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QUALITY OF CARE IN HOSPITALS SUPPORTED BY THE LIBERIA HEALTH SYSTEMS STRENGTHENING PROJECT

June 2023

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ABBREVIATIONS

EVD	Ebola Virus Disease
GFF	Global Financing Facility for Women, Children and Adolescents
GWH	George Way Harley
HSSP	Health Systems Strengthening Project
IPC	Infection, Protection and Control
JFD	Jackson Fiah Doe
MCH	Maternal and Child Health
MD	Medical Doctor
PBF	Performance-Based Financing

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EXECUTIVE SUMMARY

Introduction

The post-war Liberia health system remains fragile. A critical shortage of health workers, erratic supply of drugs and vaccines, and poor infrastructure are among the major barriers to the provision of quality healthcare in the country. To rebuild the Liberian health system and improve the quality of mother and child health (MCH) care, the Government of Liberia in collaboration with the World Bank and the GFF implemented a Health Systems Strengthening Project (HSSP) between May 2013 and November 2021. The main objective of the HSSP was to improve the quality of primary and secondary health care services, with a focus on maternal, neonatal and child health. To evaluate the performance of the hospitals which were supported under the HSSP, an evaluation comparing six HSSP hospitals (intervention) to three non-HSSP hospitals (control) was conducted. The aim of the study was to assess; (i) availability of health workers, infrastructure, and supplies; (ii) motivation of the health workers; (iii) skills and capacity of the health workers to perform in obstetrics, pediatrics, emergency, and surgery; and (iv) patient satisfaction.

Methodology

A mixed-methods exponential-sequential design was used to undertake the study. Firstly, a prospective facility-based quantitative study was conducted at all the nine intervention and control facilities through a review of patient records, direct observation, vignettes, staff motivation interviews, and patient exit interviews. Existing policy documents and clinical treatment protocols were also reviewed. This was followed by a qualitative review where in-depth interviews were conducted with the heads of the hospitals in both the intervention and control groups. Overall, the study assessed whether the health workers at HSSP facilities had improved the provision of quality MCH care. The study specifically looked at changes in capacity, knowledge, motivation, performance, and client satisfaction between 2015 and 2022. Data for the study was collected in 2013, 2015, and 2022.

Results

The results from the evaluation are summarized in Table 1. For the aggregated results in the seven counties (six HSSP vs three non-HSSP hospitals), there was improved capacity at both the HSSP and non-HSSP between 2015 and 2022 with regards to the availability and status of medical equipment. In other words, there was more equipment in 2022 than in 2015, and most of the equipment were working; but this was for both HSSP and non-HSSP facilities. Secondly, there was less absenteeism among nurses at HSSP facilities in 2022 than in 2015. Thirdly, health workers at HSSP hospitals had more knowledge and were more motivated in 2022 than in 2015. For health workers at non-HSSP hospitals, there was reduced knowledge and motivation between 2015 and 2022. Fourth, health workers at non-HSSP hospitals performed better than those at HSSP hospitals on obstetrics. The performance of the health workers on pediatrics and surgery at both HSSP and non-HSSP was relatively the same. For infection prevention and control, there was reduced performance between 2015 and 2022 for health workers at both HSSP and non-HSSP facilities in almost all the measures of infection prevention and control.

These results suggest that even though there was reduced absenteeism (nurses), and increased knowledge and motivation of health workers at HSSP hospitals between 2015 and 2022; this did not translate into improved quality of service provision as envisaged. As a matter of fact, the performance of the health workers at HSSP hospitals went down on the second and third stages of obstetrics quality; and infection prevention and control. Furthermore, results from the patient exit interviews show that at both HSSP and non-HSSP facilities, there was an increase in patient satisfaction as measured through the Likert score, and the proportion of the good things that the health workers did in pediatrics. However, there was reduced patient satisfaction at both HSSP and non-HSSP facilities on the qualities that are important to patients, and convenience.

The results from county-specific analyses in Nimba and Lofa counties are summarized in Table 1. The analysis was undertaken to examine changes in the quality of healthcare in two geographical settings—each with an intervention and control facility. Generally, the results show that quality of healthcare was better at the HSSP than at the non-HSSP hospitals in Nimba and Lofa counties (Table 1). In particular, health workers in HSSP hospitals performed better than those in non-HSSP hospitals on obstetrics and surgery, while the performance of the health workers on pediatrics at both HSSP and non-HSSP hospitals was relatively the same. For infection prevention and control, there was improved performance by health workers at HSSP hospitals in Nimba county, while the opposite is true for Lofa county. Lastly, patient satisfaction was better at HSSP facilities than non-HSSP facilities in Nimba and Lofa counties.

Though the results on performance from the county-specific analysis are positively leaning towards the HSSP facilities as compared to the aggregated analysis; the results on capacity, knowledge and motivation from the county-specific analysis are mixed. For example, in Nimba county, health workers at both HSSP and non-HSSP hospitals had more knowledge and were more motivated in 2022 than in 2015. This was not the case in Lofa county where knowledge among health workers increased more at the non-HSSP hospital as compared to the HSSP hospital. Further, there was reduced motivation among health workers at both the HSSP and non-HSSP hospitals in 2022 as compared to 2015. These results suggest that there is no clear relationship between increased knowledge and motivation, and performance of health workers.

