Primary health care management effectiveness as a driver of family planning service readiness: A cross-sectional survey in central Mozambique

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Abstract

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Objective: To assess the relationship between management effectiveness and family planning service readiness among primary health care facilities in an on-going Health Alliance International study in central Mozambique.

Methods: Using a selection of indicators from the Service Availability and Readiness Assessment (2018) and the Service Delivery Indicators management module (2018), we used descriptive statistics to evaluate the management and readiness environment, and we used logistic quantile regression equations to model associations between management effectiveness and family planning service readiness.

Results: Only 26.5% of facility managers ever received official management training, and the average proportion of daily time spent on management responsibilities was 63%. Higher management effectiveness and urban health facilities were significantly associated with higher readiness for family planning service delivery.

INTRODUCTION

Quality primary health care (PHC) is recognized as a fundamental component of health systems strengthening and is inextricably linked with the Sustainable Development Goals (SDGs) and universal health coverage (UHC).[1] Forty years after the Alma Ata Declaration announced the ambitious goal to achieve "Health for All" through strong PHC,[2] many low- and middle-income countries (LMICs) struggle to deliver high-quality PHC services.[3] In particular, many LMICs are projected to fall short of the SDG target of achieving at least 75% of women of reproductive age who have their need for family planning satisfied with modern contraception methods by 2030 in all countries,[4] a proxy indicator that is used to monitor progress towards UHC.[5] While there are several health system components which directly support PHC outcomes, the Primary Health Care Performance Initiative (PHCPI) conceptual framework highlights the fundamental role that facility and organizational management play in improving service delivery and ultimately health outcomes.[6] Management competencies such as strategic-thinking, human resource management, financial and operational management, performance management, governance and leadership, and community engagement are vital in order to maximize efficiencies to meet the health needs of populations in resource-constrained settings.[7] However, there is limited research about PHC management effectiveness in LMICs and the association with facility readiness, particularly for family planning services.

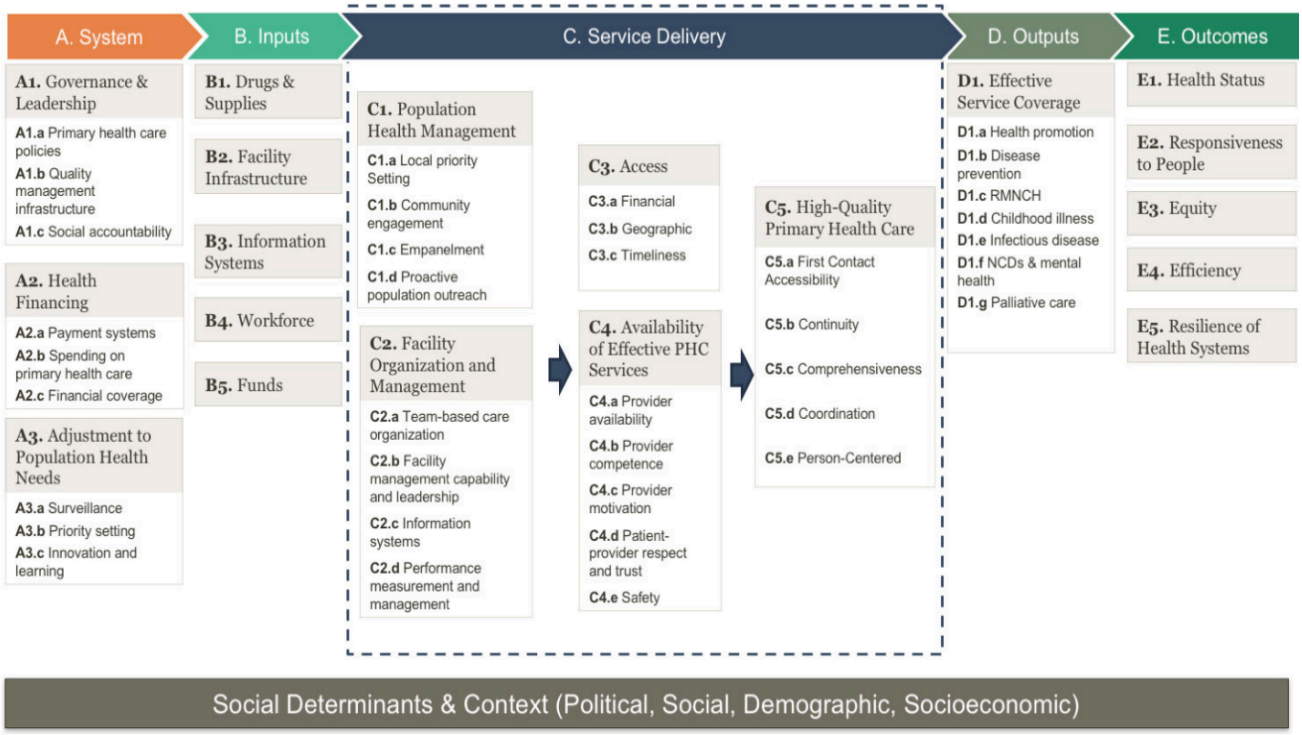

Figure 1. PHCPI conceptual framework. PHCPI, Primary Health Care Performance Initiative.

