The Three-Gap Model of Health Worker Performance

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METHODOLOGY

The Three-Gap Model of Health Worker Performance

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Abstract

Background: Improving process quality remains a significant opportunity to improve outcomes in many low resource settings, however a continued focus on improving knowledge through increased training has proven ineffective. In this context, we introduce a methodology for diagnosing the causes of low quality care, including not only low knowledge, but also infrastructure and material as well as motivation.

Methods: The Three-Gap Model uses four measures of performance — target performance, actual performance, the capacity to perform and the knowledge to perform — to define three gaps for each health worker: the gap between target performance and what they have the knowledge to do (the know gap); the gap between their knowledge and their capacity to perform (the know-can gap) and the gap between their capacity and what they actually do (the can-do gap).

Results: Using data on pediatric care from hospitals in Liberia, we illustrate how the model can be used to investigate the potential for improvements in the quality of care from several possible policy interventions

Conclusions: The analysis of the relationships between these gaps across health workers in a health system help to paint a better picture of the determinants of performance and can assist policymakers in choosing relevant policies to improve health worker performance.

Keywords: Health Care Evaluation; Pay for Quality; Pay for Performance; Liberia

Background

Despite significant increases in funding directed at improving access to health care in developing and transition countries, obstacles to quality care remain. Although overwhelming majorities have access to a health facility, in many set-

tings, the quality of health care services is low, reducing the value of access. A primary symptom of this poor quality is low adherence to medical protocols [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]. Given the significant evidence that increases in protocol adherence are one of the most effective ways to improve outcomes and prevent childhood deaths [12, 13, 14, 15], a continued focus on process quality seems appropriate.

Unfortunately, it is also clear that training is not adequate because performance suffers from a know-do gap: health worker knowledge of correct protocol is often well above performance [16, 17, 18, 19, 6, 20]. However, knowing that a know-do gap exists does not help us know how to close the gap. We propose a new methodology for examining the determinants of performance and the role of policy-relevant inputs. We demonstrate the utility of the methodology using data from pediatric units of hospitals in Liberia.

Liberia is a West African country with a population of 4.8 million, of whom 2.3 million are under the age of 18. It emerged from a period of civil wars that ended in 2003 facing significant damage to the health infrastructure as well as the flight of qualified health personnel. Like its neighbors, Liberia has experienced significant improvements over the past 20 years and much room for improvement remains. Under-five mortality has fallen from 187 in 2000 to 71 today (compared to 170 to 97 regionally). The infant mortality rate is 53 (64) per thousand and the neonatal mortality rate is 24 (31). The probability of a child dying between 5 and 14 is 17% (23%). Ninety-six percent of births were preceded by at least one antenatal visit and a skilled birth attendant assisted 61% of deliveries (compared to 87% and 57%, regionally). HIV prevalence in Liberia and West Africa is relatively low compared to Eastern and Southern Africa. Rates of health-seeking are higher than the regional average with 60 percent of families seeking care for diarrhea and 78 percent seeking care for a fever (36% and 61%). [1]

The post-conflict progress was disrupted by the Ebola crises, which exposed the low level of readiness in the hospital system as well as again severely disrupting the health system. Thus, having made significant progress in maternal and child health, attention turned to the rural hospital system and the low quality of care

[1] All statistics are drawn from UNICEF's "State of the World's Children Report, 2019,"

in existing hospitals. Having experienced success with performance-based financing (P4P) in the primary care system, the government of Liberia investigated a similar program in the hospital system focusing on quality not quantity. Thus, the government embarked on a program to improve quality through 1) enhanced infrastructure, equipment and medicines, 2) creative programs to improve the knowledge of health staff and improved motivation through performance-based incentives. What remained unknown is how these inputs interact with each other and with the existing patterns in the health system.

Methods

The Three-Gap Model methodology diagnoses quality problems in the health system and guides the implementation and evaluation of policies to improve quality. The model starts with three measures of performance — actual performance, capacity and knowledge — and three gaps: the gap between what a health worker should be doing and what they have the knowledge to do (the know gap); the gap between what they have the knowledge to do and their capacity to perform (the know-can gap) and the gap between what they have the capacity to do and what they do (the can-do gap). To avoid confusion, although knowledge and capacity are measures of performance, henceforth, the term performance refers to actual performance, what health workers do with their patients. These measures are not merely summary statistics but can be used to analyze the determinants of quality and the possibilities for effective interventions.