Conclusion

Overall, results from the evaluation show a mixed picture regarding the contribution of the HSSP towards the provision of quality healthcare. This is consistent with a program that was bedeviled by two major health crises—Ebola Virus Disease (EVD) and COVID-19 outbreaks. While health workers at HSSP hospitals had more knowledge and were more motivated in 2022 than in 2015, this did not translate into improved quality of service provision as planned. However, all the heads of hospitals that were part of the HSSP indicated that money that was provided through the performance-based financing (PBF) program was important to maintaining the quality of healthcare at their hospitals. But if the PBF money was used as an incentive to provide higher quality healthcare, then there was supposed to be a contemporaneous relationship between “facility values the worker” and improved performance of health workers. Instead, only the baseline measure of this source of motivation led to a decreased know-do and can-do gap. In contrast, there was a strong relationship between the characteristics of the facility and the performance of health workers. However, this was less about incentives to work hard but more about the motivation that is inherent in working at a health facility that is well run. Moreover, health workers under the HSSP who were presumed to have been “more satisfied” were not resilient to shocks than the other health workers.

It is also key to note that there is an important distinction between direct incentives to improve performance, and incentives that come from general increases in spending. The results suggest that increased spending at well-managed health facilities improved the performance of health workers, but health workers were not responding to direct incentives. Overall, this suggests that programs like the HSSP can do better in facilities that are already well run; and that increases in funding (in the climate of a crisis) can close the know-do and know-can gap. Thus, while improving the welfare of health workers through the provision of monetary staff incentives is critical to improved service delivery and provision of quality healthcare—the characteristic of a health facility matters. Lastly, the results reveal that due to the COVID-19 pandemic, the government implemented a hiring freeze and reduced the salaries for health workers countrywide. This affected health workers at both the HSSP and non-HSSP facilities. Nevertheless, PBF staff incentives which were being provided at HSSP facilities seemed to have cushioned the effects of the salary reduction. As such, the PBF program was instrumental in alleviating human resource problems that would have otherwise been worse.

Limitations of the Study

Given the non-random assignment of the HSSP and non-HSSP hospitals, the delayed final evaluation due to the COVID-19 outbreak, and the large and unknown effects of the EVD and COVID-19 outbreaks; it was very difficult to do a rigorous evaluation. Consequently, while the initial goal was to conduct an impact evaluation of the PBF program, the poor state of the health system and lack of complementary funds from the government made it difficult to implement the PBF program as planned. Given the disruption to project implementation and the initial study design during the EVD and COVID-19 outbreaks, it was impossible to treat PBF as a counterfactual. As such, the study looks at the HSSP as a whole and not the PBF program. In this regard, the PBF was treated as one of the covariates. Furthermore, this evaluation cannot validate the success of the HSSP with a high degree of certainty as implementation of the HSSP as a whole was also disturbed by the EVD and COVID-19 outbreaks.

To overcome the limitations in this study, future evaluations in fragile states like Liberia, could combine routine data with primary data to account for the effect of time. Recent evidence has shown the potential of using routine data for robust impact evaluation of health intervention programs in low-income settings (Kuunibe, 2023). In addition, where randomization is intended, like in the case of the HSSP in Liberia, care should be taken to allow for an equal chance of selection into either the intervention or control groups. However, there was no randomization and hospitals were deliberately selected for the intervention and/or the control. This can lead to selection bias, even in the absence of the EVD and COVID-19 outbreaks. If it is necessary to handpick intervention facilities, quasi-experimental approaches such as the interrupted time series design with multiple groups can account for the time effect (Linden, 2015). Combining this with primary data presents a perfect opportunity for robustness checks using alternative estimation procedures (i.e., the difference-in-difference regression and segmented regression).

Recommendations

Based on the results, our recommendation is that health system challenges in Liberia should be addressed at the sub-systems level. This includes improving the management of hospitals by providing all the required medical equipment and human resources management. Incentives such as rural retention allowances, opportunities for study leave, staff housing and so forth are likely to improve the motivation of health workers in rural and hard-to-reach areas.

Table 1: Changes in Capacity, Knowledge, Motivation, Performance, and Client Satisfaction

	ALL Seven Counties	County Level	
		Nimba	Lofa
1. Capacity			
<i>Infrastructure</i>	Improved in both HSSP and non-HSSP	<ul style="list-style-type: none"> • Increased in HSSP • Declined in non-HSSP 	Improved in both HSSP and non-HSSP
<i>Absenteeism</i>	Results were statistically insignificant for all health cadres, except for nurses. Nurses in HSSP were less absent in 2022 than in 2015	<ul style="list-style-type: none"> • Reduced in HSSP • Increased in non-HSSP 	Reduced in both HSSP and non-HSSP
2. Knowledge	Improved in HSSP but reduced in non-HSSP	Increased in both HSSP and non-HSSP	Increased in several measures in non-HSSP as compared to HSSP
3. Motivation	Improved in HSSP but reduced in non-HSSP	For both HSSP and non-HSSP, there was an increase in self-satisfaction but a reduction in facility characteristics	For both HSSP and non-HSSP, there was a reduction in 5/6 measures of staff motivation
4. Performance			
<i>Obstetrics ward</i>	Non-HSSP did better than HSSP	HSSP did better than non-HSSP	HSSP did better than non-HSSP
<i>Pediatric ward</i>	Improved in both HSSP and non-HSSP	Improved in both HSSP and non-HSSP	Improved in both HSSP and non-HSSP
<i>Surgery ward</i>	Improved in 4/8 measures of surgical quality in both HSSP and non-HSSP	Improved in HSSP in 3/8 measures of surgical quality but reduced in non-HSSP	Improved in HSSP in 3/8 measures of surgical quality but not in non-HSSP
<i>Infection prevention and control</i>	Reduced in both HSSP and non-HSSP in almost all the measures of Infection prevention and control	HSSP did better than non-HSSP	Non-HSSP did better than HSSP
5. Patient Satisfaction	<ul style="list-style-type: none"> • For both HSSP and non-HSSP, increased patient satisfaction as measured through the Likert score, and the proportion of the good things that the health workers did in pediatrics. • At both HSSP and non-HSSP, reduced patient satisfaction on the qualities that are important to patients; and convenience. 	HSSP did better than non-HSSP	HSSP did better than non-HSSP