PHC and Family Planning in Mozambique

The Government of Mozambique's 2014-2019 Health Sector Strategic Plan centers around two strategic pillars: "more and better health services" and a "reform and decentralization agenda."[8] The expansion of health care infrastructure by the Ministry of Health (MoH) during the past decade increased utilization of PHC services resulting in improvements in antenatal care, facility births, and child vaccination coverage, which has significantly reduced reductions in mortality.[9,10] However, PHC service coverage and quality remains limited due to chronic resource shortages, vertical funding, and management challenges.[9,11] Notably, the most recent Demographic Health Survey (DHS) indicated that between 20% and 30% of women in a relationship who expressed a desire to delay, space, or limit births have an unmet need for family planning in central Mozambique.[12] Continued efforts to decentralize Mozambique's health

system in order to bring decision-making closer to service beneficiaries has been done with limited success in developing the PHC workforce management capacity.[9]

Contemporary research examining health systems strengthening leverages a variety of survey instruments designed to measure PHC facility readiness and service delivery data, such as the World Health Organization's (WHO) Service Availability and Readiness Assessment (SARA) and the DHS Service Provision Assessment (SPA).[13] Although these surveys describe facility readiness and service delivery, they do not capture workforce management effectiveness. The absence of a systematic method for measuring and improving facility-level management effectiveness has limited the number of investigations into the mediating role that management has on facility readiness and health outcomes.[14,6]

Despite some evidence suggesting strong associations between effective facility-level management and positive health outcomes,[15] research at the PHC level remains limited.[7,6] In particular, there is minimal research investigating the associations between facility-level management and family planning service readiness among PHC facilities in LMICs. A study in Ghana found significantly positive associations between health facilities with stronger management and the integration of family planning services into maternal and child health services and HIV services, family planning types provided, and essential equipment availability.[16] Another study in Ethiopia found positive associations between health facilities with higher management capacity and five health system performance indicators, including contraceptive acceptance rate.[17]

To our knowledge, no studies exist that investigate the associations between PHC facility management effectiveness and facility readiness for family planning service delivery. A recent study on the quality of care for long acting reversible contraceptives (LARCs) noted that although user-related and cost-related barriers to LARC uptake are prevalent in rural Mozambique, provider-related barriers hamper access to contraceptives in general.[18] Whereas the study examined several provider-related barriers, such as time limitations and provider biases, it did not explore associations between management effectiveness and facility readiness. A 2008 paper in Mozambique documented positive changes in PHC service delivery after health workers were trained in Management Sciences for Health's Challenges Program.[19] However, the study used exposure to the program as the indicator of management effectiveness rather than creating a quantifiable measure, which limited the study's ability to establish a statistically significant relationship between management effectiveness and performance indicators.[17] Similar research in Mozambique found statistically significant evidence that higher numbers of health facility staff is strongly related to lower rates of stock-outs of essential medical supplies such as progestin-only injectable contraceptives and condoms.[11] Examining the association between management effectiveness and facility readiness for family planning services will generate evidence to fill an important knowledge gap in PHC service delivery.

METHODS

This study is a cross-sectional analysis assessing whether or not the strength of management effectiveness is associated with facility readiness for family planning services in 72 PHC facilities across central Mozambique.

Setting

Primary health care utilization is high across Mozambique,[20] with antenatal care coverage exceeding 90% and high levels of utilization for basic preventive and curative maternal, newborn, and child health services.[12,9] High PHC utilization is driven by the Mozambique National Health Service's (NHS) strategy to rapidly expand PHC services through a network of health facilities, which increased by 48% from 755 to 1,300 facilities between 2007 and 2015.[21] District-level PHC facilities are classified by Rural Health Center Type I and II, Urban Health Center Type A, B, and C, and Rural and District Hospital, which vary in factors such as location, staffing, and service availability.[8] These PHC facilities are supported by district health directorate management teams composed of a district director, chief medical officer, pharmacist, statistician, and administrator.[9] District management teams receive routine operational support and technical supervision from their respective provincial health directorates (DPS), which are key organizational units for managing, coordinating, and scaling PHC services across Mozambique's eleven provinces.[9] Despite significant increases in national health sector spending during the previous two decades, district health directorates remain underfunded and receive limited technical, managerial, and workforce capacity.[9] These challenges are exacerbated by high rates of internal migration of health workers from the public sector to higher-paying jobs with donor agencies, non-governmental organizations (NGOs), and the private sector, resulting in a workforce disproportionately composed of junior-level managers with limited training and experience.[22]

This study supports ongoing research of a 5-year mixed-methods evaluation employing multiple implementation science methods to assess the impact of Health Alliance International's (HAI) Integrated District Evidence to Action (IDEAs) intervention in central Mozambique. Funded by the Doris Duke Charitable Foundation, the IDEAs intervention has five main study aims: 1) Reach; 2) Effectiveness; 3) Adoption; 4) Implementation; 5) Maintenance. This thesis research will focus on study aim 2 (Effectiveness) and three of its sub-aims: i) structural quality (system readiness); ii) process quality (provider capabilities); iii) service coverage. Data from the IDEAs management survey is compared with 2018 SARA facility readiness data.