We start with a simple mathematical representation of the basic relationship between these measures: knowledge (K) is a function of the target level of performance ($\mathbb{1}$), capacity (C) is a function of knowledge (K) and performance (D) is a function of capacity (C).

$$K = \mu_1 \mathbb{1} \tag{1}$$

$$C = \eta_2 + \mu_2 K \tag{2}$$

$$D = \eta_3 + \mu_3 C \tag{3}$$

The coefficients μ_1, μ_2, and μ_3 represent the relationship between these inputs, where a value of 0 suggests no relationship and a value of 1 represents a perfect correspondence. The default theory of the value of training is that new knowledge

translates into capacity ($\mu_2 = 1$) and that capacity translates into performance ($\mu_3 = 1$).

Equations 4 - 6 expand equations 1 - 3 to show the role of potential levers including training (T), infrastructure, equipment and consumables (I), and motivation (M).

First, knowledge is a function of the training of a health worker and β_1 shows the degree to which training improves knowledge.

$$K(T) = \beta_1 T + \nu_1 \mathbb{1} \tag{4}$$

Second, capacity is a function of knowledge $K(T)$ and the availability of equipment and infrastructure (I). Note that we include an interaction term for knowledge and infrastructure. This term captures the intuition that knowledge may require infrastructure (or that infrastructure may require knowledge) to be effective.

$$C = \alpha_2 + \beta_2 I + \nu_2 K(T) + \gamma_2 K(T) * I \tag{5}$$

Finally, performance is a function of capacity and effort. Generally, we do not observe effort directly, but it is an increasing function of motivation, and we can observe and manipulate motivation. Thus, we include the term $E(M)$ to represent the combination of these two factors.

$$D = \alpha_1 + \beta_3 E(M) + \nu_3 C(K, I) + \gamma_3 C(K, I) * E(M) \tag{6}$$

Results

We illustrate the model using data from pediatric care units in hospitals in Liberia. The data collection team was present at each health facility for 5 to 6 days observing consultations of children in the pediatric and emergency wards. For each patient, the activities of the health worker were compared to a checklist derived from the national protocol for the primary presenting symptom. The checklist was then be converted to a scale from 0 to 1. When they were not seeing patients, each health worker was examined with four vignettes designed to measure both knowledge and capacity. In the vignettes, knowledge (know) is measured by asking health workers to demonstrate how they would treat a hypothetical patient "assuming you have all the necessary equipment and supplies." The capacity (can) of health workers is measured by evaluating whether the equipment and supplies the health worker

proposed to use were present. For example, if a health worker knows that protocol requires the use of a medicine that is out of stock, capacity will be lower than knowledge. Each health worker was assigned an average capacity score and an average knowledge score derived from the four vignettes. Thus, for each health worker who sees pediatric patients, we have multiple measures of their performance tied to their capacity and knowledge. The instruments and data collection are discussed in more detail in Bawo et al. [21] and in the appendix.

Note that the data are cross–sectional and therefore used here only to illustrate the model and demonstrate its use in the policy context. This methodology, however, can be used with data from a Randomized Controlled Trial (RCT), which would allow hypothesis testing such as in [22, 23, 24].

Overall Patterns in the Three Gap framework

The average level of knowledge was 45% of the target, capacity was 42.5%, and performance was 35.4%. The corresponding gaps include a know gap of 55 percentage points, a know-can gap of 2.5 percentage points and a can-do gap of 8.9 percentage points. The immediate lesson from these averages seems to be that knowledge is very low but that there is not much of a gap in either capacity or even motivation. As we will show, this is the wrong interpretation because the averages do not tell the full story.

Table 1 and Figure 1 illustrate the data and model in both regression and graphical format. The three columns of Table 1 correspond to equations 1-3 outlined above. Column 1 shows the know relationship, column 2 shows the know-can relationship, and column 3 shows the can-do relationship, Figure 1 is designed to show all of the gaps as well as the relationships between the gaps. Graph 4 (the lower right quadrant) shows the know gap as well as the know-can relationship. Graph 2 shows the know-do relationship, and Graph 1 shows the can-do relationship. Note that Table 1 describes each relationship assuming a linear form, whereas the graphical analysis allows for a more flexible relationship between the performance measures.

Knowledge and its relationship to the target are shown in Column 1 of Table 1 and Graph 4 of Figure 1. Average knowledge of 45% of the target is represented by the coefficient in Column 1 and the vertical line from the average of the distribution of knowledge.

Graph 4 also shows the relationship between knowledge and capacity, represented in Column 2 of Table 1. Capacity is 98% of knowledge, and the dashed line in Graph 4 is almost precisely the 45-degree line, the line that shows the relationship if all knowledge directly translated into capacity. Both column 1 and Graph 4 suggest that health workers with low levels of knowledge have low capacity and health workers with high levels of knowledge have high capacity.

