



RESEARCH ARTICLE

# The relationship between decision-making autonomy and training on facility-level management performance of primary health care facilities in Odisha, India [version 1; peer review: 1 approved]

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## Abstract

**Background:** Primary health care quality remains poor in many countries, despite its importance for universal health coverage. Evidence shows that better management of primary health care facilities improves service quality, and that facility managers' autonomy and training levels can augment their management performance. In India, there is scant research in this area. Research questions include: 1) What is the effect of facility-level autonomy on management performance and is the effect modified by management training? 2) Which aspects of facility management are most sensitive to facility-level autonomy and is the effect augmented by management training?

**Methods:** Using a multi-stage, regionally representative survey of health facilities in Odisha (n=396), a validated tool was used to measure management performance. An "autonomy score" was created to understand which facility management decisions are within a manager's capacity. Multivariable linear regressions were used to assess the association of decision-making autonomy and management training with performance scores.

**Results:** The mean performance score across all facilities was 0.657 (SD = 0.148) on a 0-1 scale; the mean autonomy score was 0.619 (SD = 0.305). Autonomy scores were not associated with a significant difference in performance scores; however, management training had an independent positive association with the human resources and monitoring domains of facility management.

**Conclusion:** In Odisha, India management training may improve management performance, and targeted training initiatives may strengthen a primary care facility's ability to retain staff and monitor

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performance. Our data did not demonstrate a significant association between decision-making autonomy and management performance, highlighting a need for further study on how decision-making autonomy may augment a manager's ability to leverage their skills to improve facility outcomes. In summary, neither management training nor decision-making autonomy alone will sufficiently improve primary care management but targeting the improvement of management training may improve a subset of performance outcomes.

## Keywords

facility management, management performance, decision-making, autonomy, training, primary health care, Odisha, India

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## Introduction

All United Nations member states have pledged to achieve universal health coverage (UHC) by 2030<sup>1</sup>. There is general agreement that primary health care is a foundational component of UHC as it expands comprehensive service coverage while linking health to people's homes and communities; however, primary health care delivery and quality are generally poor and improvement is slow and limited<sup>2,3</sup>. Countries that have successfully expanded access to primary health care still struggle to improve the quality of care delivered<sup>2</sup>.

Improving primary health care facility management may be one important tactic for improving quality. The World Management Survey (WMS) project has documented how managerial and organizational practices are critical for organizational productivity, and how variation in managerial quality may account for an important amount of the differences in productivity between countries and industries<sup>4-6</sup>. In health care, recent studies have suggested that better management is associated with higher quality care and improved health outcomes at higher level facilities<sup>6</sup>. Although management quality has not been robustly studied at the primary health care facility level, a recent randomized experiment evaluated the effects of management consulting for primary health care centers in Nigeria [8]. The study showed short-term improvements in management practices suggesting potential for positive change, though it was not able to demonstrate an effect on long-term outcomes<sup>7</sup>.

A relationship between management quality and health outcomes has been demonstrated outside of primary care. A 2014 survey of over 2000 hospitals worldwide – including hospitals in India – showed lower 30-day mortality from acute myocardial infarctions in the best-managed hospitals<sup>8</sup>. Importantly, they found that this effect was most pronounced in countries such as the United States and United Kingdom where managers of hospitals were independent, not politically appointed, and had higher degrees of autonomy to change practices within their hospital. The study suggests that managerial autonomy may be important for achieving better health outcomes and that further study of the factors that make high quality management possible may help better target and refine future interventions.

Similarly, a study of Ugandan health facilities found some evidence of a positive relationship between the decentralization of decision-making authority and managerial performance<sup>9</sup>. The locus of decision-making authority can serve as a proxy for measuring autonomy; if decision-making is at the level of facility managers rather than local or national government, the facility, theoretically, has greater autonomy over its own functioning. Managerial autonomy alone may not improve overall health care performance, but it does have a role in mitigating factors including supply and staffing shortages, which ultimately impact the ability to deliver high quality care<sup>9</sup>. Together, literature suggests that the effectiveness of facility managers in high-autonomy settings is likely related to the management skills of individual managers and may help to achieve better health outcomes<sup>8,9</sup>.

