguished best and worst performers. This study expands the positive deviance literature by exploring the factors that distinguish high and low performing facilities and the mechanisms that underlie performance in a decentralized health system. Findings can be used to inform quality improvement efforts and health system reforms in Nepal and other under-resourced health systems.

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CHAPTER 2:

ASSOCIATIONS BETWEEN WOMEN'S EMPOWERMENT, CARE SEEKING, AND QUALITY OF MALARIA CARE FOR CHILDREN IN 16 SUB-SAHARAN AFRICAN COUNTRIES

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Abstract

Fever and malaria are highly prevalent among children under five years of age across sub-Saharan Africa, but utilization and quality of care for febrile illness remain insufficient. Many studies examine socioeconomic and demographic determinants of care seeking; however, few assess how women's empowerment influences care seeking and quality. We examine associations of women's empowerment with: a) care utilization for children with fever and malaria and b) the quality of that care in 16 sub-Saharan African countries.

We used data from Demographic and Health Surveys conducted between 2010 and 2018. We constructed indices for economic, educational, sociocultural, and health-related empowerment and calculated the proportion of children with fever and malaria who sought care and received a range of recommended clinical actions. We used multivariable Poisson hurdle models to assess associations between empowerment, utilization, and number of components of quality care, controlling for socioeconomic and demographic factors.

Our sample consisted of 25,871 febrile children, 4,731 of whom had malaria diagnosed by rapid diagnostic test. Empowerment among mothers of children with fever was 0.50 (interquartile range, 0.38-0.63). In both the fever and malaria groups, over 30% of children were not taken for care. Among care seekers, febrile children received on average 0.47 (SD=0.37) of components of quality care, and children with malaria received 0.38 (SD=0.34). Multidimensional women's empowerment was significantly associated with care seeking and quality among febrile children, and with quality among children with malaria. Associations persisted after adjustment for socioeconomic and demographic characteristics.

Results demonstrate substantial gaps in women's empowerment and poor utilization and quality for fever and malaria among children. Increased women's empowerment is associated

with seeking care and, separately, obtaining high quality care. To improve health outcomes, consideration of how empowering women can promote care seeking and extract quality from the health system is warranted.

Introduction

An estimated six million children under five years old die each year worldwide and over half of these deaths occur in sub-Saharan Africa.[1] Malaria, the third leading cause of mortality in children under five years of age, resulted in 7% of these deaths.[1] However, some progress has been made in recent decades with the availability of low-cost vector control strategies and effective preventive therapies: global malaria mortality decreased nearly 30% between 2010 and 2017.[2] Despite these gains, the high burden of malaria persists, especially among children under five who accounted for 61% of malaria deaths worldwide in 2017.[2]

Averting severe malaria and related mortality requires prompt diagnosis and treatment, though utilization of high quality care for fever and malaria remains low.[2,3] National household surveys conducted in 19 sub-Saharan African countries between 2015 and 2017 indicate that a median of 52% of febrile children were taken to any type of trained medical provider for care.[2] Febrile children who seek care should receive a malaria rapid diagnostic test (RDT) or microscopy to confirm malaria diagnosis, but many do not.[4,5] Children with confirmed malaria should be treated with appropriate antimalarial drugs, such as artemisinin-based combination therapy (ACT).[6] Despite wide availability and efficacy, appropriate use of ACTs among febrile children is low.[5,7] Further, children with negative RDT results frequently receive inappropriate treatment, including unindicated antibiotics or antimalarials.[4,5]

In recent years, research on the determinants of care seeking and quality for children has expanded to include dimensions of women's empowerment, defined as "the process of change wherein an individual with prior inability to choose has the access and freedom to make choices."[8,9] Existing literature, largely qualitative, provides evidence that factors related to empowerment such as household structures and power dynamics have a substantial impact on

utilization of care, including for malaria.[10–12] However, this literature is largely limited to utilization decisions, with little focus on how empowerment may influence subsequent quality of care. Further, few studies assess multiple dimensions of women's empowerment, such as decision-making power, interpersonal autonomy, or social status, that may be associated with both utilization and quality of care for sick children.

We use survey data from 16 countries in sub-Saharan Africa to examine the relationship between women's empowerment and care for children with fever and malaria. We constructed four indices of women's empowerment to assess the extent to which empowerment determines care seeking and receipt of high quality care for sick children. Results can be used to understand how multidimensional empowerment, beyond the usual measures of education and wealth, may influence care quality. This insight may inform potential interventions to raise people's demand for quality and reduce malaria mortality in sub-Saharan Africa.

Methods

Study sample

Data for each country were obtained from the Demographic and Health Surveys (DHS), which conducts nationally-representative household surveys of population, health, and nutrition. The Household Questionnaire collects information on basic household characteristics, such as household wealth. The Woman's Questionnaire, which surveys women age 15 to 49 years, includes a limited set of indicators regarding women's status and empowerment. Since 2000, DHS surveys have included indicators regarding malaria prevention and treatment and testing for malaria parasites using rapid diagnostic tests for children under age five.

We used the most recent DHS data available in the last ten years for countries that included malaria biomarker testing in their survey, including the following 16 countries: Angola, 2015-16; Benin, 2017-18; Burkina Faso, 2010; Burundi, 2016-17; Côte d'Ivoire, 2011-12; Democratic Republic of the Congo, 2013-14; Gambia, 2013; Ghana, 2014; Guinea, 2012; Mali, 2012-13; Mozambique, 2011; Rwanda, 2014-15; Senegal, 2017; Tanzania, 2015-16; Togo, 2013-14; and Uganda, 2016.

We analyzed receipt of care among two groups of children under five years old: 1) children with fever reported in the last two weeks and 2) children with fever reported in the last two weeks who had malaria diagnosed by RDT. To reduce recall bias from mothers' self-reports, we included the youngest child under five only. All statistical analyses were carried out using Stata version 14.2 (Stata-Corp, College Station, TX, USA).

Outcome definition and assessment

Using indicators available in the DHS surveys, we developed two primary outcomes to assess the number of components of high quality care obtained by children who sought treatment for fever (four items) and malaria (six items). Both outcomes included the following components: 1) whether the mother sought any form of advice or treatment for her child; 2) whether the mother sought care at a formal facility or provider, such as a government health center, rather than an informal provider such as a traditional practitioner; 3) whether or not the child had blood taken from her finger or heel for testing; and 4) whether or not the child did not receive inappropriate treatment. Inappropriate treatment was defined as receipt of a contraindicated or unrecommended medication according to country guidelines, such as an outdated antimalarial.

The outcome for children with malaria included two additional components: 5) whether or not the child received timely treatment for malaria, measured as prompt care if the child began treatment the same or next day after the fever started; and 6) whether or not the child received correct treatment, defined as receipt of an antimalarial deemed appropriate by each country's national malaria treatment guidelines. The final outcome is a count of items ranging from zero to four among the sample of children with fever and zero to six in the subsample of children with diagnosed malaria. A score of zero indicates no care for fever was sought, while four or six indicates care was sought and all components of high quality care were obtained among children with fever and malaria respectively.

Covariates

We created a conceptual model of women's empowerment based on previous validated models that use women's status indicators available in the DHS (Figure 2.1; Appendix figure A.1).[8,13–15] We modified the conceptual framework to include 25 indicators of empowerment most likely to be associated with seeking care and obtaining high quality care for a child with fever or malaria. Our conceptual model includes four broad dimensions of empowerment: educational, economic, sociocultural, and health-related empowerment. Each dimension is composed of multiple domains, such as labor and workforce participation, household decision-making, and attitude towards violence, that categorize specific empowerment indicators. Indicators within each domain are binary, with a one indicating greater empowerment (see Appendix table A.1 for a full set of included indicators and their definitions). A woman's empowerment score in each dimension is calculated as an average of the proportion of

empowerment factors she experiences in each domain. The resulting dimension score ranges from zero to one with a higher score corresponding to greater empowerment.

In addition to empowerment, our models include mother, child, and household characteristics that may influence care seeking and obtaining high quality care, such as child sex, maternal and child age, type of place of residence (urban vs rural), and household wealth quintile.

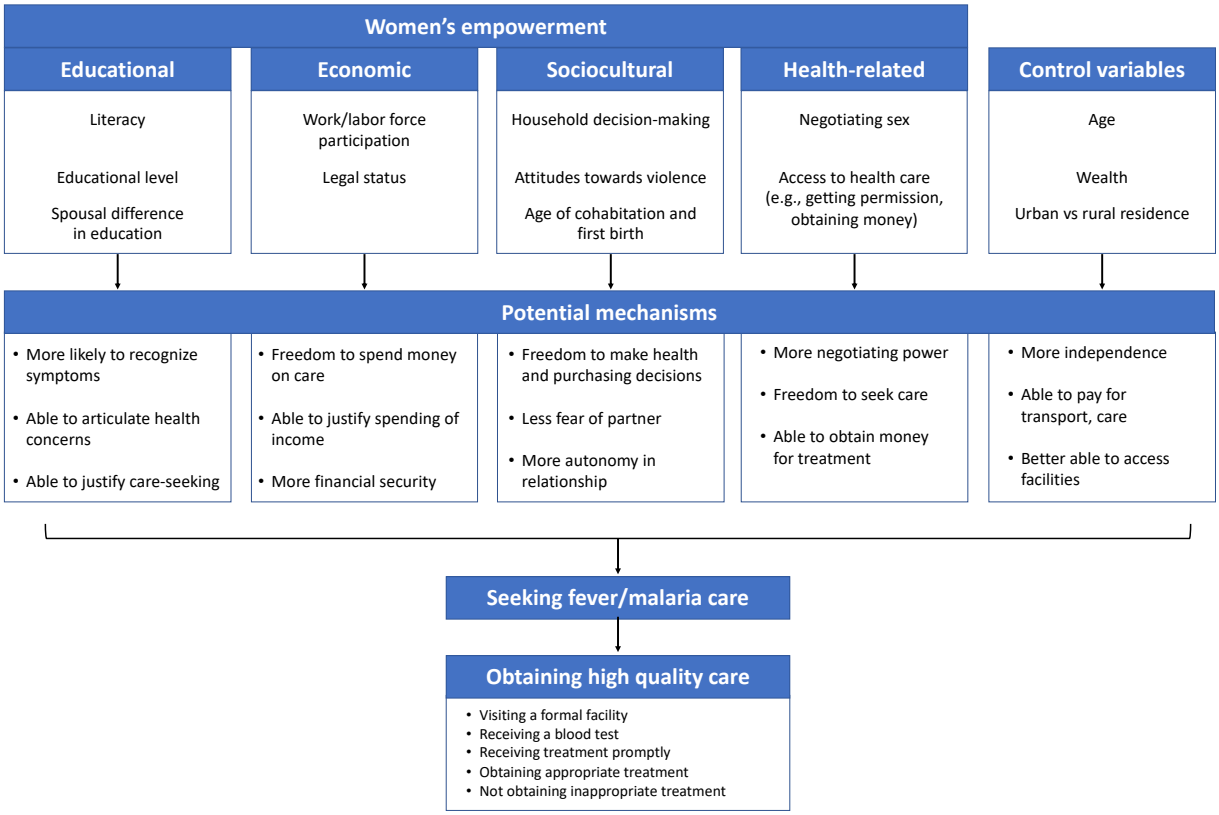

Figure 2.1 Conceptual model of women's empowerment and care seeking for children with fever and malaria

Statistical analysis

To assess empowerment, we calculated the interquartile range (IQR) of empowerment scores overall in the sample, by each of the four dimensions of empowerment, and by country. To assess utilization and quality, we calculated the proportion of children who sought care and received each subsequent component of high quality care. We also calculated the mean and standard deviation of empowerment scores in each domain, comparing these among children who did and did not obtain each component of care for fever or malaria, and tested significance of differences using F tests corrected for the design effect of repeated sampling within country. We also calculated the difference in performance for each factor between best and worst performers to assess which factors most clearly discriminate quality between the two groups.

We constructed multivariable Poisson hurdle regression models to test the association between empowerment in each dimension and utilization and quality of care. We use a separate index for each dimension of empowerment as we posit that each dimension operates differently in determining quality. Hurdle regression is a two-equation model for count outcomes with excess zeros.[16] The first equation determines the likelihood of a binary outcome (i.e., whether a mother sought any care for her child) and the second equation examines the positive count of outcomes (i.e., the number of components of high quality care received). Hurdle regression allows separate modelling of both processes and accounts for excess zeros in the dependent variables (31% of children with fever and 32% of children with malaria in the sample did not seek care).

To select this model, we compared the goodness of fit of a Poisson model, a Poisson hurdle model, and a negative binomial hurdle model, and found evidence supporting use of a two-equation Poisson model. We also found the hurdle model provided similar goodness of fit to

a zero-inflated Poisson (ZIP) model that models individuals not "at risk" of the outcome and those "at risk" but with a zero count. As children who did not seek care are unable to receive subsequent components of care, we selected a Poisson hurdle as our final model.

In the first stage, we used logistic regression to determine the likelihood of a mother seeking care for her child. In the second stage, we used a zero-truncated Poisson model to determine the count of recommended care items a child received, with a higher count indicating better care quality. The first model tested associations with the four-item outcome among children with fever and the second model tested associations with the six-item outcome among children with diagnosed malaria. Both models controlled for mother, child, and household characteristics that may influence receipt of care and confound the relationship of interest, and country fixed effects to control for unobserved factors such as health system strength.

To assess the combined influence of all empowerment factors, we tested associations between an overall empowerment score averaged across dimensions and the four-item outcome among children with fever and the six-item outcome among children with malaria in separate models. We also included an interaction term to this model to assess whether wealth modified the relationship between empowerment and either outcome. In addition, we constructed separate logistic regression models testing the association between empowerment and each component of care in the sample of children with fever or malaria. As a sensitivity analysis to test whether the associations held in areas with greater disease prevalence and thus community and health system familiarity with malaria, we estimated our primary models among countries where malaria transmission occurs year-round separately from countries with seasonal transmission.

Ethical approval

The original survey implementers obtained ethical approvals for data collection; the Harvard University Human Research Protection Program deemed this analysis based on deidentified data in the public domain as exempt from human subjects review.

Results

The DHS surveys included 111,339 mothers and 159,717 children under age five across the 16 countries of interest, among whom 108,531 children were the youngest and had mothers interviewed regarding empowerment. The analytic samples include 25,871 children who had fever in the last two weeks and a subset of 4,731 children who had fever in the last two weeks and malaria diagnosed by RDT.

Table 2.1 describes characteristics of mothers and children in both analytic samples across all 16 countries. Just under half of the children were female and a majority were under age three in both samples. Most mothers were between 20 to 34 years old. At least one quarter of mothers and children in both samples were in the lowest household wealth quintile in their country, with the majority in both samples living in the bottom three wealth quintiles.

Table 2.1 Description of mothers, their children with fever, and their children with malaria

	Characteristics of mothers and their children with fever (N=25871)		Characteristics of mothers and their children with malaria (N=4731)	
Variable	**N**	**%**	**N**	**%**
Child sex				
Female	12564	49	2293	48
Child age (years)				
<1	7034	27	674	14
1	8495	33	1677	35
2	5560	21	1314	28
3	2963	11	650	14
4	1819	7	416	9
Woman age (years)				
15-19	1777	7	287	6
20-24	5808	22	1004	21
25-29	6577	25	1166	25
30-34	5302	20	941	20
35-39	3742	14	716	15
40-44	2013	8	449	9
45-49	652	3	168	4
Household wealth				
Poorest	6573	25	1477	31
Poorer	5862	23	1252	26
Middle	5232	20	968	20
Richer	4709	18	757	16
Richest	3495	14	277	6
Rural/non-rural				
Rural	19267	74	4072	86
Country				
Angola	1017	4	114	2
Benin	892	3	98	2
Burkina Faso	2480	10	850	18
Burundi	3369	13	765	16
Côte d'Ivoire	1293	5	266	6
DRC	3494	14	641	14

Gambia	782	3	6	<1%
Ghana	653	3	167	4
Guinea	1343	5	360	8
Mali	606	2	161	3
Mozambique	1013	4	194	4
Rwanda	1135	4	73	2
Senegal	1978	8	39	1
Tanzania	1274	5	207	4
Togo	1096	4	242	5
Uganda	3446	13	548	12
Outcome: Care for fever and malaria				
Sought any treatment	17756	69	3225	68
	Mean	**SD**	**Mean**	**SD**
Proportion of care items received (out of 4 for fever; out of 6 for malaria)	0.47	0.37	0.38	0.34

Notes: DRC: Democratic Republic of the Congo; Household wealth is defined by DHS as a country-specific composite measure of a household's cumulative living standard based on ownership of selected assets. Care items received for children with fever include whether the mother/child sought treatment at a formal facility, had blood taken from the finger or heel for testing, and began treatment for fever/malaria the same or next day. Care items received for children with malaria include those for children with fever as well as whether the child received appropriate treatment and did not receive inappropriate treatment.

Care seeking and receipt of high quality care were low in the sample and varied across countries (Figure 2.2; Appendix figure A.2). On average, febrile children received 0.47 (SD=0.37) of care items, while children with malaria received only 0.38 (SD=0.34). This means that children received approximately one additional clinical action beyond seeking care on average in both samples. Care seeking was low with only 69% of mothers of febrile children and 68% of mothers of children with malaria seeking any treatment. Of these, 48% of mothers of febrile children and 46% of mothers of children with malaria sought treatment at a formal health care facility, and only 30% of febrile children and 32% of children with malaria had blood taken from the finger or heel for testing. A small majority of children avoided inappropriate treatment

for fever (66%), while just under half of children with malaria (49%) avoided inappropriate treatment. Only 32% of children with malaria began treatment the same or next day as onset of fever and only 27% of children with malaria received an appropriate antimalarial to treat their illness.

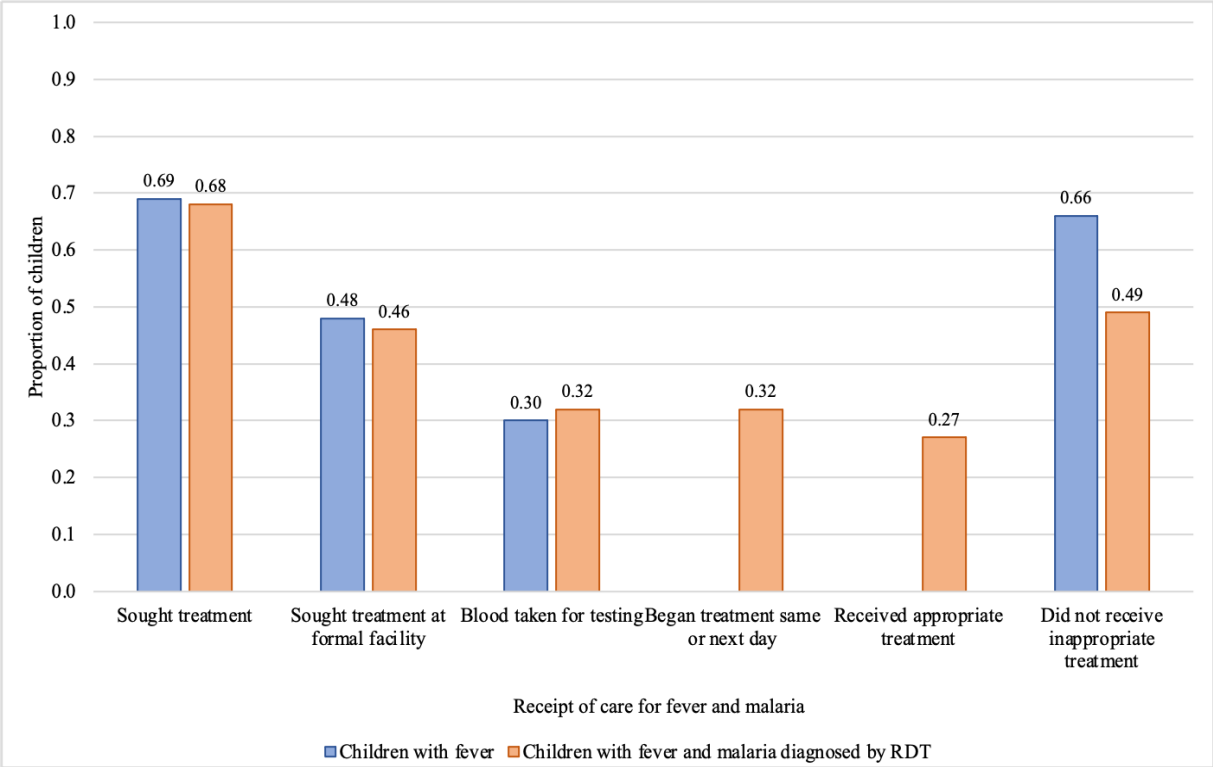

Figure 2.2 Proportion of children obtaining each component of care for fever (N=25871) or malaria (N=4731)

Notes: "Sought treatment at formal facility" is defined as seeking care at a formal facility or provider, such as a government health center, rather than an informal provider such as a traditional practitioner or marketplace. "Received appropriate treatment" is defined as receipt of an antimalarial deemed appropriate by each country's national malaria treatment guidelines for either uncomplicated or severe malaria (typically an artemisinin-based combination therapy). "Did not receive inappropriate treatment" is defined as avoidance of a contraindicated medication or an unrecommended drug for a positive malaria diagnosis, a negative malaria diagnosis, or fever but unknown malaria according to country-specific guidelines.

Overall women's empowerment in the sample of children with fever was low, with a median empowerment score of 0.50 (IQR, 0.38-0.63) (Figure 2.3). Educational empowerment

was lowest, with a median empowerment score of only 0.33 (IQR, 0-0.66), while health-related empowerment was highest, with a score of 67% (median, 0.67; IQR, 0.42-0.83). Overall women's empowerment in the sample of children with malaria diagnosed by RDT was similar but slightly lower than that in the sample of children with fever, with a median empowerment score of 0.46 (IQR, 0.35-0.57) (data not shown). Empowerment also varied substantially by country, ranging from 33% (median, 0.33; IQR, 0.24-0.44) in Guinea to 68% (median, 0.68; IQR, 0.56-0.77) in Rwanda (Figure 2.4; Appendix table A.2). Bivariable associations suggest that children who were taken to care and obtained high quality care had mothers who were equally or more empowered in every dimension compared to children who were not (Appendix table A.3).

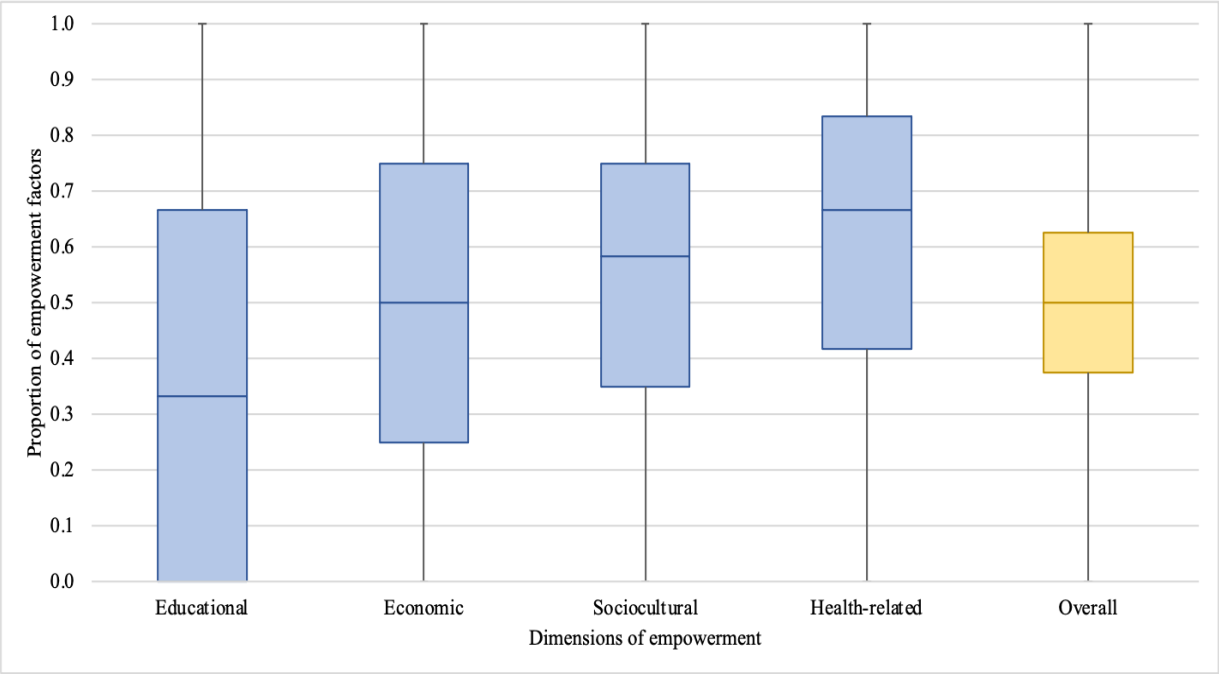

Figure 2.3 Proportion of empowerment factors experienced by mothers of children with fever by dimension (N=25871)

Notes: Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains:

work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total).

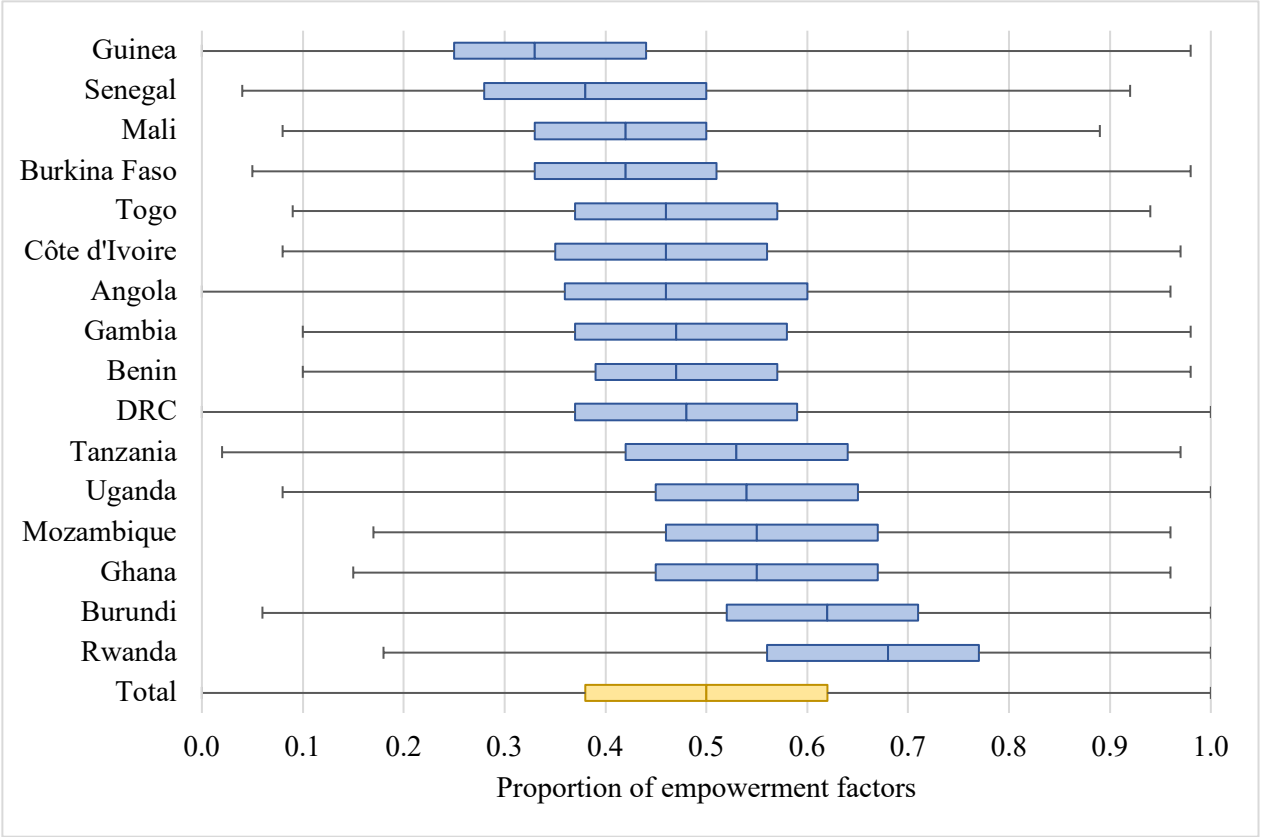

Figure 2.4 Proportion of empowerment factors experienced by mothers of children with fever by country (N=25871)

Notes: DRC: Democratic Republic of the Congo. Empowerment is calculated as an average of the proportion of empowerment factors a woman experiences in four empowerment dimensions: educational, economic, sociocultural, and health-related (25 indicators total).