The average capacity is 42.5%, as seen by the horizontal line from the average of the distribution of capacity shown to the right of Graph 4 as well as the vertical line from Graph 3 up through Graph 1. Graph 1 and Column 3 show the relationship between capacity and performance, with the distribution of performance shown as a histogram to the right of Graph 2 and the average (35.4%) shown on the vertical axis of Graph 1. The dashed line showing the relationship between capacity and performance has a slight upward slope but is far flatter than the 45-degree line. Recall that the 45-degree line shows the relationship we would observe if all capacity were directly translated into performance. Column 3 suggests that a 10-unit increase in capacity results in slightly less than a 2 unit increase in performance, far less than a one-to-one relationship.

Graph 2 shows the know-do gap (not shown in Table 1). In this case, the know-do relationship and the can-do relationship have similar shapes, largely because the know-can relationship is close to one.

The four graphs are shown in the same figure because they are related to each other. Graph 4 and 2 share a horizontal axis (know), and all levels of knowledge shown in Graph 4 can be immediately translated into the know-do space by following a vertical line straight up to the next graph, as we have shown with the average level of knowledge. By extending the average level of knowledge to the 45-degree line in Graph 2, we show what performance would be if all knowledge translated into performance — the knowledge to perform. The distance between the 45-degree line and the actual line shows the overall know-do gap, and this can be measured at all levels of knowledge as well. Graph 2 shows that some health workers have a small (even negative) know-do gap, while others (with high levels of knowledge) have a much larger know-do gap.

Similarly, we can translate the average level of capacity from Graph 4 by following the horizontal line to Graph 3. In this case, Graph 3 serves as a “reflector”: by using

the 45-degree line, every level of capacity is translated from the horizontal to the vertical axis perfectly. Then we can move upwards, following the vertical line, to Graph 1. Following the average level of capacity (42.5%) from Graph 4, through Graph 3, to Graph 1, we can see 42.5% represented on the horizontal axis. Following the vertical line from Graph 3 up to the 45-degree line in Graph 1, we see the level of performance if there was no gap, the capacity to perform.

Finally, all four measures of performance (target, knowledge to perform, capacity to perform and actual performance) are shown on the vertical axis of Graph 1. However, it is the patterns in the relationships that inform policy, not the size of the gaps. This is easy to demonstrate in Figure 1. If knowledge were to improve, shifting the distribution to the right, it would increase capacity at almost a one–to–one rate. However, given the weak relationship between capacity and performance, the resulting increase in performance would be small, almost unnoticeable. In fact, increasing every health worker to 100% knowledge (every health worker knows every item of protocol) would result in an increase in performance of about 2 to 3%. The coefficients from Table 1 suggest a slightly more positive story: an increase in knowledge of 55 percentage points would increase capacity by 54 points, but performance by only 8 points.

Investigating Potential Policy Interventions

We have three sources of data to examine the role of potential policy inputs on performance: cadre or level of training of each health worker, infrastructure and equipment levels in each hospital and the responses of each health worker to a survey on their attitudes and motivation. Recall that this study, as a baseline, includes only cross-sectional variation in these inputs, so we cannot make causal statements. We investigate the role of three potential levers as examples that illustrate the use of the model: additional training, improvements in infrastructure, equipment and consumables, and changes in the motivation of health workers.

To investigate the role of training, we look at the cadre of health workers, comparing those with more training to those with less training. The relationships between cadre and knowledge are shown in Table 2, corresponding to equation 6, where training is a vector of dummy variables for each cadre. Note that the target (a proper evaluation of children in the outpatient and emergency wards of a hospital)

does not vary with cadre. The know gap does not appear to be strongly affected by cadre: the results show that, compared to the omitted category of physician's assistants, only certified midwives have a larger know gap, meaning that their levels of knowledge are further from the target. Since certified midwives are plausibly the only group whose training does not include pediatric care, this result is not particularly surprising.

Table 3 examines the role of functioning equipment in explaining the know-can gap, corresponding to equation 5. The table shows that the level of equipment available does not significantly alter either the intercept or the slope. This does not mean every facility has adequate equipment, only that the level of equipment does not explain their performance.

To examine the determinants of the can-do relationship, we summarize the results of 54 questions on an attitude and motivation survey, producing five summary measures of motivation: **self-satisfaction**, **feeling valued by the facility**, **job satisfaction**, **positive facility characteristics** and **positive worker behavior**. The questions that make up the summary measures are listed in Appendix B and each score is described briefly here.