Like many countries, recent reforms in India are focused on improving rural care delivery and primary health care, including the introduction of a national public health insurance fund known as Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB PM-JAY)<sup>10-12</sup>. Aligned with the broader Indian context, primary care in the state of Odisha is delivered through Primary Health Centers (PHC), Sub-Centers (SC), and Health and Wellness Centers (HWC), which were newly introduced by the AB PM-JAY initiative<sup>13</sup>. The provision of health services is centralized at the state-level, whereby states are responsible for the organization and delivery of care, resulting in wide variation across India<sup>13</sup>. More specifically, research in Odisha has identified variation in facility capacity for service provision; while antenatal care and immunizations are widely available, access to non-communicable disease care remains low<sup>14</sup>. Facilities report the ability to provide a wide range of primary health care services, but often lack the functional equipment and medications to deliver care consistently<sup>13</sup>. Additionally, there is little evidence on the state of primary health care management for both Odisha and India at large, but it is possible that existing service capacity gaps may be addressed in part by management quality.

Our previous work adapts the World Management Survey, a tool applied to hospital settings in high-income countries, into a primary health care-specific management evaluation for low- and middle income-countries known as the Primary care facility Management Evaluation (PRIME) Tool<sup>15,16</sup>. Use of the PRIME-Tool in Ghana found that higher management scores were associated with better supply stocks and patient-reported experiential outcomes<sup>16</sup>. In Uganda, better facility management was associated with better essential drug availability while facilities with better management scores trended towards better performance on a number of experiential quality measures<sup>17</sup>. Although the PRIME-Tool is unable to measure health outcomes, our previous studies suggest that the PRIME-Tool score is associated with patient-reported outcome and experiential quality<sup>16,17</sup>.

Using the PRIME-Tool, we conducted a survey of managers in charge of primary care facilities across six districts within Odisha to better understand primary health care management and to determine:

- 1) What is the effect of facility-level autonomy on management performance? Is the effect augmented by management training?
- 2) Which aspects of facility management are most sensitive to facility-level autonomy? Is the effect of autonomy augmented by management training?

## Methods

### Study area and data collection

Our survey of primary care facilities in Odisha was a part of the Odisha Health System Assessment Study, a series of 10 different assessments designed to empirically evaluate the performance of Odisha's health system<sup>18,19</sup>. Cumulatively, the surveys covered over 30,000 individuals and several thousand providers. The surveys used a multi-stage sampling design

to ensure representativeness of the sample across population, health facility type, and location throughout the state.

First, a development index using data from Odisha's Regional Development Councils was used to create district strata, with six districts (Balasore, Khorda, Kalahandi, Rayagada, Jharsuguda, and Kendujhar) selected to best reflect the development and geography of the state. The development index captured differences in socioeconomic and demographic characteristics including population, district gross development product, poverty, and female literacy. Next, proportionately stratified sampling was used to create blocks which were further divided into primary sampling units to reflect the urban/rural distribution of the state. Ultimately, 396 primary health care facilities from 30 sampled blocks representing six districts of Odisha were surveyed following facility sampling recommendations provided in the World Health Organization's Service Availability and Readiness Assessment (SARA) and the World Bank's Service Provision Assessments (SPA). These facilities were chosen at the block level from government-maintained records of primary health care facilities based on whether they were in or near primary sampling units for the household survey portion of the study. The household survey data was not used in this current analysis of primary health care facility management. Surveyed facility types included PHCs, SCs, and HWCs.

Health facility surveys were administered in the local language (Oriya) by trained local interviewers. Interviewers asked to interview the medical or administrative officer in charge of the facility. If primary informants did not know the answers to specialized questions, other facility staff were asked, as needed. The survey was fielded in Odisha between August 2019 and March 2020 in partnership with Oxford Policy Management, an independent research agency. Notably, survey fielding was completed prior to the onset of the COVID-19 pandemic, and thus reflects pre-pandemic circumstances.

### Ethics

In the United States, ethical approval was received from the Institutional Review Board (IRB) at the Harvard T.H. Chan School of Public Health. In India, ethical approval was granted by SIGMA, an independent IRB, and the health research approval committee of the Government of Odisha. All study participants provided written informed consent prior to participation in the survey.