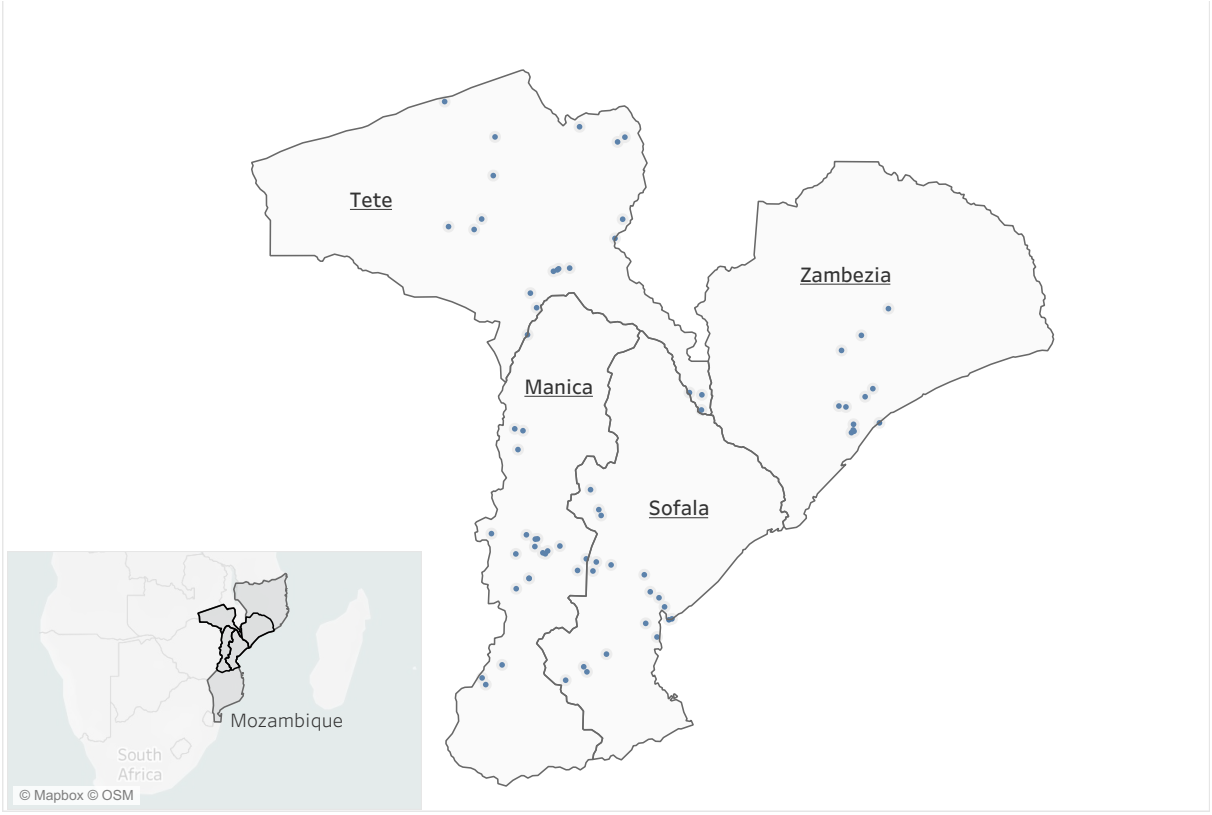

Figure 2. Distribution of IDEAs sampled health facilities in central Mozambique (N=72).

Data sources

Data collection strategies for outcome measures include service readiness assessments, use of routinely collected health information system data, and interview data.

Management effectiveness survey. In order to quantify PHC management effectiveness, the IDEAs study included measurements from the Health Service Delivery Indicators (SDI) Management module. The SDI initiative is a partnership of the World Bank, the African Economic Research Consortium, and the African Development Bank which focuses on quality of service delivery and was designed to link with other research studies in health to capture the inputs in policy and institutional environments as well as health outcomes.[23] In Mozambique, the most recent Health SDI survey was implemented in 2014 and collected three dimensions of service delivery: 1) two measures of provider effort; 2) three measures of provider knowledge/ability; 3) five measures of the availability of key inputs, such as drugs, equipment, and infrastructure.[24] Findings from the 2014 Health SDI revealed that provider competence and adherence to clinical guidelines are weak, indicating that inadequate provider knowledge and management practices may undermine health outcomes.[24] For the IDEAs study, a survey team visited a representative sample of health facilities to gather novel data collected via semi-structured and structured interviews, focus group discussions, and direct observation to assess management effectiveness. The survey included two sub-sections. The first sub-section includes responses to a 17-item questionnaire for PHC facility care providers to capture perceptions of management effectiveness in their respective PHC facility. These questions were taken directly from the Health SDI module covering measures of provider knowledge, ability, and management. The second sub-section includes responses from facility managers to capture facility-level information about management procedures in their respective PHC facility. This

questionnaire included a sample of questions taken directly from the Health SDI module covering management and governance practices (see Supplemental Information 1). This study only analyzed the data collected from PHC facility managers.

Facility readiness framework. The WHO SARA is a systematic survey that contains a set of indicators designed to measure service availability, general service readiness, and service-specific readiness for a range of basic health care interventions.[25] Service-specific readiness refers to the ability of a health facility to provide a specific service, such as family planning, and the capacity to provide the service.[25] This is measured through a set of tracer items including trained staff, guidelines, equipment, diagnostic capacity, and medicines and commodities. The family planning service-specific readiness module includes indicators about the prescription and provision of modern methods of contraception, family planning guidelines and checklists, trained staff, and current stock, and three-month stockout records.[26] Facility-level data from Mozambique's 2018 SARA survey was used to identify key characteristics of interest. This study analyzed data from the SARA Section 5, which contains indicators related to service-specific readiness for family Planning (see Supplemental Information 2).

Quality Control

All study personnel were trained in research ethics and were made aware of their role in the study procedures when the proposal was developed. All study staff were informed of any changes in procedures and requirements, as well as their duties and functions, through periodic project meetings where any update to protocol was shared. Study staff were also trained to identify potential adverse events and instructed to report them immediately to the project PIs and in-country

research coordinator. Study staff attended training sessions by the study investigators and received ongoing supervision in areas related to ethical conduct, confidentiality protection, and other topics of human subjects' protection. The study team ensured that study staff were trained to explain the purpose of the study to potential respondents, obtain informed consent, and inform respondents about their rights and benefits without coercion to participate. The study team also ensured that interviewers informed the potential respondents about the confidentiality measures put in place to protect their privacy.

Study Subjects

Sampling method. Intervention facilities in the IDEAs study consists of 12 districts and 36 selected facilities in Manica and Sofala provinces. For the evaluation of intervention impact on IDEAs study sub-aim 2 (Effectiveness), the control group consists 12 matched districts and 36 selected facilities in Zambezia, Tete, and Sofala provinces. Control districts were selected in a pairwise fashion matched on: 1) population size; 2) rural/urban location; 3) distance from the district to the provincial capital; 4) size of facility network (number and distribution facility type).

Within each intervention and control district, three health facilities were selected for additional data collection using the following procedures. First, with the exception of provincial capitals, the highest volume facility (defined by the number of 1st antenatal care visits) was selected in each district. Second, two facilities were randomly selected in each district from the remaining health facilities with at least 200 institutional births per year. In provincial capitals, the three

study facilities were randomly selected from all facilities with at least 200 institutional births per year. This number of institutional births was chosen as a contextually relevant way to exclude very small health facilities with insufficient staff or supplies to accurately track changes resulting from the ongoing health systems strengthening intervention.[11]

Source of subjects. Health workers assessed for knowledge of Ministry of Health norms were selected based on their presence at selected facilities, and location of work in targeted Maternal and Child Health (MCH) services.