Self-satisfaction: Eight questions related to the worker's perception of herself and not directly related to the facility or her role in it. Most of them measure her feelings of self-worth.

Feeling valued by the facility: Nine questions related to the worker's perception of whether she is a valued and useful employee in the facility.

Job satisfaction: Six questions related to the worker's satisfaction with the facility and feelings of fulfillment in her job or profession.

Positive facility characteristics: Nineteen questions related to the facility's processes, resources, and coworkers.

Positive worker behavior: Twelve questions related to the worker's positive attitude to their job.

We use confirmatory factor analysis (CFA) to determine the extent to which these five motivation dimensions, defined *a priori*, are reflected in the data, following the CFA best practices [25]. After confirming that each of the five motivation dimensions is reflected in the data, we use factor analysis with varimax rotation to construct a

latent variable for each category. We then normalize each factor to take on values in the range 0 to 1 to make the regressions results easier to interpret.

Table 4 demonstrates the value of the Three-Gap framework in exploring the role of motivation on performance. We include four types of regressions, which we call "naive," "gap," "partial" and "full." Column 1 (naive) shows the simplest analysis of the effect of motivation on performance, ignoring the role of capacity: is performance linked to measures of health worker motivation? This analysis suggests that **self-satisfaction**, **job satisfaction** and **positive facility characteristics** do not affect performance. In contrast, increasing **feeling valued by the facility** leads to a decrease in performance and increasing **positive worker behavior** leads to an increase in performance. This is somewhat puzzling at face value — why would a worker who feels more valued by the facility have lower performance? In Column 2 (gap) we examine the effect of motivation on the size of the can-do gap directly, calculated as the health worker's performance score subtracted from their capacity score. The results show that neither **positive worker behavior** nor **facility values the worker** now significantly changes the size of the can-do gap. Column 3 (partial) examines performance after controlling for capacity and finds similar results to Column 1 with the addition that capacity is also crucial in determining performance.

Finally, in Column 4, we examine the effect of motivation by interacting capacity with each motivation factor, thereby allowing the relationship between capacity and performance to change with each measure of motivation. This regression corresponds to equation 4, where motivation is a vector of the five factors. The results in Column 4 clarify the role of motivation and help explain the counter-intuitive results of the naive analysis. We see that allowing **feeling valued by the facility** to interact with capacity (can) causes the constant (the y–intercept) to decrease but that the slope of the overall relationship between capacity and performance significantly increases. This indicates that an increase in **feeling valued by the facility** allows health workers to translate capacity into performance at a higher rate. However, the decrease in the intercept indicates that the can-do gap itself only decreases for workers with high capacity. For workers with low capacity, being more valued by the facility decreases performance. In other words, increasing **feeling valued by the facility** causes the can-do function to rotate.

In Column 4, the intercept for **positive worker behavior** is now no longer significant; however, the p-value of the coefficient is 0.114, suggesting some possible positive effect. The coefficient for the slope (the interaction between the factor and capacity) is not significant, meaning that workers with high levels of **positive worker behavior** provide higher performance independent of their level of capacity. In other words, increasing **positive worker behavior** causes the can-do function to shift upwards.

These effects are shown in Figure 2 which compares, separately, two stylized health workers with high and low **facility values worker** and **positive worker behavior** scores. For each comparison, we choose the 25th percentile of the distribution as the low score and the 90th percentile as the high score. Rather than show the full four graph model, we focus on Graph 1, the can-do quadrant. Panel A shows that improving **facility values worker** rotates the relationship between capacity and knowledge, and Panel B shows that changing the **positive health worker behavior** score shifts the distribution upwards.

Discussion

The overall patterns in the four measures show that increases in knowledge are unlikely to lead to significant improvements in the quality of care. This highlights the key shortcoming of improving performance via knowledge rather than effort, seen in many other settings [26, 19, 20] and systematic reviews [27].

The methodology allows us to understand what other levers might help improve quality. We focus first on the implications of **facility values worker** as a source of motivation. The assumption here is that a performance–based financing or pay–for–quality interventions would work by changing the relationship between facility management and health workers and might improve this particular score. This has two policy implications for how to use the motivation policy lever and capacity inputs to improve performance. The cross-sectional analysis suggests that health workers who have low skills but feel valued by the facility have lower performance than health workers with the same skills who do not feel valued by the facility. This result is somewhat surprising, and we recognize the value of some qualitative analysis among health workers of these types. Can feeling valued really demotivate some health workers with low levels of capacity?