Table 2.2 presents the results of the fully adjusted hurdle regression models focusing on the effect of empowerment on seeking care and obtaining high quality care among children with fever and malaria. Among children with fever in the last two weeks, we found that educational empowerment, sociocultural empowerment, and health-related empowerment were significant predictors of seeking any care for fever, though effect sizes were small. Health-related

empowerment had the largest effect: a one-unit increase (from no empowerment to complete empowerment) in health related empowerment was associated with a 32% increase in the odds of seeking care (95% CI 1.08, 1.62). Wealth and maternal age were also significantly associated with care seeking. Mothers in the country's wealthiest quintile had a 58% increase in the odds of seeking care as compared to those in the poorest.

Table 2.2 Multivariable hurdle regressions on care seeking and receipt of quality care for children with fever (N=25871) and malaria (N=4731)

	Children with fever in the last two weeks				Children with malaria diagnosed by RDT			
	Logistic part: Sought care (yes or no)		Poisson part: Number of care items (if care was sought)		Logistic part: Sought care (yes or no)		Poisson part: Number of care items (if care was sought)	
Variable	**AOR**	**95% CI**	**AIRR**	**95% CI**	**AOR**	**95% CI**	**AIRR**	**95% CI**
Educational empowerment	**1.11**	**(1.037 - 1.187)**	1.01	(0.991 - 1.031)	0.90	(0.737 - 1.105)	1.03	(0.984 - 1.084)
Economic empowerment	1.14	(0.995 - 1.312)	1.03	(0.998 - 1.070)	1.03	(0.726 - 1.448)	1.05	(0.981 - 1.127)
Sociocultural empowerment	**1.22**	**(1.072 - 1.379)**	**1.05**	**(1.012 - 1.084)**	1.00	(0.810 - 1.243)	**1.10**	**(1.021 - 1.176)**
Health-related empowerment	**1.32**	**(1.079 - 1.621)**	**1.04**	**(1.003 - 1.080)**	1.14	(0.895 - 1.454)	**1.09**	**(1.022 - 1.165)**
Female	1.01	(0.958 - 1.068)	0.99	(0.986 - 1.003)	0.97	(0.863 - 1.099)	0.99	(0.972 - 1.018)
Child age	1.01	(0.985 - 1.045)	1.00	(0.990 - 1.002)	**0.92**	**(0.865 - 0.979)**	1.01	(0.993 - 1.021)
Mother age	**0.99**	**(0.987 - 0.996)**	1.00	(0.998 - 1.000)	0.99	(0.982 - 1.002)	1.00	(0.998 - 1.002)
Rural	0.92	(0.799 - 1.050)	0.98	(0.951 - 1.011)	0.96	(0.738 - 1.261)	0.97	(0.910 - 1.024)
Wealth (ref: Poorest quintile)								
Second quintile	1.06	(0.925 - 1.204)	1.00	(0.967 - 1.037)	1.07	(0.937 - 1.217)	1.01	(0.952 - 1.064)
Third quintile	1.15	(0.975 - 1.363)	1.00	(0.965 - 1.043)	1.17	(0.893 - 1.528)	1.02	(0.972 - 1.080)
Fourth quintile	**1.25**	**(1.023 - 1.520)**	1.01	(0.964 - 1.049)	**1.36**	**(1.068 - 1.729)**	1.05	(0.974 - 1.125)
Richest quintile	**1.58**	**(1.179 - 2.129)**	1.01	(0.963 - 1.057)	**2.26**	**(1.646 - 3.099)**	1.09	(0.998 - 1.181)
Observations	25871		17756		4731		3225	

Notes: Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total). Care items for children with fever include seeking care at a formal facility, having blood taken, and not receiving inappropriate treatment. Care items for children with malaria include seeking care at a formal facility, having blood taken, beginning treatment the same or next day, receiving appropriate treatment, and not receiving inappropriate treatment. Estimates were obtained using Poisson hurdle regression clustered at the country level. All models included country fixed effects. AOR, adjusted odds ratio; AIRR, adjusted incidence rate ratio.

Sociocultural and health-related empowerment were both associated with small increases in the four-item count of high quality care items among febrile children. A doubling of the index of sociocultural empowerment was associated with a 5% increase in the rate of care items received (95% CI 1.01-1.08), while the same increase in health-related empowerment was associated with a 4% increase in the rate of items received (95% CI 1.00-1.08). If mothers of children with fever were fully empowered across each dimension, predictions based on the hurdle regression model suggest that children with fever would receive on average two of the four components of high quality fever care (data not shown). No socioeconomic or demographic characteristics predicted meaningful change in the count of care items received by febrile children.

In the sample of children with diagnosed malaria, mothers of older children were significantly less likely to seek care for malaria (AOR 0.92, 95% CI 0.87-0.98), and mothers in the fourth and fifth wealthiest quintiles in their countries were highly associated with seeking treatment: on average, mothers in the richest quintile had 2.26 times the odds of seeking care for their children as compared to mothers in the poorest quintile (95% CI 1.65-3.10).

As among febrile children, sociocultural empowerment and health-related empowerment were significantly associated with the count of high quality care items received among children with malaria. A doubling of the sociocultural empowerment index was associated with a 10% increase in the rate of care items received (95% CI 1.02-1.18), while the same increase in health-related empowerment was associated with a 9% increase (95% CI 1.02-1.17). If mothers of children with malaria were fully empowered across each dimension, predictions based on the hurdle regression model suggest that children with malaria would receive on average approximately three of the six components of high quality malaria care (data not shown). In

contrast, the effects of socioeconomic and demographic covariates were small in magnitude and not significant.

When testing associations using an overall empowerment score across dimensions, results are similar to our main models: Overall empowerment is highly associated with seeking care (AOR 2.01, 95% CI 1.57, 2.56) and obtaining high quality care (AIRR 1.13, 95% CI 1.08, 1.18) among children with fever; among children with malaria, overall empowerment is not a significant predictor of seeking care, but is associated with a 29% increase in the rate of care items received (95% CI 1.15-1.45) (Appendix table A.4). Results from zero-inflated Poisson regressions are very similar to those from the hurdle model (Appendix table A.5). Logistic regressions for each component of care are also similar, though resulting coefficients are slightly larger in magnitude (Appendix tables A.6 and A.7). Results of models that included an interaction between wealth and empowerment were similar to those from our main models, though we find small but statistically significant decreases in the relationship between empowerment and quality received among children with malaria who have mothers in the third ($p=0.006$), fourth ($p<0.001$), and fifth ($p=0.015$) wealthiest quintiles (results not presented). When examining results in countries with year-round versus highly seasonal malaria transmission, empowerment remained a significant predictor of utilization and quality in both country groups.

Discussion

We assessed utilization and quality of care for children with fever and malaria in 16 sub-Saharan African countries and found that on average only 69% of children with fever and 68% of children with malaria were taken for care. Among those who did seek care, children with fever

received on average 0.47 (SD=0.37) of care items, while children with malaria received only 0.38 (SD=0.34). Consistent with prior studies, we found that multidimensional women's empowerment is low across dimensions and countries. However, results suggest that empowered mothers are more likely to seek care for their children and to obtain high quality care. Though effect sizes were modest, these results persisted after adjustment for socioeconomic and demographic characteristics. This study benefits from the use of large, nationally-representative samples with parasitological diagnosis of malaria.

Our results show that sociocultural empowerment and health-related empowerment, which consist of a mother's interpersonal autonomy, decision-making power, and health-seeking independence, influence her ability to seek care for her sick child.[10,17–19] Once care has been sought, empowerment is predictive of receipt of higher quality care for both fever and malaria. This relationship may reflect an empowered mother's ability to extract quality care by identifying better facilities or negotiating higher quality from providers irrespective of her demographic profile or socioeconomic status. This is particularly striking given mothers may not know all elements of quality care and supply side constraints may limit receipt of both diagnostic tests and appropriate treatment with ACTs.[5,20] While relatively small in magnitude, these gains could result in a child receiving diagnostic confirmation of malaria or an appropriate antimalarial drug, both of which could have dramatic effects in reducing avertable mortality from malaria.[2,21] Empowerment of women is commonly considered an important strategy for reducing gender inequity and fostering good health.[8,9,14] While quality of care is largely determined by the health system, our results align with past studies showing that more empowered patients or caregivers may be able to identify better quality clinics and negotiate good quality services from providers.[22–25] In particular, decision-making power, control of resources, and intra-household

relationships have been shown to have a considerable impact on care seeking and on overall child health.[10,17,18,26,27]

Our results also show that the relationship between empowerment and care seeking and quality varies by severity of illness. Empowerment was significantly associated with care seeking among children with fever, but not among children with malaria. It may be that mothers of young children with malaria, who are typically very visibly ill, seek out a trained medical professional irrespective of empowerment. Wealth may be the primary limiting factor for these very ill children: women in the richest wealth quintile in their country have over twice the odds of seeking care for a child with malaria as compared to those in the poorest quintile.[28,29] While empowerment was not a significant predictor of care seeking for children with malaria, sociocultural and health-related empowerment were both associated with receipt of high quality care. These results suggest that empowerment, while not a critical factor in care seeking for severely ill children, may still play an important role in the extraction of high quality care from the health system.

In contrast, educational empowerment, sociocultural empowerment, and health-related empowerment were all significantly associated with care seeking for fever. Mothers of febrile children, for whom illness may be harder to detect, may only seek care when they are sufficiently knowledgeable about symptoms or able to negotiate care seeking with their partners. These relationships reflect the important role of empowered mothers in appropriately identifying illness and advocating for necessary care.

The observed associations between empowerment and both care seeking and quality were significant even after adjusting for commonly used sociodemographic characteristics. These socioeconomic and demographic factors, including household wealth, child age, and place of

residence, were not significantly associated with receipt of quality care conditional on having sought care for fever.[30,31] While economic empowerment, which includes factors such as work force participation and home or land ownership, was not a significant determinant of care seeking or quality in either sample, mothers with higher household wealth were more likely to take their ill child for treatment as found elsewhere.[3,31] Maternal and child age also influenced care seeking: Among children with fever, older mothers were less likely to seek care for their children, and among children with malaria, older children were less likely to be taken for care; other sociodemographic characteristics such as child sex or place of residence, typically strong determinants of care seeking, were not significant in our models.

Past studies have explored the determinants of low utilization of care for febrile children, in which socioeconomic and demographic variables are prominent. Wealthier households, those living in urban areas, and women with secondary or higher education have been shown to be more likely to seek appropriate care.[28,32] Younger children are also more likely to be brought to care.[32] Building upon these findings, our results suggest that while sociodemographic factors influence care seeking behavior, maternal empowerment is a stronger predictor of the subsequent quality of care received. When interpreting these results, it is important to recognize that households may have multiple decisionmakers, such as fathers or grandmothers, who may influence care seeking and facility selection, but are less likely to inform subsequent aspects of quality care.[10,12]

Limitations

This study is subject to some limitations. Care-seeking data are based on a mother's self-report of the last two weeks and may suffer from recall bias.[33] Associations may also be

influenced by delays in care seeking, as some mothers may intend to seek care for their children, but have not yet done so by the time of the survey. In addition, children with diagnosed malaria who received appropriate treatment may have cleared the parasite prior to the survey. These children would be coded as having received antimalarials inappropriately given the negative test result, though the treatment was in fact appropriate. Duration of positivity is highly variable by RDT type and other factors, though persistent positivity is more common among children and those treated with ACT which may limit bias.[34] We are careful in interpreting the effects of individual empowerment components, as our models may lack power to sufficiently distinguish between them. There may also be residual confounding in regression estimates from unobserved variables such as maternal health status. Finally, measurement of empowerment is limited to indicators available in DHS surveys, and other useful frameworks exist.[35,36] These indicators are constructed and applied in different ways, which can make comparisons challenging. In particular, this analysis would benefit from measures of empowerment that extend beyond the individual level, such as indicators of community empowerment or local governance, though such measures were not available in the dataset. However, this study aimed to use a readily available set of indicators comparable across countries. Given our limited knowledge of how indicators beyond socioeconomic and demographic characteristics influence receipt of care, the use of these indicators remains an important contribution.

Conclusion

This study demonstrates that women's empowerment influences both care seeking and quality of care for sick children and that it may be a more important factor than education and social position alone in extracting good quality of care. Therefore, consideration of a broader

array of determinants of care seeking and obtaining high quality care for sick children is warranted. However, additional research is needed to develop rich insight into the mechanisms that enable empowered mothers to obtain higher quality care. In particular, rigorous evaluation of interventions to empower women and the effect on subsequent quality received can inform policy efforts to ignite demand for high quality care among the population.

We found that empowerment was low across countries, and thus promoting women's agency in economic, health, and family decisions, in addition to important intrinsic merits, may be a fruitful approach for improving health systems and promoting child survival. Any such efforts must consider local needs, expectations, malaria transmission dynamics, and health system features in each country context to effectively improve care seeking and quality of care across sub-Saharan Africa.

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CHAPTER 3:

MANAGEMENT PRACTICES ARE STRONGLY RELATED TO HIGH-PERFORMING PRIMARY CARE IN SEVEN LOW- AND MIDDLE-INCOME COUNTRIES

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Abstract

Primary care quality is poor in many low- and middle-income countries; however, some health facilities perform better than others in similar contexts. Determinants of performance gaps have not been well studied. We conducted a quantitative, multi-country best performer analysis, identifying performance drivers in best versus worst performing facilities in seven countries. We identified 152 best and 142 worst performing hospitals and 464 best and 451 worst performing clinics based on clinical performance within country. On average, over 70% of essential clinical actions were performed in best performing hospitals and clinics, but only 32% and 23% in worst performing hospitals and clinics, respectively. Facility governance, workforce management, community engagement, and service readiness were predictors of best performance; ownership type and patient volumes were not. Governments should look to best performers to identify scalable practices that can raise the level of primary care quality overall and decrease quality gaps between health facilities.

Introduction

Primary care is an essential platform within the health system.[1] It can reduce morbidity, increase patient longevity, and improve health equity.[2,3] A functioning primary care service is crucial for detecting and treating infectious diseases and managing the growing burden of chronic illness facing low- and middle-income countries (LMICs).[2,4] The 2018 Declaration of Astana reaffirmed the critical role of primary care in building strong health systems and achieving the Sustainable Development Goals.[5,6] The global pursuit of universal health coverage will also require access to affordable, high-quality primary care for all people.[7]

The quality of primary care services is not always adequate to optimize health.[8] Poor quality health systems result in more than 8 million deaths per year in LMICs from treatable conditions, many of which can be treated in primary care.[8] Studies show poor adherence to clinical guidelines among health care workers, who perform on average just over half of recommended care actions during adult and child visits for primary care conditions.[9,10] Low patient safety, limited detection and prevention functions, and poor user experience also undermine the impact of primary care on health outcomes.[8]

Data from direct observations of care in LMICs show technical quality varies within countries, with some facilities substantially outperforming others.[9] This suggests that higher quality care is obtainable in settings with similar resource constraints.[8] Multiple factors influence variation in facility performance, including the underlying strength of the local health system in which they operate.[8,9,11] However, knowledge gaps remain regarding the facility-level and contextual factors that drive variation in primary care quality in LMICs.[12]

Positive deviance analysis, which compares the practices of best performing organizations to low performers to identify strategies for success, can be used to understand

variations in performance.[13–15] Most positive deviance analyses focus on secondary care in high-income settings.[13,16] Many are solely qualitative in nature, providing deep insight on a small number of facilities with limited generalizability within and between countries.[13,17] Additionally, there is more work on what drives success in high-performing facilities than what factors underlie low performance.[17] We modified the positive deviance approach to explore drivers of best and worst performance using large, nationally-representative health systems surveys.

In this study, we aimed to identify determinants of best performance in the provision of primary care services across seven LMICs. We developed a framework of potential drivers of facility performance and used the positive deviance approach to understand which of these factors explain variation between the best and worst performing facilities. Findings can be used to identify scalable practices that can improve primary care quality in resource-constrained health systems.

Methods

Study sample

We used data from Service Provision Assessments (SPA), nationally-representative surveys of health facilities conducted by the Demographic and Health Surveys program. SPAs include an audit of facility resources, surveys on clinical practices, and direct observations of care. We used the most recent survey available since 2010 for countries that included direct observations of care for all facility types, including: The Democratic Republic of Congo (2018), Haiti (2013), Kenya (2010), Malawi (2013), Nepal (2015), Senegal (an ongoing survey from 2013 through 2018), and Tanzania (2015). Several other countries have conducted SPA surveys but are not included in this analysis due to age of the data, existence of a more recent survey, or

data inaccessibility. Within surveyed facilities, a maximum of five patients per provider per service area were selected for observation using systematic random sampling, aiming to survey approximately eight providers per facility. Trained observers assessed visits in their entirety for antenatal care, family planning, and sick child care consultations. We stratified surveyed facilities into hospitals and non-hospitals ("clinics") based on whether or not the facility conducts Caesarean sections, a proxy measure for surgical capacity.

Outcome definition: Identifying best and worst performers

To identify best and worst performing health facilities, we used the Good Medical Practice Index (GMPI) which we previously developed to capture a minimum set of clinical activities required for making a diagnosis and proposing correct management (Appendix table B.1).[10] The index counts the completion of basic clinical activities covering history-taking, physical examination, and counseling that are routinely taught to clinicians and should be conducted for most patients presenting with a health problem. Based on available data, the index covers antenatal care (ten items), family planning care (eight items), and sick child care (ten items) based on items asked in all SPAs matched with existing clinical guidelines. History-taking items may not apply to follow-up visits in antenatal care, so these items were excluded from the GMPI for relevant observations. A facility's GMPI score was calculated as an average of the proportion of index items clinicians completed across patient encounters. The resulting facility-level score ranges from 0 to 100 with a higher score corresponding to greater performance of essential clinical actions.

To identify best and worst performing facilities, we calculated deciles of the GMPI within each country among hospitals and separately among clinics. In a given country, facilities

with a GMPI score in the top 10% of the country's distribution were identified as best performers, while those with a score in the bottom 10% were identified as worst performers. We then pooled best and worst performing hospitals and best and worst performing clinics across countries. Our primary outcome is a binary indicator for status as a best performing hospital or clinic versus a worst performing one.

Covariates

To identify potential drivers of health facility performance, we reviewed organizational and management frameworks from health services research, business, and education. We synthesized indicators and domains common across these frameworks and mapped them to previously identified foundations of high quality health systems.[8] The resulting conceptual model has five foundations, each composed of multiple domains that categorize specific performance drivers measured at the facility level: 1) Population (the role of individuals, families, and communities), 2) governance (leadership, policies, financing, learning, and intersectoral action), 3) workforce (the role of facility managers and the health workforce), 4) platforms (care organization, connective systems), and 5) tools (hardware and software), and contextual factors (demographic, socioeconomic, and overall health system factors) (Appendix figure B.1 and table B.2).

To operationalize the components of our framework, we identified available SPA indicators and organized them within each domain, resulting in 17 measured potential drivers of health facility performance and three contextual factors. Indicators are binary for facility-level factors and proportions for provider-level factors averaged to the facility level.

Statistical analysis

We first performed descriptive analyses of facilities in best and worst performing hospitals and clinics. To assess quality, we calculated the mean and interquartile range of Good Medical Practice Index scores among best and worst performers. We also calculated the levels of each potential performance drivers in both samples, using F-tests and chi-squared tests to assess the significance of differences between best and worst performers.

We constructed two multivariable logistic regression models that include the full range of hypothesized drivers of best performance available in the dataset. The first assesses associations between potential performance drivers and the likelihood of being a best performing hospital compared to worst performing hospital; the second assesses the same among clinics. Our models included robust standard errors and controlled for facility characteristics that are likely to influence performance and confound the relationship of interest, and country fixed effects to control for unobserved national factors such as health system strength. Senegal, which had a GMPI score near the median among both hospitals and clinics, was used as a reference country.

To assess sensitivity of results to different specifications, we applied our main regression models to a sample of the top and bottom 10% of facilities pooled across countries to compare with the within-country sample. Second, we applied our models using a more stringent cut-off of top and bottom 5% of the GMPI. Use of a 5% threshold did not materially change results, though resulted in positivity violations, so we retained the 10% threshold used elsewhere.[18] Because DRC and Senegal constituted large portions of the hospital and clinic samples respectively, we ran our main models with the remaining countries only and our results still applied. All analyses were carried out using Stata version 16.1 (Stata-Corp, College Station, USA).

Ethical approval

The Harvard University Human Research Protection Program deemed this analysis based on deidentified data in the public domain as exempt from human subjects review.

Results

The SPA surveys included 6,383 health facilities across the seven countries that had at least one direct observation of care and complete data on the predictor variables. Of these, 1,544 facilities were designated as hospitals and 4,389 facilities as clinics based on surgical capacity. Using the top and bottom deciles of performance, we identified 152 best performing and 142 worst performing hospitals and 464 best performing and 451 worst performing clinics.

Table 3.1 describes characteristics of the study sample (best and worst hospital and clinics). A majority of hospitals were privately owned (53%) and located in rural areas (58% among the best and 52% among the worst). Clinics were slightly more rural than the hospital sample (62% among the best and 69% among the worst) and more likely than hospitals to be owned by governments. The average GMPI score was 0.79 (SD=0.10) among best performing hospitals and 0.32 (SD=0.08) among worst performing hospitals (Figure 3.1). Among clinics, GMPI scores ranged from 0.73 (SD=0.08) among best performers to 0.23 (SD=0.09) among worst performers.

Table 3.1 Characteristics of health facilities by performance status in seven countries, 2010-2018

Variable	Hospitals		Clinics	
	Best (n=152)	Worst (n=142)	Best (n=464)	Worst (n=451)
Patient volumes				
Mean client visits on day of survey	17.7	17.0	9.6	7.6
Urban/rural				
Urban	42.0%	48.0%	38.0%	31.0%
Facility ownership				
Government	46.7%	46.5%	67.5%	69.2%
NGO or private not-for-profit	2.6%	2.1%	6.5%	7.1%
Private for-profit	23.7%	23.2%	14.2%	14.9%
Mission or faith-based	27.0%	28.2%	11.9%	8.9%
Facility country				
Democratic Republic of Congo	48.7%	47.9%	8.8%	9.5%
Haiti	5.9%	6.3%	13.2%	13.3%
Kenya	7.9%	9.2%	7.3%	7.1%
Malawi	4.0%	2.1%	11.2%	11.8%
Nepal	6.6%	7.0%	10.6%	12.2%
Senegal	9.9%	9.9%	34.1%	32.8%
Tanzania	17.1%	17.6%	14.9%	13.3%
Technical quality				
Mean Good Medical Practice Index	0.79	0.32	0.73	0.23

Notes: Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Total surveyed facilities in each country were as follows: Democratic Republic of Congo (n=1163), Haiti (n=730), Kenya (n=481), Malawi (n=629), Nepal (n=689), Senegal (n=1726), and Tanzania (n=965). The variable urban/rural was not available in Kenya and Nepal.

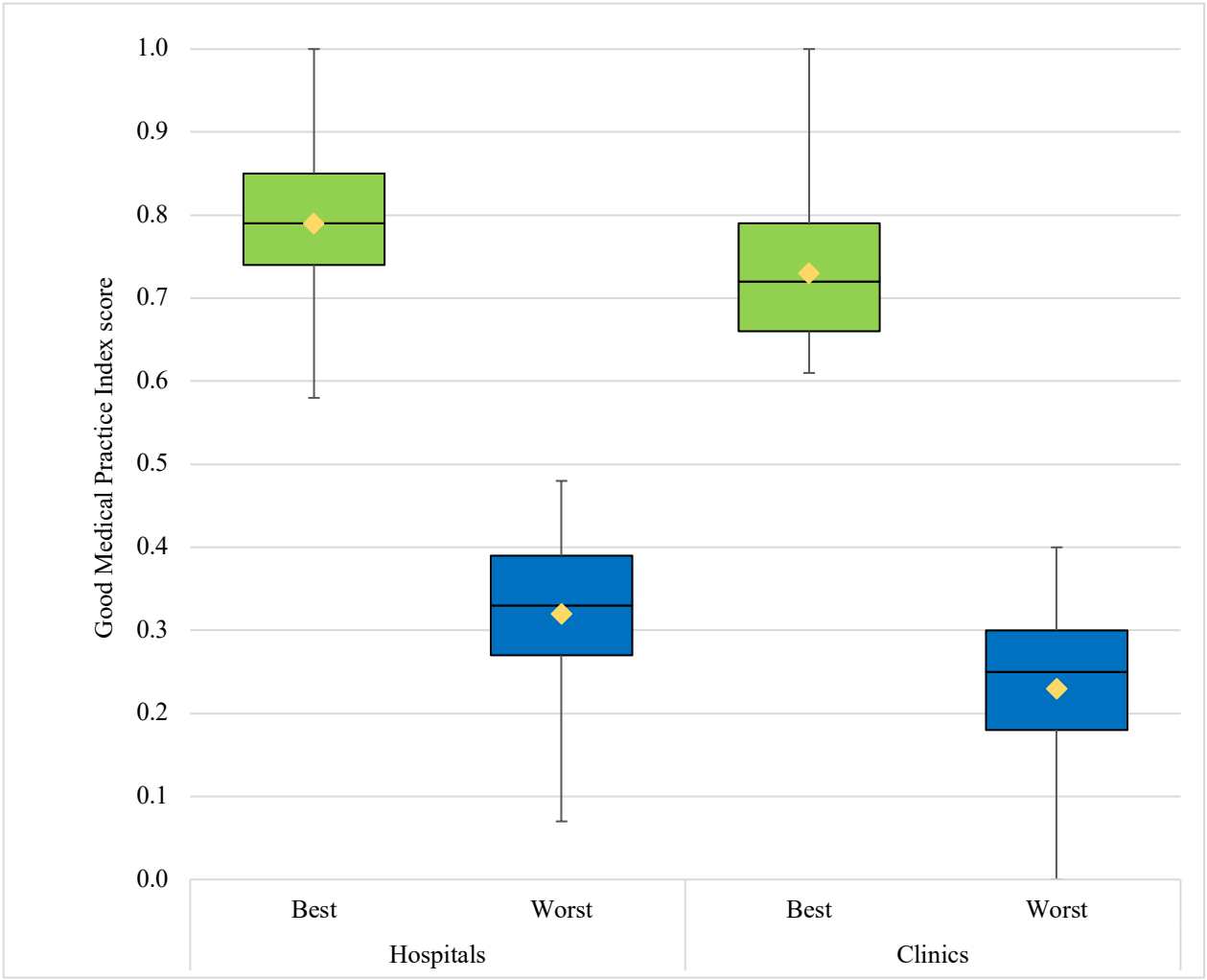

Figure 3.1 Good Medical Practice Index score among health facilities by performance status in seven countries, 2010-2018

Notes: Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Diamonds indicate mean performance.