Eligibility criteria. For districts and health facilities, the intervention targeted all public sector health facilities in 12 districts selected for study. Controls for the effectiveness sub-aim included all districts and facilities nationwide, excluding Maputo City. There were no exclusion criteria for intervention districts and facilities. Maputo City was excluded due to the higher level of resource allocation, and robust use of the private sector, in the capital.

For district management teams and health facility staff, all district managers and frontline facility health workers of the Mozambique National Health Service from districts and clinics participating in the study were eligible to participate in the research activities. There were no exclusion criteria for district and facility staff.

Numbers, response rates. The IDEAs management effectiveness module contains two sub-sections: one that was administered to health providers, and a second that was administered to the health facility manager. Out of the 72 health facilities included in the survey, 135 health

providers and 70 facility managers responded. As a result, one health center in Gondola and Espungabera were excluded from the analysis. Similarly, we were unable to obtain SARA facility readiness data for one health facility in Mocuba and Mutarara districts, and as a result these were excluded from the analysis.

Sample size. The sample includes 68 PHC facilities that are part of the IDEAs study.

Analysis

Standard descriptive statistics were calculated to characterize health facilities with respect to rural/urban status, level of health facility, distance from the Provincial Health Directorate (DPS), and staffing. Additionally, descriptive statistics were calculated to characterize the health facility managers that were surveyed in terms of number of first-time managers, number years of experience as a manager, and management training experience.

Management effectiveness. The main explanatory variable was management effectiveness measured at the PHC facility level. We categorized 17 management component indicators from the IDEAs management survey into three management domains: Management Practices, External Supervision, and Community Engagement. All of these indicators were binary or ordinal measures. Each indicator was rescaled from 0 (lowest) to 1 (highest). We created a composite management score based on the average of these three management practice domains (see Supplemental Information 3). We also analyzed two additional variables: the number of years of management experience each facility manager had (Years of Management Experience), and whether or not the facility manager was a first-time manager (First-Time

Manager). These measures were collected during the IDEAs management effectiveness survey and were included in the analysis for comparison purposes.

Facility readiness. The main outcome variable of this study is facility readiness for family planning services measured at the facility level. We categorized 26 component indicators from the SARA family planning readiness sub-section into five domains: Provision & Prescription, Guideline & Checklist, Trained Staff, Current Stock, and Stockouts. All of these indicators are binary or ordinal measures. Each indicator was rescaled from 0 (lowest) to 1 (highest). We created an overall readiness indicator based on the average of these five readiness domains (see Supplemental Information 4).

Regression analysis. We used robust logistic linear quantile regression to analyze the association between management effectiveness scores and facility readiness scores. Logistic linear quantile regression models the conditional quantile of the outcome rather than the conditional mean.[27] We chose this model over a generalized linear regression model because it is particularly useful for skewed data and for bounded outcomes.[28] We based our model on the median quantile of the overall readiness score. Using this approach, the exponentiated coefficients are interpreted as a change in the odds-ratios for a score above the median quantile of the overall readiness score given a one-unit change in the explanatory variable. For each explanatory variable (Overall Management score, Years of Management Experience, and First Time Manager), we built three models: one unadjusted (Model A), another (Model B) adjusting for health facility type (rural health center, urban health center, or hospital), and the last (Model C) adjusting for facility type and the distance to the provincial health directorate (DPS).

We used RStudio Version 1.1.383 to conduct all analyses; associations were evaluated for statistical significance at $\alpha = 0.05$ using two-tailed tests.

RESULTS

Description of PHC facilities and facility managers

Sixty-eight of the original 72 health facilities were included in the analysis, representing 94.4% of the IDEAs study sample. One health facility in Gondola, Espungabera, Mutarara and Mocuba districts were left out of the analysis due to data availability. The majority of health facilities surveyed were in rural areas (*79.4%*) and were located an average of 125.38 km from the provincial health directorate (Table 1). Rural health centers (Type I and II) made up more than half of the sample (*n = 51*), followed by urban health centers (*n = 14*) and secondary-level hospitals (*n = 3*), of which 100% offer family planning services. Over two-thirds of the facility managers surveyed were first-time managers (*n = 47*) with an average of 2.52 years of management experience, and one-quarter of managers ever received any type of official health management training (*n = 18*) (Table 1).

Table 1. Characteristics of sampled health facilities & facility managers offering PHC services (N=68).

Characteristics - Health Facilities	**Mean (SD)**	**Median (IQR)**
Number of total staff	30.15 (38.39)	9.00 (4.00 – 51.50)
Number of technical staff	20.72 (26.24)	5.00 (3.00 – 34.25)
Number of pharmacy staff	2.1 (2.77)	1.00 (0 - 4.00)
Number of laboratory staff	2.00 (3.73)	0.00 (0 – 3.00)
Number of admin staff	5.32 (10.67)	1.00 (0.00 – 3.25)
Distance to Provincial Health Directorate (DPS) in kilometers	125.38 (109.94)	104 (29.75 – 187.50)
	n (%)	
Number of rural facilities (% rural)	54 (79.4)	
Rural Health Center Type I	9 (13.2)	
Rural Health Center Rural Type II	42 (61.8)	
Urban Health Center Type A	4 (5.9)	

Urban Health Type B	8 (11.8)	
Urban Health Type C	2 (2.9)	
Secondary-level hospitals	3 (4.4)	
Characteristics - Facility Managers	**Mean (SD)**	**Median (IQR)**
Years of experience in the health sector	8.37 (8.44)	5.00 (3.00 – 8.73)
Years of experience as a facility manager	2.52 (2.12)	2.00 (1.00 – 3.00)
	n (%)	
First-time health facility managers	47 (69.1)	
Received official management training	18 (26.5)	

The average overall management score was 0.59 (SD = 0.17) (Table 2) with moderate variation across the three management domains. The Management Practices domain scored the highest (mean = 0.63, SD =0.18), although there was substantial variation among the component indicators. The majority of managers employed essential management practices such as recording staff absences (mean = 0.90, SD = 0.30) and requesting monthly medication refills during the previous six months (mean = 0.88, SD = 0.32). Meanwhile, duties related to performance management, such as a conducting performance reviews (mean = 0.63, SD = 0.49) and linking staff salaries and incentives to work performance (mean = 0.12, SD = 0.33) were not commonly practiced. On average, facility managers spent more than one-third of their time on non-managerial tasks such as clinical duties.