Taking the results at face value, however, there are some interesting implications. First, if a health facility implements a program that improves how the facility values the health worker, a simultaneous intervention that increases capacity for low capacity workers at baseline is necessary or else quality could easily fall. If instead, the policymaker cannot increase **feeling valued by the facility**, this analysis implies that it would also be useful to increase the capacity of health workers who work in facilities where the **feeling valued by the facility** score is already high. In contrast, increasing the capacity of health workers who do not feel valued, appears to have no impact on performance. Thus, the **feeling valued by the facility** motivation factor works not by increasing the level of health worker performance, but by decreasing the can-do gaps specifically for high capacity workers.

The implications for the **positive worker behavior** score are quite different. Note that this score is likely correlated with intrinsic motivation, which is unlikely to be malleable [24]. If a policy maker *does* know how to change the way a health worker approaches their job, there is no reason to target facilities or to pair the intervention with another intervention because improving this factor will increase the performance at every level of capacity.

Conclusion

Using an example from a hospital setting in Liberia to illustrate the model, we show the value of measuring two intermediate inputs into health — knowledge to perform and capacity to perform — and comparing these to target performance as well as actual performance. In this setting, we show that knowledge, capacity and performance are all low, but that performance is only limited (currently) by knowledge and motivation. In other words, in this setting, improvements in infrastructure and equipment are unlikely to lead to improvements in performance.

Why is there a weak link between capacity and performance? The methodology reveals that capacity interacts with a measure of motivation — the degree to which a health worker feels valued by their facility. As capacity increases (due to increases in knowledge), health workers who feel valued by their facility significantly improve their performance.

By also examining performance through other models, we can show that this potentially critical interpretation of the impact of policy could be missed. If we look at

performance in isolation, it looks as if feeling valued by one's health facility significantly decreases performance on average. This demonstrates one of the advantages of collecting more measures of performance and analyzing them in a more nuanced model.

Competing interests

The authors declare that they have no competing interests.

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Ethics approval and consent to participate

This Research was approved by the University of Maryland Institutional Review Board. Clearance number: 574034-3. All clinicians in the study gave written consent to participate.

Consent for publication

This study contains no personal information or other information that could be used to identify individuals and therefore consent to publish is not applicable.

Availability of data and materials

The data is published at the World Bank MicroData Library: https://microdata.worldbank.org/index.php/catalog/3574

Author's contributions

The study was designed by Rianna Mohammed and Kenneth Leonard in collaboration with Luke Bawo. The data collection was implemented by Luke Bawo and Kenneth Leonard. Fabliha Ibnat and Kenneth Leonard analyzed and wrote the paper with assistance from Rianna Mohammed.

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Figures

Figure 1 The Three-Gap model in pediatric hospital care, Liberia

The relationship shown as dashed lines is derived from non-parametric representation of each health worker in the respective two-dimensional spaces. We used locally-weighted kernel regression with a bandwidth of 10 percentage points and the Epanechnikov kernel. Graph 1 shows the relationship between capacity (Can) and Performance (Do) and the translated levels of knowledge to perform, capacity to perform and performance which demonstrate the know gap, the know-can gap and the can-do gap. Graph 2 shows the relationship between knowledge and performance, Graph 4 shows the relationship between knowledge and capacity and Graph 3 serves as a "reflector" for capacity, shifting it from the vertical to the horizontal axis.

Figure 2 The Three-Gap Framework with multiple types of motivation
The relationship between capacity and performance is shown for two virtual experiments. Panel A compares those who have a score at or above the 90th percentile for **facility values worker** (the dotted line) to those who have a score at or below the 25th percentile for the same measure (the solid line). Panel B compares those who have a score at or above the 90th percentile for **positive worker behavior** (the dotted line) to those who have a score at or below the 25th percentile for the same measure (the solid line).

Tables

Table 1 The know, know-can, and can-do gaps

	(1) Know	(2) Can	(3) Do
Target	0.451***		
	(0.0336)		
Know		0.980***	
		(0.0300)	
Can			0.157*
			(0.0850)
Constant	n.a.	-0.0156	0.270***
	n.a.	(0.0157)	(0.0407)
Observations	831	831	831
Adjusted R^2	n.a.	0.937	0.023

Clustered standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendices

0.1 Instruments

The instruments used to measure knowledge, capacity, and performance are available at https://sites.google.com/site/hfqualityassessment/home/hpa, on the page titled Hospital Quality Assessment. The measurement of these three elements comes from a series of yes or no questions on each instrument. For each condition, there is something that the health worker is supposed to do (take the patient's temperature or check that the patient has signed a consent form, for example) and the member of the research team administering the case study, vignette or direct observation vignette will indicate whether that thing was done. The knowledge, capacity and performance score for each health worker is the percentage of items required or suggested by protocol that are actually administered. This follows the standard process for scoring direct observation and vignettes [28].