Best performing clinics outperformed worst performing clinics on the majority of service drivers, with significant differences for 15 of 17 factors (Figure 3.2; See Appendix figure A.5 for full details). For example, the mean proportion of clinicians with a recent training was high at 0.66 among best performers and 0.54 among worst ($p<0.001$). A majority of best performers (81%) had multiple sources of funding, while 70% of worst performers did. Population and

community factors were lowest: 25% of best performers and 7% of worst performers had any mechanism for client feedback ($p<0.001$).

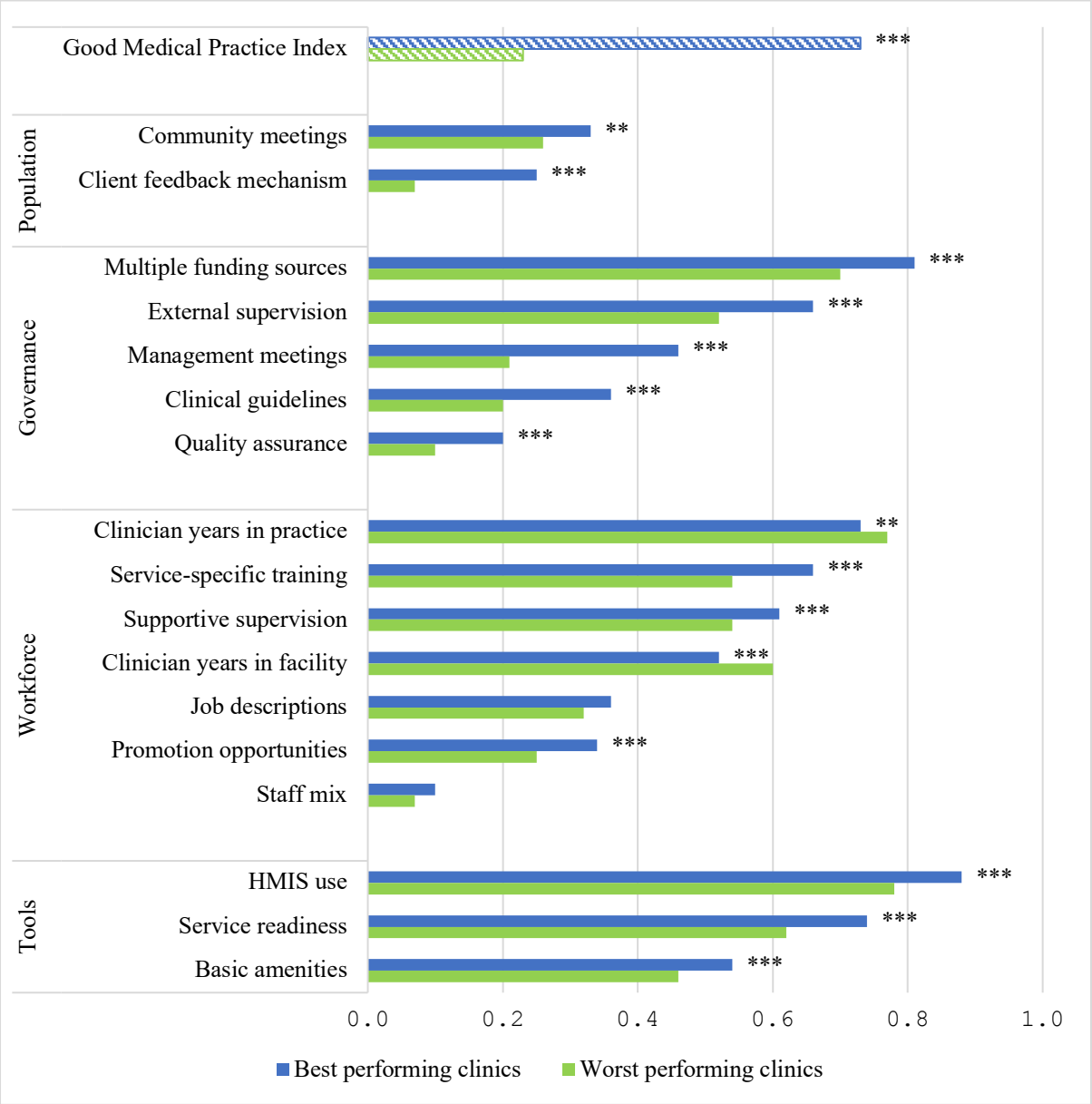

Figure 3.2 Performance drivers among clinics in seven countries, 2010-2018

Notes: HMIS: health management information system. Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Management meetings was defined as having regular meetings, having a record of meetings, making decisions during meetings, and taking actions in response. External supervision was defined as

whether an external supervisor performed a set of 11 supervisory activities, such as checking facility registers and observing clinical care. See appendix for a full list of activities. Basic amenities were measured as the average of seven items: electricity, water, any private room, toilet, communication, computer and internet, and ambulance. Service readiness was measured as the average of indices for each service area (sick child care, antenatal care, family planning care) with indicators covering basic equipment, diagnostics and medication. Asterisks indicate a statistically significant difference between best and worst performing facilities using F-tests for continuous variables and chi-squared tests for categorical variables. $^{**}p < 0.05$ $^{***}p < 0.01$

Best performing hospitals similarly outperformed worst performing hospitals on every performance driver (Appendix figure B.3). Best performers were more likely to have opportunities for promotion (0.37 versus 0.30), recent service-specific trainings (0.45 versus 0.39), and supportive supervision for clinicians (0.63 versus 0.54). In terms of governance, 75% of best performing hospitals had high quality management, while only 54% of worst performers did. Population and community factors were again lowest.

Table 3.2 presents the results of the fully-adjusted multivariable regression models testing associations between proposed performance drivers and status as a best performing as compared to worst performing hospital or clinic (See Appendix table B.4 for full details). Among hospitals, two workforce factors were significant predictors of best performance: staff mix (AOR=3.89, 95% CI 1.56, 9.67) and the proportion of clinicians who had received recent supportive supervision (AOR=3.61, 95% CI 1.05, 12.41). Having multiple sources of funding and regular management meetings with subsequent actions taken were also significant predictors of best performance; hospitals with higher quality management meetings had 3.04 times the odds of being a best performer compared to hospitals without (95% CI 1.51, 6.14). Service-specific service readiness was also associated with a 55% increase in the odds of being a best performing hospital (95% CI 1.26, 1.90).

Table 3.2 Predictors of best performance among health facilities in seven countries, 2010-2018

Variable	Hospitals (n=294)	Clinics (n=915)
	Odds ratio	Odds ratio
Population		
Community meetings	1.47	0.91
Client feedback mechanism	0.72	3.45***
Governance		
Management meetings	3.04***	1.81***
External supervision	1.26	1.11
Clinical guidelines	1.04	1.94***
Quality assurance	0.71	1.49
Multiple funding sources	2.22**	1.62**
Workforce		
Staff mix	3.89***	1.29
Clinician years in practice	1.22	0.69
Clinician years in facility	1.98	0.54***
Job descriptions	1.81	1.17
Promotion opportunities	2.54	1.70**
Service-specific training	3.05	3.57***
Supportive supervision	3.61**	0.90
Tools		
Basic amenities	1.47	1.32
Service readiness	1.55***	1.47***
HMIS use	0.46	1.25
Contextual factors		
Facility ownership (Ref: Government)		
NGO or private not-for-profit	1.68	0.89
Private for-profit	2.49	2.15***
Mission or faith-based	0.98	1.63
Client education	1.09	1.33
Client visits	1.00	1.01

Notes: HMIS: health management information system. Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Management meetings was defined as having regular meetings, having a record of meetings, making decisions during meetings, and taking actions in response. External supervision was defined as whether an external supervisor performed a set of 11 supervisory activities, such as checking facility registers and observing clinical care. See appendix for a full list of activities. Basic amenities were measured as the average of seven items:

electricity, water, any private room, toilet, communication, computer and internet, and ambulance. Service readiness was measured as the average of indices for each service area (sick child care, antenatal care, family planning care) with indicators covering basic equipment, diagnostics and medication. Estimates were obtained using logistic regression with country fixed effects. **p<0.05 ***p<0.01

Among clinics, our model identified three workforce factors that predicted best performance. The proportion of clinicians who received a recent service-specific training was associated with increased odds of being a best performer (AOR=3.57, 95% CI 2.21, 5.75), as was clinicians' awareness of opportunities for promotion (AOR=1.70, 95% CI 1.03, 2.81). In contrast, longer average time spent working in the facility by the health providers was associated with decreased odds of being a best performer (AOR=0.54, 95% CI 0.37, 0.79). Three governance factors were also significant: Having regular management meetings with subsequent actions taken and having service-specific guidelines increased the odds of a clinic being a best performer by 81% (AOR=1.81, 95% CI 1.26, 2.61) and 92% (AOR=1.94, 95% CI 1.32, 2.85) respectively. As with hospitals, multiple sources of funding also predicted best performance. Service-specific service readiness was likewise associated with an increase in the odds of best performance (AOR=1.47, 95% CI 1.31, 1.64). Among population and community factors, only having a mechanism for client feedback predicted best performance among clinics (AOR=3.45, 95% CI 1.96, 6.09). Finally, private for-profit clinics were more likely to be best performers than government-owned clinics (AOR=2.15, 95% CI 1.23, 3.77).

Results from sensitivity analyses were similar to those from our main model (Appendix table B.5).

Discussion

We identified best and worst performing health facilities in seven low- and middle-income countries, and measured associations between potential performance drivers and best versus worst performer status. We found large differences in clinical quality between best and worst performers. Effective facility governance, health workforce management, and community engagement were associated with best performance and helped explain the performance gap. Our results align with the growing literature suggesting that effective facility management is related to facility quality.[19–22] We contribute to this literature by applying the positive deviance model to large-scale, nationally-representative surveys of health facilities and identifying salient management factors that help explain the difference between best and worst performers.

Governance and management factors

We found that strong governance was a key differentiator between best and worst performing hospitals and clinics. Important factors included high quality management meetings, having clinical guidelines, and obtaining multiple sources of funding. These factors reflect the important role of leaders who engage their staff, take action based on feedback, and make transparent decisions. These leaders also ensure availability of essential resources for top performance, including up-to-date clinical information and reliable sources of revenue.

High-quality management is a frequently cited driver of best performance.[11,21–26] A study in Ghana for example found that better facility management was associated with trust in providers, ease of following a provider's advice, and overall quality rating.[22] Management activities like facility planning, target setting, performance tracking, and problem solving have shown to be critical for differentiating best and worst performing facilities.[23] Further, strong

management is instrumental to creating a positive work environment in which clinicians are motivated to excel and amenable to change.[21,24,27] Management accountability mechanisms, such as performance management systems, quality monitoring, and health information systems, are closely linked with clinician adherence to guidelines which can promote high quality clinical practice.[11,21,27]

We also found that having any mechanism for obtaining, reviewing, and reporting client feedback was associated with best performance among lower-level facilities. Increased accountability or social pressure from communities has been shown to contribute to improved performance. Managers of best performing facilities often have multiple forms of community engagement and close ties with traditional leaders, while those of worst performing facilities have been shown to trouble-shoot with the community on an ad hoc basis.[23] The role of communities is likely to differ between public and private facilities, though our results suggest responsiveness to the community is important to performance regardless of ownership type.

Workforce management factors

We found that workforce factors are strong predictors of best versus worst performance and differ by facility type. We found that hospitals with a one-to-one ratio of physicians to other clinicians had nearly four times the odds of being a best performer compared to hospitals with no physicians. This may reflect the important role of physicians as leaders of care teams.[30] Studies indicate that establishing high-functioning, interdisciplinary teams is essential for good workforce management.[11,23,24,29] When senior clinicians are less available, junior physicians, non-physician clinicians, and clinician trainees are more likely to provide care.[31] However,

physicians, as highly skilled providers, may be more likely to adhere to guidelines than other clinician cadres.[32]

Supportive supervision was also a significant predictor of hospital best performance. Evidence indicates the style and quality of feedback has a strong effect on hospital performance and may be more important than receipt of feedback alone.[27] Supportive supervision can improve performance and serve as a mechanism for professional development, job satisfaction, and clinician motivation.[27,33] As supervision is already ubiquitous, the primary challenge is to provide adequate tools and supports to managers to improve the quality of supervision and maximize effectiveness.[27] Beyond supervision, facilities may consider clinical mentoring, a more intensive approach focused on excellent performance that has also shown potential to improve practice.[34]

In clinics, we identified two workforce factors associated with best versus worst performance: clinician awareness of opportunities for promotion and receipt of service-specific trainings. This suggests that opportunities to improve skills and build a career trajectory within the health system may enable better quality of care in facilities. While in-service training programs typically yield only moderate gains in quality, they may be particularly effective when paired with other interventions such as supportive supervision.[27,35] Opportunities for promotion may influence provider motivation, which is considered a critical factor for performance. Interventions that improve motivation, such as a clear job trajectory within the work environment, often lead to better quality performance.[23,27]

The proportion of clinicians spending longer than five years in the same facility was the only factor significantly associated with a lower likelihood of best performance. Studies indicate that the environment in which clinicians practice is a critical determinant of performance.[27]

Building a positive, mission-driven organizational culture and a workforce that embraces change is essential for high quality care.[11,16,17] However, ongoing poor performance by peers or a lack of supervision from leadership may perpetuate and reinforce poor medical practice within the facility.[36]

Management of supplies and equipment

We found that hospitals and clinics with more adequate supplies, including equipment, diagnostics, and medication for each service area were more likely to be best performers. While supplies are certainly essential to care provision, they are no guarantee of high quality care.[37] It may be that facilities with strong management and leadership are better able to ensure adequate infrastructure in the facility, rather than infrastructure leading to strong medical practice. The role of leadership capacity in maintaining service readiness warrants further study.

Despite large gaps between best and worst performers, we do not see obvious differences in the number of best and worst performing hospitals or clinics by type of ownership, patient volumes, or urban versus rural location. Only private, for-profit clinics were significantly more likely to be best performers; quality often differs between public and private facilities, though this varies by setting.[8,38] Perhaps counter-intuitively, our findings show that good performance can be located within different geographic settings and within both private and government systems. This suggests that the literature on variation in quality would benefit from expanding beyond common measures of ownership and geographic location to understand what drives performance. Results are also supportive of the growing shift in focus to the structural factors that influence good quality.[8] In this study, we see relatively small differences among

performance drivers, suggesting that other factors, such as management and health system factors, are the key differentiators between best and worst performers.

Limitations

This study has several limitations. Service Provision Assessments offer only a limited set of indicators that do not measure the full range of potential drivers of facility performance.[12] Given varying facility nomenclature, we used Cesarean section as a proxy for hospitals (versus lower level clinics), though this may miscategorize health facilities in certain countries. The relationships between potential drivers and best performance are associations; unobserved factors, such as health system organization or financing, may confound regression estimates. Further exploration of these associations is warranted.

Conclusion

Our study demonstrates substantial performance gaps between facilities within and across countries despite operating in similar contexts. This suggests that good medical practice is possible in resource-constrained settings when facilities have the right tools and supports. Local examples of these best practices are available and should be studied by leaders to replicate conditions for excellence more widely.

It is important to note that facility-level performance is heavily influenced by health system factors, such as governance and financing, that are determined at district, province, and national levels and may not be modifiable by health facilities.[8] Identified facility level factors can only raise facility performance so much; elevating quality in the country as a whole will require large-scale, upstream improvements to the health system.[8] As countries progress towards

universal health coverage, governments should look to best performing health facilities to identify scalable best practices and new opportunities for quality improvement in primary care.

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CHAPTER 4:

BEST AND WORST PERFORMING HEALTH FACILITIES: A POSITIVE DEVIANCE ANALYSIS OF PRIMARY CARE PERFORMANCE IN NEPAL

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Abstract

Primary care services are on average of low quality in Nepal. However, there is marked variation in performance of basic clinical and managerial functions between primary health care centers. The determinants of variation in primary care performance in low- and middle-income countries have been understudied relative to the prominence of primary care in national health plans. We used the positive deviance approach to identify best and worst performing primary health care centers in Nepal and investigated drivers of best performance. We selected eight primary health care centers in Province 1, Nepal, using an index of basic clinical and operational activities to identify four best and four worst performing primary health care centers. We conducted semi-structured, in-depth interviews with managers and clinical staff from each of the eight primary health care centers for a total of 32 interviews. We identified the following factors that distinguished best from worst performers: 1) Managing the facility effectively, 2) engaging local leadership, 3) building active community accountability, 4) assessing and responding to facility performance, 5) developing sources of funding, 6) compensating staff fairly, 7) managing clinical staff performance, and 8) promoting uninterrupted availability of supplies and equipment. These findings can be used to inform quality improvement efforts and health system reforms in Nepal and other similarly under-resourced health systems.

Background

There has been renewed interest in primary care in recent years.[1] When functioning optimally, primary care is an entry point to the health system and provides continuous, coordinated services to all people at an affordable cost.[2] These services will be essential to reaching universal health coverage and achieving the Sustainable Development Goals as reaffirmed in the 2018 Declaration of Astana.[3] In Nepal, a low-income country facing a growing double burden of infectious and non-communicable diseases, strengthening primary care performance is paramount.[4]

In many settings, primary care services are poorly equipped to optimize health. Large-scale analyses show major deficits in the care people receive across countries and conditions, including in Nepal.[5] Recent nationally-representative analyses show low adherence to clinical guidelines for basic primary care services and poor performance of routine newborn care practices in Nepal.[6,7] Other studies highlight deficits in critical areas such as service readiness, staffing levels, and patient experience.[8–10]

Despite overall poor quality, data from direct observations of care in multiple low- and middle-income countries (LMICs) show large variations in primary care quality within countries.[11] This suggests that higher performance is attainable for some facilities, and that identifying and replicating practices used by best performing facilities may improve overall performance.[5] In Nepal, which began adopting a federal system of government in 2017, investigating performance variation is particularly timely. With federalization, municipal governments play a direct role in the administration of primary health care centers and provision of services to local communities. This places high demands on local leaders in a health system with uneven distribution of expertise and resources.[12]

However, relatively little is known about the factors that drive facility-level performance variation in Nepal and other LMICs. There is also little empirical research on how Nepal's federalization has influenced primary care performance. Positive deviance analysis, an approach to quality improvement that identifies and learns from organizations and individuals who demonstrate exceptional performance, can help fill these gaps.[13] Positive deviance can surface solutions to problems that use approaches and resources already available within a community, increasing the likelihood that new practices are adopted and sustained.

In this study, we sought to identify drivers of primary care quality and explore how drivers generated good performance. We first developed a framework of potential drivers of facility performance to guide investigation. Using routinely collected health system data, we identified best and worst performing primary health centers in one province in Nepal and interviewed facility managers and clinicians to understand how perceived drivers influence facility performance. Evidence from this study can advance understanding of best-in-class facility performance drivers and inform quality improvement efforts in Nepal and elsewhere.

Methods

Study setting

This study took place in Province 1 in eastern Nepal (Figure 4.1). The province is composed of 14 districts and 137 municipalities, and all three of the nation's ecological zones: Terai (a lowland region), hills, and mountains. The area is prone to natural disasters such as floods and earthquakes. Province 1 contains approximately 40 public primary health care centers (PHCCs) in addition to district hospitals, urban health centers, health posts, and several private

facilities. Each PHCC has approximately three beds and should be staffed by one medical officer and at least eight additional health workers. Services include diagnosis and treatment of illness, basic services such as family planning and immunization, basic emergency obstetric and neonatal services, and laboratory services. PHCCs also oversee community-based services provided by mid-level health workers. Each PHCC is overseen by a local Management Committee composed of six to seven elected officials and local leaders. The 2019 New National Health Policy aimed to establish primary hospitals in each municipality, and some primary health care centers had begun expanding staff and services during this study. In 2021, when qualitative data collection took place, the COVID-19 pandemic was ongoing in Nepal.

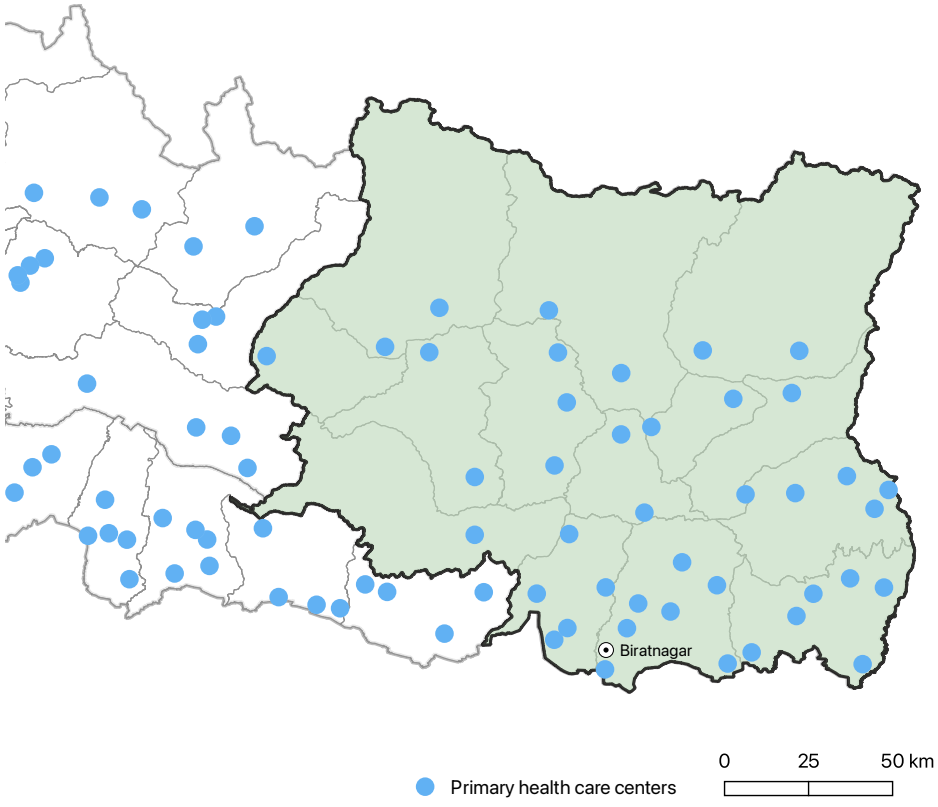

Figure 4.1 Primary health care centers in Province 1, Nepal

Notes: Province 1 is highlighted in green. Facility location data comes from the 2015 Nepal Service Provision Assessment, a nationally-representative survey of health facilities that is publicly-available from the Demographic and Health Surveys website. Shapefiles were obtained from Nepal's National Spatial Data Center.

Study design and conceptual framework

We conducted an in-depth qualitative study of eight primary health care centers in Province 1 to understand leader and clinician perspectives on the factors that distinguish best and worst primary care performance. We used a positive deviance framework to investigate why some PHCCs outperform others in this context.[13,14] We first used quantitative methods to identify best and worst performing PHCCs using routine health system data. We then used qualitative methods to develop rich insight the factors that drive performance.

To identify potential drivers of health facility performance for investigation, we reviewed organizational and management frameworks from multiple disciplines and mapped common factors to previously identified foundations of high-quality health systems (Figure 4.2). The resulting conceptual model has five foundations composed of multiple domains: 1) Population (the role of individuals, families, and communities), 2) governance (leadership, policies, financing, learning, and intersectoral action), 3) workforce (management of the health workforce and its role), 4) platforms (health system care organization and connections), and 5) tools (hardware and software), and contextual factors (demographic, socioeconomic, and overall health system factors).

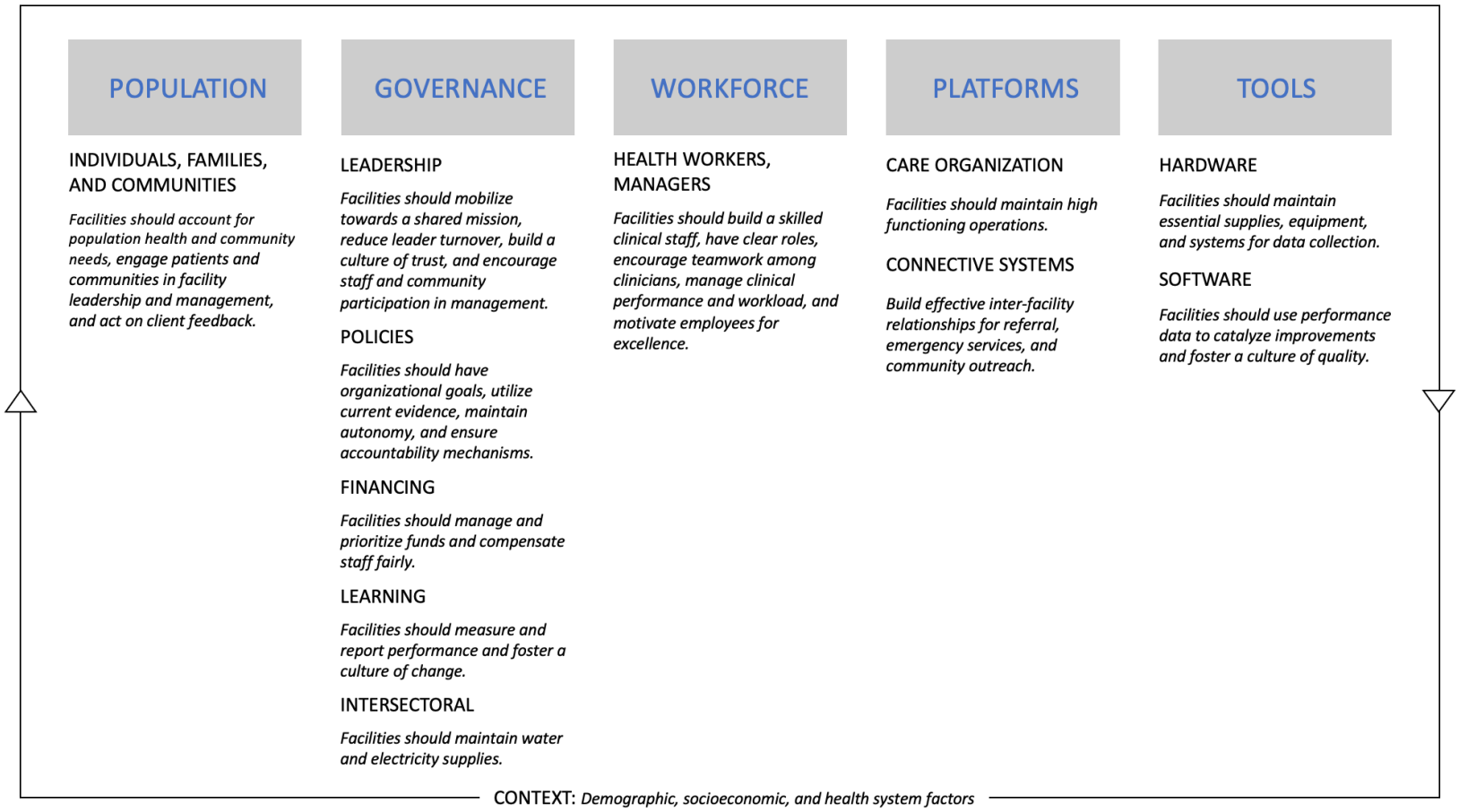

Figure 4.2 Hypothesized drivers of high performing health facilities

Identifying best and worst performers

We obtained 12 months of routinely-collected health system data at the facility level for all government-run PHCCs in Province 1 from Baishakh 2076 to Chaitra 2076 (approximately April 2019 to March 2020), before the COVID-19 pandemic was widespread in Nepal. Based on the framework developed by *The Lancet Global Health* Commission on High Quality Health Systems in the SDG Era and discussions with local health system leaders on what constitutes good primary care performance in this setting, we reviewed available indicators and identified six measures of either clinical or operational performance. For clinical performance, we included: 1) the percent of children under five years with pneumonia who received antibiotics, 2) the percent of children under five years with diarrhea who were treated with zinc and oral rehydration salts (ORS), and 3) the percent of newborns who had chlorhexidine ointment applied immediately after birth. For operational performance, we included: 1) the percent of planned immunization clinics conducted, 2) the percent of planned immunization sessions conducted, and 3) the vaccine wastage rate across eight commonly offered vaccines as per the Nepal vaccine schedule. Subject matter experts in Province 1 reviewed the indicator set and verified the quality and completeness of data. A facility's performance score was calculated as the average of the six indicators. We ranked the performance scores for each facility from best to worst and identified the four best performing and four worst performing PHCCs. To assess robustness of results, we also calculated the standard deviation of a facility's performance score across the 12 months and found that the best performing facilities also had the lowest variability. Province 1 health system leaders reviewed selected facilities and agreed with the categorization of best and worst performers, providing face validity for the selection.