The External Supervision domain scored lowest (mean = 0.54, SD = 0.29), and just over half (*n* = 36) of the facility managers surveyed received a monthly supervisory visit during the previous six months. Similar to facility managers, external supervisors generally did not conduct evaluation summaries for facility staff during their visit (mean = 0.30, SD = 0.43). There was substantial variation in the Community Engagement domain (mean = 0.59, SD = 0.27). Although 59 facility managers reported having a Community Health Committee, only 17 of them confirmed having monthly meetings during the past 12 months (mean = 0.42, SD = 0.38). The majority of facility managers collected patient feedback through a formal mechanism (mean =

0.75, SD = 0.39), though fewer managers implemented management changes based on patient feedback (mean = 0.62, SD = 0.49).

Table 2. Management effectiveness indicators within sampled health facilities offering PHC services (N=68).

	Mean (SD)
Overall Management score	**0.59 (0.17)**
Management Practices score	**0.63 (0.18)**
Proportion of time spent on managerial duties*	0.63 (0.16)
Keeps records of staff absences	0.90 (0.31)
Conducted performance reviews with employees in past 12 months	0.63 (0.49)
Results of performance reviews are related to employee salaries and incentives	0.12 (0.33)
Facility requested medication once per month in the past 12 months	0.88 (0.33)
External Supervision score	**0.54 (0.29)**
Facility received six external supervisory/technical visits in past six months ^	0.65 (0.42)
External supervisor used a control or verification list during most recent visit	0.66 (0.48)
External supervisor observed consultations during most recent visit	0.59 (0.50)
External supervisor observed staff attendance logs during most recent visit	0.53 (0.50)
External supervisor observed stocks of medications during most recent visit	0.72 (0.45)
External supervisor observed financial registries during most recent visit	0.31 (0.47)
Facility staff received an evaluation summary from external supervisor during most recent visit	0.30 (0.43)
Community Engagement score	**0.59 (0.27)**
The facility Community Health Committee met monthly during the past 12 months ~	0.42 (0.38)
Collects patient opinions through a formal mechanism	0.75 (0.39)
Made management changes in past six months based on patient opinions	0.62 (0.49)

Overall management effectiveness and domain scores are averages of individual component indicators on a scale of 0 (lowest) to 1 (highest). All individual component indicators are binary from 0 (No) to 1 (Yes) unless otherwise specified.
* Proportion of manager's time spent on managerial duties
^ Fewer than 3 visits (0); Between 3 and 5 visits (0.5); 5 or more visits (1)
~ Fewer than three meetings (0); Between 3 and 5 meetings (.25); Between 6 and 11 meetings (.5); 12 meetings or more (1)

Description of PHC facility-level family planning readiness

The average overall family planning facility readiness score was 0.69 (SD = 0.20) (Table 3). The Guidelines & Checklists domain (mean = 0.74, SD = 0.38) and the Trained Staff domain (mean = 0.72, SD = 0.45) scored the highest among the sample facilities. The Provision & Prescription domain scored the lowest (mean = 0.64, SD = 0.12), however this domain improves substantially (mean = 0.78, SD = 0.14) when removing male and female sterilization from the score, which together are only available in three of the sample facilities. Regarding the Current Stock domain (mean = 0.71, SD = 0.17), more than half of the facilities did not have female condoms on the survey date (mean = 0.46, SD = 0.50), and nearly a third did not have emergency contraceptive pills (mean = 0.68, SD = 0.47). Similarly, the Stockout score (mean = 0.69, SD = 0.30) was

driven lower because half of the facilities reported a stockout of female condoms, and nearly a third reported stockouts of emergency contraceptive pills, within the previous three months.

Table 3. Readiness indicators for family planning services within sampled health facilities offering primary health care services (N=68).

	Mean (SD)
Overall family planning readiness score	**0.69 (0.20)**
Provision & prescription readiness score	**0.64 (0.12)**
Facility provides or prescribes any of the following modern methods of family planning:	
Combined estrogen progesterone oral contraceptive pills	0.94 (0.24)
Progestin-only contraceptive pills	0.90 (0.31)
Combined estrogen progesterone injectable contraceptives	0.35 (0.48)
Progestin-only injectable contraceptives	0.72 (0.45)
Male condoms	0.87 (0.34)
Female condoms	0.57 (0.50)
Intrauterine contraceptive device (IUCD)	0.97 (0.17)
Implants	0.97 (0.17)
Emergency contraceptive pills	0.71 (0.46)
Male sterilization	0.00 (0.00)
Female sterilization	0.04 (0.21)
Family planning guides & checklists readiness score	**0.74 (0.38)**
Facility has the following documents available at time of survey:	
National family planning guidelines	0.66 (0.48)
Family planning checklists and/or job-aids	0.81 (0.40)
Family planning trained staff readiness score	**0.72 (0.45)**
Facility family planning staff members received any family planning training in the last two years	0.72 (0.45)
Current Stock readiness score	**0.71 (0.17)**
Facility has the following reproductive health medicines and commodities available at the time of survey^ :	
Combined estrogen progesterone oral contraceptive pills	0.82 (0.38)
Progestin-only contraceptive pills	0.77 (0.42)
Combined estrogen progesterone injectable contraceptives	0.27 (0.45)
Progestin-only injectable contraceptives	0.71 (0.46)
Male condoms	0.72 (0.45)
Female condoms	0.46 (0.50)
Implants	0.94 (0.24)
Emergency contraceptive pills	0.68 (0.47)
Intrauterine contraceptive device (IUCD)	0.93 (0.26)
Stockout readiness score	**0.69 (0.30)**
Facility had a stock-out in the past three months for each of the following~ :	
Female condoms	0.50 (0.50)
Implants	0.90 (0.30)
Emergency contraceptive pills	0.67 (0.47)

Overall family planning readiness and domain scores are averages of individual component indicators on a scale of 0 (lowest) to 1 (highest). All individual component indicators are binary from 0 (No) to 1 (Yes) unless otherwise specified.