1. INTRODUCTION

1.1 Background

Liberia's 14-year civil war destroyed most of the country's basic infrastructure, including the health system. Subsequently, there is limited access to electricity, water, and health services with significant disparities between urban and rural areas. Supply-side constraints including shortage of health workers, erratic supply of drugs and vaccines, and poor infrastructure are among the major barriers to the provision of quality healthcare in the country (Yerger *et al.* 2020). To support the Government of Liberia to rebuild the health system and improve the quality of MCH care, the Liberia Ministry of Health with financial support from the World Bank and the Global Financing Facility implemented the HSSP between May 2013 and November 2021. The development objective of the HSSP was to "improve the quality of primary and secondary health care services, with a focus on maternal, neonatal and child health."

At approval, the two main components of the project were: (a) Strengthening the institutional capacity to improve the quality of selected health interventions at PBF health facilities; and (b) Improving health worker competencies to address key health-related concerns at selected health facilities. The first component was to be accomplished through the provision of PBF incentives aimed at improving health service delivery. Although the PBF focused on specific services, it was expected to have a much broader impact beyond the targeted services. The second component was to complement efforts to improve the quality of healthcare at targeted health facilities by enhancing the availability and competence of health workers in critical specialists areas through a Graduate Medical Residency Program and in-service training. In particular, the HSSP sought to enhance the clinical capabilities and competencies of mid-level cadres (nurses, midwives, and physician assistants) in obstetrics, surgery, pediatrics, and internal medicine through the provision of in-service training and mentorship; and to upgrade the equipment and infrastructure at the targeted health facilities through direct investments and PBF incentives.

To evaluate the performance of the hospitals which were supported under the HSSP, an evaluation comparing six HSSP hospitals (intervention) to three non-HSSP hospitals (control) was conducted. The aim of the study was to assess; (i) availability of health workers, infrastructure, and supplies; (ii) motivation of the health workers; (iii) skills and capacity of the health workers to perform in obstetrics, pediatrics, emergency, and surgery; and (iv) patient satisfaction. By looking at changes in these measures overtime and across intervention and control hospitals; it was possible to determine whether quality of care was enhanced during the implementation of the HSSP. However, given the non-random assignment of HSSP and non-HSSP hospitals, the delayed final evaluation, and the large and unknown impacts of the EVD and COVID-19 outbreaks; it was very difficult to do a rigorous evaluation. However, it is still important to track any potential effect that the HSSP could have had on the country's health system, even amid the challenges in the evaluation design.

1.2 HSSP Theory of Change

The study design is guided by the theory of change for the HSSP, which outlines the changes in skills, equipment, and motivation that were expected to be brought about by the HSSP. Firstly, it is postulated that the skills and experience of a health worker determine his/her *competence*, which can be increased by training. One of the goals of the HSSP was to improve the competence of health workers with more specialized training. Secondly, the equipment and infrastructure available to a health worker, combined with their competence, determines his/her capacity. The other goal of the HSSP was to increase *capacity* directly through structural and supply improvements

and indirectly through improvements in competence. Thirdly, health worker *effort* combined with capacity, determines the *performance* of health workers. Effort is driven by motivation and can be improved through better management, increased information, and/or improved incentives. The HSSP sought to improve performance by enhancing capacity (and competence) and through the PBF program by increasing the motivation of the health workers to perform. Staff motivation was expected to increase through individual performance-related bonuses, opportunities for training, and improved provider-accountability mechanisms related to the achievement of results. These changes were expected to improve the quality of services, increase utilization of health services by patients, and facilitate better health outcomes.

2. EVALUATION APPROACH

2.1 Study Design

A **mixed-methods exponential-sequential design** was used to undertake the study. Firstly, a prospective facility-based quantitative study was conducted at all the nine intervention and control facilities through a review of patient records, direct observation, vignettes, staff motivation interviews, and patient exit interviews. Existing policy documents and clinical treatment protocols were also reviewed. This was followed by a qualitative review where in-depth interviews were conducted with the heads of the hospitals in both the intervention and control groups. Overall, the study assessed whether the health workers at HSSP facilities had improved provision of quality mother and child healthcare. The study specifically looked at changes in capacity, knowledge, motivation, performance, and client satisfaction between 2015 and 2022.