Study sample and data collection

Qualitative data were obtained through 32 semi-structured in-depth interviews conducted with four respondents at each of the eight PHCCs (Appendix table C.1). We sought perspectives on facility performance from individuals performing diverse and critical roles, totaling four interviews per PHCC. We used a criterion sampling approach to identify each of the following respondents: one member of the Management Committee, the facility in-charge (typically a physician with both administrative and clinical duties), one advanced clinician (a physician or other senior clinician), and one nurse or auxiliary health worker. When possible, we sought interviewees who had been employed at the facility for at least two years, worked at the facility fulltime, and supervised or directly provided primary care services. We first contacted the facility in-charge of each PHCC to request participation; the in-charge helped to identify each additional interviewee from the facility according to the established criteria. The number of sites and respondents were selected to obtain a wide breadth of viewpoints and representation of multiple facility stakeholders; theoretical saturation within facility was typically achieved with fewer than four respondents.[14]

All interviews were conducted in Nepali from February to May of 2021 using a standardized interview guide tailored to each job category (Appendix tables C.2-C.4). Interview guides were pre-tested within the research team and piloted with respondents at a PHCC in Province 1 that was not selected for the study. For the safety of the research team and respondents during the COVID-19 pandemic, all interviews were conducted virtually and recorded using Zoom (Version 5.4.7, Zoom Video Communications Inc.). Interview questions were based on the framework of potential performance drivers and covered topics such as facility management practices, the role of the community, and the role of local and municipal leaders.

We asked questions such as “How do you set new rules or norms at this facility?” and “How is the relationship between facility managers and clinical staff?” Interviews were conducted by trained members of the research team with extensive knowledge of the Nepali health system and ranged from approximately 30 to 60 minutes. During the data collection period, the research team held meetings weekly or more frequently to debrief about findings, discuss emerging themes, and draft memos of initial perceptions. Three research assistants fluent in Nepali and English transcribed interviews verbatim and translated the interview recordings. To assure quality of the transcripts, bilingual research team members back translated sections of the transcripts and reviewed transcripts alongside interview recordings to verify accuracy and completeness. The Institutional Review Board at the Harvard T.H. Chan School of Public Health and the Nepal Health Research Council approved a verbal consent process and waived the requirement to document consent given the minimal risk to participants presented by this research.

Data analysis

To identify themes, we conducted a thematic analysis using both deductive and inductive approaches.[15] Deductive codes were identified based on our performance framework. The research team reviewed the transcripts and interview memos to develop additional inductive codes. The preliminary codebook was applied to a subset of transcripts by two team members, after which codes were refined through research team consensus. This iterative process continued until no new concepts emerged and the final coding structure was obtained (Appendix table C.5). We conducted an inter-rater reliability test for a subset of transcripts to ensure

consistency between coders, with a Cohen's Kappa of 0.93. Two members of the research team then coded all remaining transcripts and interview memos.

We used the constant comparative method for subsequent analysis in two phases. First, data were organized to provide a basic description of each PHCC and to identify factors that were perceived to promote or inhibit performance by multiple respondents at each facility. We also assessed consistency of responses among respondents and the importance ascribed to each factor to identify meaningful performance drivers. Second, we compared the factors that were consistent across the majority of best performers and, separately, the majority worst performers, to identify the factors that differentiated performance between the two groups. We sought out counter-examples of positive aspects in worst performers and negative aspects in best performers. Key themes were triangulated through similar analysis of interview memos. We used Dedoose (Version 8.3.47, SocioCultural Research Consultants, LLC, Los Angeles, CA, USA) to facilitate data coding, organization, retrieval, and visualization. Key results will be summarized, tailored to group, and shared with province, district, and municipal health system leaders.

Research team and reflexivity

This study was designed and managed by the first author, a non-Nepali doctoral candidate trained in health systems research and based in the United States. The first author had experience conducting qualitative research and some prior experience with the health system of Nepal. This research was supervised by the Chief of the Public Health Division in the Ministry of Social Development in Province 1 and two faculty members from the Harvard T.H. Chan School of Public Health with deep expertise in health systems and qualitative methods. The study team also included two interviewers: The first was a Nepali researcher with a master's

degree, fluency in English and Nepali, and extensive expertise designing health policy within the country. The second was a trained nurse with a master's degree who was local to Province 1 and serves as a Nursing Officer in the area. The three Nepali co-authors provided substantial contributions to the development and translation of the study tools. The entire research team provided input on key decision points throughout the study.

Regular team debrief meetings were used to discuss emerging findings, which highlighted differences in researcher perspectives on the most salient concepts and how they apply within Province 1. Local team members noted important considerations for data collection practices, including the gender and ethnicity of the interviewers, and critical topic areas for exploration in interviews. Experts within the co-author team also vetted best and worst performers to enhance face validity. In team meetings, Nepali research team members helped to contextualize respondent perspectives within their experience as users and leaders of the local health system. The team also influenced the coding and analysis process, identifying key concepts in the transcripts that are particular to the Nepali context, such as the unique roles of municipal governments and local Management Committees. Overall, these differences in experiences and perspectives yielded a more thorough and balanced interpretation of the data.

Ethical approval

All research procedures were approved by the Harvard T.H. Chan School of Public Health Institutional Review Board and the Nepal Health Research Council.

Findings

Among all PHCCs in Province 1, performance scores ranged from 69% to 96% with a median score of 86%. Quality scores were 95% or above in the four highest ranked primary health care centers (best performers) and 75% or below among the lowest ranked (worst performers) (Appendix figure C.1). Table 4.1 describes the operational profile of each selected PHCC. The identified facilities are similar in staffing and services provided, and span eight different districts across the three ecological regions of Nepal. In our qualitative analysis, we identified the deductive and inductive performance drivers perceived as meaningful by respondents (Table 4.2). Among these, eight key themes distinguished performance between best and worst performing PHCCs. Governance factors included: 1) Managing the facility effectively, 2) engaging local and municipal leadership, 3) developing sources of funding, 4) compensating staff fairly, and 5) assessing and responding to facility performance. We also identified one factor each among the domains for workforce, population, and tools: 5) managing clinical staff performance, 6) building active community accountability, and 7) promoting uninterrupted availability of supplies and equipment. Table 4.3 summarizes the key themes and highlights the ways in which they influenced best or worst performance.

Table 4.1 Overview of best and worst performing primary health care centers in Province 1, Nepal

Best performers	**PHCC-1**	**PHCC-2**	**PHCC-3**	**PHCC-4**
Location	Semi-urban area in the hills	Rural area in the terai	Rural area in the terai	Rural area in the hills
Catchment area	>5 wards in ~3 municipalities	multiple wards in 2 municipalities, some users from a nearby large city	4 wards in 1 municipality	4 wards in 1 municipality
Patient volumes	100-150 per day	~200 per day	170-200 per day	10 per day
Total staff	16	17	14	9
Clinicians on staff	1 physician (in-charge), 1 health assistant, 4 staff nurses, 2 auxiliary health workers, 4 auxiliary nurse midwives	1 senior health assistant (in-charge), 2 health assistants, 1 staff nurse, 1 auxiliary health worker, 5 auxiliary nurse midwives, 1 lab technician, 1 lab assistant	1 health assistant (in-charge), 1 staff nurse, 4 auxiliary nurse midwives, 1 lab technician, 1 lab assistant, 1 radiographer	1 health assistant (in-charge), 1 staff nurse, 2 auxiliary health workers, 2 auxiliary nurse midwives, 1 lab worker
Facility hours	Outpatient: 10am to 5pm, Emergency: 24 hours	Outpatient: 10am to 4pm	Outpatient: 10am to 5pm, Emergency: 24 hours	Outpatient: 10am to 5pm, Emergency: 24 hours
Common services	Outpatient services, maternity care, emergency services, post-mortem services, immunization, ambulance services, tuberculosis services, leprosy services	Outpatient services, maternity care, laboratory services, immunization, family planning, tuberculosis services, leprosy services	Outpatient services, maternity care, emergency services, laboratory services, family planning, radiography	Outpatient services, maternity care, emergency services, laboratory services, immunization, family planning, radiography
Worst performers	**PHCC-5**	**PHCC-6**	**PHCC-7**	**PHCC-8**
Location	Semi-urban area in the terai	Rural area in the hills	Rural area in the hills	Rural area in the mountains
Catchment area	>3 wards in ~2 municipalities	wards in ~3 municipalities	4 wards in 2 municipalities	1 municipality and some surrounding wards
Patient volumes	35-40 per day	30-35 per day	15-20 per day	~45 per day
Total staff	12	15	10	11
Clinicians on staff	1 physician (in-charge), 1 health assistant, 2 auxiliary health workers, 4 auxiliary nurse midwives, 1 lab assistant	1 physician (in-charge), 1 health assistant, 3 auxiliary health workers, 7 auxiliary nurse midwives	1 physician, 1 health assistant (in-charge), 1 staff nurse, 3 auxiliary health workers, 3 auxiliary nurse midwives	3 physicians, 1 health assistant, 1 auxiliary health worker, 5 auxiliary nurse midwives, 1 dental hygienist
Facility hours	Outpatient: 10am to 5pm	Outpatient: 10am to 5pm, Emergency: 24 hours	Outpatient: 10am to 5pm	Outpatient: 10am to 5pm, Emergency: 24 hours
Common services	Outpatient services, maternity care, sick child care, laboratory services, family planning, tuberculosis services	Outpatient services, maternity care, emergency services, post-mortem services, family planning, nutrition programs	Outpatient services, maternity care, laboratory services, immunization	Outpatient services, maternity care, emergency services, post-mortem services, immunization, radiography, telemedicine, eye services, dental services

Notes: Other staff may include office assistants, lab assistants, and/or custodial staff. Rural municipalities range in size from ~5,000 to ~50,000 people.

Table 4.2 Observed performance drivers in best and worst performing primary health care centers in Province 1, Nepal

Domain	Performance driver	Best performers				Worst performers			
		PHCC-1	PHCC-2	PHCC-3	PHCC-4	PHCC-5	PHCC-6	PHCC-7	PHCC-8
Governance and management	Create a strategic vision		✓					✓	
	Build trust in leadership	✓							
	Encourage stakeholder leadership	✓	✓	✓	✓		✓		✓
	Set organizational goals	✓	✓	✓			✓	✓	✓
	Evaluate facility performance	✓	✓	✓	✓			✓	
	Rely on evidence	✓	✓						
	Ensure institutional accountability		✓		✓			✓	✓
	Foster a culture of change		✓						
	Maintain facility autonomy								
	Manage and ensure adequate funding	✓	✓				✓		
	Compensate staff fairly	✓		✓	✓				
	Connect with public utilities	✓	✓	✓			✓	✓	
	Make decisions transparently	✓	✓	✓		✓	✓	✓	✓
	Maintain leadership stability								
	Partner with community leaders	✓	✓	✓	✓				
	Engage local government	✓		✓					
	Ensure skilled management	✓	✓	✓	✓				
	Mobilize funding/revenue	✓	✓	✓	✓				
Workforce	Build a skilled clinical staff	✓	✓					✓	✓
	Codify clinician roles	✓	✓	✓	✓	✓	✓	✓	✓
	Integrate the care team	✓			✓	✓	✓		
	Manage staff performance	✓	✓	✓	✓				✓
	Motivate employees for excellence	✓	✓	✓	✓	✓	✓	✓	✓
	Promote a collaborative environment	✓	✓	✓	✓	✓	✓	✓	✓
Population	Serve population health	✓	✓					✓	✓
	Engage community voices		✓	✓	✓			✓	✓
	Act on community feedback	✓	✓					✓	✓
	Be accountable to the community	✓	✓	✓	✓				
Platforms	Maintain high functioning operations	✓		✓	✓		✓		✓
	Build relationships across health system	✓	✓	✓	✓	✓	✓	✓	✓
Tools	Ensure availability of resources	✓	✓		✓				
	Promote a culture of quality								
	Collect performance data	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Italicized performance drivers were identified inductively. Shaded performance drivers differed between best and worst performing facilities.

Table 4.3 Summary of key performance drivers differentiating best and worst performing primary health care centers in Province 1, Nepal

Domain	Theme	Managers of best performing PHCCs…	Managers of worst performing PHCCs…
Governance and management	Managing the facility effectively	Meet regularly with full staff; include staff in facility decision-making; provide feedback regularly; are responsive to staff needs; help train junior clinicians; monitor staff performance informally; build a collaborative and collegial culture; engage local leaders through the Management Committee	Leave staff out of decision-making and leadership; have irregular or no facility-wide meetings; face high turnover at the facility in-charge level; provide little feedback to clinical staff; engage less with local leaders
	Engaging local leadership	Respond to the facility's needs; have regular meetings with the facility in-charge, the Management Committee, and the full staff; partner with local leaders and engage them for success; raise funds for the facility and lobby the municipality for funding; field community feedback and report to the facility; problem-solve jointly with local and facility leaders; monitor facility performance regularly	Disengage from the facility and/or the community; fail to meet regularly; ignore facility requests and needs; do not ensure adequate supplies and equipment or disengage from resource needs; do not monitor facility performance; have a poor relationship with or are deprioritized by municipal government
	Assessing and responding to facility performance	Record and report facility data; monitor facility performance regularly; host staff-wide discussions and problem-solving sessions to improve performance; ensure staff understanding of targets and their utility	Record and report data irregularly or infrequently; provide little or no performance monitoring; lack staff discussions or feedback on collected data; have limited understanding of targets or their utility
	Developing sources of funding	Mobilize funding from local government; seek alternative sources of revenue; fundraise; help make budgetary decisions	Struggle to access funding from local government; do not seek alternative sources or fundraise; disengage from facility-level budgeting
	Compensating staff fairly	Pay staff in a way that recognizes their workload and hours; pay overtime wages; provide financial incentives	Do not compensate workers fairly, do not provide overtime pay; do not offer financial incentives
Workforce	Managing clinical staff performance	Distribute workload fairly across staff; delineate roles clearly and transparently; ensure staff preparedness for practice; encourage staff autonomy	Do not clearly define staff roles; distribute workload inequitable among staff members; do not ensure staff are sufficiently skilled for their roles

Population	Building active community accountability	Feel accountable to the community; regularly solicit community feedback; have group meetings to interpret feedback and act on it; integrate community leaders into facility leadership	Feel less accountable to the community; do not solicit or obtain community feedback; often fail to act on community feedback; build inadequate partnerships with community leaders
Tools	Promoting uninterrupted availability of supplies and equipment	Obtain medicines and equipment when needed; access additional funds for supplies; fix equipment when possible	Struggle to obtain medicines and equipment; unable to access funds for additional supplies; often cannot fix equipment when necessary

Managing the facility effectively

Best performing PHCCs had high-quality management practices. Effective management was characterized by a range of practices from encouraging staff engagement to building a collaborative work environment between managers and staff. In contrast, worst performers tended to have more disengaged staff and a weaker relationship between staff and facility leaders. Critical to this theme was a strong facility in-charge, regardless of clinical training, who catalyzed and maintained these practices within the facility. In particular, best performing facility's had regular team check-ins:

> *We conduct staff meetings monthly…We discuss in these meetings who is doing what kind of work, any mistakes from any staff, which problem originated from where and how to solve them (Physician in-charge, PHCC-1, best performer).*
>
> *Mostly we discuss queries, complaints, problems faced by staff regarding services, and what we should do to provide effective services and how we can provide better services…and if a problem should be represented to [higher levels of authority], then we will coordinate there too. So, these are the things we discuss regularly (Senior health assistant in-charge, PHCC-2, best performer).*

Worst performing PHCCs were less likely to engage their staff or involve them in important facility decision-making processes:

> *There is no [monthly meeting with the in-charge] meeting to date. This is a huge gap. [If we had a regular meeting], I think things would get done. We have so many problems in the birthing center [at the PHC] (Auxiliary nurse midwife, PHCC-5, worst performer).*

Best performers also built an effective work environment by providing and accepting feedback and responding to staff concerns, as well as working together to jointly solve problems:

> *As someone responsible for management, the team provides me feedback and talks to me about everything…We prioritize their queries and problems and do our best to solve them (Senior health assistant in-charge, PHCC-2, best performer).*

> *We have a good relationship between the management and the clinical staff. The work environment is good here. We constantly accept help from others and make suggestions to one another (Health assistant in-charge, PHCC-4, best performer).*

In contrast, worst performers lacked the same degree of collaboration and responsiveness from management:

> *I have to show the reason that such and such instrument is not working, and because of this, the service users are not receiving the best service. That's my role: pointing out the problem and asking them to sort out the problem (Auxiliary health worker, PHCC-7, worst performer).*

Finally, worst performing facilities lacked a collaborative culture. In contrast, facility managers in best performing PHCCs built a strong institutional culture in which managers and staff had a positive working relationship:

> *We are at this level and leading this PHCC because of the contributions of all staff. Not only because I am in management, but because of my supporters, all my friends, doctors, nurses, lab staff—the reason we are here is due to their joint and close relationships (Senior health assistant in-charge, PHCC-2, best performer).*
>
> *Our best thing is we work together, sharing both happiness and sadness. We help each other with our duties. We provide services in a very good environment. (Auxiliary health worker, PHCC-3, best performer).*

Engaging local leadership

Best performing PHCCs had strong relationships with their local Management Committee. They viewed the Management Committee as accessible, responsive, and integral to the facility's management processes and leadership team. While the staff of even the best performing facilities sought more engagement from their Management Committees in certain

areas, respondents from best performers clearly described their committee as an important and effective advocate for the PHCC:

> *It has been easy to work with the Management Committee. The chairman of the Management Committee listens to the matters of the health staff. He is very easy to approach and is like our guardian (Senior auxiliary nurse midwife, PHCC-1, best performer).*
>
> *We feel secure with the management committee. They are the people's representative. The chairman of the management committee is the ward chairman and they are local so we feel kind of secured…The ward chairman himself visits the municipality and talks to them about our PHCC. The Committee members are very helpful (Auxiliary nurse midwife, PHCC-2, best performer).*

Management Committees of best performing facilities also performed regular management functions and were seen as well-integrated facility leaders, often providing feedback or conducting monitoring visits at the facility. Committee visits helped to ensure high quality services for users and a good work environment for staff:

> *We have regular meetings on a fortnightly or monthly basis. We ask the staff here if they have any problems or if they haven't received leave from the doctor…We tell them: "If you are facing any problems or issues like not receiving your salary, not getting leave, or not receiving over time compensation, let us know and we will make sure you receive them." We will make demands to the respective authority on your behalf (Management Committee vice president, PHCC-1, best performer).*
>
> *People share these issues with the Management Committee. We hold meetings [with the clinical staff] to discuss the issues and make sure the relationship between employees and citizens is cooperative (Staff nurse, PHCC-4, best performer).*

Worst performing facilities had less reliable Management Committees who were often unavailable for meetings and unresponsive to facility needs. They typically had weaker or no monitoring functions and rarely visited the facility:

> *There is exactly no relationship with them. I have been here for one and a half years and they have not visited the PHCC. During this crisis time of COVID-19, they also did not show any concern. They are responsible for managing our problems and visiting the PHCC, but there is no such thing. They do not visit even if we call them. Our relationship is not good (Auxiliary nurse midwife, PHCC-6, worst performer).*

Effective Management Committees also engaged external stakeholders for best performing PHCCs. In particular, they lobbied the municipality for funding for supplies and equipment and to expand services. Their ability to work with the municipality and mobilize funds helped best performing PHCCs avoid some of the resource constraints and management deficits keenly felt by worst performing PHCCs:

> *If [restocking supplies] is asked of the municipality, then it is delayed. But necessary items that small in amount…are managed through internal sources, and then replaced by funds from the Management Committee. Then there is no delay with it (Physician, PHCC-2, best performer).*
>
> *If we have any problems, [the Management Committee] comes to support us, saying that we are beside you and we will fully support you. If anything deteriorates, we solve this in our Management Committee meeting. For example, the Committee has played a great role in initiating health insurance services here. We did not have a pharmacy; they constructed a pharmacy room here (Physician in-charge, PHCC-1, best performer).*

In comparison, Management Committees of worst performers were disengaged and less able to marshal support for the facility, even if funds were available from the municipality:

> *The coordination between staff and management committee was not great. Before me, a doctor had come here with the aim to run emergency services. The municipality had also approved the budget. But the emergency services were not run because the Committee said that the staff would not receive money for extra duty. Because the coordination was not good, the approved budget was never used by the PHCC. As a result, no emergency services were provided, and the poor people had to suffer (Physician in-charge, PHCC-5, worst performer).*

Building active community accountability

Staff and leaders in the best performing facilities felt accountable to their local communities. They regularly solicited feedback from users and community members, typically in an informal fashion, and received additional feedback from the Management Committee. Best performers were more likely to act on community feedback and find ways to involve the community in facility management:

> *When I first came here, community members were raising concerns about the staff not being present in the PHCC in a timely manner. We held a meeting and sorted out this problem. Another example is the shortage of medicines. We also made changes on that front. Whatever problem arises, we do our best to sort out the problem urgently (Health assistant in-charge, PHCC-3, best performer).*

> *The responsible authorities [for soliciting community feedback] are the municipality and mayor. They are local people. They ask people about the quality of the services as well as any weak points in service delivery. They conduct board meetings every month and take feedback from the people during the meeting. They invite other politicians from other wards and they give us feedback received (Physician in-charge, PHCC-1, best performer).*

While worst performers reported receiving feedback from users, few had mechanisms for addressing issues or examples of remediating problems. Often, feedback mechanisms were ad hoc or addressed on an annual basis. In the few instances when problems were raised with the Management Committee or municipality, staff at worst performers found it more difficult to find support or solutions:

> *Feedback or complaints come to us from the health chief or member-secretary…Difficulties and problems occur and have occurred. But we cannot do anything. We have noted down the issues and sent [them] to the municipality many times and even to the district health office but we did not hear any response from them (Senior auxiliary health worker, PHCC-5, worst performer).*

> *Truthfully speaking, there isn't substantial communication between [the clinical staff] and the community (Physician, PHCC-8, worst performer).*

Developing sources of funding

Best performing health facilities were able to access funds for their essential programs, medicines and supplies, and equipment, either through internal sources or through support from the Management Committee. For example, one facility described selling medicines to raise funds to buy other medicines they lacked. While no facility was free of funding shortages, the best performers described finding ways to cope and reinvesting funds in the facility:

> *We do not face shortage or materials or problems with equipment at all. We have internal sources [of revenue] so even if the municipality does not do anything, the PHCC can manage (Physician, PHCC-2, best performer).*

Worst performers described ongoing funding shortages that hampered service provision. They often lacked the ability to mobilize funds from the Management Committee or the municipality. One PHCC was unable to access essential funds already allocated to their insurance program and Safe Motherhood Program because of the Management Committee's mismanagement of funds:

> *I wanted to hold a meeting with the management committee in order to start the insurance program…The account is still in the names of a senior doctor who has already left this PHCC and a past president of the management committee. The account was not even transferred to the current management committee...The account is blocked because it is not in use (Physician, PHCC-6, worst performer).*

Assessing and responding to facility performance

Another differentiator between best and worst performing PHCCs was whether they tracked data on facility performance and used it to evaluate and improve their services. While no facility described a thorough target-setting procedures or indicators that capture processes or

outcomes of care, best performers had regular recording and reporting procedures and engaged staff in these processes:

> *I think tracking indicators helps us increase the quality of services. It helps us to know if we are working according to the targets or not. It also helps us to understand why people are not taking our services or if after our services they are satisfied or not. And it is helpful to solve any problems (Auxiliary health worker, PHCC-4, best performer).*
>
> *Sometimes we have a monitoring visit, [the Management Committee] sees the data and provides comments. And every fifth of the month there is a meeting of in-charges from all health facilities [in the municipality] and after that meeting the doctor tells us if we are coming up short in something (Senior auxiliary nurse midwife, PHCC-1, best performer).*

Target-setting was limited to measures of utilization and coverage in most facilities; few mentioned measurement of process or outcome measures. However, most worst performing PHCCs collected little data and recorded and reported data irregularly. When they did collect data, they rarely reported findings to the staff.