^ Never available OR not available today (0); Reported available but not seen (.33); Available but not valid (.66); At least one available and valid (1)

~ Facility stockout register is not available OR Facility has had a stockout of any length of time during the previous three months OR Product is not provided or prescribed OR Facility stockout register is not filled in (0); Facility has not had any stockouts during the previous three months (1)

Association between management effectiveness and family planning readiness

In the unadjusted analysis (Model A) for management effectiveness, higher overall management effectiveness scores were independently associated with higher facility readiness scores for family planning services. A one-unit increase in the overall management effectiveness score was associated with a 7.15-fold increase in the odds of having a facility readiness scores above the median quantile ($p < 0.001$). When adjusting for facility type and distance from DPS (Model C), we saw a significant association in the same direction, however the strength of the relationship weekend to a 4.88-fold increase ($p = 0.001$). While urban health centers and hospitals were 2.10 and 4.26 times more likely have a facility readiness score above the median quantile, respectively, neither of these associations were statistically significant ($p = 0.318$, $p = 0.399$).

Association between management experience and family planning readiness

Our analysis of two additional explanatory variables related to management experience also had significant results. In our unadjusted model (Model A), each additional year of management experience was associated with a 1.30-fold increase in the odds of scoring above the median quantile overall family planning readiness score ($p = 0.025$). This association maintained strength and significance even after adjusting for facility type and distance from the DPS. Adjusting for facility type only (Model B), urban health centers were 5.23 times more likely to have a readiness score above the median quantile ($p = 0.029$). Our final model concluded that being a first-time facility manager was associated with a 3.20-fold increase in the odds of having a readiness score above the median quantile ($p = 0.019$), though the direction of this association is unexpected.

Table 4 - Logistic quantile regression models estimates for the overall family planning readiness score

Variable	Model A		Model B		Model C	
	OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value
Overall management score	7.15 (3.02 ; 16.91)	< 0.001	4.70 (1.95 ; 11.30)	< 0.001	4.88 (1.86 ; 12.82)	0.001
Facility type						
Rural health facility	-		reference		reference	
Urban health facility	-		2.29 (0.65 ; 8.04)	0.198	2.10 (0.49 ; 8.96)	0.318
Hospitals	-		4.09 (0.12 ; 138.12)	0.432	4.26 (0.15 ; 123.40)	0.399
Distance DPS in 10km	-		-		0.99 (0.95 ; 1.04)	0.785
Years experience as manager	1.30 (1.03 ; 1.63)	0.025	1.20 (1.02 ; 1.43)	0.0317	1.21 (1.01 ; 1.45)	0.042
Facility type						
Rural health facility	-		reference		reference	
Urban health facility	-		5.23 (1.18 ; 23.06)	0.029	5.12 (0.98 ; 26.66)	0.052
Hospitals	-		4.38 (0.28 ; 67.42)	0.289	4.42 (0.28 ; 70.88)	0.294
Distance DPS in 10km	-		-		1.00 (0.93 ; 1.07)	0.955
First time facility manager	3.20 (1.21 ; 8.48)	0.019	2.12 (0.93 ; 4.82)	0.073	2.12 (0.89 ; 5.01)	0.088
Facility type						
Rural health facility	-		reference		reference	
Urban health facility	-		3.82 (0.84 ; 17.39)	0.083	3.84 (0.71 ; 20.79)	0.118
Hospitals	-		6.11 (0.08 ; 466.80)	0.413	6.10 (0.08 ; 481.45)	0.417
Distance DPS in 10km	-		-		1.00 (0.94 ; 1.06)	0.990

Model A: Unadjusted
Model B: Adjusted for facility type (rural clinic, urban clinic, hospital)
Model C: Adjusted for facility type and distance to Provincial Health Directorate
Cells that are shaded blue are statistically significant at $p < 0.05$

DISCUSSION

To our knowledge, this is the first study to quantify the association between management effectiveness and facility-level family planning service readiness among PHC facilities in Mozambique. Increased management capacity was independently associated with higher facility readiness for family planning services. In addition to this result, there are several important findings that characterize the PHC management and family planning service readiness environment in central Mozambique.

Notably, our finding that only a quarter of the PHC facility managers in our sample received any kind of official management training highlights the scarcity of investments in management-related quality improvements in the health workforce in certain areas of Mozambique. This may be a reflection of the MOH's focus on expanding the workforce to increase the density of health workers from 1.87 per 1,000 inhabitants in 2015 to the SDG index threshold of 4.45 health workers per 1,000 inhabitants.[29] Our finding that facility managers spent over one-third of their time on non-managerial tasks such as clinical duties is consistent with other available evidence about the severe shortage of health workers in resource-constrained environments.[30] However, the lack of trained managers may also indicate a reluctance to invest scarce resources in management quality improvements among a workforce that experiences a high degree of internal migration to NGOs, donor organizations, private sector organizations, and other countries.[22] Although there is clear evidence that increasing the number of health workers is can improve service delivery, additional research related to management quality improvements and the associations with service readiness and health outcomes is also needed.[15,31]