- (i) **Competence of health workers** through efforts to increase the knowledge and skills of health workers to provide quality MCH services;
- (ii) **Capacity of health workers** through efforts to ensure that health workers have the skills, drugs, equipment and other medical supplies to provide quality MCH services;
- (iii) **Staff motivation** to measure the health workers' self-worth, attitude, and satisfaction with their job and facility characteristics;
- (iv) **Performance of the health workers in obstetrics, pediatrics, emergency, and surgery** through efforts (and incentives) to ensure that health workers provide adequate and quality MCH care; and
- (v) **Patient satisfaction** to show the responsiveness of health workers to the demands of their patients.

By looking at changes in the above measures of quality over the years and across intervention and control hospitals, it was possible to determine whether the quality of care was enhanced or not during the implementation of the HSSP. The desired outputs can be traced to the characteristics and performance of health workers. This depends on whether the health workers are motivated to work, if they are trained in the required skills, and if they are provided with the right equipment and medicines to do their jobs. Therefore, in addition to the above measures of quality, the study assessed changes in the presence/availability of key health workers (i.e. reduced health worker absenteeism), record keeping, and staff motivation.

2.2 Study Setting

The study was originally envisaged as a **five-year evaluation with a baseline, mid-point, and endline**. However, the EVD crisis of 2014-2015 and the COVID-19 outbreak (2020-2021) interrupted the implementation of the HSSP and original evaluation design. Consequently, James Jenkins Dossen Hospital was dropped and replaced by Francis Joseph Grante Hospital in the intervention group. St. Francis Hospital, which was initially supposed to be a control, became an intervention hospital. Further, while baseline data had been collected at Charles Henry Rennie Hospital in 2015, it was impossible to collect data from the hospital in 2022 as it had been damaged by a fire. As such, very few services were being provided at the hospital by 2022 and it was dropped from the evaluation. Thus, the study was conducted at six HSSP hospitals (intervention group) and three non-HSSP hospitals (control group) in seven counties as provided in Table 2. At the hospitals, the main study sites were the obstetrics, pediatrics, emergency/triage, and surgery wards.

Table 2: List of Hospitals in the Intervention and Control Groups

Name of Hospital	County	Original Design 2013	Baseline 2015	Endline 2022
1. Jackson Fiah Doe	Nimba	HSSP	HSSP	HSSP
2. Phebe	Bong	HSSP	HSSP	HSSP
3. Redemption	Montserrado	HSSP	HSSP	HSSP
4. Tellewoyan	Lofa	HSSP	HSSP	HSSP
5. Francis Joseph Grante	Sinoe	----	HSSP	HSSP
6. St. Francis	Rivercess	Control	HSSP	HSSP
<i>James Jenkins Dossen</i>	<i>Maryland</i>	<i>HSSP</i>	<i>Dropped</i>	
1. Curran	Lofa	Control	Control	Control
2. George Way Harley	Nimba	Control	Control	Control
3. Liberian Government Hospital	Bomi	Control	Control	Control
<i>Charles Henry Rennie</i>	<i>Margibi</i>	<i>Control</i>	<i>Dropped</i>	

2.3 Data Collection

Data collection for the study was undertaken in 2013, 2015, and 2022. In 2013, data collection tools were developed and pre-tested at five of the 10 hospitals which were part of the original design. The main purpose of this exercise was to test whether the data collection tools would be able to gather information relevant to the study and measure the theory of change for the HSSP. The pre-test led to the refinement of the data collection tools. The data that was collected during the pre-testing survey was also used to develop weights for measuring health worker motivation and patient satisfaction. These weights were used at subsequent stages of the study. In 2015, data were collected at ten hospitals (including Charles Henry Rennie hospital which was later dropped), and at nine hospitals in 2022. Data on the performance of the health workers was collected from the obstetrics, pediatrics, emergency, and surgery wards through a review of patient records, direct observation, and vignettes. The data on staff motivation and patient satisfaction were collected through closed-ended questionnaires, while for the interviews with heads of hospitals, an interview guide with open-ended questions was used. A document review of existing policy documents and clinical treatment protocols was also undertaken.

All the survey instruments were reviewed by the principal investigators in consultation with the clinical staff from the Ministry of Health to verify their medical accuracy and local appropriateness. The instruments¹ were revised prior to the training of the enumerators. After the instruments were finalized and before the data was collected, two supervisors and 32 enumerators were trained. The training covered a range of topics, including objectives of the data collection exercise, familiarization with the survey instruments, research ethics, and quality assurance. Data collection was done in two groups, each with a supervisor and 16 enumerators. Each group's enumerators were divided into five teams (obstetrics, pediatrics, surgery, emergency/triage, and hospital assessment) to focus on specific data collection instruments based on their medical training and/or area of expertise. At each hospital, the groups spent five days for data collection and an additional sixth day to observe staffing on weekends. A total of 33 separate instruments were used to collect data for the study. For the data collection in 2015, a total of 3,688 instruments were completed across 10 facilities while in 2022 about 5,914 instruments were completed across nine facilities.