Compensating staff fairly

Best performing facilities ensured their staff received reasonable salaries, that salaries arrived on time, and that staff were compensated for overtime duties, such as additional night-shifts to cover 24-hour services. In most cases, it was the responsibility of the Management Committee or the municipality leadership to provide and guarantee these funds:

> *There has been a system for providing incentive allowances, such as giving 35% of lab revenue to motivate the staff. This has been a precedent set by the municipality—a good precedent—to motivate and incentivize the staff (Physician in-charge, PHCC-1, best performer).*

In contrast, worst performers noted low salaries, especially in remote locations, and a lack of compensation for additional working hours:

> *I have a friend who works at a PHCC near my house and they receive eighty or ninety or one hundred thousand. They are in a good place. We are here in a very remote place where going home costs ten or fifteen thousand, truthfully speaking (Physician, PHCC-8, worst performer).*

Managing clinical staff performance

Best performing PHCCs ensured that clinical staff had adequate skills and training so they could perform confidently in their roles. Some facilities also appointed section leaders to promote staff leadership and autonomy in practice:

> *I feel capable and ready because the experience and training I have from all these years working in many different places have helped me a lot. Although I may not be perfect in everything, I am confident about doing what is expected of me in my job description. I am doing it all quite well (Staff nurse, PHCC-3, best performer).*

> *We feel autonomy to make decisions while working. But whenever there is any type of risk, we consult our seniors and discuss with our in-charge (Auxiliary health worker, PHCC-4, best performer).*

Best performing PHCCs also had staff-wide procedures for delineating roles and for ensuring that workloads were reasonable and fairly distributed:

> *All staff of the PHCC attend the meeting. We discuss and then determine the role of all staff members. We have a 24-hour birthing service so we also discuss night duty (Auxiliary health worker, PHCC-3, best performer).*

The worst performing facilities struggled to manage staff workloads and delineate clinical staff roles. Staff reported feeling underprepared for the duties expected of them within the facility. They noted specific issues with night duty:

> *The [municipal] health coordinator…believes that it is not difficult to look after emergency patients during the night shift…Sometimes there two to three delivery cases per night…that cause fatigue during the next day's duty. Such difficulties arise at times and I have requested help from this authority and it gets managed for a week and then it returns as a problem after a few days (Physician in-charge, PHCC-8, worst performer).*

Promoting uninterrupted availability of supplies and equipment

No facility had an adequately supply of medicines or supplies; most described issues obtaining and maintaining essential equipment such as X-ray machines. Many had received essential equipment via donation but could not access a technician to make repairs. Leaders and staff described how these issues hampered daily service provision. However, best performing PHCCs mobilized support through their Management Committee or found alternative ways to obtain the minimum required infrastructure:

> *This health institution did not have video X-ray machines. The Management Committee has helped procure video X-ray machines. Doctors did not have a room to stay. [The Management Committee] has managed rooms for them. Doctors also did not have different rooms for examining patients. [The Management Committee] has managed that as well. These are the things [the Management Committee] looks after (Management Committee vice president, PHCC-1, best performer).*

Worst performing PHCCs similarly struggled to access supplies and equipment. However, in contrast to best performers, their leaders and staff described no alternative approaches to obtaining these resources if they were not readily available from the municipality.

Discussion

We found several key factors that distinguished performance among best performing and worst performing primary health care centers in Nepal. Governance and management factors included effective management by leaders within the facility, the engagement of the local Management Committee, facility performance assessment and response, developing sources of funding, and fair staff compensation. We also found that best performers had stronger clinical staff performance management, community accountability mechanisms, and the ability to access and maintain supplies and equipment in comparison to worst performing PHCCs. We did not find meaningful differences in basic characteristics or other hypothesized drivers. Evidence from this study indicates that leaders in best performing facilities were highly motivated for success. They were more effective advocates than leaders in worst performing facilities, leveraging relationships with community and municipal leaders to find solutions to common constraints.

Our findings suggest that health system quality improvement efforts may benefit from strengthening the leadership capacity of health facilities. In this study, better performance was obtained through soft skills such as relationship-building with staff and local leaders. Capacity-building interventions should support facility leaders in developing these abilities, including motivating teams, creating a shared vision, and promoting collaboration.[16] Best performers outperformed worst performers despite facing similar constraints such as stockouts, inoperable equipment, and remote locations. Further, nearly all facilities described difficulties working with municipal leaders underprepared for oversight of primary care provision, though best performers were able to extract the support they needed by developing and nurturing strong relationships with these leaders. These findings suggest that investment in management and leadership

capacity at the lower levels of the health system may be important to elevating performance among struggling PHCCs.

Previous research has found that high-quality management, broadly, is associated with higher-quality primary care.[17–20] In our study, strong in-charges used a range of management strategies, from having regular meetings that include all staff members to establishing a collegial culture where the staff feel responsible for one another.[21] Facility leaders in best performers also engaged staff in leadership decisions within the facility, especially in terms of workload sharing and budgeting priorities.[19] While respondents in all facilities noted issues with certain managerial functions, such as ensuring stocks of medicines or filling vacant positions, leaders of best performing PHCCs were able to were able to overcome barriers that leaders in worst performers could not.[17] Importantly, no facility in-charge reported leadership or management training, and strong management was not tied to level of clinical education. This suggests that struggling facilities may need innately capable, motivated leaders or intensive management coaching and supports to improve performance.

Best and worst performing PHCCs were also distinguished by the engagement of their local Management Committees. Effective Management Committees provided support for internal management functions at the facility, conducting monitoring visits and problem-solving jointly with staff and facility leaders. Strong Management Committees were also critical to the other key distinguishing features of best performers. Together with facility in-charges, Committee members ensured sufficient financial resources to support facility operations, provided staff incentives or overtime pay, secured new equipment, or helped get it repaired. Critically, the Management Committee and in-charges of best performers had robust performance management functions in comparison to worst performers.[17,21] They monitored facility performance through

data collection and target-setting, and managed clinical staff roles, responsibilities and workloads. Strong managers also engaged clinicians in making decisions and solving problems. Our findings align with previous work showing that staff performance management is critical for improving provider practice. Multifaceted approaches in particular, such as group problem solving with training, have been shown to have a large effect on performance.[22]

In addition, Management Committees were essential liaisons to the health coordinator and other leaders at the municipal government level. Previous positive deviance work in Ethiopia identified a strong relationship with the local health office as critical to success.[23] While no facility in our study described a completely positive relationship with the municipal authorities, best performers had Management Committees that could mobilize support from the municipality when necessary.[24] With the recent health system decentralization in Nepal, municipal governments share authority over local PHCCs functions, such as procurement and staffing. While shifting power to local authorities has been documented to have positive effects, it must be accompanied by capacity building and accountability mechanisms for new local authorities.[25] Municipalities currently lack clear roles and responsibilities, often receiving little guidance and few resources from higher levels of authority.[12,25] They may also lack the management skills, decision-making autonomy, and knowledge of procurement required to fulfill their duties. While best performers in our study were able to overcome some of these issues, structural changes are needed to prepare municipal governments to support struggling facilities, including strong financing, adequate human resources, and national quality standards.[26]

Our findings also demonstrated the importance of community accountability mechanisms in local PHCCs.[27] Managers and clinical staff in best performers reported feeling more accountable to their local communities than worst performers.[28] They also reported acting on

feedback from patient visits and community meetings in a timely manner, whereas worst performers often reported lacking the know-how or municipal support necessary to respond. Social accountability interventions in Nepal and other low- and middle-income countries have been shown to improve service quality for maternal health by improving health system responsiveness, increasing community ownership, and involving the community in decision-making processes.[29] The mechanisms by which community accountability is established and leveraged to improve performance is an area ripe for further research.

This study demonstrates the usefulness of positive deviance analysis in understanding primary care performance. Future research may benefit from replication of this approach in other LMICs to identify common factors that promote or inhibit quality across contexts. Positive deviance could also be expanded to the level of countries or regions to explore higher-level factors that enable best-in-class performance. This study also demonstrates the successful application of the positive deviance approach using an online platform, an important contribution for when in-person data collection is not practicable.

Limitations

Our study is subject to several limitations. First, as with other positive deviance research, this study investigated relatively few primary health care centers and findings are specific to the context of the local setting, in this case Province 1; replicating this work with additional facilities in other regions of Nepal would improve transferability of findings. Second, this study could only capture respondents' perceptions of the factors that drive performance but is unable to test whether these factors had any significant effect. Third, our methodology does not allow us to investigate factors affecting facilities that originate upstream, such as preservice education.

Finally, we were unable to blind all interviewers to the best or worst status of health facilities, which could bias how interviewers probed during interviews. However, interviewers were trained to be even-handed in data collection and did not know any particular respondent's status or affiliation, and real-time debriefings during data collection may have mitigated bias. Previous work has shown that blinding in positive deviance analyses may be unnecessary.[14]

Conclusion

Our findings demonstrate the importance of high-functioning leadership at the facility and local levels to achieving best clinical and operational performance in primary care facilities. In addition to its intrinsic value for facility operations, high-quality management can improve access to resources, enhance performance assessment, and increase engagement with communities. An unexpected contribution of this work is the importance of good municipal leadership; the capacity of these leaders was considered as critical to performance as factors more proximal to facilities such as clinical skills or equipment.

Efforts to improve health system quality should invest in managerial and leadership capacity-building within facilities and local authorities that oversee health care provision. This is especially salient in the context of decentralization of health care delivery in Nepal. While additional research is needed, this is likely to be relevant in other decentralized contexts. Future work should develop best practices for strengthening local governance and generating community accountability mechanisms to improve primary care performance across under-resourced health systems.

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CHAPTER 5:

CONCLUSIONS

The three studies that comprise this mixed methods dissertation examine variations in health system quality and identify user and facility determinants of performance in low- and middle-income countries. Results demonstrate that a wide array of factors influence clinical quality at the point of care and broader performance at the facility level. Two overarching areas emerged across the three studies: The first is the important role of management across levels of health system leadership in optimizing service provision. The second is the critical role of users and communities in ensuring services meet their needs. Together, these findings indicate that common health system reforms, often small-scale and technical in nature, may be inadequate to the task of elevating health system performance.

Key findings and implications

Increasing management capacity across the health system

We find that management and leadership were critical for best performance in primary care across multiple LMICs.[1] In Chapter 3, we found that regular performance of simple management activities was strongly associated with better primary care performance. These activities included holding frequent management meetings, making decisions in meetings, reporting decisions back to staff, and taking subsequent action. In assessing these factors among primary health care centers in Nepal in Chapter 4, we found the qualitative data supported these same factors as critical to performance. Management capacity has been linked to better health system performance, though there has been insufficient research on building management

capacity, especially among LMICs.[2,3] These management activities require few resources or advanced skills to implement and, as we found, are already taking place in some facilities. Scaling standardized versions of these management activities may be a "quick win" for health systems seeking to improve primary care.

More complex and resource-intensive forms of management were also identified as key performance drivers in both Chapters 3 and 4. These included facility performance tracking and closely managing the roles, responsibilities, and skillsets of clinical staff. The former will require strong national data collection mechanisms, quality standards, and human resources to meaningfully evaluate and report performance data.[4] The latter will require strong preservice education to ensure providers are prepared for clinical practice, standardized roles and expectations for clinicians, adequate compensation and incentives for staff members, and facility leaders who can delegate responsibilities and advocate for resources. In addition to improving facility performance, these strategies may protect and sustain health workers often strained in under-resourced systems.[5,6]

We also found that leadership among local government and community leaders was critical to best performance. The capacity of local leaders, such as municipal health coordinators, is not widely measured or evaluated. However, these leaders play and important role in management, monitoring, staffing, and procurement for primary care facilities; a better understanding of their performance and contributions is essential to reducing variation in performance. In Nepal, municipal leaders who oversaw several primary health care centers and health posts were typically clinicians with no training in common management functions. Management Committee members, a small group of community leader volunteers, often played a key role in helping facilities overcome deficits in municipal-level leadership. While

decentralization can promote local flexibility and prioritization in health systems, it must be accompanied by capacity building, skills training, and adequate human resources to ensure health is not deprioritized. Municipal and community leaders must also have standardized roles, responsibilities, and resources for facilities to have equal opportunity to thrive.

Engaging users and communities

Across the three studies, we found that users and communities were instrumental to obtaining high quality clinical care. Evidence from Chapter 2 demonstrates that more empowered users were able to obtain higher quality services at the point of care. This suggests that empowering users to expect more from their health systems may be a fruitful approach to improving health outcomes. These findings align with recent work calling for increased population demand for quality.[7] Generating demand has both intrinsic value to individuals and instrumental value in elevating health system performance. Empowering users may also raise population expectations for care and reduce power asymmetries between providers and patients. Further, empowering patients to demand quality could increase the health system's accountability to its users.

In Chapters 3 and 4, we found that community accountability was a key component distinguishing best and worst performers. Community engagement through establishing feedback mechanisms, acting on feedback received, and feeling a strong sense of accountability to the community were hallmarks of best performance. Best performing facilities in Nepal were more closely managed by public representatives and elected officials, which reinforced community and facility ties. These findings suggest that social accountability mechanisms have a key role to play in raising performance at health facilities.

However, there is no one-size-fits all approach to empowering users or engaging communities. Many approaches to community engagement and oversight exist, including facility-user co-management meetings, joint planning practices, and health service monitoring, though receptivity to these strategies depends on a range of sociopolitical and economic factors, such as perceived legitimacy of citizen groups and health system enforceability mechanisms.[8,9] Some community accountability models, such as participatory women's groups and community monitoring programs, have proven fruitful in certain contexts.[10,11] Our results provide preliminary evidence that further exploration of these interventions is warranted. Policymakers should consider interventions that view users and communities as active agents in their health systems in order to best meet population needs.

Future directions

This dissertation enhances understanding of how health system leaders can optimize performance, with a particular focus on reducing variation in primary care. While common health system interventions tend to focus on more tangible "hardware" strategies, like building facilities or training health workers, the distinguishing factors identified in this work involve the "software" of health system management. Additional work is needed to identify how to establish these mechanisms where absent. For example, the health systems literature frequently points to good management as critical to performance, though there has been limited attention paid to how management capacity is cultivated and few examples of successful strategies in this area.[2,12] Deep investigation of how good management manifests at all levels of health system leadership is warranted. In this work, we were only able to investigate the lower levels of health system governance, such as health facilities, municipalities, and districts. However, further study of the

role of higher level leadership, including provincial and national levels, should be undertaken to inform any future health system reforms.

Similar work is needed to understand how best to build close ties with communities and users. While effective community engagement is likely a function of management capacity, it may also require mobilization from users and community leaders themselves. There are limited examples of interventions explicitly designed to establish community accountability and scant evidence of effectiveness in improving quality. More evidence is needed on the ways in which users can identify and demand higher quality care and engage in stewardship of their local health system. Further, research is needed to determine the acceptability of models in which partial responsibility for health system management falls to communities and individuals.

These studies jointly describe an array of drivers of primary care performance: Chapters 2 and 3 identify possible drivers, while Chapter 4 helps to explain why they matter, at least in the case of Nepal. However, this may not represent a complete set of performance levers; more research on the mechanisms that lead to better performance is required for practices to be evaluated or scaled. For example, Chapter 4 could easily be replicated to generate hypotheses regarding performance drivers in other LMICs to gain more generalizable insight. The model could also be extended to include a wider array of stakeholders, such as district health officers or community members, or could be applied at the national or regional levels. Countries with robust health information management systems could apply the methods of Chapter 3 to this data to assess whether drivers apply in other municipalities or regions.

Strategies to bring identified best practices to scale will depend on local and national context. In Nepal, decentralization has placed new demands on municipal leadership, introducing deficits at this critical level health system governance; thus, raising the performance of best

performers in Nepal will require supporting municipal health coordinators. In more centralized contexts, such an intervention may not be necessary. Much of the guidance around health system performance has been developed for centralized health systems, which have greater authority to impose national systems for health care payment and delivery. However, best practices for performance in decentralized health systems have received relatively less attention. Additional research is needed to transfer policy insights from centralized systems and contextualize them for newly decentralized contexts.

This research agenda will demand use of diverse methodologies. Qualitative methods are essential to generating hypotheses about performance drivers when literature on potential causes of variation is sparse, such as with district level management. However, quantitative methods are helpful to test whether these hypotheses hold true, and more quantitative confirmation of performance drivers is warranted. This points to the usefulness of mixed methods, such as the explanatory sequential mixed methods model used in this dissertation, in investigating variation in health systems. However, mixed methods approaches require deep knowledge of context and access to communities, as well as high-quality survey data. Quality indicators in widely-available health facility surveys, such as Service Provision Assessments, are broadly defined and cover limited areas; for example, there are no measures of leadership captured by SPA surveys. Given the resource-intensive nature of large-scale surveys and evaluations, preconceiving and prioritizing better performance measures is essential.

Fulfilling this research agenda will require close collaboration between multiple disciplines. Future studies of health system governance may benefit from partnerships between health system researchers and experts in management, leadership, and organizational science. Better understanding community engagement may require input from sociologists and

community organizers. Certainly, active engagement from users themselves will be essential to any initiatives in this area. Strong relationships between researchers and implementation partners will also be critical to successfully evaluate performance interventions. Finally, local communities and politicians must work together to identify key areas for improvement, design appropriate solutions, and build political will for reforms.

Research into potential causes of variation does not supply a ready-made solution set for increasing health system quality; rather, it signals practices that likely contributed to better performance. These practices, such as high quality management and community engagement, are intermediate measures of health system performance—more research is required to assess the impact they could have on health. Researchers should partner with implementers to thoughtfully package and rigorously evaluate performance interventions around potential drivers. This could include randomized controlled trials of community engagement models or natural experiments when new management models are established, as with decentralization in Nepal.

Finally, the findings from this research point to practices that distinguish better health system performance. These practices warrant further investigation to assess whether their replication could help close gaps in primary care quality. While potentially a useful strategy, this approach can only raise quality to a country's existing maximum. In settings where even exceptional performance is inadequate, raising average quality will be paramount. This will require large-scale, structural solutions led by governments in partnership with the people they serve.

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APPENDIX

Appendix A *Chapter 2 supplementary materials*

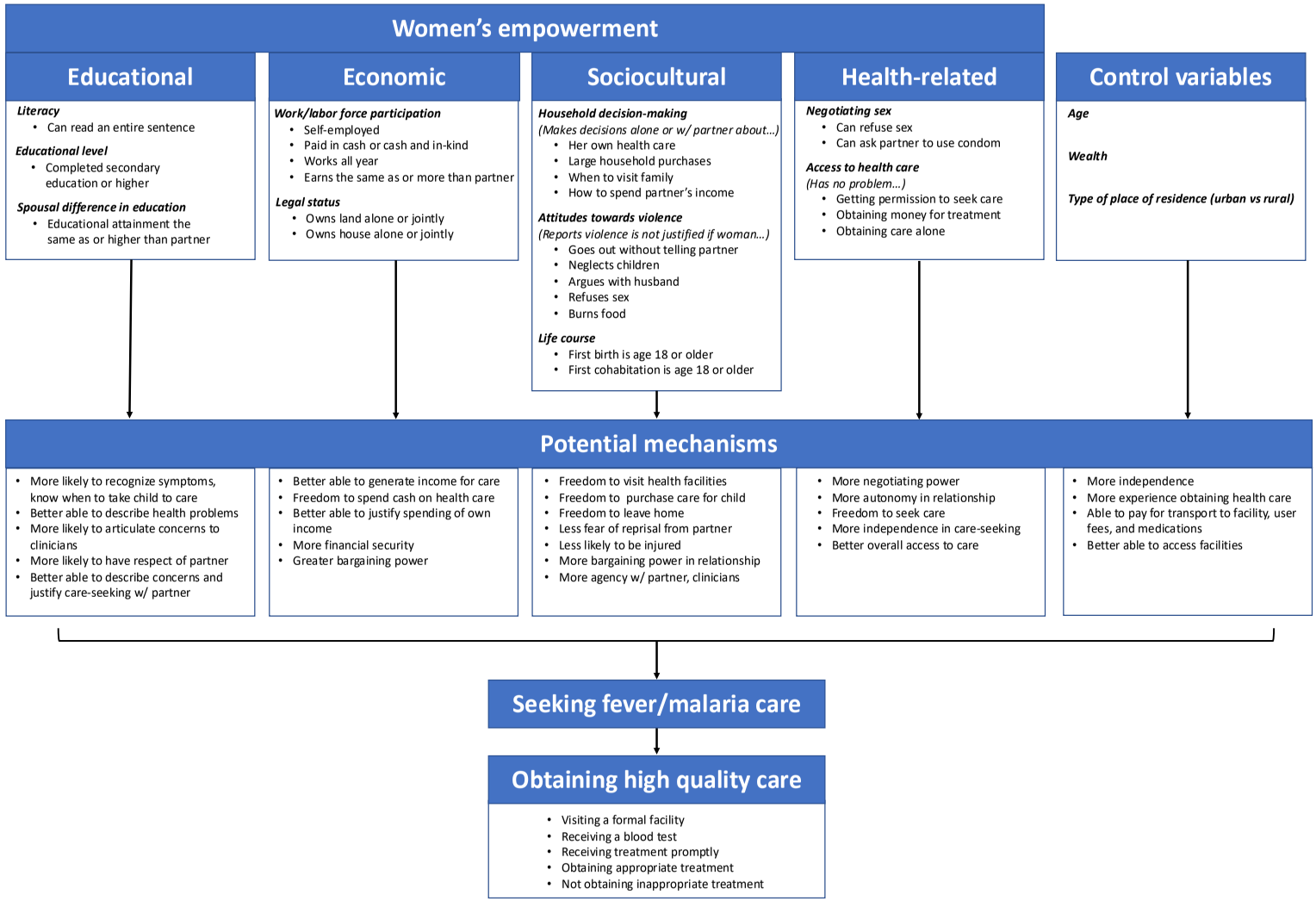

Figure A.1 Full conceptual model of women's empowerment and care seeking for children with fever and malaria

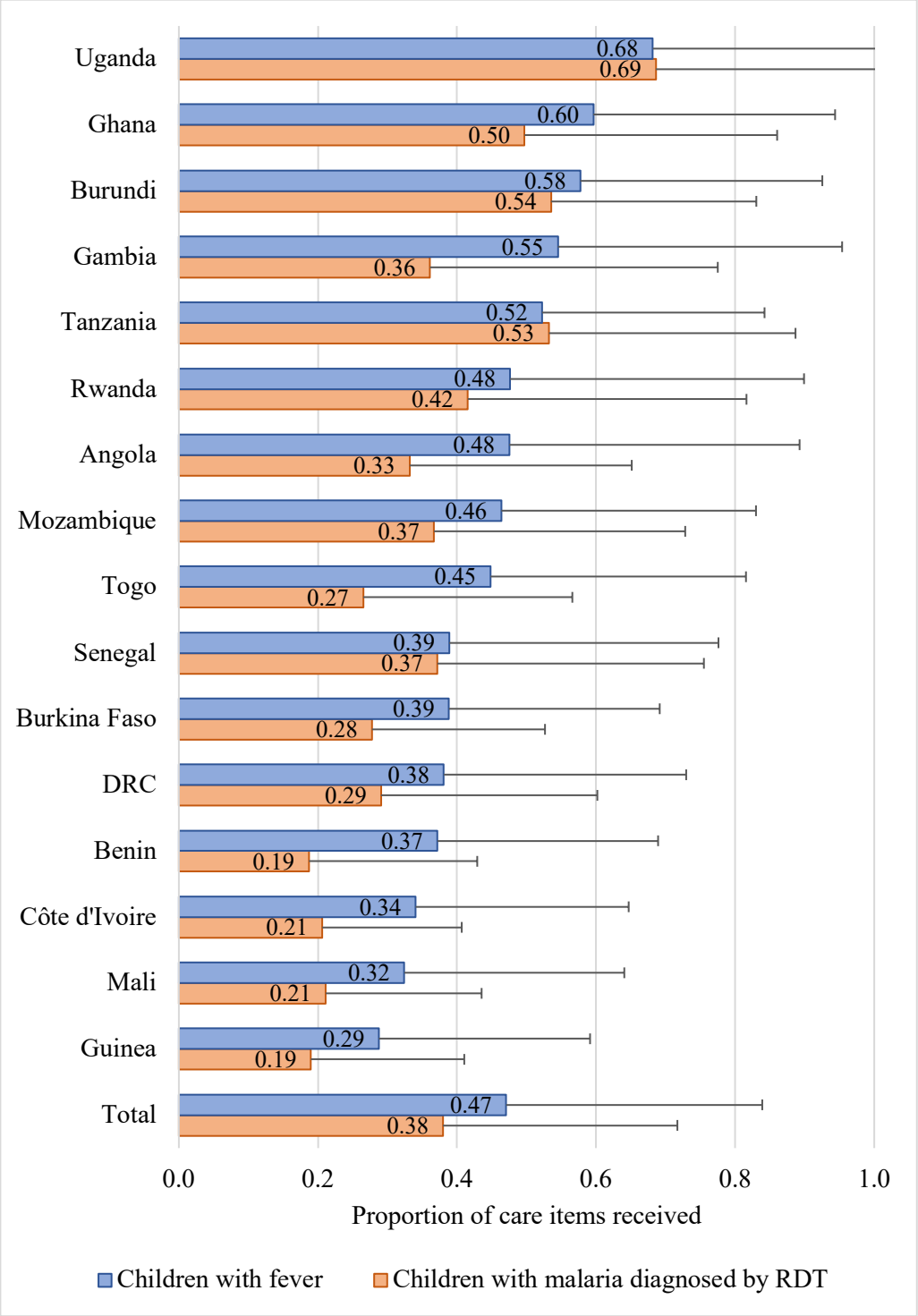

Figure A.2 Proportion of children obtaining each component of care for fever (N=25871) or malaria (N=4731) by country

Notes: DRC: Democratic Republic of the Congo. Care items for children with fever include seeking care at a formal facility, having blood taken, and not receiving inappropriate treatment. Care items for children with malaria include seeking care at a formal facility, having blood taken, beginning treatment the same or next day, receiving appropriate treatment, and not receiving inappropriate treatment. Whiskers indicate one standard deviation from the average proportion of care items received.