Our finding that many facility managers did not conduct staff performance reviews, and most did not link performance reviews to staff salaries, highlights an important gap in facility-level performance management that is well documented in other studies.[32] In the absence of routine staff performance management, facility managers are unable to identify areas for provider improvements that may directly translate to improved outputs and outcomes at reduced costs.[33,34] Furthermore, the absence of performance reviews, and the provision of compensation and incentives that are commensurate with performance, may be a driving cause for an unmotivated workforce and internal migration.[22] There is widespread evidence about the positive impact of

financial and nonfinancial incentives, such as career development and personal recognition, in improving PHC workforce motivation and retention.[32] Similarly, the study also revealed that there were significant gaps in the quality and frequency of external supervision visits, which is an essential management tactic to better integrate and improve service management at the PHC facility level.[35] Evidence suggests that the quality and frequency of external supervision is linked to systems accountability and improvements in management-related health system deficiencies, highlighting the need for additional capacity at the provincial level to ensure meaningful and sustainable improvements at the district facility level.[9]

With regard to facility readiness, higher management effectiveness scores were significantly associated with the overall family planning facility readiness scores. This finding is consistent with similar research in sub-Saharan Africa which found positive associations between higher facility-level management effectiveness and family planning process outcomes.[16,17] Our finding that urban facilities were significantly associated with higher readiness for family planning services was different from other recent evidence examining SARA family planning data in sub-Saharan Africa.[36] Whereas research in other countries across the region found that rural facilities generally have more availability of contraceptives than urban facilities, the rural facilities in our sample generally had less.[36] This may be related to the unique logistical and infrastructure challenges experienced in Mozambique that may not be directly comparable to other countries. Similarly, this may reflect that recent MOH commitments to improving supply chain and logistics performance for family planning products are supporting readiness improvements, though additional research is needed to determine if early stages of family planning supply chain and logistics investments have targeted urban facilities over rural facilities.[37] Finally, our finding

that first-time facility managers were more likely to have a readiness score above the median quantile was unexpected. Additional research is needed to understand the drivers behind the direction of this association, as it may be related to increased family planning training investments among recently recruited health managers.

These results should be interpreted in light of several study limitations that need to be considered. First, this was a cross-sectional study examining a statistical association between facility-level management effectiveness and family planning service readiness. While we cannot determine causality from this observational study, HAI intends to repeat this analysis over time to understand longitudinal trends. Second, the sample size is relatively small and only represents four regions of one specific country, limiting the generalizability of the results. Future studies with larger sample sizes would increase statistical power and generalizability of the results Third, the SARA survey family planning stockout domain only measures three tracer indicators (female condoms, implants, and emergency contraceptive pills), which limits the ability to derive a robust stockout score and therefore readiness. Given that the most common method of modern contraception in Mozambique is injection, it would be helpful to understand the stockout history for this method.[12] In general, the absence of a consensus for the most appropriate PHC performance indicators and a common framework onto which they can be mapped out, particularly with respect to management effectiveness, poses a noteworthy challenge to comprehensively address this knowledge gap.[34,15]

CONCLUSION

Our finding that higher management effectiveness is independently associated with an increased likelihood of higher family planning service readiness is an important contribution to the evidence base for management related PHC implementation research. Additional data and research are needed to examine the key drivers for facility-level variations in management effectiveness and service readiness for family planning, which were significant among the facilities sampled in our study. In general, our result supports the limited evidence available in this subject and motivates the need for additional research into the topic of PHC management effectiveness and, importantly, a consensus around the indicators and instruments that can be used to measure it. Finally, our results also motivate the need for longitudinal analysis of the association between management and readiness to determine how the strength of this association varies across time. Given the steady increase in global health funding during the previous decade, additional implementation science and economic research that incorporates cost-benefit analysis of PHC management improvements would help guide investment decisions among national governments and global health donors.[38]

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SUPPLEMENTAL INFORMATION

SI1: Management effectiveness survey questions for health facility managers.

The sampled health facility managers were asked to respond to the following 15 questions related to health facility management practices.

Management Practices

1. On a typical day, how much time do you spend on each activity (in hours)?
    a. Supervise patient flow (e.g. patient admission, transfer discharge, screening)
    b. Supervise clinical staff (e.g. check absences, check for treatment by nurses and physicians)
    c. Distribution of tasks
    d. Reporting / completion of bulletins / administrative activities
    e. Check equipment and availability of medications
    f. Treating patients
    g. Manage relationships with health professionals, community, health unit committee, donors, and government
    h. Other
2. Do you keep records of staff attendance?
    a. Yes
    b. No
3. In the past 12 months, did you (the person in charge of the health facility) have an individual meeting with each employee to review/evaluate their performance?
    a. Yes
    b. No
4. Are performance reviews related to salaries and incentives that staff members receive?
    a. Yes
    b. No
5. In the past 12 months, how many times did this health facility request medications?

External Supervision

1. During the past six months, how many supervision or technical assistance visits have you received from representatives of Provincial Health Directorate (DPS) or SDSMAS?
2. During the last visit, did the external supervisor use a control list?
    a. Yes
    b. No
3. During the last visit, did the external supervisor observe consultations?
    a. Yes
    b. No
4. During the last visit, did the external supervisor observe staff attendance logs?
    a. Yes

    b. No
5. During the last visit, did the external supervisor observe stock of medications?
    a. Yes
    b. No
6. During the last visit, did the external supervisor observe financial registries?
    a. Yes
    b. No
7. During the last visit, did the external supervisor write feedback in the supervisory log of this health facility?
    a. Yes
    b. No

Community Health Committee

1. In the past 12 months, how many times did the Community Health Committee meet?
2. Does this health facility have a formal mechanism to collect patient opinions (surveys, suggestion box, other)
    a. Yes
    b. No
3. In the past six months, were management changes made as a result of patient opinions?
    a. Yes
    b. No

SI 2: The following five questions are from Mozambique's 2018 SARA survey within the family planning service readiness module.