¹ The full list of instruments, questions, and training materials is available at the health quality assessment website: <https://sites.google.com/site/hfqualityassessment/home/hpa>

2.3.1 Staff Motivation Survey

Health workers were asked to answer a series of questions about their attitudes and motivations on a five-point Likert scale with options ranging from “Strongly Agree” to “Strongly Disagree.” The results from the survey were grouped into five measures of motivation, namely: self-satisfaction, feeling valued by the facility, job satisfaction, positive facility characteristics, and positive worker behavior. The 54 questions that made up the summary measures are broken down as follows:

- *Self-satisfaction*: Eight questions on the worker’s perception of herself/himself and not directly related to the facility or her/his role in it. These questions measure the worker’s self-worth.
- *Feeling valued by the facility*: Nine questions on the worker’s views on whether she/his a valued and useful employee at the facility.
- *Job satisfaction*: Six questions on the worker’s satisfaction with the facility and feelings of fulfilment in her/his job.
- *Positive facility characteristics*: Nineteen questions on the facility’s processes, resources, and co-workers.
- *Positive worker behavior*: Twelve questions on the worker’s positive attitude to her/his job.

Using the 2013 data, confirmatory factor analysis was conducted to determine the extent to which the five dimensions of motivation, defined a priori, are reflected in the data. After confirming that each of the five dimensions of motivation were reflected in the data, factor analysis with varimax rotation was used to construct a latent variable for each category. Thereafter, each factor was normalized to take on values ranging from 0 to 1, aimed at making the regression results easier to interpret.

2.3.2 Competence and Capacity

To measure competence and capacity, vignettes were used to test knowledge as well as to assess the availability of equipment and materials that would allow health workers to use the knowledge that they possess. In this regard, capacity was considered equal to knowledge, after subtracting the things that health workers knew and could do but they could not do them because the required equipment was non-functional or unavailable. The scores from the vignettes represent the proportion of recommended items (i.e. procedures, questions, etc) that were properly implemented. A score of 1, therefore, represents a case in which a health worker implemented the case study or simulation according to national standards. The health worker was expected to obtain the correct diagnosis or treatment by taking the history, physical examination, and laboratory tests. Each of the vignettes was associated with a list of possible history-taking questions, physical examination procedures, and laboratory tests. The health workers received a higher score if they used more of these items. The inputs made more sense in the pediatric and surgical vignettes where health workers were trying to assess the hypothetical patient’s condition.

The obstetric vignettes focused on the ability of the caretaker to recognize an imminent condition, assess the needs of the patient, and deliver the necessary care. We focused on vignettes that simulated conditions that midwives and MDs normally face in their work. There were no input scores for obstetrics because history-taking and physical examination were integrated into the simulations. The instruments focused on the ability to assess and treat the conditions. The vignettes were administered to staff who were present in each ward and who would have seen similar cases before in real life.

2.3.3 Direct Observation

Non-participant observation of health workers on duty in the obstetric, pediatric, emergency, and surgical wards was undertaken. The activities of the health workers were recorded by looking at three different sets of checklists on obstetric, pediatric, and surgery. Each checklist was designed in line with the national standards, as such, the health workers were expected to be familiar with the conditions that the patients presented. Some activities generated discrete measures, but most of them were scored as percentages.

2.3.4 Patient Exit Survey

Patients were also interviewed about their experiences. Respondents scored several characteristics on a five-point Likert scale which had options ranging from (1) “Strongly Disagree” to (5) “Strongly Agree.” Using the same survey that was administered in 2013, factor analysis was undertaken on the answers aimed at summarizing the answers into two factors, namely: “quality” and “convenience.” Patients were also asked to state factors that they considered important to them. Using answers from the patients on what they considered to be important, two factors were generated. These were: “overall satisfaction” and “individual attention.” In addition, there were specific questions on the services that patients received. For patients who had received services in the obstetrics ward, there were a series of questions on whether certain activities were performed; and if the services that were provided were good or bad. The responses were summarized in four parts: (i) percentage of good things that were done in pediatrics, (ii) percentage of good things that were done in pre-surgery, (iii) percentage of positive behaviors on obstetrics which were displayed, and (iv) percentage of negative behaviors on obstetrics which were displayed.

2.3.5 Interviews with the Heads of Hospitals

At eight of the hospitals in the intervention and control groups, the heads of the hospitals were interviewed on the most important changes and challenges that they had observed at their hospital 5 to 6 years prior to the study. This included questions on the contribution of the government and development partners to the hospital; provider preparedness to provide quality MCH services and to handle epidemics; infection control measures; availability of staff and levels of staff training; availability of equipment and other resources for staff to do their job; and measures in place to motivate staff and to increase patient satisfaction. The hospital heads were also asked to identify high- and low-performing units or wards at their hospitals with respect to training, equipping, and motivating staff; factors for success; and measures to address the gaps.