Table A.1 Dimensions, domains, and indicators of women's empowerment in the Demographic and Health Surveys

Dimension	Domain	Indicator	More empowered (code=1)	Less empowered (code=0)
Educational empowerment	Literacy	Literacy	Woman was able to read an entire sentence	Woman could not read or was able to read only parts of a sentence
	Educational attainment	Educational attainment	Woman completed secondary education	Woman completed no education or primary school only
	Spousal difference in education	Spousal difference in education	Woman had the same or higher educational attainment as her spouse/partner	Woman had lower educational attainment than her spouse/partner
Economic empowerment	Work/labor force participation	Type of employment	Woman was self-employed	Woman was unemployed or employed by someone else
		Type of earnings	Woman received cash or cash and in-kind earnings	Woman was unpaid or received in-kind earnings only
		Timing of employment	Woman was employed throughout the year	Woman was employed seasonally, occasionally, or on a temporary basis
		Relative income	Woman earned more or about the same as her spouse/partner	Woman made less than her spouse/partner or did not know
	Legal status	Land ownership	Woman owned land alone or jointly with her spouse/partner, or both	Woman did not own land
		Home ownership	Woman owned a home alone or jointly with her spouse/partner, or both	Woman did not own a home
Sociocultural empowerment	Household decision-making	Decisions about own health care	Woman reported making decisions alone or jointly with her partner	Woman reported that decisions were made by her partner or another person alone
		Decisions about visiting family	Woman reported making decisions alone or jointly with her partner	Woman reported that decisions were made by her partner or another person alone
		Decisions about spending spouse's/partner's income	Woman reported making decisions alone or jointly with her partner	Woman reported that decisions were made by her partner or another person alone
	Attitude towards violence	Violence is justified if a woman goes out without telling her husband	Woman reported that domestic violence is not justified	Woman reported that violence is justified or that she doesn't know

		Violence is justified if a woman neglects her children	Woman reported that domestic violence is not justified	Woman reported that violence is justified or that she doesn't know
		Violence is justified if a woman argues with her husband	Woman reported that domestic violence is not justified	Woman reported that violence is justified or that she doesn't know
		Violence is justified if a woman refuses sex	Woman reported that domestic violence is not justified	Woman reported that violence is justified or that she doesn't know
		Violence is justified if a woman burns food	Woman reported that domestic violence is not justified	Woman reported that violence is justified or that she doesn't know
	Life course	Age at first birth	Woman was age 18 or older	Woman was younger than age 18
		Age at first cohabitation	Woman was age 18 or older	Woman was younger than age 18
Health-related empowerment	Ability to negotiate sex	Refusing sex	Woman could refuse sex	Woman could not refuse sex or didn't know
		Asking spouse/partner to use a condom	Woman could ask spouse/partner to use a condom	Woman could not ask spouse/partner to use a condom or didn't know
	Access to health care	Getting permission to seek care	Woman said this was not a big problem	Woman said this was a big problem
		Obtaining money for treatment	Woman said this was not a big problem	Woman said this was a big problem
		Obtaining care alone	Woman said this was not a big problem	Woman said this was a big problem

Table A.2 Proportion of empowerment factors experienced by mothers of children with fever by country (N=25871)

Country	Educational		Economic		Sociocultural		Health-related		All empowerment factors	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Angola	0.29	(0.36)	0.48	(0.30)	0.61	(0.23)	0.55	(0.31)	0.48	(0.18)
Benin	0.29	(0.29)	0.38	(0.27)	0.68	(0.21)	0.59	(0.29)	0.48	(0.15)
Burkina Faso	0.34	(0.21)	0.33	(0.28)	0.51	(0.21)	0.53	(0.27)	0.43	(0.13)
Burundi	0.43	(0.30)	0.71	(0.24)	0.66	(0.24)	0.65	(0.23)	0.61	(0.14)
Côte d'Ivoire	0.32	(0.29)	0.45	(0.30)	0.49	(0.24)	0.58	(0.28)	0.46	(0.15)
DRC	0.38	(0.40)	0.52	(0.29)	0.49	(0.24)	0.53	(0.27)	0.48	(0.16)
Gambia	0.42	(0.34)	0.34	(0.25)	0.51	(0.23)	0.67	(0.25)	0.48	(0.15)
Ghana	0.44	(0.35)	0.38	(0.27)	0.68	(0.22)	0.73	(0.24)	0.56	(0.16)
Guinea	0.31	(0.23)	0.39	(0.25)	0.33	(0.21)	0.36	(0.39)	0.35	(0.15)
Mali	0.35	(0.23)	0.51	(0.33)	0.39	(0.22)	0.44	(0.26)	0.42	(0.13)
Mozambique	0.34	(0.32)	0.61	(0.36)	0.64	(0.22)	0.66	(0.29)	0.56	(0.15)
Rwanda	0.51	(0.29)	0.62	(0.27)	0.75	(0.21)	0.76	(0.21)	0.66	(0.15)
Senegal	0.38	(0.31)	0.22	(0.24)	0.47	(0.27)	0.51	(0.25)	0.39	(0.16)
Tanzania	0.50	(0.34)	0.40	(0.28)	0.55	(0.25)	0.66	(0.32)	0.53	(0.17)
Togo	0.34	(0.35)	0.31	(0.21)	0.60	(0.22)	0.66	(0.26)	0.48	(0.15)
Uganda	0.38	(0.35)	0.51	(0.29)	0.57	(0.24)	0.75	(0.22)	0.55	(0.15)
Total	0.38	(0.32)	0.47	(0.31)	0.56	(0.25)	0.60	(0.29)	0.50	(0.17)

Notes: DRC: Democratic Republic of the Congo. Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total).

Table A.3 Bivariable associations of empowerment with receipt of quality care among children with fever (N=25871) and malaria (N=4731)

Care component	Educational empowerment		Economic empowerment		Sociocultural empowerment		Health-related empowerment	
Children with fever in last two weeks (N=25871)								
	Mean (SD)	P-value F test	Mean (SD)	P-value F test	Mean (SD)	P-value F test	Mean (SD)	P-value F test
Sought any treatment								
No	0.35 (0.30)	**<0.001**	0.45 (0.31)	0.187	0.53 (0.25)	**0.003**	0.56 (0.29)	**<0.001**
Yes	0.39 (0.33)		0.48 (0.31)		0.57 (0.25)		0.63 (0.28)	
Sought treatment at formal facility								
No	0.36 (0.32)	**<0.001**	0.45 (0.30)	0.092	0.53 (0.25)	**0.001**	0.57 (0.29)	**<0.001**
Yes	0.40 (0.33)		0.48 (0.31)		0.58 (0.25)		0.64 (0.28)	
Blood taken from finger/heel for testing								
No	0.36 (0.32)	**<0.001**	0.44 (0.30)	**0.035**	0.53 (0.25)	**<0.001**	0.57 (0.29)	**<0.001**
Yes	0.42 (0.34)		0.54 (0.31)		0.61 (0.25)		0.67 (0.26)	
Did not receive inappropriate treatment								
No	0.38 (0.32)	0.806	0.48 (0.31)	0.434	0.55 (0.25)	0.723	0.60 (0.29)	0.505
Yes	0.38 (0.33)		0.46 (0.31)		0.56 (0.25)		0.61 (0.28)	
Children with malaria diagnosed by RDT (N=4731)								
	Mean (SD)	P-value F test	Mean (SD)	P-value F test	Mean (SD)	P-value F test	Mean (SD)	P-value F test
Sought any treatment								
No	0.32 (0.26)	0.120	0.47 (0.30)	0.316	0.50 (0.25)	0.103	0.52 (0.29)	**0.006**
Yes	0.34 (0.29)		0.50 (0.31)		0.53 (0.24)		0.58 (0.28)	

Sought treatment at formal facility								
No	0.32 (0.27)	**0.003**	0.47 (0.30)	0.182	0.50 (0.24)	**0.024**	0.52 (0.29)	**0.001**
Yes	0.35 (0.29)		0.51 (0.31)		0.55 (0.25)		0.61 (0.28)	
Blood taken from finger/heel for testing								
No	0.31 (0.26)	**0.013**	0.45 (0.30)	0.077	0.49 (0.24)	**0.005**	0.52 (0.29)	**<0.001**
Yes	0.37 (0.31)		0.58 (0.30)		0.58 (0.24)		0.65 (0.26)	
Began treatment for malaria same or next day								
No	0.32 (0.27)	**0.002**	0.46 (0.30)	**0.021**	0.50 (0.24)	**0.002**	0.53 (0.29)	**<0.001**
Yes	0.36 (0.30)		0.56 (0.30)		0.57 (0.25)		0.64 (0.27)	
Received appropriate treatment								
No	0.32 (0.26)	**0.016**	0.48 (0.31)	0.380	0.51 (0.25)	0.075	0.54 (0.29)	**0.021**
Yes	0.36 (0.32)		0.52 (0.30)		0.55 (0.25)		0.64 (0.28)	
Did not receive inappropriate treatment								
No	0.33 (0.27)	0.882	0.48 (0.31)	0.632	0.51 (0.24)	0.316	0.55 (0.28)	0.638
Yes	0.33 (0.28)		0.50 (0.30)		0.53 (0.25)		0.57 (0.29)	

Notes: Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total). "Sought treatment at formal facility" is defined as seeking care at a formal facility or provider, such as a government health center, rather than an informal provider such as a traditional practitioner or marketplace. "Received appropriate treatment" is defined as receipt of an antimalarial deemed appropriate by each country's national malaria treatment guidelines for either uncomplicated or severe malaria (typically an artemisinin-based combination therapy). "Did not receive inappropriate treatment" is defined as avoidance of a contraindicated medication or an unrecommended drug for a positive malaria diagnosis, a negative malaria diagnosis, or fever but unknown malaria according to country-specific guidelines. Estimates were clustered at the country level.

Table A.4 Multivariable hurdle regressions on care seeking and receipt of quality care for children with fever (N=25871) and malaria (N=4731) with overall empowerment index

	Children with fever in the last two weeks				Children with malaria diagnosed by RDT			
	Logistic part: Sought care (yes or no)		Poisson part: Number of care items (if care was sought)		Logistic part: Sought care (yes or no)		Poisson part: Number of care items (if care was sought)	
Variable	**AOR**	**95% CI**	**AIRR**	**95% CI**	**AOR**	**95% CI**	**AIRR**	**95% CI**
Overall empowerment	**2.01**	**(1.570 - 2.561)**	**1.13**	**(1.078 - 1.179)**	1.07	(0.588 - 1.949)	**1.29**	**(1.145 - 1.447)**
Female	1.01	(0.959 - 1.068)	0.99	(0.986 - 1.003)	0.97	(0.864 - 1.098)	0.99	(0.972 - 1.018)
Child age	1.01	(0.984 - 1.044)	1.00	(0.990 - 1.002)	**0.92**	**(0.866 - 0.979)**	1.01	(0.992 - 1.021)
Mother age	**0.99**	**(0.987 - 0.996)**	**0.99**	**(0.998 - 0.999)**	0.99	(0.981 - 1.003)	1.00	(0.998 - 1.002)
Rural	0.91	(0.795 - 1.052)	0.98	(0.953 - 1.010)	0.97	(0.735 - 1.279)	0.97	(0.912 - 1.022)
Wealth (ref: Poorest quintile)								
Second quintile	1.06	(0.926 - 1.205)	1.00	(0.966 - 1.037)	1.07	(0.939 - 1.224)	1.01	(0.953 - 1.067)
Third quintile	1.16	(0.978 - 1.368)	1.00	(0.963 - 1.044)	1.17	(0.895 - 1.536)	1.03	(0.974 - 1.083)
Fourth quintile	**1.25**	**(1.027 - 1.530)**	1.01	(0.961 - 1.051)	**1.36**	**(1.077 - 1.722)**	1.05	(0.975 - 1.128)
Richest quintile	**1.59**	**(1.182 - 2.143)**	1.01	(0.957 - 1.060)	**2.25**	**(1.667 - 3.037)**	**1.09**	**(1.000 - 1.178)**
Observations	25871		17756		4731		3225	

Notes: Overall empowerment is an average of four dimensions of empowerment factors: Educational, economic, sociocultural, and health-related. Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total). Care items for children with fever include seeking care at a formal facility, having blood taken, and not receiving inappropriate treatment. Care items for children with malaria include seeking care at a formal facility, having blood taken, beginning treatment the same or next day, receiving appropriate treatment, and not receiving inappropriate treatment. Estimates were obtained using Poisson hurdle regression clustered at the country level. All models included country fixed effects. AOR, adjusted odds ratio; AIRR, adjusted incidence rate ratio.

Table A.5 Multivariable zero-inflated Poisson regression models of care seeking and receipt of quality care for fever (N=25871) and malaria (N=4731)

	Children with fever in the last two weeks				Children with malaria diagnosed by RDT			
	Zero inflated part: Sought care (yes or no)		Poisson part: Number of care items (if care was sought)		Zero inflated part: Sought care (yes or no)		Poisson part: Number of care items (if care was sought)	
Variable	**AOR**	**95% CI**	**AIRR**	**95% CI**	**AOR**	**95% CI**	**AIRR**	**95% CI**
Educational empowerment	**0.89**	**(0.814 - 0.973)**	1.01	(0.990 - 1.039)	1.15	(0.887 - 1.504)	1.04	(0.979 - 1.096)
Economic empowerment	0.87	(0.729 - 1.041)	1.04	(0.998 - 1.085)	0.96	(0.656 - 1.418)	1.05	(0.972 - 1.143)
Sociocultural empowerment	**0.83**	**(0.714 - 0.953)**	**1.06**	**(1.020 - 1.102)**	1.13	(0.900 - 1.415)	**1.12**	**(1.027 - 1.223)**
Health-related empowerment	**0.72**	**(0.542 - 0.963)**	**1.05**	**(1.002 - 1.104)**	0.89	(0.659 - 1.212)	**1.10**	**(1.024 - 1.189)**
Female	0.98	(0.915 - 1.042)	0.99	(0.982 - 1.004)	1.02	(0.876 - 1.186)	0.99	(0.965 - 1.019)
Child age	0.97	(0.937 - 1.010)	0.99	(0.985 - 1.003)	**1.11**	**(1.033 - 1.184)**	1.01	(0.991 - 1.025)
Mother age	**1.01**	**(1.004 - 1.016)**	**1.00**	**(0.998 - 1.000)**	1.01	(0.998 - 1.021)	1.00	(0.998 - 1.002)
Rural	1.09	(0.909 - 1.299)	0.97	(0.938 - 1.012)	1.04	(0.704 - 1.525)	0.96	(0.892 - 1.037)
Wealth (ref: Poorest quintile)								
Second quintile	0.93	(0.782 - 1.103)	1.00	(0.958 - 1.042)	0.94	(0.790 - 1.108)	1.01	(0.944 - 1.076)
Third quintile	0.84	(0.680 - 1.032)	1.00	(0.955 - 1.053)	0.87	(0.646 - 1.181)	1.03	(0.971 - 1.100)
Fourth quintile	**0.75**	**(0.581 - 0.956)**	1.00	(0.949 - 1.059)	**0.70**	**(0.525 - 0.940)**	1.05	(0.966 - 1.143)
Richest quintile	**0.54**	**(0.370 - 0.798)**	1.01	(0.951 - 1.074)	**0.42**	**(0.276 - 0.649)**	1.11	(0.996 - 1.240)

Notes: Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total). Care items for children with fever include seeking care at a formal facility, having blood taken, and not receiving inappropriate treatment. Care items for children with malaria include seeking care at a formal facility, having blood taken, beginning treatment the same or next day, receiving appropriate treatment, and not receiving inappropriate treatment. Estimates were obtained using zero-inflated Poisson regression clustered at the country level. All models included country fixed effects. AOR, adjusted odds ratio; AIRR, adjusted incidence rate ratio.

Table A.6 Multivariable logistic regression models for each care activity for children with fever (N=25871)

	Sought any treatment		Sought treatment at formal facility		Blood taken from finger/heel for testing		Did not receive inappropriate treatment	
Variable	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
Educational empowerment	**1.11**	**(1.037 - 1.187)**	1.09	(0.997 - 1.192)	**1.11**	**(1.004 - 1.236)**	0.98	(0.874 - 1.106)
Economic empowerment	1.14	(0.995 - 1.312)	**1.28**	**(1.055 - 1.563)**	**1.37**	**(1.141 - 1.633)**	0.88	(0.737 - 1.054)
Sociocultural empowerment	**1.22**	**(1.072 - 1.379)**	**1.34**	**(1.152 - 1.564)**	1.18	(0.969 - 1.446)	**1.24**	**(1.046 - 1.480)**
Health empowerment	**1.32**	**(1.079 - 1.621)**	**1.44**	**(1.260 - 1.653)**	**1.45**	**(1.172 - 1.798)**	0.91	(0.785 - 1.051)
Female	1.01	(0.958 - 1.068)	0.98	(0.931 - 1.023)	0.96	(0.918 - 1.009)	1.00	(0.936 - 1.066)
Child age	1.01	(0.985 - 1.045)	0.98	(0.951 - 1.012)	**1.09**	**(1.064 - 1.125)**	**0.89**	**(0.863 - 0.926)**
Mother age	**0.99**	**(0.987 - 0.996)**	**0.99**	**(0.989 - 0.995)**	**0.99**	**(0.983 - 0.995)**	1.00	(0.994 - 1.011)
Rural	0.92	(0.799 - 1.050)	0.92	(0.777 - 1.090)	**0.77**	**(0.645 - 0.929)**	1.04	(0.898 - 1.215)
Wealth (ref: Poorest quintile)								
Second quintile	1.06	(0.925 - 1.204)	1.06	(0.920 - 1.230)	0.98	(0.821 - 1.164)	0.95	(0.849 - 1.055)
Third quintile	1.15	(0.975 - 1.363)	1.14	(0.914 - 1.426)	1.01	(0.783 - 1.292)	0.94	(0.803 - 1.095)
Fourth quintile	**1.25**	**(1.023 - 1.520)**	1.22	(0.926 - 1.605)	1.01	(0.760 - 1.337)	0.89	(0.687 - 1.154)
Richest quintile	**1.58**	**(1.179 - 2.129)**	1.39	(0.964 - 1.992)	1.14	(0.721 - 1.809)	0.84	(0.587 - 1.199)
Observations	25871		25871		25871		25871	

Notes: Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total). "Sought treatment at formal facility" is defined as seeking care at a formal facility or provider, such as a government health center, rather than an informal provider such as a traditional practitioner or marketplace. "Did not receive inappropriate treatment" is defined as avoidance of a contraindicated medication or an unrecommended drug for a positive malaria diagnosis, a negative malaria diagnosis, or fever but unknown malaria according to country-specific guidelines. Estimates were obtained using logistic regression clustered at the country level. All models included country fixed effects. AOR, adjusted odds ratio.

Table A.7 Multivariable logistic regression models for each care item for children with malaria diagnosed by RDT (N=4731)

	Sought any treatment		Sought treatment at formal facility		Blood taken from finger/heel for testing		Began treatment for malaria same or next day		Received appropriate treatment		Did not receive inappropriate treatment	
Variable	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
Educational empowerment	0.90	(0.737 - 1.105)	1.02	(0.948 - 1.104)	1.22	(0.979 - 1.516)	1.03	(0.786 - 1.360)	1.17	(0.895 - 1.530)	1.06	(0.845 - 1.331)
Economic empowerment	1.03	(0.726 - 1.448)	**1.31**	**(1.020 - 1.671)**	0.90	(0.559 - 1.459)	**1.43**	**(1.026 - 2.001)**	1.17	(0.776 - 1.765)	0.90	(0.640 - 1.262)
Sociocultural empowerment	1.00	(0.810 - 1.243)	1.30	(0.968 - 1.733)	1.22	(0.849 - 1.740)	**1.37**	**(1.058 - 1.771)**	1.32	(0.908 - 1.927)	**1.33**	**(1.023 - 1.737)**
Health-related empowerment	1.14	(0.895 - 1.454)	**1.55**	**(1.179 - 2.040)**	**1.68**	**(1.086 - 2.589)**	**1.55**	**(1.162 - 2.061)**	1.19	(0.799 - 1.770)	**0.83**	**(0.716 - 0.973)**
Female	0.97	(0.863 - 1.099)	0.95	(0.851 - 1.071)	1.06	(0.970 - 1.168)	0.99	(0.877 - 1.120)	0.94	(0.845 - 1.048)	1.02	(0.954 - 1.087)
Child age	**0.92**	**(0.865 - 0.979)**	0.93	(0.841 - 1.034)	0.95	(0.890 - 1.004)	1.05	(0.982 - 1.116)	1.02	(0.924 - 1.117)	1.00	(0.964 - 1.041)
Mother age	0.99	(0.982 - 1.002)	**0.99**	**(0.975 - 0.998)**	1.00	(0.985 - 1.011)	1.00	(0.988 - 1.008)	1.00	(0.993 - 1.011)	1.01	(0.996 - 1.022)
Rural	0.96	(0.738 - 1.261)	0.88	(0.637 - 1.224)	**0.80**	**(0.657 - 0.967)**	0.93	(0.785 - 1.108)	0.87	(0.645 - 1.169)	1.05	(0.862 - 1.280)
Wealth (ref: Poorest quintile)												
Second quintile	1.07	(0.937 - 1.217)	1.03	(0.852 - 1.235)	1.18	(0.989 - 1.414)	0.98	(0.803 - 1.186)	1.07	(0.864 - 1.333)	0.91	(0.741 - 1.110)
Third quintile	1.17	(0.893 - 1.528)	1.13	(0.865 - 1.480)	1.13	(0.763 - 1.666)	1.14	(0.851 - 1.522)	1.14	(0.824 - 1.575)	0.91	(0.744 - 1.106)
Fourth quintile	**1.36**	**(1.068 - 1.729)**	1.26	(0.959 - 1.656)	**1.45**	**(1.137 - 1.856)**	1.27	(0.812 - 1.980)	**1.49**	**(1.114 - 2.002)**	0.92	(0.650 - 1.293)
Richest quintile	**2.26**	**(1.646 - 3.099)**	**1.67**	**(1.046 - 2.655)**	**1.84**	**(1.268 - 2.680)**	1.70	(0.963 - 2.996)	**2.28**	**(1.758 - 2.950)**	0.75	(0.508 - 1.111)
Observations	4731		4731		4731		4731		4731		4731	

Notes: Educational empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: literacy, educational level, and spousal difference in education (three indicators total). Economic empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: work/labor force participation and legal status (six indicators total). Sociocultural empowerment is an average of the proportion of empowerment factors a woman experiences in three domains: household decision-making, attitudes towards violence, and life course (11 indicators total). Health-related empowerment is an average of the proportion of empowerment factors a woman experiences in two domains: negotiating sex and access to health care (five indicators total). "Sought treatment at formal facility" is defined as seeking care at a formal facility or provider, such as a government health center, rather than an informal provider such as a traditional practitioner or marketplace. "Received appropriate treatment" is defined as receipt of an antimalarial deemed appropriate by each country's national malaria treatment guidelines for either uncomplicated or severe malaria (typically an artemisinin-based combination therapy). "Did not receive inappropriate treatment" is defined as avoidance of a contraindicated medication or an unrecommended drug for a positive malaria diagnosis, a negative malaria diagnosis, or fever but unknown malaria according to country-specific guidelines. Estimates were obtained using logistic regression clustered at the country level. All models included country fixed effects. AOR, adjusted odds ratio.

Appendix B *Chapter 3 supplementary materials*

Table B.1 Facility performance by good medical practice index clinical action item in seven countries, 2010-2018

Clinical action item	Hospitals				Clinics			
	Best (n=152)		Worst (n=142)		Best (n=464)		Worst (n=451)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Antenatal care								
History-taking								
Asks client age	0.92	(0.21)	0.61	(0.42)	0.94	(0.22)	0.67	(0.42)
Asks number of past pregnancies	0.83	(0.29)	0.51	(0.43)	0.87	(0.29)	0.53	(0.46)
Asks date of last menstrual period	0.93	(0.19)	0.64	(0.40)	0.93	(0.23)	0.62	(0.44)
Asks about bleeding in pregnancy	0.58	(0.38)	0.09	(0.19)	0.44	(0.43)	0.03	(0.13)
Examination								
Checks for anemia	0.88	(0.24)	0.25	(0.33)	0.88	(0.28)	0.44	(0.42)
Measures fundal height	0.93	(0.21)	0.67	(0.39)	0.91	(0.25)	0.69	(0.41)
Measures blood pressure	0.99	(0.05)	0.47	(0.44)	0.97	(0.15)	0.49	(0.46)
Measures weight	0.96	(0.17)	0.46	(0.45)	0.97	(0.15)	0.45	(0.46)
Counseling								
Encourages questions	0.87	(0.28)	0.31	(0.40)	0.79	(0.37)	0.31	(0.42)
Counsels on 1+ danger signs	0.58	(0.41)	0.12	(0.20)	0.69	(0.40)	0.11	(0.27)
Family planning								
History-taking								
Asks client age	0.86	(0.29)	0.52	(0.39)	0.76	(0.37)	0.30	(0.40)
Asks desired timing of next child	0.44	(0.44)	0.06	(0.19)	0.20	(0.36)	0.02	(0.13)
Asks about STI symptoms	0.44	(0.43)	0.06	(0.18)	0.29	(0.41)	0.01	(0.10)
Asks date of last menstrual period	0.78	(0.35)	0.40	(0.35)	0.77	(0.35)	0.16	(0.32)
Examination								
Measures blood pressure	0.91	(0.23)	0.35	(0.43)	0.89	(0.28)	0.34	(0.44)
Measures weight	0.88	(0.27)	0.35	(0.42)	0.83	(0.35)	0.29	(0.42)
Counseling								
Asks about concerns w/ method	0.70	(0.41)	0.42	(0.37)	0.78	(0.35)	0.21	(0.36)
Counsels on 1+ issues on 1+ methods	0.94	(0.19)	0.65	(0.35)	0.91	(0.25)	0.47	(0.45)
Sick child care								
History-taking								
Asks about ability to drink	0.47	(0.39)	0.12	(0.24)	0.43	(0.42)	0.06	(0.18)
Asks about fever	0.95	(0.15)	0.74	(0.32)	0.94	(0.16)	0.61	(0.36)
Asks about sick feeding pattern	0.52	(0.40)	0.13	(0.24)	0.49	(0.41)	0.05	(0.15)
Asks about cough/trouble breathing OR vomiting	0.91	(0.20)	0.62	(0.34)	0.91	(0.20)	0.54	(0.37)

Examination								
Measures temperature	0.95	(0.14)	0.66	(0.40)	0.95	(0.16)	0.55	(0.43)
Assesses dehydration	0.48	(0.41)	0.13	(0.24)	0.51	(0.40)	0.08	(0.20)
Assesses respiration	0.54	(0.43)	0.08	(0.21)	0.58	(0.43)	0.05	(0.16)
Measures weight	0.75	(0.38)	0.41	(0.44)	0.73	(0.41)	0.26	(0.40)
Counseling								
States diagnosis	0.64	(0.40)	0.22	(0.32)	0.53	(0.44)	0.10	(0.23)
Counsels on 1+ danger signs	0.36	(0.41)	0.02	(0.10)	0.32	(0.39)	0.03	(0.14)

Notes: Three antenatal care history-taking items were assessed for first visits only: asks client age, asks number of past pregnancies, and asks date of last menstrual period.

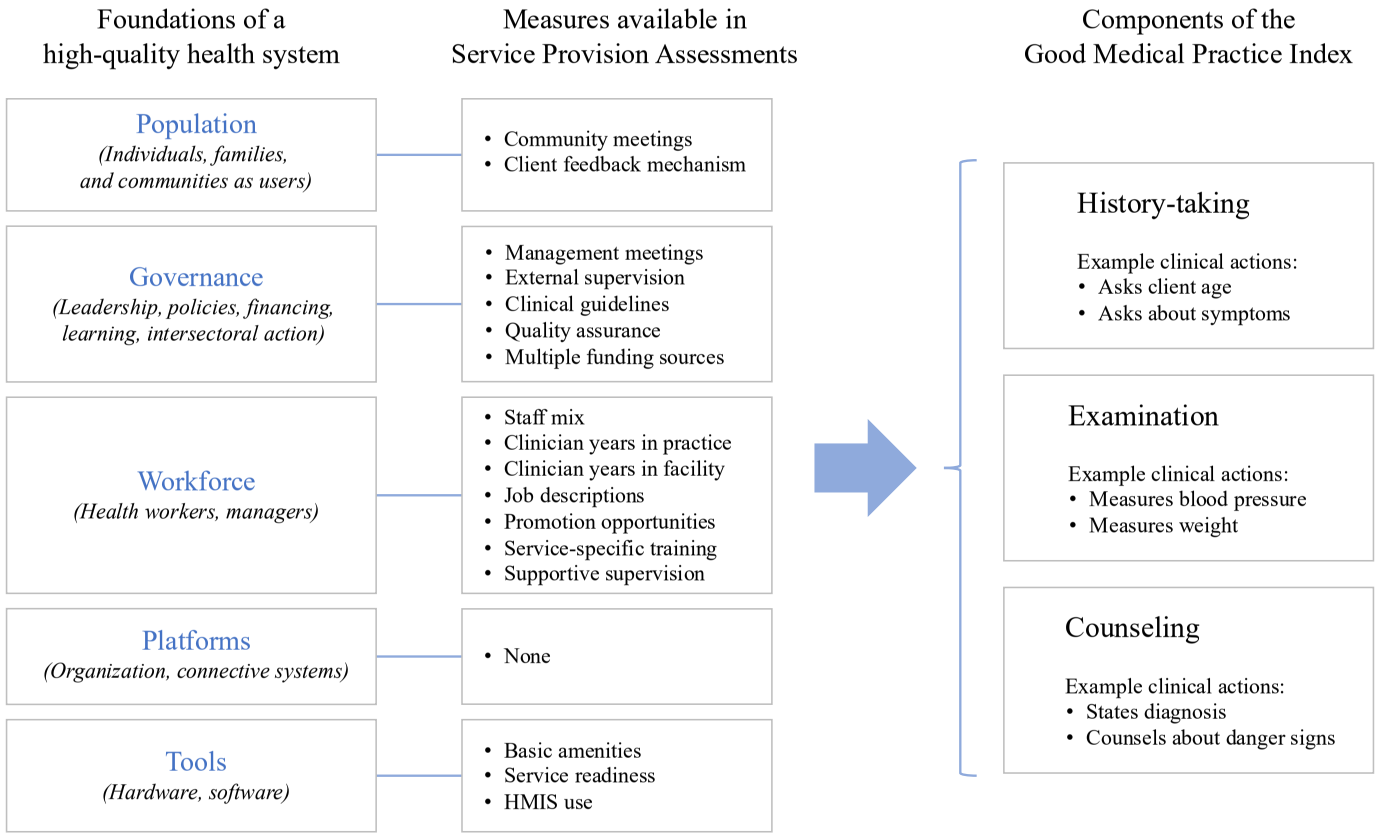

Figure B.1 Facility-level determinants of high quality primary care

Notes: HMIS: health management information system.