1. Does this facility provide or prescribe any of the following modern methods of family planning:
    a. Combined estrogen progesterone oral contraceptive pills
    b. Progestin-only contraceptive pills
    c. Combined estrogen progesterone injectable contraceptives
    d. Progestin-only injectable contraceptives
    e. Male condoms
    f. Female condoms
    g. Intrauterine contraceptive device (IUCD)
    h. Implants
    i. Emergency contraceptive pills
    j. Male sterilization
    k. Female sterilization
2. Please tell me if the following documents are available in the facility today:
    a. National family planning guidelines
    b. Family planning checklists and/or job-aids
3. Have you or any provider(s) of family planning services:
    a. Received any family planning training in the last two years?
4. Are any of the following reproductive health medicines and commodities available in this service site today?
    a. Combined estrogen progesterone oral contraceptive pills

b. Progestin-only contraceptive pills
c. Combined estrogen progesterone injectable contraceptives
d. Progestin-only injectable contraceptives
e. Male condoms
f. Female condoms
g. Implant
h. Emergency contraceptive pills
i. Intrauterine contraceptive device (IUCD)

5. For each of the following items, please check in the facility records if there has been a stock-out in the past three months:
   a. Female condoms
   b. Implant
   c. Emergency contraceptive pills

SI 3: Management component indicators based on the Service Delivery Indicator framework

	Questions to facility manager:		
Management Practices		**0**	**1**
	1. Time spent for managerial activities on a typical day: a. Supervise patient flow (e.g., patient admission, transfers, discharges, screening); b. Supervise clinical staff (e.g., check absences, check for treatment by nurses and physicians); c. Distribution of tasks; d. Reporting, completion of bulletins, administrative activities; e. Check equipment and availability of medications; Manage relationships with health professionals, community, health unity committee, donors, and government	Proportion of average managerial time spent:	
	2. Do you keep records of staff attendance?	Do not know / No	Yes
	3. In the past 12 months, did you have an individual meeting with each employee to review/evaluate their performance?	Do not know / No	Yes
	4. Are performance reviews related to salaries and incentives that staff members receive?	Do not know / No	Yes
	5. In the past 12 months, how many times did this health facility request medications? **Score conversion: 1 = 12 | 0 = < 12**	Proportion of average number of medication requests:	

	Management Practices score:	**_____ / 5**		
External Supervision		**0**	**0.5**	**1**
	1. During the past six months, how many supervision or technical assistance visits have you received from representatives of Provincial Health Directorate (DPS) or SDSMAS? **Score conversion: >3 = 0 | >= 3 and < 5 = 0.5 | >= 5 = 1**	>3 visits	>= 3 and <5 visits	>= 5 visits
	2. During the last visit, did the external supervisor use a control list?	Do not know / No		Yes
	3. During the last visit, did the external supervisor observe consultations?	Do not know / No		Yes
	4. During the last visit, did the external supervisor observe staff attendance logs?	Do not know / No		Yes
	5. During the last visit, did the external supervisor observe stock of medications?	Do not know / No		Yes
	6. During the last visit, did the external supervisor observe financial registries?	Do not know / No		Yes
	7. During the last visit, did the external supervisor write feedback in the supervisory log of this health facility?	Do not know / No	Yes, but did not see it	Yes, and read it
	External Supervision score:	**_____ / 7**		
Community Engagement		**0**		**1**
	1. In the past 12 months, how many times did the Community Health Committee meet? **Score Conversion: 1 = >= 12 | 0.5 = >= 6 & < 12 | 0.25 = >= 3 & < 6 | 0 = < 3**	Score:		
	2. Does this health facility have a formal mechanism to collect patient opinions? (surveys, suggestion box, other)	Do not know / No		Yes
	3. In the past six months, were management changes made as a result of patient opinions?	Do not know / No		Yes
	Community Engagement score:	**_____ / 3**		
	TOTAL MANAGEMENT SOCRE:			

SI 4: Family planning facility readiness component indicators based on the Service Availability and Readiness Assessment framework

	Questions to health facility:		
Family planning Provision		0	1
	1. Does this facility provide or prescribe any of the following modern methods of family planning?		
	a. Combined estrogen progesterone oral contraceptive pills	No	Yes
	b. Progestin-only contraceptive pills	No	Yes
	c. Combined estrogen progesterone injectable contraceptives	No	Yes
	d. Progestin-only injectable contraceptives	No	Yes
	e. Male condoms	No	Yes
	f. Female condoms	No	Yes
	g. Intrauterine contraceptive device (IUCD)	No	Yes
	h. Implants	No	Yes
	i. Emergency contraceptive pills	No	Yes
	j. Male sterilization	No	Yes
	k. Female sterilization	No	Yes
	Provision readiness score:	**_____ / 11**	
Guidelines & Checklists		**0**	**1**
	1. Are any of the following documents available in the facility today?		
	a. National family planning guidelines	No	Yes
	b. Family planning checklists and/or job-aids	No	Yes
	Guideline & Check-list readiness score:	**_____ / 2**	
Training		**0**	**1**
	1. Have you or any provider(s) of family planning services received any family planning training in the last two years?	No	Yes
	Training readiness score:	**_____ / 1**	
Stock Readiness			
	1. Are any of the following reproductive health medicines and commodities available in this service site today? **Score conversion: 1 = At least one valid | 0.66 = Available but not valid | 0.33 = Available but not seen | 0 = Not available today or Never available**	Score:	
	a. Combined estrogen progesterone oral contraceptive pills		

	b. Progestin-only contraceptive pills	
	c. Combined estrogen progesterone injectable contraceptives	
	d. Progestin-only injectable contraceptives	
	e. Male condoms	
	f. Female condoms	
	g. Implant	
	h. Emergency contraceptive pills	
	i. Intrauterine contraceptive device (IUCD)	
	Stock readiness score:	**_____ / 9**
Stockout		**Score**
	1. For each of the following items, please check in the facility records if there has been a stock-out in the past three months: **Score conversion: 1 = No stockouts | 0 = At least one stockout for any period of time OR Stock registry not available OR Stock registry not filled in OR Product not provided or prescribed**	Score:
	a. Female condoms	
	b. Implants	
	c. Emergency contraceptive pills	
	Stockout readiness score:	**_____ / 3**
	TOTAL FAMILY PLANNING READINESS SCORE:	