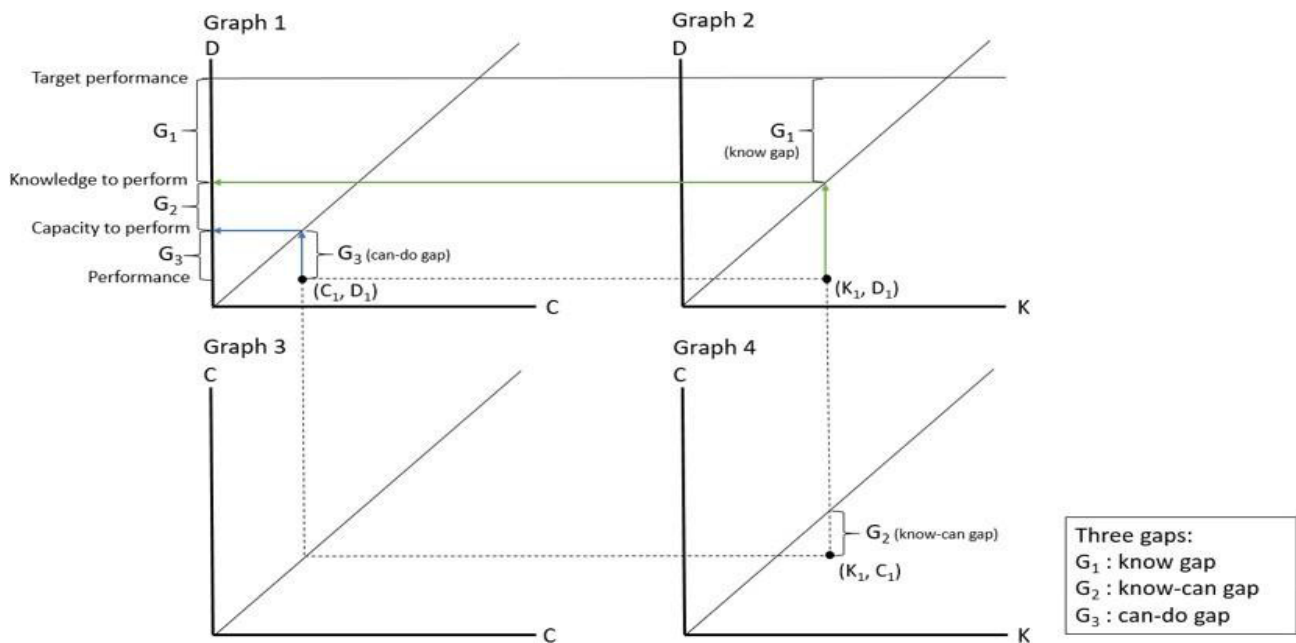
2.4 Data Analysis

Regression analysis was used to measure changes in knowledge, capacity, motivation, performance, and client satisfaction (endline vs baseline) for (i) all the six HSSP hospitals in six counties against all the three non-HSSP hospitals in three counties and (ii) Nimba and Lofa counties which each had an intervention and control hospital, a county-specific analysis was conducted. As such, in Nimba county, changes at Jackson Fiah Doe (JFD) hospital (HSSP) were compared to changes at George Way Harley (GWH) hospital (non-HSSP). In Lofa county, changes at Tellewoyan hospital (HSSP) were compared to changes at Curran hospital (non-HSSP). Further, the three-gap analytical framework (Ibnat et al. 2019) was used to examine whether changes in the knowledge and capacity of health workers contributed to improved performance and quality. This is described further below. Lastly, information that was obtained from the interviews with the head of hospitals was used to get further insights into the findings from the quantitative component.

2.4.1 Three-Gap Analytical Framework

The three-gap model (Ibnat *et al.* 2019) is a way to evaluate the determinants of quality in a given setting. The key question is: if quality improved, why? The three-gap model focuses on four levels of care: (i) the competence to perform; (ii) the capacity to perform; (iii) actual performance; and (iv) the target levels of performance. The three gaps defined by these four levels are: *the know gap*, *the know-can gap*, and *the can-do gap*. Figure 1 demonstrates how the three-gap model interacts with the theory of change. It is postulated that performance is a function of motivation and capacity; capacity is a function of knowledge and infrastructure, equipment, and supplies; and knowledge (or competence) is a function of training. To estimate the model, a measure of each target level of performance, knowledge, and capacity are included as described by their relationship to the target. For this evaluation, the three-gap model was used to examine whether the HSSP achieved its goals by using baseline and endline data. This allowed us to identify the most important levers in achieving the results.

Figure 1: The Three-Gap Framework



Source: Ibnat *et al.* (2019)

2.5 Research Ethics

Before commencing the study, ethical approval was received from the University of Maryland and the University of Liberia. In addition, permission to conduct the research was obtained from the Liberia Ministry of Health and Social Welfare.

3. RESULTS

3.1 Changes in Knowledge and Capacity, Motivation, Performance, and Client Satisfaction

3.1.1 Capacity

We examined changes in capacity by looking at changes in the scores on infrastructure and absenteeism. Table 3 shows the changes in the aggregated and county-level infrastructure scores for HSSP and non-HSSP facilities. The aggregated analysis shows that all the facilities (in both HSSP and non-HSSP) had more equipment in 2022 than in 2015, and most of the equipment were working. For the county-level analysis, the results in Lofa are similar to the aggregate analysis. In Nimba, at JFD hospital (HSSP), there was more equipment in 2022 than in 2015 and most of the equipment were working; but at GWH hospital (non-HSSP) there was less equipment in 2022 than in 2015, and most of the equipment were not working.

Table 3: Change in Average General Hospital Infrastructure Scores

Score	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
Average of necessary equipment present	0.18	-0.21	0.25	0.42	0.08	0.08
Average of necessary equipment working	0.17	-0.20	0.24	0.44	0.07	0.09
Proportion of infrastructure present that is not working	0.02	-0.01	0.01	-0.04	0.00	-0.01

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties.