Knowledge and capacity are measured for identical procedures and differentiated by the use of specific questions about the availability of equipment. For example, when assessing newborn care with the Newborn Health Simulation vignette, the health worker is asked "Please tell me, when a healthy baby is delivered, what care is important to give them immediately after birth and the first few hours thereafter?" One of the items that indicate knowledge is that they administer vitamin K. If the health worker indicates this procedure, the enumerator is instructed to verify that vitamin K is immediately available to the health worker. Saying they would administer vitamin K indicates knowledge, saying they would administer vitamin K together with having vitamin K present indicates capacity. Of course, the final test comes during direct observation when we indicate whether or not the health worker actually did administer vitamin K. In other cases, at the end of the case study we ask "what equipment or materials would you have used if it had been available to you?"

0.2 Motivation Questions used in Motivation Summary questions

Table 2 Policy levers that affect the know gap

	(1) Know
Target	0.508***
	(0.0839)
Certified Midwife	-0.191*
	(0.101)
Registered Nurse	-0.120
	(0.0974)
Associate Degree Nurse	-0.0394
	(0.148)
Bachelors of Science Nurse	-0.0700
	(0.0879)
Medical Doctor	-0.0270
	(0.0839)
Other	-0.101
	(0.146)
Constant	n.a.
	n.a.
Observations	767
Adjusted R^2	0.057

Clustered standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note that the category "Physician Assistant" was chosen as the reference category for cadre in column 1 because it has the highest number of observations. It requires the second most years of education and training, after MDs.

Table 3 Policy levers that affect the know-can relationship

	(1) Can
Know	0.921***
	(0.114)
Average of necessary equipment working	-0.0485
	(0.106)
Know × Average of necessary equipment working	0.103
	(0.199)
Constant	0.0119
	(0.0583)
Observations	831
Adjusted R^2	0.937

Clustered standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4 Policy levers that affect the can-do gap

	(1) Naive	(2) Gap	(3) Partial	(4) Full
self-satisfaction	-0.0418	0.116	-0.0560	0.219
	(0.0911)	(0.178)	(0.0934)	(0.314)
facility values worker	-0.378**	0.188	-0.341**	-1.287***
	(0.148)	(0.248)	(0.136)	(0.481)
job satisfaction	0.104	0.124	0.0601	0.0869
	(0.193)	(0.251)	(0.185)	(0.563)
facility characteristics	0.0370	-0.102	0.0495	-0.0799
	(0.0952)	(0.139)	(0.0861)	(0.248)
worker behavior	0.352**	-0.248	0.332**	0.808
	(0.153)	(0.310)	(0.158)	(0.550)
Can			0.192**	-0.460
			(0.0860)	(0.602)
Can × self-satisfaction				-0.631
				(0.755)
Can × facility values worker				2.147**
				(0.971)
Can × job satisfaction				-0.222
				(1.519)
Can × facility characteristics				0.300
				(0.621)
Can × worker behavior				-0.799
				(1.211)
Constant	0.294***	-0.0102	0.240**	0.482**
	(0.0884)	(0.121)	(0.0933)	(0.235)
Observations	650	650	650	650
Adjusted R^2	0.043	0.014	0.068	0.084