### Survey: PRIME-Tool

Surveys were designed and piloted by the Odisha Health System Study team at the Harvard T.H. Chan School of Public Health and Ariadne Labs in collaboration with Oxford Policy Management – India (OPM) and the Indian Institute of Public Health - Bhubaneswar (IIPH-B)<sup>18</sup>. The management portion of the survey utilized the PRImary care facility Management Evaluation Tool (PRIME-Tool), a validated scale designed to measure managerial practices and culture in primary health care facilities in a LMIC setting<sup>15,16</sup>. The PRIME-Tool is a quantitative close-ended survey that has been fielded in Ghana and Uganda to assess managerial performance in primary health

care facilities. The tool was adapted from the World Management Survey - an extensively validated and widely known framework used to compare management performance across countries and sectors - in order to fit a primary health care context. The PRIME-Tool survey includes domains examining Target-setting, Operations, Human Resources, Monitoring, and Community Engagement. The PRIME-Tool is scored for each facility by taking the mean of scores for each indicator (ranging from 0 (lowest) to 1 (highest)) across each domain and then taking the mean of the domains to calculate an overall score<sup>15,16</sup>. For the Odisha context, all surveys were adapted to Oriya in collaboration with OPM and IIPH-B and field tested prior to deployment to the full sample size.

The studies in Ghana and Uganda using the PRIME-Tool have incorporated an indicator that measures whether the facility manager has received any management training. We chose not to include this indicator in our calculation of PRIME-Tool scores in order to measure the independent effect of management training on the PRIME-Tool score. The full list of indicators we used for calculating scores can be found in our publicly available file "Modified PRIME-Tool Calculation."

### Autonomy and management training variables

The full facility survey included general questions across several domains, including: identification of basic facility characteristics, functions and services of the facility, personnel and staffing, autonomy, and accountability and governance. In order to better understand the relationship between facility management and autonomy, we used facility-level decision-making authority as a proxy for the creation of an "autonomy score." The autonomy score assessed whether the authority to make a given decision is based at the facility or outside the facility. If decision-making authority is at the facility-level, staff within the facility have the capacity to make decisions affecting facility operations, like supporting the health workforce, maintaining facility infrastructure, and managing funds. If decision-making authority for these functions rests with higher levels of the health system, governance structure, or within the community, then facilities have less autonomy in management decision making. While community voice is an important aspect of primary health care, it is important to understand whether daily facility management has any external influences. All facility survey questions were answered by the medical or administrative officer in charge of the facility.

The facility survey asked respondents: "According to you, which of these groups has the most say in [type of decision]?" Respondents were scored a 1 if they responded that the facility, doctor or facility staff, or auxiliary nurse midwife (ANM) had the most say, and a 0 if they responded that the Department of Health, community, or other had the most say. This was evaluated for eight unique decision-making components. Following previously used methodology, the autonomy score was calculated by taking the mean of the eight component scores, with a 1 corresponding to complete decision-making autonomy at the facility level and a 0 corresponding to no decision-making autonomy at the facility level<sup>9</sup>. Details on the calculation

of the autonomy score are provided in our publicly available file “Decision Making Autonomy Calculation.”

The binary management training variable used in this study derives from the survey question “*Have you ever received any training in the management of a health facility?*” with 0 being no and 1 being yes.

### Statistical analysis

Our primary analysis used ordinary least squares (OLS) regression to predict the effect of facility-level autonomy (measured by the autonomy score) and management training on the PRIME-Tool score. In a second model, an interaction term between the autonomy score and management training was added to test whether management training modified the relationship between the autonomy score and the PRIME-Tool score. Based on previous studies using the PRIME-Tool, facility-level characteristics including the type of facility (PHC versus SC), number of outpatient visits per day, district, and rural versus urban designation were included as covariates in the models<sup>9,15,16</sup>. Standard errors were adjusted to account for the clustering of facilities within district blocks.

In a secondary analysis, a similar approach was used to assess which domains of the PRIME-Tool score are most sensitive to facility-level autonomy and management training. For each of the five PRIME-Tool domains, we used OLS regression to predict domain scores using the same covariates as in our primary analysis. We applied a Bonferroni correction to our tests of significance to account for multiple testing. We also descriptively stratified the mean PRIME-Tool domain scores by autonomy scores for facilities without management training and for facilities with management training. Finally, we utilized counts and percentages to summarize categorical data as well as means and standard deviations to describe the central tendencies of continuous variables. All analyses were performed in R version 4.0.3.