Table 4 shows changes in the proportion of staff that were present on the first day of the study (a simple measure of absenteeism) at the aggregated and county level for HSSP and non-HSSP facilities. Firstly, for the aggregated analysis, the results are not statistically significant. At county level, absenteeism appears to have been lower in 2022 than in 2015 in Lofa at Tellewoyan hospital (HSSP) and Curran hospital (non-HSSP). In Nimba county, absenteeism was lower in 2022 than in 2015 at JFD hospital (HSSP). At GWH hospital in Nimba (non-HSSP), absenteeism was higher in 2022 but the results were not statistically significant. In both Nimba and Lofa counties, the reduction in absenteeism was driven by nurses and other health cadres and not by MDs.

Table 4: Changes in the Proportion of Staff that were Present on the First Day

Health Worker	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
Doctor	-0.02	0.0	0.33	0.5	0.07	0.10
Nurse	0.18*	-0.04	0.29*	0.52*	0.18***	0.07
Other	0.36*	-0.18	0.0	0.69*	0.23	-0.08
Total	0.24*	-0.07	0.36*	0.61*	0.24	0.10

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties. ***p<0.001.

3.1.2 Knowledge

One of the major objectives of the HSSP was to improve the training of health workers, and therefore we expect knowledge to have improved. Table 5 shows that most measures of knowledge increased in the HSSP hospitals as compared to the non-HSSP hospital at the aggregated level. At county level, improvement in the level of competence between the intervention and control hospital was relatively the same in Nimba county; but in Lofa county, the increase in knowledge for health workers at Curran hospital (non-HSSP) was more than the increase at Tellewoyan hospital (HSSP).

Table 5: Change in Vignette Scores

Score	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
History taking	0.02	-0.04	0.05	0.15*	0.04*	-0.06*
Physical examination	0.01	0.02	0.10*	0.12*	0.05*	-0.03
Proportion of laboratory tests	0.20*	0.19*	0.15*	0.5*	0.25*	0.04
Correct assessment of condition	-0.2	-0.2	-0.2	0.28*	-0.10*	-0.20*
Correct detailed diagnosis	0.36*	0.27*	0.05	0.33*	-0.05	-0.06
At least partially correct diagnosis	0.10*	0.16*	0.12*	0.27*	0.11*	0.06
Correct treatment	0.18*	0.24*	0.03	0.05	0.16*	0.14*

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties. *p<0.10

3.1.3 Staff Motivation

Table 6 examines the changes in motivation scores (with the factor weights fixed at the 2013 level) at the aggregated and county level for HSSP and non-HSSP hospitals. The results show that across all health workers at HSSP hospitals, there were improvements in all the motivation scores while at non-HSSP hospitals, staff motivation scores declined between 2015 and 2022. As observed from interviews with heads of hospitals, increased motivation for health workers at HSSP hospitals could be because they had PBF funds to alleviate the impact of reduced staff salaries. However, in Nimba county, only self-satisfaction increased, and this was observed at both HSSP and non-HSSP hospitals. In Lofa county, almost all the measures of staff motivation declined at both HSSP and non-HSSP hospitals.

Table 6: Change in Average Motivation Factor Scores

Motivation Measure	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
Self-satisfaction	0.07*	0.07*	-0.11*	-0.13*	0.08*	-0.08*
Job satisfaction	0.02	0.01	-0.09*	-0.11*	0.06*	-0.04*
Facility values worker	0.00	0.01	-0.13*	-0.11*	0.06*	-0.07*
Facility characteristics	-0.09*	-0.15*	0.00	0.02	0.05*	0.01
Worker behavior	0.00	-0.11*	-0.25*	-0.42*	0.13*	-0.25*
Total score	-0.05	-0.19*	-0.20*	-0.19*	0.16*	-0.10*

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties. *p<0.10

3.1.4 Performance

Table 7 shows the changes at the aggregated and county level in key measures of quality in the obstetric, pediatrics and surgery wards for HSSP and non-HSSP hospitals. In obstetric wards, health workers in non-HSSP hospitals did better than those from HSSP hospitals on history taking, overall obstetrics intake quality, and episiotomy. At the second and third stages of obstetrics observation quality, performance reduced at both HSSP and non-HSSP facilities. At county level, there was increased performance on most of the key indicators of obstetrics quality by health workers in HSSP facilities in both Nimba and Lofa counties as compared to the performance of health workers at the non-HSSP facilities in the two counties. In pediatric wards, health workers in both HSSP and non-HSSP facilities for both the aggregated and county level analysis; exhibited increased performance on almost all the key indicators of pediatrics quality. In the surgery wards, health workers in both HSSP and non-HSSP hospitals increased their performance on most of the key indicators of surgical quality. At county level, HSSP facilities in both Nimba and Lofa counties performed relatively better than non-HSSP facilities on some of the key indicators of surgical quality.