Standard errors in parentheses

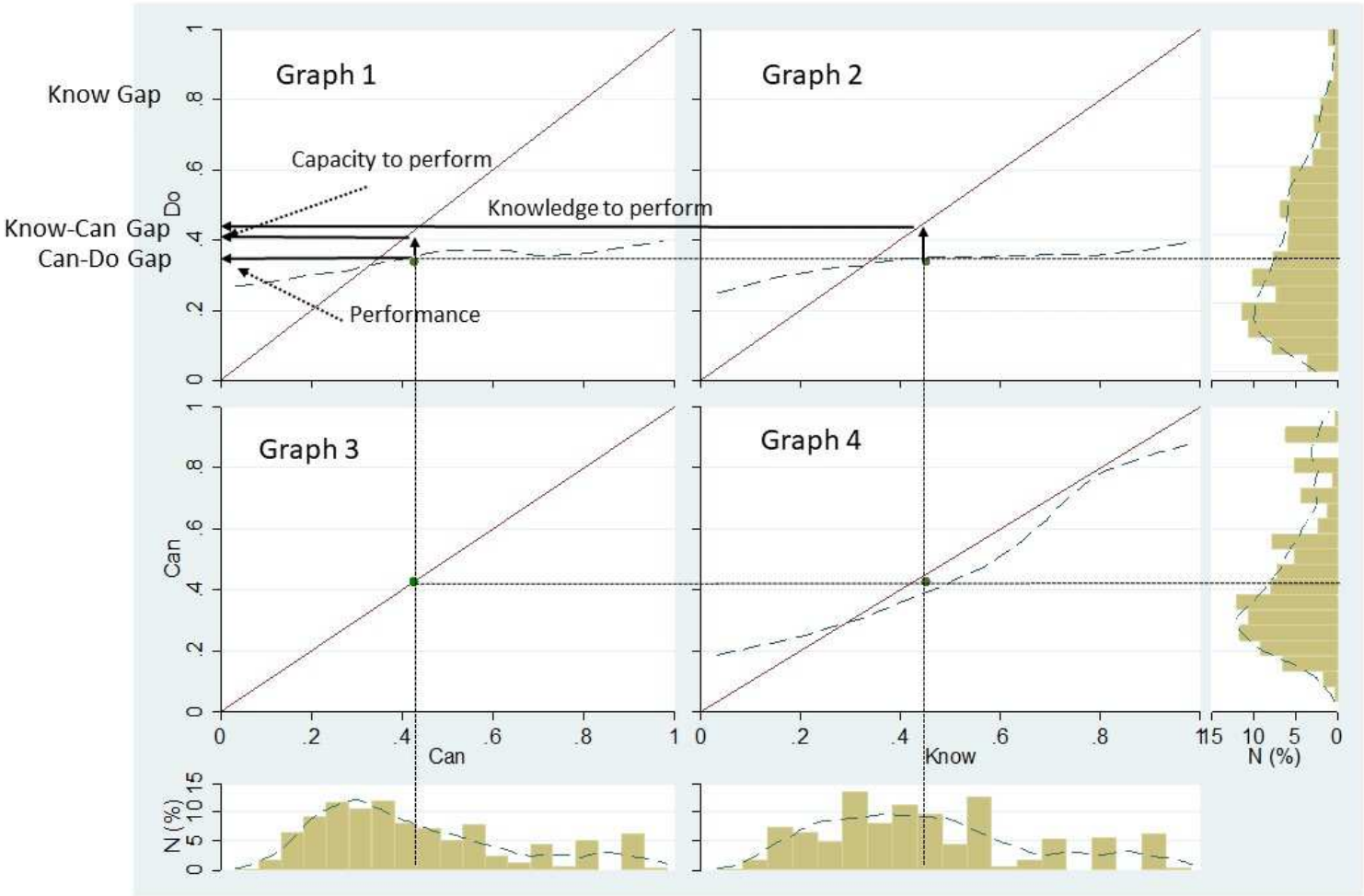
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5 Motivation Survey Questions, (continued on next page)

Measure	Question
Self-satisfaction	
	I feel that I am a person of worth, at least on an equal plane with others.
	I feel that I have a number of good qualities.
	All in all, I am inclined to feel that I am a failure.
	I am able to do things as well as most other people.
	I feel I do not have much to be proud of.
	I take a positive attitude toward myself.
	On the whole, I am satisfied with myself.
	It makes me feel appreciated when patients are grateful
Feeling valued by the facility	
	In this organization, I am taken seriously.
	In this organization, I am trusted.
	In this organization, I am important.
	In this organization, I can make a difference.
	In this organization, I am valuable.
	In this organization, I am helpful.
Job Satisfaction	
	I would recommend to my children that they choose the health profession
	I am proud to be working for this health facility
	This hospital inspires me to do my best on the job
	I am proud to tell others that I work in this ward / part of the hospital
	I am glad that I work for this facility rather than other facilities in the country
	My profession helps me to achieve my goals in life
	Overall, I am very satisfied with my work in this ward /part of the hospital
	I am very satisfied to have a position where I can work closely with the community
	I am satisfied with the opportunity to use my abilities in my job.