### Results

Our representative sample included 396 public sector facilities, of which 259 were SCs (65.4%), 130 were PHCs (32.8%), and 7 were HWCs (1.7%). HWCs were dropped from all analyses due to their limited representation within the data. The sample was assessed for outliers, and three exceptionally large facilities, based on outpatient volume per day (>5 standard deviations greater than the mean), and four facilities missing data on outpatient volume were also dropped. Altogether, 382 facilities were included in our final analysis (Table 1). The mean PRIME Score across all facilities in our final sample was 0.657 (standard deviation 0.148), and 63.6% of facilities answered “yes” to having any level of management training. For detailed information about the distribution of variables across our exposure of interest, please refer to our publicly published table “Characteristics of PHC facilities stratified by exposure.”

Decision-making autonomy in Odisha primary care facilities varied by decision type (Figure 1). The mean autonomy score across all facility types was 0.619 (standard deviation 0.305).

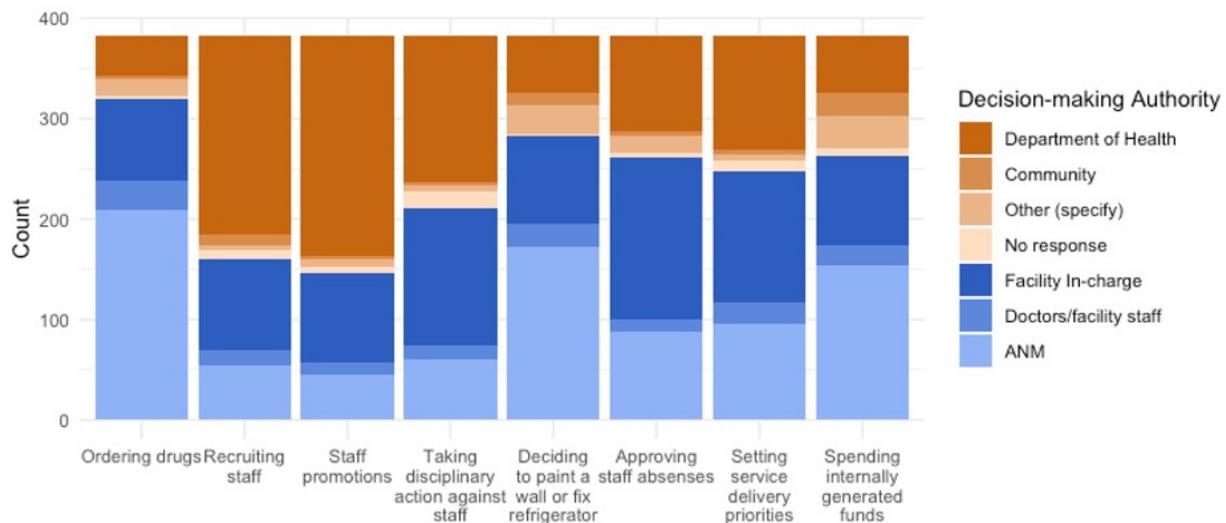
**Table 1. Characteristics of public facilities delivering primary care in Odisha, India.**

|                                     | Facilities |              |
|-------------------------------------|------------|--------------|
| Sample characteristics <sup>1</sup> | (N=382)    |              |
| <b>Facility type</b>                |            |              |
| Primary Health Center               | 127        | (33.2%)      |
| Sub-Center                          | 255        | (66.8%)      |
| <b>Outpatient visits per day</b>    |            |              |
| Mean (SD)                           | 27.8       | (30.5)       |
| Median [Min, Max]                   | 15.0       | [0, 200]     |
| <b>Location</b>                     |            |              |
| Rural                               | 377        | (98.7%)      |
| Urban                               | 5          | (1.3%)       |
| <b>District</b>                     |            |              |
| Kendhujhar                          | 71         | (18.6%)      |
| Baleswar                            | 118        | (30.9%)      |
| Khorda                              | 56         | (14.7%)      |
| Rayagada                            | 22         | (5.8%)       |
| Kalahandi                           | 78         | (20.4%)      |
| Jharsuguda                          | 37         | (9.7%)       |
| <b>Any Management Training</b>      |            |              |
| No                                  | 139        | (36.4%)      |
| Yes                                 | 243        | (63.6%)      |
| <b>Autonomy Score</b>               |            |              |
| Mean (SD)                           | 0.619      | (0.305)      |
| Median [Min, Max]                   | 0.625      | [0, 1.00]    |
| <b>PRIME-Tool Score</b>             |            |              |
| Mean (SD)                           | 0.657      | (0.148)      |
| Median [Min, Max]                   | 0.675      | [0.03, 0.96] |