Table B.2 Definitions of potential performance drivers from Service Provision Assessments

Population	
Community meetings	whether the facility held and recorded a meeting with community members in the past six months
Client feedback mechanism	whether the facility has system for obtaining, reviewing, and reporting clients' opinions
Governance	
Management meetings	whether the facility management meets at least every six months, made decisions based on the most recent meeting, and took action in follow up
External supervision	whether an external supervisor 1) conducted a supervisory visit in the last six months, 2) used a checklist to assess the quality of health services data, 3) discussed facility performance, 4) helped the facility make data-based performance decisions, 5) provided verbal or written feedback, 6) checked facility registers, 7) discussed performance problems, 8) discussed policy or administrative matters, 9) discussed technical protocols or service delivery issues, 10) held an official staff meeting, and 11) observed individuals providing clinical care
Clinical guidelines	whether the facility had service-specific guidelines for antenatal care, family planning, and sick child care
Quality assurance	whether the facility routinely carries out and records quality assurance activities
Multiple funding sources	whether the facility had multiple funding source available
Workforce	
Staff mix	the ratio of physicians to other clinicians in the facility
Clinician years in practice	the proportion of clinicians with over five years' experience since graduation from training
Clinician years in facility	the proportion of clinicians with over five years' experience in the specific facility
Job descriptions	the proportion of clinicians with a written job description
Promotion opportunities	the proportion of clinicians who reported being aware of opportunities for promotion
Service-specific training	the proportion of clinicians with a service-specific training in the last six months
Supportive supervision	the proportion of clinicians who reported supervision that included discussion of problems encountered and receipt of supervisor feedback
Tools	
Basic amenities	the proportion of seven items: electricity, water, any private room, toilet, communication, computer and internet, and ambulance

Service readiness	the proportion of essential basic equipment, diagnostics, and medication required in each service area
HMIS use	whether or not the facility had an HMIS unit and a report of health services info compiled at least every six months
Contextual factors	
Ownership	whether the facility managing authority is: 1) governmental, 2) a non-governmental or not-for-profit, 3) private for-profit, or 4) mission or faith-based.
Client education	the proportion of clients with secondary school education or higher
Client visits	the number of client visits on the day of survey

Notes: HMIS: health management information system.

Table B.3 Full characteristics of health facilities by performance status in seven countries, 2010-2018

Variable	n	(%)	n	(%)	n	(%)	n	(%)
	Hospitals				Clinics			
	Best (n=152)		Worst (n=142)		Best (n=464)		Worst (n=451)	
Patient volumes								
Client visits on day of survey (mean, SD)	18	(30.6)	17	(32.4)	10	(12.5)	8	(11.0)
Urban/rural*								
Urban	55	(42.0)	57	(48.0)	143	(38.0)	112	(31.0)
Facility ownership								
Government	71	(46.7)	66	(46.5)	313	(67.5)	312	(69.2)
NGO or Private non-profit	4	(2.6)	3	(2.1)	30	(6.5)	32	(7.1)
Private for-profit	36	(23.7)	33	(23.2)	66	(14.2)	67	(14.9)
Mission or faith-based	41	(27.0)	40	(28.2)	55	(11.9)	40	(8.9)
Facility country								
Democratic Republic of Congo	74	(48.7)	68	(47.9)	41	(8.8)	43	(9.5)
Haiti	9	(5.9)	9	(6.3)	61	(13.2)	60	(13.3)
Kenya	12	(7.9)	13	(9.2)	34	(7.3)	32	(7.1)
Malawi	6	(4.0)	3	(2.1)	52	(11.2)	53	(11.8)
Nepal	10	(6.6)	10	(7.0)	49	(10.6)	55	(12.2)
Senegal	15	(9.9)	14	(9.9)	158	(34.1)	148	(32.8)
Tanzania	26	(17.1)	25	(17.6)	69	(14.9)	60	(13.3)
Technical quality								
Good Medical Practice Index (mean, SD)	0.79	(0.10)	0.32	(0.08)	0.73	(0.08)	0.23	(0.09)

Notes: Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions; see appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Total surveyed facilities in each country were as follows: Democratic Republic of Congo (n=1163), Haiti (n=730), Kenya (n=481), Malawi (n=629), Nepal (n=689), Senegal (n=1726), and Tanzania (n=965). The variable urban/rural was not available in Kenya and Nepal.

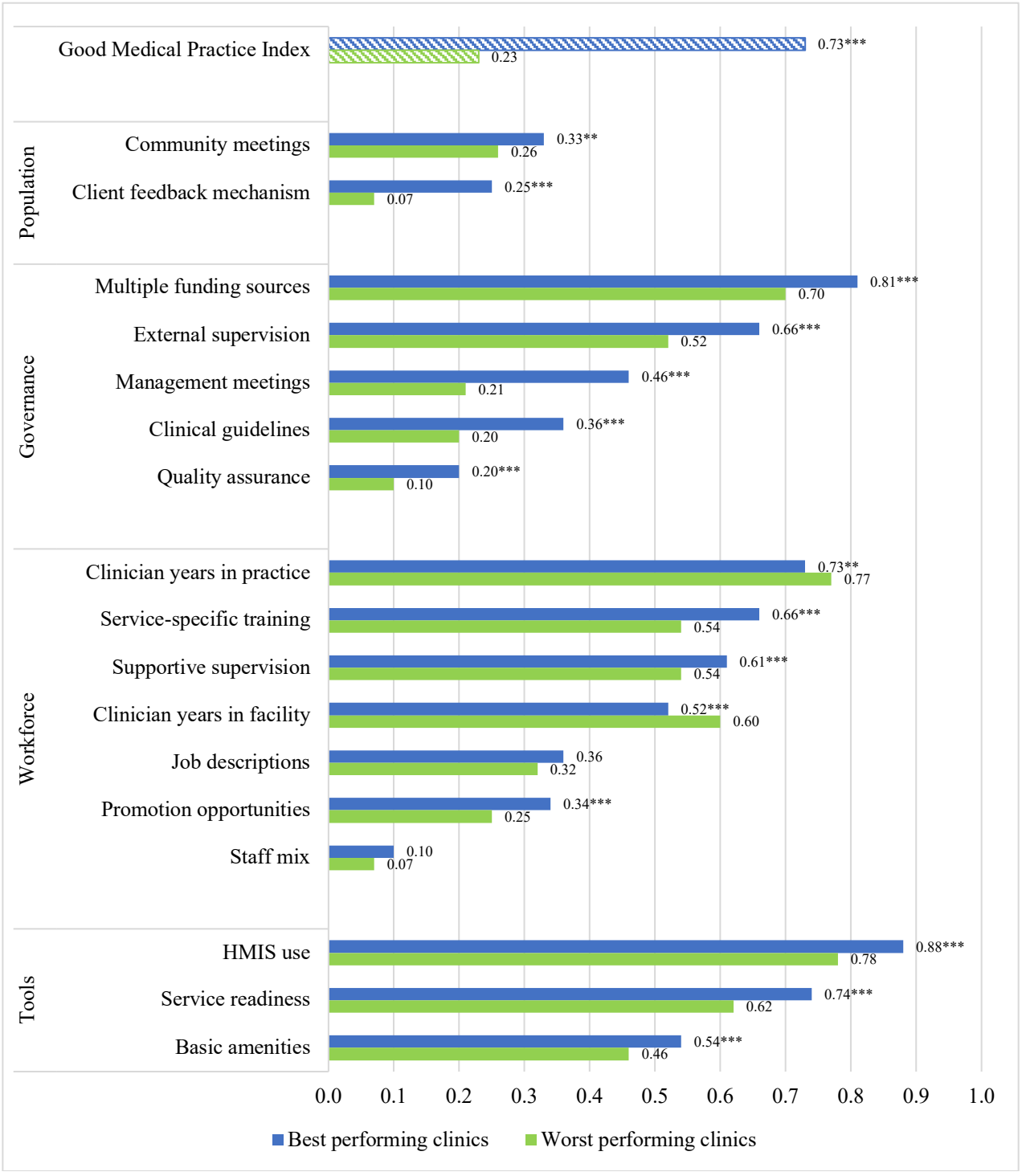

Figure B.2 Full performance drivers among clinics in seven countries, 2010-2018

Notes: HMIS: health management information system. Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Management meetings was defined as having regular meetings, having a record of meetings, making decisions during meetings, and taking actions in response. External supervision was defined as whether an external supervisor performed a set of 11 supervisory activities,

such as checking facility registers and observing clinical care. See appendix for a full list of activities. Basic amenities were measured as the average of seven items: electricity, water, any private room, toilet, communication, computer and internet, and ambulance. Service readiness was measured as the average of indices for each service area (sick child care, antenatal care, family planning care) with indicators covering basic equipment, diagnostics and medication. Asterisks indicate a statistically significant difference between best and worst performing facilities using F-tests for continuous variables and chi-squared tests for categorical variables. $^{**}p < 0.05$ $^{***}p < 0.01$

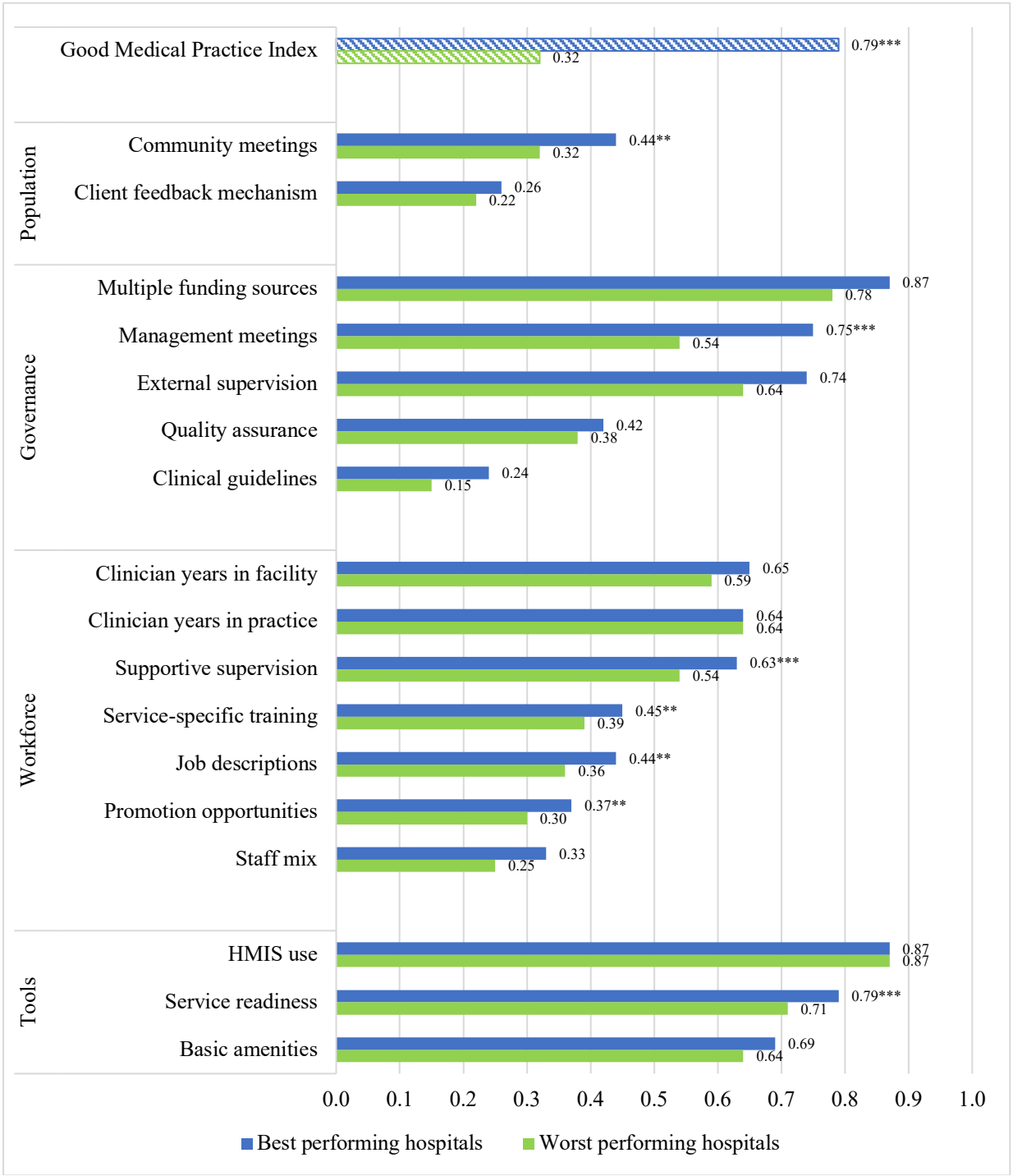

Figure B.3 Full performance drivers among hospitals in seven countries, 2010-2018

Notes: HMIS: health management information system. Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Management meetings was defined as having regular meetings, having a record of meetings, making decisions during meetings, and taking actions in response. External supervision was defined as whether an external supervisor performed a set of 11 supervisory activities, such as checking facility registers and observing clinical care. See appendix for a full list of activities. Basic amenities were

measured as the average of seven items: electricity, water, any private room, toilet, communication, computer and internet, and ambulance. Service readiness was measured as the average of indices for each service area (sick child care, antenatal care, family planning care) with indicators covering basic equipment, diagnostics and medication. Asterisks indicate a statistically significant difference between best and worst performing facilities using F-tests for continuous variables and chi-squared tests for categorical variables. $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.4 Full predictors of best performance among health facilities in seven countries, 2010-2018

Variable	Hospitals (n=294)		Clinics (n=915)	
	AOR	95% CI	AOR	95% CI
Population				
Community meetings	1.47	(0.79 - 2.73)	0.91	(0.62 - 1.34)
Client feedback mechanism	0.72	(0.33 - 1.57)	3.45***	(1.96 - 6.09)
Governance				
Management meetings	3.04***	(1.51 - 6.14)	1.81***	(1.26 - 2.61)
External supervision	1.26	(0.63 - 2.53)	1.11	(0.78 - 1.56)
Clinical guidelines	1.04	(0.49 - 2.18)	1.94***	(1.32 - 2.85)
Quality assurance	0.71	(0.38 - 1.32)	1.49	(0.92 - 2.41)
Multiple funding sources	2.22**	(1.05 - 4.70)	1.62**	(1.04 - 2.53)
Workforce				
Staff mix	3.89***	(1.56 - 9.67)	1.29	(0.75 - 2.20)
Clinician years in practice	1.22	(0.28 - 5.32)	0.69	(0.36 - 1.30)
Clinician years in facility	1.98	(0.72 - 5.46)	0.54***	(0.37 - 0.79)
Job descriptions	1.81	(0.62 - 5.31)	1.17	(0.74 - 1.83)
Promotion opportunities	2.54	(0.68 - 9.49)	1.70**	(1.03 - 2.81)
Service-specific training	3.05	(0.88 - 10.57)	3.57***	(2.21 - 5.75)
Supportive supervision	3.61**	(1.05 - 12.41)	0.90	(0.55 - 1.45)
Tools				
Basic amenities	1.47	(0.29 - 7.50)	1.32	(0.55 - 3.16)
Service readiness	1.55***	(1.26 - 1.90)	1.47***	(1.31 - 1.64)
HMIS use	0.46	(0.17 - 1.22)	1.25	(0.80 - 1.94)
Contextual factors				
Facility ownership (Ref: Government)				
NGO or private not-for-profit	1.68	(0.29 - 9.67)	0.89	(0.44 - 1.80)
Private for-profit	2.49	(0.96 - 6.51)	2.15***	(1.23 - 3.77)
Mission or faith-based	0.98	(0.48 - 2.00)	1.63	(0.91 - 2.90)
Client education	1.09	(0.45 - 2.64)	1.33	(0.81 - 2.20)
Client visits	1.00	(0.99 - 1.01)	1.01	(0.99 - 1.03)

Notes: NGO: non-governmental organization. Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities in each country based on GMPI score. Management meetings was defined as having regular meetings, having a record of meetings, making decisions during meetings, and taking actions in response. External supervision was defined as whether an external supervisor performed a set of 11 supervisory activities, such as checking facility registers and observing clinical care. See appendix for a full list of activities. Basic amenities were measured as the average of seven items: electricity, water, any private room, toilet, communication, computer and internet, and ambulance. Service readiness was measured as the average of indices for each service area (sick child care, antenatal care, family planning care) with indicators

covering basic equipment, diagnostics and medication. Estimates were obtained using logistic regression with country fixed effects. AOR=adjusted odds ratio. **p<0.05 ***p<0.01

Table B.5 Predictors of best performance among health facilities pooled across rather than within seven countries, 2010-2018

Variable	Hospitals (n=294)		Clinics (n=915)	
	AOR	95% CI	AOR	95% CI
Population				
Community meetings	1.18	(0.57 - 2.43)	1.10	(0.73 - 1.66)
Client feedback mechanism	0.74	(0.27 - 1.99)	3.12***	(1.63 - 5.97)
Governance				
Management meetings	1.97	(0.81 - 4.79)	1.63**	(1.10 - 2.41)
External supervision	1.17	(0.44 - 3.13)	1.23	(0.85 - 1.79)
Clinical guidelines	1.85	(0.69 - 4.98)	1.71**	(1.10 - 2.67)
Quality assurance	0.83	(0.36 - 1.94)	1.25	(0.74 - 2.09)
Multiple funding sources	3.08**	(1.06 - 8.91)	1.74**	(1.10 - 2.75)
Workforce				
Staff mix	8.55**	(1.54 - 47.59)	0.94	(0.47 - 1.88)
Clinician years in practice	1.83	(0.29 - 11.47)	0.72	(0.36 - 1.47)
Clinician years in facility	1.82	(0.46 - 7.15)	0.48***	(0.31 - 0.75)
Job descriptions	1.44	(0.39 - 5.36)	1.09	(0.63 - 1.86)
Promotion opportunities	3.74	(0.64 - 21.91)	1.70**	(1.01 - 2.87)
Service-specific training	2.45	(0.47 - 12.81)	3.65***	(2.12 - 6.29)
Supportive supervision	11.94***	(2.38 - 59.90)	0.90	(0.53 - 1.53)
Tools				
Basic amenities	1.51	(0.17 - 13.10)	1.35	(0.51 - 3.58)
Service readiness	1.50***	(1.13 - 1.99)	1.28***	(1.13 - 1.45)
HMIS use	0.64	(0.15 - 2.67)	1.28	(0.79 - 2.07)
Contextual factors				
Facility ownership (Ref: Government)				
NGO or private not-for-profit	1.41	(0.22 - 8.91)	0.71	(0.28 - 1.80)
Private for-profit	2.68	(0.61 - 11.85)	2.77***	(1.53 - 5.04)
Mission or faith-based	1.63	(0.69 - 3.86)	1.77	(0.96 - 3.28)
Client education	1.18	(0.36 - 3.90)	1.50	(0.80 - 2.81)
Client visits	1.00	(0.99 - 1.01)	1.00	(0.99 - 1.02)

Notes: NGO: non-governmental organization. Hospitals were defined as facilities that perform Caesarean sections. The Good Medical Practice Index (GMPI) is a proportion of essential clinical actions. See appendix for components. Best and worst performers were the top and bottom 10% of facilities based on GMPI score in a sample pooled across countries. Management meetings was defined as having regular meetings, having a record of meetings, making decisions during meetings, and taking actions in response. External supervision was defined as whether an external supervisor performed a set of 11 supervisory activities, such as checking facility registers and observing clinical care. See appendix for a full list of activities. Basic amenities were measured as the average of seven items: electricity, water, any private room, toilet, communication, computer and internet, and ambulance. Service readiness was measured as the average of indices for each service area (sick child care, antenatal care, family planning care) with

indicators covering basic equipment, diagnostics and medication. Estimates were obtained using logistic regression with country fixed effects. AOR=adjusted odds ratio. **p<0.05 ***p<0.01

Appendix C *Chapter 4 supplementary materials*

Table C.1 Respondents from best and worst performing primary health care centers in Province 1, Nepal

	Province 1 (14 districts with 137 municipalities)			
Respondent type	**PHCC-1: Best performer**	**PHCC-2: Best performer**	**PHCC-3: Best performer**	**PHCC-4: Best performer**
Management Committee member	Management Committee Vice President (3.5 years)	School principal (unknown)	School principal (9 years)	Ward chairperson (3 years)
Facility in-charge	Physician (1 year)	Senior health assistant (1.5 years)	Health assistant (2 years)	Health assistant (5 years)
Advanced clinician	Health assistant (1.5 years)	Physician (1.5 years)	Auxiliary health worker (28 years)	Auxiliary health worker (1.5 years)
Nurse or auxiliary health worker	Senior auxiliary nurse midwife (5 years)	Auxiliary nurse midwife (1.5 years)	Staff nurse (1.5 years)	Staff nurse (1 year)
	PHCC-5: Worst performer	**PHCC-6: Worst performer**	**PHCC-7: Worst performer**	**PHCC-8: Worst performer**
Management Committee member	School principal (2 years)	School principal (20 years)	Ward chairperson (3.5 years)	Municipal health coordinator (14 years)
Facility in-charge	Physician (2 years)	Physician (6 months)	Health assistant (1 year)	Physician (2 years)
Advanced clinician	Senior auxiliary health worker (13 years)	Auxiliary health worker (2.5 years)	Physician (6 months)	Physician (2 years)
Nurse or auxiliary health worker	Auxiliary nurse midwife (1 year)	Auxiliary nurse midwife (2 years)	Auxiliary health worker (1.5 years)	Staff nurse (2 years)

Table C.2 Qualitative interview guide for facility leaders

Positive deviance analysis of care quality in Nepal
Semi-structured interview protocol—Facility in-charge

[Please note: The interview will be a conversation and the following should be considered a general outline.]

PREAMBLE: Thank you so much for offering me your time today. Is now still a good time to speak for the next 45 to 60 minutes? My name is [INTERVIEWER NAME]. I am working in conjunction with the Ministry of Health and a team of researchers on a study of the health system here in Province 1. The purpose of this interview is to understand more about how primary health care centers operate in the region. You are not being evaluated and there are absolutely no right or wrong answers to any of these questions; I am simply interested in hearing any insight or experiences you would like to share as a manager of this facility. I want to hear your honest opinions, what is working well, and how the health system could work better.
Typically, we record these interviews to make sure we don't miss anything you say, but **I will never share anything you say in connection with your name. We will only save the sound recording, not the video, and we will never share your name or your PHCC.**

- Do I have your permission to record?
- Do you have any questions?

Please feel free to ask questions or stop the interview at any point. To begin, I would like to ask you a few questions about this facility and your role.

Background information

	Facility operations
1	What is the catchment area of this facility?
2	What services do you offer at this facility?
3	How many employees work at this facility in total?
4	How many physicians work regularly at this facility?
5	How many nurses work regularly at this facility?
6	What facility is your nearest referral center?
7	What sources of funds does your facility have?
	Managerial role
8	What is your position?
9	What is your level?
10	What was your training?
11	How long have you been working in this facility?
12	How long have you been in a management role?
13	Have you had any formal training as a manager? [If yes] What sort of training did you receive?
	Community and patients
14	How many patients does this community serve in one week?
15	What are the three most common reasons for individuals to visit this facility?

Facility team and culture

1. **Please describe the clinical staff at your facility. How do you feel they perform?**
    a. What criteria do you use to assess performance?
    b. How do you provide feedback to clinicians?
2. **How is the relationship between facility managers and clinical staff?**
    a. How do you build trust among employees?
    b. How do you support employees at this facility, if at all?
3. **How do you determine clinical roles at your facility (who does what)?**

a. What sort of tools/guidelines do you use to determine responsibilities?
b. How do you ensure clinicians fulfill their roles?

4. **How do you get clinicians in your facility to work together?**
    a. What promotes teamwork within your facility?
    b. What inhibits teamwork within your facility?
5. **How do you maintain motivation among clinicians?**
    a. What encourages good care at your facility?
    b. What inhibits good care at your facility?
6. **How do you solicit feedback from employees, if at all?**
    a. How do you implement changes based on this feedback?
    b. How do you ensure clinicians feel free to share opinions with managers?

Management

7. **How do you set new rules or norms for your facility?**
    a. How do you disseminate new rules/norms among employees?
    b. How do you build support for new rules/norms, if at all?
8. **How do you involve other staff members in management decisions, if at all?**
9. **What is the role of local level political leadership in managing this facility?**
    a. How does local leadership promote good performance at this facility?
    b. How does district leadership inhibit good performance at this facility?
10. **What is the role of district and province level leadership in managing this facility?**
    a. How does district/province leadership promote good performance at this facility?
    b. How does district/province leadership inhibit good performance at this facility?
11. **How does your facility communicate with other facilities, such as to obtain advice about patient care?**
    a. How frequently is your facility in touch with other facilities?
    b. How does your facility use information from other facilities, if at all?
12. **What relationship does your facility have with other facilities in the area, if any?**
    a. How do other facilities support your facility, such as through peer support or learning collaboratives?
13. **What is your role in procuring medicines and supplies for this facility, if any?**
    a. Can you quickly get the medicines and supplies you need?
    b. How do you influence this process?
14. **What is your role in buying or repairing equipment for this facility, if any?**
    a. Can you quickly get the equipment you need?
    b. How do you influence this process?
15. **What is your role in selecting who works at your facility, if any?**
    a. How are you involved in hiring and firing employees?
    b. How do you influence the types of staff members you employ?

Accountability

16. **What sort of goal-setting do you do, if any, and what is that process like?**
    a. How did you develop these goals?
    b. How do you hold yourself accountable to goals, if at all?
    c. How do you hold employees accountable to goals, if at all?
17. **Who are you accountable to for performance of this facility, if anyone?**
    a. How do district and province leaders hold this facility accountable?
    b. How does the community hold this facility accountable?
18. **How do you understand "quality of care" at the point of care?**
    a. What does "quality of care" mean in this facility?
19. **How do you monitor quality of care in your facility?**
    a. What sort of metrics do you use, if any?
    b. How did you choose these metrics?
    c. How do data systems support your work? What could be improved?