Positive Worker Behavior
I work hard to make sure that no patient has to wait a long time before being seen
I always complete my tasks efficiently and correctly.
When I am not sure how to treat a patient's condition I look for information or ask for advice
I try to get on well with the other health staff because it makes the work run more smoothly
I get along well with my superiors at work
I am willing to put in a great deal of effort to make this facility successful
These days I feel motivated to work as hard as I can.
I am punctual about coming to work
I am a hard worker
I usually cope well with changes at work
I intend to leave this facility as soon as I can find another position
I am keen use any new tools to improve my performance
Positive Facility Characteristics
Maintenance of broken equipment at this facility is prompt and reliable
I do not get feedback from my superiors so it is hard to improve my performance
My job duties and responsibilities are clear and specific
Relevant guidelines are easy to access at this facility
I often feel left alone when I have to make difficult decisions about a patient's care
I regularly have access to relevant trainings to keep my skills up to date
It is difficult for me to speak openly to my superiors about how things are really going at work
Suggestions made by health workers on how to improve the facility are generally ignored
Good performance is recognized by our superiors
This facility has a fair system for rewarding staff
My performance is appraised regularly
Some of the team members work well, yet others do not and so this facility doesn't perform well overall
We do not know how our facility is performing compared to others in the district
Our facility has clear goals that we are working towards
I understand how my work contributes to the facility's overall goals
This facility has a good reputation in the community
This facility provides everything I need to perform well at work
There are enough health providers to do the work in this facility
Too often the referral system does not work efficiently

Figures



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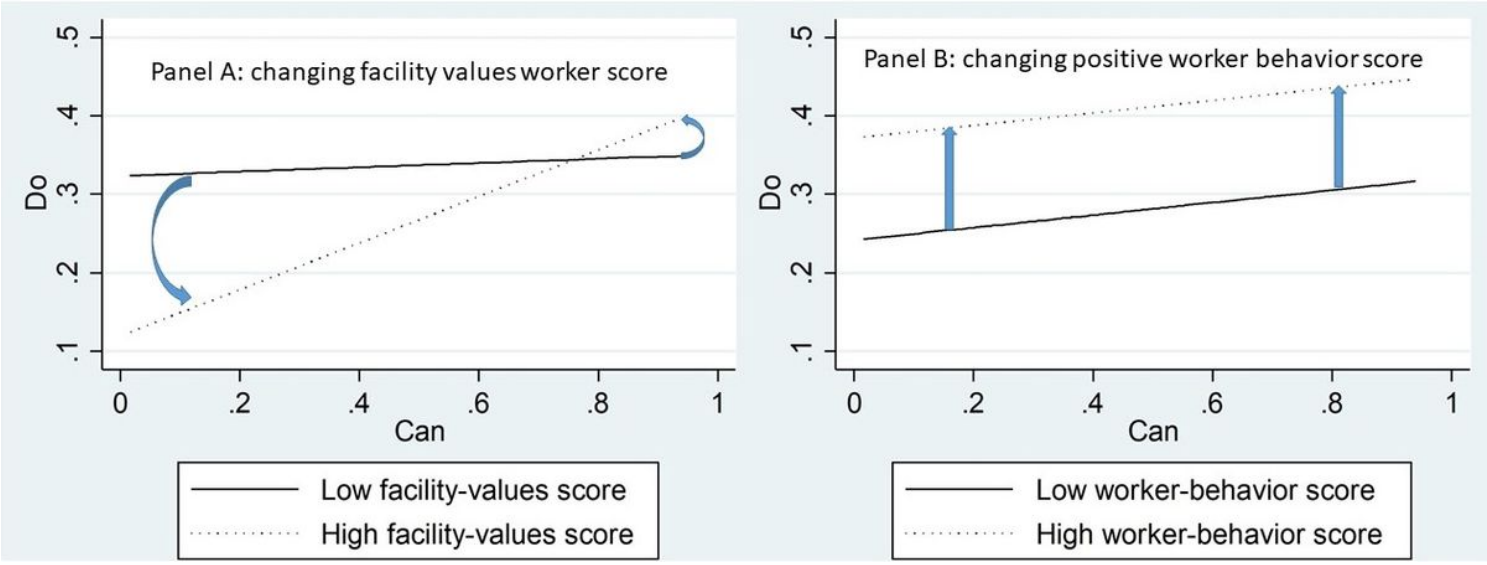

Figure 2

The Three-Gap Framework with multiple types of motivation The relationship between capacity and performance is shown for two virtual experiments. Panel A compares those who have a score at or above the 90th percentile for facility values worker (the dotted line) to those who have a score at or below the 25th percentile for the same measure (the solid line). Panel B compares those who have a score at or above the 90th percentile for positive worker behavior (the dotted line) to those who have a score at or below the 25th percentile for the same measure (the solid line).