<sup>1</sup>Variable distributions are reported as n (%) unless otherwise specified

Across all PHCs and SCs, Odisha’s Department of Health had the greatest authority over decisions regarding staff recruitment and staff promotion. For decisions surrounding facility maintenance, including ordering drugs, painting, or fixing walls, and spending internally generated funds, the decision-making authority most often rested within the health facilities themselves, although these decision categories were also controlled by central authorities in many instances.

After controlling for covariates, our model did not identify a significant relationship between facility-level autonomy and



**Figure 1. The distribution of decision-making authority in PHC facilities in Odisha.** Blue indicates facility-level authority and orange indicates non-facility level authority.

the PRIME-Tool score (Table 2). The coefficient on the interaction term in the second model was also not significant, suggesting that there is insufficient evidence to demonstrate that management training modifies the relationship between the autonomy score and the PRIME-Tool score. Notably, the model did measure a significant relationship between management training and the PRIME-Tool score (coefficient = 0.062,  $p < 0.01$ ).

Our secondary analysis also failed to measure any significant relationship between the autonomy score and the PRIME-Tool domain scores (Table 3). Our models did measure a significant relationship between completing any management training and scores in the human resources and monitoring domains of the PRIME-Tool; management training is associated with a predicted 0.160 higher Human Resources domain score and a 0.101 higher Monitoring domain score, both with  $p$ -values less than 0.0033.

## Discussion

In this study, we sought to determine if decision-making autonomy is associated with primary health care facility management scores in Odisha, India, whether management training moderates that relationship, and which elements of facility management were most influenced. While our data do not support the hypothesis that autonomy positively influences the PRIME-Tool score, we found that receiving management training is associated with a higher overall score and scores in the Human Resources and Monitoring management domains.

Our hypotheses were derived from previous research in Uganda and Nigeria that studied both the impact of decision-making autonomy and the influence of management training on primary

health care management performance. In Uganda, researchers found that decision-making autonomy was significantly associated with a positive increase in some management performance indicators<sup>9</sup>. In Nigeria, management training resulted in short term improvement in management practices but no sustained improvement past one year<sup>7</sup>. Contrary to evidence from Uganda, our results did not confirm a significant relationship between decision-making autonomy and management performance, but we did identify a positive relationship between management training and performance in specific management domains, as seen in Nigeria.

The statistically significant relationship between management training and management performance scores suggests that prioritizing training and skill development may help to increase overall management scores. It may be helpful to prioritize improving the quality of management training before further investigation of the role of autonomy in management performance. While autonomy and management training are likely both important components of primary health care facility management, their interdependent relationships may be more complex and multifactorial than our analyses here are capable of elucidating. There may also be components of facility-level autonomy and management that we were not able to capture with the autonomy score and PRIME-Tool score, leaving the need for a more targeted tool that can further examine this relationship and its context within a highly centralized government health system. Furthermore, these relationships may be context specific, and thus relationships present in Uganda or Nigeria may not be the same in Odisha. In the context of Odisha, decision-making autonomy varies by decision-type and rests between both the PHC-level and the regional

**Table 2. Predicted effect of facility-level autonomy and management training on the PRIME-Tool score.**

|                                | Dependent variable: |         |
|--------------------------------|---------------------|---------|
|                                | PRIME-Tool Score    |         |
|                                | (1)                 | (2)     |
| Autonomy score                 | 0.004               | 0.006   |
|                                | (0.034)             | (0.045) |
| Management training            | 0.062*              | 0.064   |
|                                | (0.020)             | (0.054) |
| Autonomy score × Mgmt training |                     | -0.003  |
|                                |                     | (0.076) |
| Observations                   | 382                 | 382     |

Coefficients are adjusted for facility type, urban/rural setting, outpatient volume, and district. Standard errors (reported in parentheses below the coefficients) account for the clustering of facilities within district blocks.