Relationship with the community

20. **How does the local community influence facility performance, if at all?**

    a. How important is the local community to facility functions, if at all?
21. **How do you assess the health needs of your local community, if at all?**
    a. What helps you meet the needs of the community?
    b. What makes it difficult to meet the needs of the community?
22. **How do you share information with the community?**
    a. How do you build transparency on facility performance, such as finances?
23. **How do you obtain feedback from patients and community members, if at all?**
    a. Please describe this feedback.
24. **What actions have you taken in response to community feedback, if any?**

Overall perception of facility

25. **Overall, what do you think of the quality of care provided by this facility?**
    a. Why do you think the quality is good/poor?
26. **What are the most important factors to providing high quality care?**
27. **What are some successes you have had in managing this facility?**
    a. What did you learn from these successes?
28. **What are the primary challenges you have faced managing this facility?**
    a. What did you learn from these challenges?
29. **What would it take to make this the best performing health facility in this district?**

CONCLUSION: I notice we are nearing the end of our time today. **Before we close, is there anything we have not asked you that you think is important to tell us regarding the performance of your facility?** Is there anything more you would like to ask me?

[Identifying other interviewees]
Before we end, I would like your help identifying two clinicians at your facility who would be able to speak with us about their role. We are interested in speaking with a physician and a nurse who regularly see patients and have worked at this facility for a few years.
We would also like to speak with a community representative on the facility board.
Could you provide us with the names and contact information of these individuals?

I want to sincerely thank you for your time today. Please contact me with any questions. Have a great day

Table C.3 Qualitative interview guide for Management Committee members

Positive deviance analysis of care quality in Nepal
Semi-structured interview protocol—Facility Management Committee member

[Please note: The interview will be a conversation and the following should be considered a general outline.]

PREAMBLE: Thank you so much for offering me your time today. Is now still a good time to speak for the next 45 to 60 minutes? My name is [INTERVIEWER NAME]. I am working in conjunction with the Ministry of Health and a team of researchers on a study of the health system here in Province 1. The purpose of this interview is to understand more about how primary health care centers operate in the region. You are not being evaluated and there are absolutely no right or wrong answers to any of these questions; I am simply interested in hearing any insight or experiences you would like to share about this facility. I want to hear your honest opinions, what is working well, and how the health system could work better.
Typically, we record these interviews to make sure we don't miss anything you say, but **I will never share anything you say in connection with your name. We will only save the sound recording, not the video, and we will never share your name or your PHCC.**

- Do I have your permission to record?
- Do you have any questions?

Please feel free to ask questions or stop the interview at any point.

Warm-up

1. **To get started, I would love to hear a bit about you. Please tell me a little about yourself.**
    a. How long have you been a board member at this facility?
    b. How would you describe your role and responsibilities?

Facility team and culture

2. **How do you feel the clinical staff at this facility performs?**
    c. What criteria do you use to assess performance?
3. **How is the relationship between facility managers and clinical staff?**
    c. How do you support the manager at this facility, if at all?
    d. How do you support employees at this facility, if at all?
4. **How do you solicit feedback from employees, if at all?**
    c. How do you implement changes based on this feedback?
    d. How do you ensure employees feel free to share opinions?

Management

5. **How do you set new rules or norms for your facility?**
    c. How do you disseminate new rules/norms among employees?
    d. How do you build support for new rules/norms, if at all?
6. **What is the role of local level political leadership in managing this facility?**
    c. How does local leadership promote good performance at this facility?
    d. How does district leadership inhibit good performance at this facility?
7. **What is the role of district and province level leadership in managing this facility?**
    a. How does district/province leadership promote good performance at this facility?
    b. How does district/province leadership inhibit good performance at this facility?

Accountability

8. **What sort of goal-setting do you do, if any, and what is that process like?**
    a. How did you develop these goals?
    b. How do you hold yourself accountable to goals, if at all?
    c. How do you hold employees accountable to goals, if at all?
9. **Who are you accountable to for performance of this facility, if anyone?**
    c. How do district and province leaders hold this facility accountable?
    d. How does the community hold this facility accountable?

10. **How do you understand "quality of care" at the point of care?**
    a. What does "quality of care" mean in this facility?
11. **How do you monitor quality of care in your facility?**
    d. What sort of metrics do you use, if any?
    e. How did you choose these metrics?
    f. How do data systems support your work? What could be improved?

Relationship with the community

12. **How does the local community influence facility performance, if at all?**
    a. How important is the local community to facility functions, if at all?
13. **How do you assess the health needs of your local community, if at all?**
    c. What helps you meet the needs of the community?
    d. What makes it difficult to meet the needs of the community?
14. **How do you share information with the community?**
    b. How do you build transparency on facility performance, such as finances?
15. **How do you obtain feedback from patients and community members, if at all?**
    b. Please describe this feedback.
16. **What actions have you taken in response to community feedback, if any?**

Overall perception of facility

17. **Overall, what do you think of the quality of care provided by this facility?**
    b. Why do you think the quality is good/poor?
18. **What are the most important factors to providing high quality care?**
19. **What would it take to make this the best performing health facility in this district?**

CONCLUSION: I notice we are nearing the end of our time today. **Before we close, is there anything we have not asked you that you think is important to tell us regarding the performance of your facility?** Is there anything more you would like to ask me?
I want to sincerely thank you for your time today. Please contact me with any questions. Have a great day

Table C.4 Qualitative interview guide for clinicians

Positive deviance analysis of care quality in Nepal
Semi-structured interview protocol—Clinicians

[Please note: The interview will be a conversation and the following should be considered a general outline.]

PREAMBLE: Thank you so much for offering me your time today. Is now still a good time to speak for the next 45 to 60 minutes? My name is [INTERVIEWER NAME]. I am working in conjunction with the Ministry of Health and a team of researchers on a study of the health system here in Province 1. The purpose of this interview is to understand more about how primary health care centers operate in the region. You are not being evaluated and there are absolutely no right or wrong answers to any of these questions; I am simply interested in hearing any insight or experiences you would like to share as a health care worker at this facility. I want to hear your honest opinions, what is working well, and how the health system could work better.
Typically, we record these interviews to make sure we don't miss anything you say, **but I will never share anything you say in connection with your name. We will only save the sound recording, not the video, and we will never share your name or your PHCC.**

- Do I have your permission to record?
- Do you have any questions?

Please feel free to ask questions or stop the interview at any point.

Warm-up

1. **To get started, I would love to hear a bit about you. Please tell me a little about yourself.**
    a. How long have you been practicing at this facility?
    b. How would you describe your role and responsibilities?

Facility team and culture

2. **How do you determine your role and responsibilities as a clinician at the facility?**
    a. How do you know what your responsibilities are?
    b. How well do you think responsibilities are distributed across the clinical staff?
3. **How well do clinicians in your facility work together?**
    a. What promotes teamwork within your facility?
    b. What inhibits teamwork within your facility?
4. **How is your relationship with the managers of this facility?**
    a. How do managers build trust among employees?
    b. How do managers support clinicians at this facility, if at all?
5. **What motivates you to provide good quality care?**
    a. What encourages good care at your facility?
    b. What inhibits good care at your facility?
6. **How prepared do you feel to perform your duties?**
    a. How do you receive feedback from managers or others at the facility?

Management

7. **Please describe the management of the facility. How well are managers serving the needs of the facility?**
    a. How well are managers serving the needs of the clinicians and staff?
    b. How well are managers serving the needs of the patients?
8. **How do you feel this facility performs in terms of day-to-day operations?**
    a. What at the facility runs very smoothly? Why?
    b. What at the facility does not run smoothly? Why?
9. **How do managers solicit feedback from employees, if at all?**
    a. How do you give feedback to managers within this facility?
    b. How do managers implement changes based on this feedback?
10. **How are new rules or norms set for your facility?**

e. How are these disseminated among employees?

11. **How are clinicians involved in management decisions at the facility, if at all?**
    a. How much autonomy do you have to make decisions within the facility?
12. **How does your facility communicate with other facilities, such as to obtain advice about patient care?**
    a. How frequently is your facility in touch with other facilities?
    b. How does your facility use information from other facilities, if at all?
13. **What relationship does your facility have with other facilities in the area, if any?**
    a. How do other facilities support your facility, such as through peer support or learning collaboratives?

Accountability

14. **What sort of goal-setting happens at the facility, if any, and what is that process like?**
    c. How do you hold yourself accountable to goals, if at all?
    d. How do managers hold you accountable to goals, if at all?
15. **Who are clinicians accountable to for their quality of care, if anyone?**
    a. How do managers hold clinicians accountable?
    b. How does the community hold clinicians accountable?
16. **When you hear the phrase "quality of care," what does that mean to you?**
    a. What does "quality of care" mean in this facility?
17. **How is quality of care monitored in your facility?**
    a. What sort of metrics do you use, if any?
    b. How did you choose these metrics?
    c. How do data systems support your work? What could be improved?
18. **How do you use evidence to improve the care you provide at this facility? Could you give me an example?**
    a. What helps you make these changes in practice?
    b. What makes it difficult to change in response to new evidence?

Relationship with the community

19. **How does the local community influence facility performance, if at all?**
    a. How important is the local community to facility functions, if at all?
20. **How do you assess the health needs of your local community, if at all?**
    a. What helps you meet the needs of the community?
    b. What makes it difficult to meet the needs of the community?
21. **How do you obtain feedback from patients and community members, if at all?**
    a. Please describe this feedback.
22. **What actions have you or colleagues taken in response to community feedback, if any?**

Overall perception of facility

23. **Overall, what do you think of the quality of care provided by this facility?**
    a. Why do you think the quality is good/poor?
24. **What are the most important factors to providing high quality care?**
25. **What are some successes you have had practicing in this facility?**
    b. What did you learn from these successes?
26. **What are the primary challenges you have faced practicing in this facility?**
    b. What did you learn from these challenges?
27. **What would it take to make this the best performing health facility in this district?**

CONCLUSION: I notice we are nearing the end of our time today. **Before we close, is there anything we have not asked you that you think is important to tell us regarding the work you do at your facility? Is there anything more you would like to ask me?**
I want to sincerely thank you for your time today. Please contact me with any questions. Have a great day!

Table C.5 Codebook for analysis of primary health care centers in Province 1, Nepal

Domain	Code	Definition	When to use	When not to use	Example
Governance	Access to funds	Any comment regarding facility access to funds or availability of facility funding, positive or negative	This refers to how funds are raised/collected.	This does not refer to using or budgeting funds.	Most of our services are free in our health center since it is under government. We get funds from the municipality for PHCC work provision and another one from the ward office where we ourselves go and visit the ward president in a meeting.
Population	Addressing community needs	Any comment on facility addressing population health and patient needs (i.e., local priority setting, monitoring common conditions, accounting for new disease outbreaks), positive or negative			When people could not cross the river during the rainy season and people were dying, we took the initiative to bring the army doctors to provide treatment.
Platforms	Basic operations	Any comment regarding management and operations (e.g., open at reasonable times, has health workers present 24/7, displays user fees), positive or negative			At first we were not able to provide a complete, basic level of services, but now, due to a large well-equipped building we are able to provide multiple services.
Context	Care organization	Any comment regarding how health system organization/care structures/care levels influence facility functions, positive or negative			Another thing is that many PHCCs have been upgraded from health posts. So even though they are declared to be PHCCs, their structure is that of health posts. Because of that, it is difficult to work.
Workforce	Care team integration	Any comment about integration of all clinicians into care processes (e.g., empowered nursing staff, integrated pharmacists), positive or negative	This refers to integrating team members in care provision.	This does not refer to integrating clinicians into administration/leadership.	But whenever there is any type of risk, we consult our seniors and discuss with our in-charge. I do not have SBA (skill birth attendant) training so I consult the SBA trained

					senior sister and then handle that case or refer it.
Tools	Clinical information/evidence	Any comment on obtaining/disseminating up-to-date information to clinicians, positive or negative	This refers to information accessed by or provided to staff.	This does not refer to knowledge of clinical practice.	I had a gap year after my studies, after which I went to a health post in Saptari. The patient flow was not high in the health post. But when I went to the PHCC, maybe because I got SBA immediately, I feel like I have gained a lot of knowledge. I have had the opportunity to observe many things. I have received training and also guidelines from doctors. It's good.
Workforce	Clinical staff skills	Any comment regarding recruitment/retention of competent, engaged, and adaptable health workers; overall quality of clinical staff performance, positive or negative	This refers to skills or knowledge about practice.	This does not refer to guidelines or trainings.	We have skilled staff here and they have provided services to people in the best way possible.
Workforce	Clinician roles	Any comment about clear, appropriate roles and responsibilities for facility staff, positive or negative			We hold meetings and have in a written format that a particular person will be responsible for a particular section.
Population	Community feedback	Any comment on soliciting client feedback, sharing feedback with the community, and taking appropriate action, positive or negative			Sometimes we receive good responses and sometimes bad. Some local people think that the PHCC services should be available in the community which are not possible, like emergency services for people. Some have given good responses

					after receiving satisfying services.
Population	Community involvement	Any mention of engaging patients and communities in facility leadership and management (e.g., by having a community advisory board or a community member attend staff meetings) and account for community culture, traditions, preferences, and knowledge, positive or negative		This does not apply to facility staff engaged in leadership, even if they are part of the community.	We do have any program that involves directly working in the community. But we have chart boards in different places on topics of health, sanitation, and balanced diet.
Governance	Culture of change	Any comment regarding receptivity to change and growth, positive or negative	This refers to acceptance of and willingness to change.	This does not refer to quality improvement initiatives.	We all continuously discuss in our staff meeting how to strengthen and improve management of our PHCC to provide more effective service and how to include client satisfaction with our service.
Tools	Culture of quality	Any mention of facilities determining, communicating, or fostering a culture of quality (mission, motivation, spirit, emphasis), positive or negative	This refers to institutional culture in terms of quality improvement, maintenance, or mission.	This does not refer to adapting or learning functions.	Personally, I'm happy when I'm able to deliver more than the available resources seem to allow. I feel like we've given many services here.
Governance	Decision-making	Any comment regarding how decisions are made at the facility and who is involved, positive or negative	This refers to decision-making at the facility level (among staff and managers) or among the Management Committee or		All decisions are made through the management committee meetings.

			upper-level government.		
Context	Demographics	Any mention of community and catchment area demographics, such as urbanicity, volumes			From ward number 2, a total of 6,200 come for services. People come from another ward too but I do not know their exact population. Total population of our Gramthan rural municipality is 42,000.
Governance	District/province/federal effectiveness	Any mention of how well the facility is able to work with upper level government officials at the district province or federal levels, how embedded they are, whether facility has access to power/influence, positive or negative			We remain in contact with the district only on issues related to immunizations, etc. But other than that, we do not even receive direct letters from the district.
Governance	District/province/federal role	Any mention of the role and responsibilities of various levels of higher government in relationship to the facility			There is not any direct program from the province. The province and health office are correlated and we coordinate with the health office for reporting. There is no such program from the province.
Tools	Essential resources	Any mention of the supply of drugs, supplies, and information systems, and ability to mobilize resources when necessary, positive or negative			We have experienced that the medicines that are sent in bulk to us are not the ones that we need the most. But the medicines we need on a regular basis are provided only on a nominal basis.
Governance	Facility autonomy	Any mention of aligning with the health system and/or maintaining autonomy as a facility, positive or negative	This should be used for autonomy is mentioned by clinical staff or management. We		The economic status is also not good. The institution is dependent on others, so it is difficult to run this institution.

			should look at them as one unit.		
Context	Facility info	Any comment on general facility information, like opening times, location, geography, history, etc.			Other services are not available here. For example, people come for OPD services. We also do normal delivery. We haven't been able to provide more advanced services.
Governance	Facility management activities	Any mention of fundamental management activities (e.g., meetings, meeting minutes, reporting back to staff), positive or negative			Every month, we have a staff meeting in our PHCC but, the committee meeting, our in-charge attends it and I don't know other participants in the meeting.
Governance	Financial management	Any mention of facilities recording, managing, or prioritizing expenses, positive or negative	This refers to use, application, or budgeting of funds.	This does not refer to accessing or collecting funds.	From those earnings we do management like repairing offices, buying some small instruments.
Platforms	Health system relations	Any mention of developing or managing networks and relationships, such as emergency services, referral systems, and community outreach, positive or negative			We have good coordination. Sometimes we meet in training with all health staff. We have good coordination. We borrow medicines from other facilities like Chatara and Prakashpur health post when in need.
Tools	Infrastructure	Any mention of facility physical assets/infrastructure, positive or negative; any comment on adding or updating infrastructure (e.g., new buildings, new lab, new facility living quarters)	This refers to the building and structures on the facility premises.	This does not refer to basic utilities.	If road infrastructure were easier then it would also help with referral. We sent a patient and in the middle they had to change to another vehicle in Dudhkoshi.

Governance	Institutional accountability	Any comment regarding internal and external accountability mechanisms for institutional change, positive or negative			We are first accountable to the citizens and then to the municipality. Most importantly, we are accountable to those who receive services at the PHCC.
Context	Insurance mechanisms	Any mention of how insurance mechanisms influence facility performance, positive or negative			If people tend to get checked and treated in time then it won't create difficulties later. This has been promoted by the health insurance program to a greater extent.
Governance	Leadership experience/skills	Any mention of experience/training/qualifications of facility leadership, positive or negative	This refers to facility leadership preparedness.	This does not refer to other leaders, like managing committee members of palika officials.	I haven't received any administration or management related training. I've been learning by doing here.
Governance	Leadership stability	Any comment regarding turn-over of medical officer and/or managing committee, consistency of leadership, positive or negative			I am neither permanent nor contract-based. I was recruited by the Municipal Hospital.
Governance	Management committee effectiveness	Any mention of whether the management committee is effective or ineffective, and general qualities of the managing committee	This refers to how well the Management Committee executes its role.		They help with financial as well as manpower resources however they can. We have an internal fund too but if it's not sufficient then they help in raising funds from the municipality and INGOs.
Governance	Management committee role	Any comment regarding the responsibilities and/or role of the managing committee or their relationship with the facility, positive or negative	This refers to the responsibilities expected of the Committee.		Management committee is the committee to resolve the problems faced by the PHCC. We have a similar committee in schools. If a problem occurs while doing some major work, the committee meets and discusses the way forward.

Governance	Municipality effectiveness	Any mention of whether the municipality/palika is effective or ineffective, and general qualities of the municipal leadership	This refers to how well the municipality executes its role.		I do not know why this problem is arising. Local government should me making things more convenient. It might be because this area is very remote.
Governance	Municipality role	Any comment regarding the responsibilities and/or role of the municipality/palika or their relationship with the facility, positive or negative	This refers to the responsibilities of the municipality.		For example, we make the emergency services routine. But it is the local government who determines and provides the salary.
Governance	Organizational goals	Any comment regarding facility targets with specified timeframes supported by coordinated activities, positive or negative	This refers to specific goals set out by the facility, mostly in the short-term.	This does not refer to the facility's mission or long-term vision.	Our main goal now is to resume the insurance program run by the Nepal insurance board.
Governance	Performance tracking	Any mention of collection or use of performance data (e.g., tracking adverse events), monitoring progress, and transparency of results, positive or negative	This is for any use, reporting, or sharing of data.	This is not for guidelines or clinical evidence.	We have to send a monthly report to the municipality and that report will help with the annual report. It helps us to know the number of services we achieved.
Context	Political commitment	Any mention of relevant politicians' commitment to facility performance, positive or negative			We, all staff, are responsible for our work. Only a few aren't since this area has a political impact and they are involved in it.
Governance	Public utilities	Any mention of linkage to basic resources/utilities like water and electricity, positive or negative			Our electricity is in yellow but everything else is in green. We did not have an electricity backup. But now a generator is being managed.
Context	Socioeconomic factors	Any mention of community socioeconomic factors such as education level, income, employment			And another is the transportation problem. We tell the patients that the case is serious and they have to go but they say that they do not have money and will not go. This creates trouble for us. If

					they do not go, the case will deteriorate. And we'll have to wait on them all the time.
Workforce	Staff appointment	Any mention of reason/motivation for staff appointment or placement, process for hiring at particular facility, positive or negative	This is for any comments about how staff are appointed, filling vacant roles, recruiting, etc.	This does not refer to turnover.	Not just in PHCC, in health posts as well, advertisements are announced as soon as the position becomes vacant.
Governance	Staff compensation	Any mention of compensation for health workers, positive or negative	This could include incentives or bonuses.		Yes, there is an incentive to only those staff who perform night duty. The financial incentive is less, Nrs. 8000 per month and is divided per duty.
Workforce	Staff motivation	Any mention of incentivizing or motivating health worker engagement with rewards, incentives, and opportunities for promotion			This is also like god's blessings. I feel somewhere this sense of responsibility because our profession is involved in the health of people. That's why that responsibility, a sense of service, to implement something utilizing our knowledge and learning, these kinds of things motivate me to provide quality services.
Workforce	Staff performance management	Any mention of support for health workers through trainings, supportive supervision, and workload management, positive or negative			The staff working in OPD and dispensary say that the work load is too much. Because the patient flow is very high. They complain about a lack of enough manpower.

Governance	Stakeholder leadership (within facility)	Any mention of leaders engaging clinical voices at all levels, such as physician and nurse champions, positive or negative	This refers to involvement of staff members in facility administrative matters.	Does not apply to community engagement in leadership	We have such a type of staff that if there is any problem being faced, we resolve it together.
Governance	Strategic vision	Any mention of leaders establishing and communicating a shared mission (e.g., values, goals, strategy) or mobilizing key stakeholders for change, positive or negative	This refers to long-term vision and planning.	This does not refer to short-term targets or goals.	You asked about the long-term goal which is simply to provide inpatient available services, such as USG, snake bite management, delivery services. We want to add anesthesia, caesarian section services here. Soon, in about 2 years. we will be able to attain it. is my thinking. Until I am here, this will be my motto.
Workforce	Teamwork	Any comment regarding having a collaborative workplace culture with good communication, effective teamwork, and a strong peer network, positive or negative			For teamwork, like if there is training then we take turns so that each staff gets an equal chance. We share both benefits and work equally, that's why everyone helps each other.
Governance	Trust in leadership	Any comment on leadership building a culture of trust within the organization or with external stakeholders, positive or negative			There is a big role. The major role is their trust in me and my institution. They have regained the feeling of trust in us. They are motivated to utilize services from me and my staff.
Governance	Understanding of quality (leadership)	Any mention of whether leadership has a meaningful, thoughtful, and appropriate understanding of quality of care, positive or negative; also for perception of the facility's quality	This refers to medical officers and management committee members.	This does not refer to clinicians and staff.	To us, quality health services means that all the health services that the Nepal government has included as basic rights is provided to the citizens in a convenient and timely manner by skilled health professionals.

Workforce	Understanding of quality (staff)	Any mention of whether staff has a meaningful, thoughtful, and appropriate understanding of quality of care, positive or negative; also for perception of the facility's quality, like "we have effective services"	This refers to clinicians and staff.	This is not for the facility medical officer or management committee member.	In my view, what I understand about quality health services is people should exactly receive that service that they are seeking. Also, prevention is an important part. Our responsibilities are preventive services too. Receiving only curative services is not a quality health service.
Population	View of community	Any mention of how leaders/staff view the community, perceptions of community members and patients, positive or negative			I think people trust this center very much.

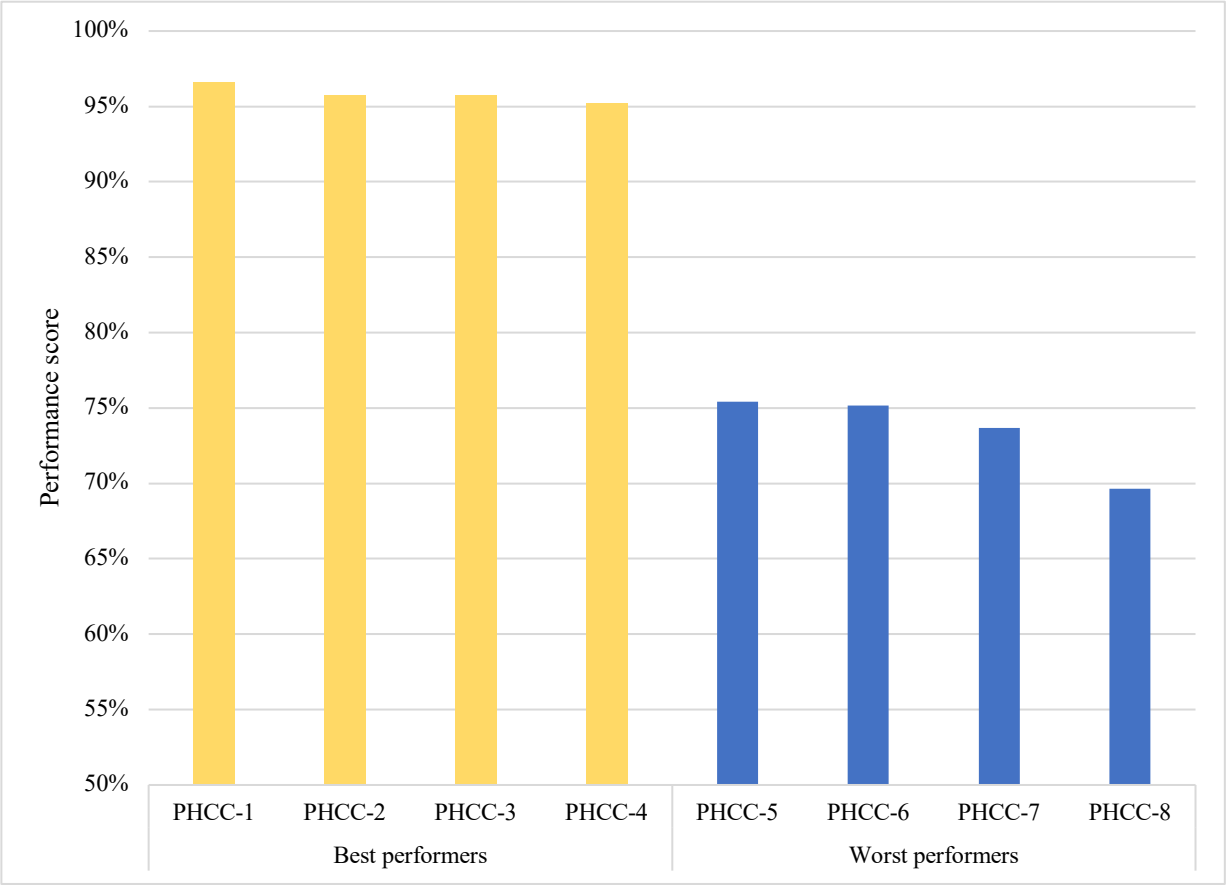

Figure C.1 Performance scores of best and worst performing primary health care centers in Province 1, Nepal

Notes: PHCCs: primary health care centers. Performance scores are determined as the average of six quality measures: 1) percent of children under five years with pneumonia who received antibiotics, 2) percent of children under five years with diarrhea treated with zinc and oral rehydration salts, 3) percent of newborns who had chlorhexidine ointment applied immediately after birth, 4) percent of planned immunization clinics conducted, 5) percent of planned immunization sessions conducted, and 6) the vaccine wastage rate for BCG, Measles, DPT-HepB-Hib, Td, JE, Polio, PCV vaccines.