\* Association is significant at  $\alpha=0.01$

**Table 3. Predicted effect of autonomy and management training on PRIME-Tool domain scores.**

|                                | Target Setting |         | Operations |         | Human Resources |         | Monitoring |         | Community Engagement |         |
|--------------------------------|----------------|---------|------------|---------|-----------------|---------|------------|---------|----------------------|---------|
|                                | (1)            | (2)     | (3)        | (4)     | (5)             | (6)     | (7)        | (8)     | (9)                  | (10)    |
| Autonomy score                 | -0.126         | -0.050  | 0.019      | -0.030  | 0.081           | 0.071   | 0.054      | 0.063   | -0.007               | -0.026  |
|                                | (0.070)        | (0.101) | (0.047)    | (0.051) | (0.052)         | (0.072) | (0.044)    | (0.065) | (0.041)              | (0.056) |
| Management training            | -0.065         | 0.017   | 0.026      | -0.027  | 0.160*          | 0.149   | 0.101*     | 0.110   | 0.091                | 0.071   |
|                                | (0.033)        | (0.098) | (0.028)    | (0.053) | (0.030)         | (0.080) | (0.027)    | (0.068) | (0.028)              | (0.057) |
| Autonomy score × Mgmt training |                | -0.142  |            | 0.091   |                 | 0.018   |            | -0.016  |                      | 0.034   |
|                                |                | (0.162) |            | (0.074) |                 | (0.108) |            | (0.091) |                      | (0.080) |
| Observations                   | 382            | 382     | 382        | 382     | 382             | 382     | 382        | 382     | 382                  | 382     |

Coefficients are adjusted for facility type, urban/rural setting, outpatient volume, and district. Standard errors (reported in parentheses below the coefficients) account for the clustering of facilities within district blocks.

\* Association is significant at  $\alpha=0.0033$  (after accounting for multiple comparisons)

department of health and this division in decision-making may further complexify the relationships therein.

While the PRIME-Tool summary scores may not yield clear relationships, by examining the domain scores within the tool, there is opportunity for targeted improvement initiatives specific to the Odisha context. Our study found that management training may improve performance in the Human Resources and Monitoring domains. Consequently, it may be opportune for future management training initiatives in Odisha to focus on skills related to these domains. Currently, management training in Odisha is limited to short, mandated courses provided by the state government on specific interventions and the quality of this training is not known. However, providing PHC managers with ongoing education and supportive supervision may help facilities to better support human resource management and facility

monitoring and evaluation. This ultimately could increase the skill of managers at the facility level and enable more autonomous decision-making in concepts related to these domains. However, from study results alone, it remains unclear in the Odisha setting how much autonomy, and in what domains, managers should optimally be given.

Improving long-term health outcomes will require a multi-prong approach that holistically targets the broader health system, including strengthening governance and infrastructural improvements, in addition to improvement in facility autonomy and management. Given the importance of improving primary care delivery in the broader agenda of the Sustainable Development Goals and UHC, it is critical to continue studying the relationships between these different levers in order to best understand – both in Odisha and globally – how we can advance

our collective goals<sup>20,21</sup>. Ultimately, for sustainable progress towards strong primary care and achieving universal health coverage, all aspects of the system need to be supported to succeed.

### Limitations

There are important limitations to this study. Firstly, our evaluation of management performance relies solely on cross-sectional technical skills assessments. Plausibly, this may discount or ignore the importance of “soft skills” of management, which include interpersonal skills such as leadership, communication, and teamwork among others. These soft skills could play a role at both the interpersonal and larger organizational levels<sup>22</sup>. The PRIME-Tool is not designed to assess these skills, and future assessments may wish to take this into account in developing more robust and nuanced tools, taking note of the differences in how these soft skills may differ across contexts. Additionally, the cross-sectional nature of the survey prevents the ability to discern any causal relationships. Moreover, the question on management training lacks a temporal and content dimension that allows for any answer regardless of time passed or extent and quality of training and may introduce a recall bias. This may have an impact on the study’s inability to find a moderating relationship of management training on the relationship between the autonomy score and the PRIME-Tool score.

Secondly, the sample included in this analysis is composed entirely of public sector facilities. We acknowledge that management in private sector primary care facilities in Odisha may have substantively different contexts, including levels of autonomy and the relationships between autonomy and performance. Similarly, given the likely differences in autonomy, it is plausible that management training may have different impacts within private sector facilities.

Finally, as previously mentioned, it is possible that these relationships differ across contexts throughout the world, and thus, these data may not be applicable outside of Odisha.

### Data availability

#### Underlying data

Open Science Framework: The relationship between decision-making autonomy and training on facility-level management performance of primary health care facilities in Odisha, India,

<https://doi.org/10.17605/OSF.IO/9XGHD>.

This project contains the following underlying data:

- Odisha Facility Management Dataset.csv (Raw analytical data used.)

#### Extended data

Open Science Framework: The relationship between decision-making autonomy and training on facility-level management performance of primary health care facilities in Odisha, India, <https://doi.org/10.17605/OSF.IO/9XGHD>.

This project contains the following extended data:

- Modified PRIME-Tool Calculation.pdf (Modified PRIME-Tool calculation used.)
- Decision Making Autonomy Calculation.pdf (Autonomy Score calculation used.)
- Characteristics of PHC facilities stratified by exposure.jpg (Distribution of exposures across variables of interest.)

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

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## Open Peer Review

Current Peer Review Status: 

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### Version 1

Reviewer Report 15 September 2022

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 **Nachiket Mor** 

Banyan Academy of Leadership in Mental Health, Thiruvindandai, Tamil Nadu, India

This is an elegantly done paper which asks a sharply defined question I understand as: In an environment where the government is a minor provider of primary care (la Forgia *et al.*, 2019<sup>1</sup>, figure 4.13) and where the overall incentives for health systems quality are low to non-existent within the government facilities (Das *et al.*, 2018<sup>2</sup> and 2022<sup>3</sup>), does offering partial autonomy to facility managers and some managerial training produce any impact on the performance of the facility? Unsurprisingly, they do not find any effect of partial autonomy. It is noteworthy that they find a statistically significant link with self-reported managerial training (which, however, attenuates when the interaction term is added). Some suggestions for additional work on the paper would be:

1. To add a discussion of the materiality of the statistically significant effect of managerial training so that it becomes possible for policymakers to decide if, indeed, it is cost-effective for them to offer some of this training to all the facility managers.
2. OLS has been used to assess the relationships between variables without establishing if the underlying production function shape is linear. Perhaps using more generalised non-parametric approaches could be helpful, as could providing two/three-dimensional plots.
3. The data underlying the study are rich and have been carefully assembled. Merely providing aggregate analyses may not do full justice to this work. For example, there are likely to be district-level variations that could be explored using tools that work well with small samples. The Autonomy variable ranges from 0 to 1 – it would be good to understand if there are threshold effects after which one starts to see larger impacts.

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**Is the work clearly and accurately presented and does it cite the current literature?**

Yes

**Is the study design appropriate and is the work technically sound?**

Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**

Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**

Yes

**Are all the source data underlying the results available to ensure full reproducibility?**

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** I work in the field of health systems design.

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

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## Comments on this article

### Version 1

Reader Comment 29 Aug 2022

**Eliudi Eliakimu**, Health Quality Assurance Unit, Ministry of Health, Dodoma, Tanzania

The authors have done an excellent job. I concur with their concluding paragraph in which they note that: *"Improving long-term health outcomes will require a multi-prong approach that holistically targets the broader health system, including strengthening governance and infrastructural improvements, in addition to improvement in facility autonomy and management."* We need tools that will enable us to get all the information we need to understand styles and practices in managing PHC facilities in LMICs. In this, a scorecard by Mabuchi *et al.* (2020) is one of such needed tools

given its potential to be incorporated in routine supportive supervisions so that we can continuously get information on PHC facilities management practices<sup>1</sup>.

<sup>1</sup>Mabuchi S, Alonge O, YTsugawa Y, & Sara Bennett (2020) Measuring management practices in primary health care facilities – development and validation of management practices scorecard in Nigeria, *Global Health Action*, 13:1, DOI: [10.1080/16549716.2020.1763078](https://doi.org/10.1080/16549716.2020.1763078)

**Competing Interests:** I have not any competing interests. I work at the Ministry of Health Tanzania Mainland as Director of Health Quality Assurance. As part of my work, I oversee quality assessments in PHC facilities through a process called star rating assessment.

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