Table 7: Change in Key Indicators for Obstetrics, Pediatrics and Surgery Wards

Key Indicators	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
Obstetrics Ward						
Obstetric intake: history taking	-0.12	0.70*	0.62*	-0.22	0.11	0.38*
Obstetric Intake: presence of complications	0.26*	-0.44*	0.04	0.31	0.01	-0.40*
Obstetric intake: overall quality	0.09*	0.21*	0.27*	0.22	0.04	0.17*
First stage of labor observation quality	0.23*	-0.08	0.39*	-0.04	0.08	-0.03
Second and third stage observation quality	0.20*	-0.05	0.15*	-0.18	-0.10*	-0.12*
Episiotomy	0.00	0.00	-0.13	0.75*	0.01	0.22*
Newborn care quality index	0.50*	0.07	0.41*	-0.10	0.05	-0.04
Pediatric Ward						
History taking score	0.37*	0.07*	0.09*	0.20*	0.18*	0.19*
Physical examination score	0.27*	0.06	0.07*	0.19*	0.12*	0.14*
Total inputs	0.35*	0.09*	0.09*	0.21*	0.18*	0.20*
Health education score	0.45*	0.18*	0.06	0.57*	0.30*	0.27*
Surgery Ward						
Cleanliness of operating theater	-0.03	-0.05	0.19*	0.08	-0.04	-0.07*
Percentage of preparation tasks worker completed	0.09	0.15*	-0.19	-0.01	0.12*	0.13*
Percentage of surgery preparation tasks worker completed	0.00	0.02	0.10	0.03	-0.03	0.07*
Antibiotic prophylaxis given or confirmed	0.44*	1.00	0.80*	0.00	0.62*	0.77*
General surgical quality	0.15*	-0.07*	0.40*	0.08	0.25*	0.13*
Surgeon broke the surgical field during surgery	-0.10	0.00	0.00	0.00	-0.03	-0.02
Medical staff post-surgery clean up	-0.06	-0.16*	-0.09	-0.22	-0.04	-0.13*
Housekeeping staff post-surgery clean up	0.27*	0.01	0.04	-0.25	0.20*	-0.03

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties. *p<0.10

Table 8 examines adherence to infection prevention and control measures at the aggregated and county level for HSSP and non-HSSP hospitals. In 2015, the measures were driven by concerns about EVD, and between 2020 and 2022, they were driven by concerns about COVID-19. The results show that health workers in both HSSP and non-HSSP facilities for both the aggregated and county level analysis; exhibited reduced performance on almost all the key indicators of infection prevention and control. However, at county level, the status in 2022 vs 2015 was better at JFD hospital (HSSP) than at GWH hospital (non-HSSP) in Nimba county. On the other hand, in Lofa county, the status in 2022 vs 2015 was better at Curran hospital (non-HSSP) than at Tellewoyan hospital (HSSP).

Table 8: Adherence to Infection, Prevention and Control Guidelines

	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
Wear gloves	0.21*	-0.12*	-0.37*	-0.10	-0.14*	-0.11*
Not touching thing or surface before	0.00	0.11*	-0.02	0.42*	0.09*	0.04
Not touching skin or patient before	0.02	0.01	0.05	0.20*	0.10*	0.01
Remove gloves after	-0.07	-0.21*	-0.24*	-0.19*	-0.14*	-0.13*
Properly remove the gloves	0.06	-0.40*	-0.35*	0.03	-0.13*	-0.29*
Wash hands after removing gloves	0.12	-0.22*	0.03	0.10	-0.10*	-0.14*
New sterile gloves before next patient	0.13*	-0.28*	-0.45*	0.16*	-0.12*	-0.22*
Wear boots or shoe covers	0.01	-0.46*	-0.10	-0.32*	-0.40*	-0.30*
Wear a gown?	-0.40*	-0.74*	-0.25*	-0.35*	-0.55*	-0.73*
Wear a face shield?	-0.14*	-0.42*	-0.04	0.06	-0.15*	0.04
Total Score	-0.02	-0.31*	-0.20*	-0.06	-0.21*	-0.25*

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties. *p<0.10

3.1.4.1 Staff Motivation and Quality of Healthcare

The effect of the HSSP can also be analyzed by comparing measures of staff satisfaction with performance on key indicators of quality. Table 9 shows the result from a regression of key quality measures in pediatric care with the baseline measures of staff motivation. The results suggest that the HSSP had the largest positive impact on health workers in pediatric care who had high levels of self-satisfaction and a positive assessment of the facility characteristics. Thus, the HSSP did not universally improve the quality of pediatric care but had a positive impact on health workers who felt good about themselves and those that felt that their facility was well-managed. For the non-HSSP facilities, almost all measures of quality of pediatric care reduced as compared to the baseline scores except for history taking vs facility valuing the worker and education vs self-satisfaction.

Table 9: Baseline Motivation and Quality in Pediatric Care

	HSSP					Non-HSSP				
	Self-satisfaction	Job satisfaction	Facility values worker	Facility characteristics	Worker behavior	Self-satisfaction	Job satisfaction	Facility values worker	Facility characteristics	Worker behavior
History	2.12*	-0.39	-1.99*	1.63*	-0.20*	-0.26	-0.46	1.17*	-1.62*	0.26
Physical	2.04*	-0.20	-2.11*	1.73*	-0.20*	-0.32	1.48	0.53	-3.23*	0.14
Education	1.74*	0.04	-2.23*	0.79*	0.15	1.41*	0.03	-0.22	0.97	-0.03
Total inputs	2.11*	-0.35	-2.05*	1.65*	-0.20*	-0.30	-0.08	1.05*	-1.94*	0.27

Source: Authors' calculations from 2015 and 2022 survey data. *p<0.10

3.1.5 Patient Satisfaction

Table 10 examines the changes in the satisfaction of patients (aggregated and at county level) for HSSP and non-HSSP hospitals. At both HSSP and non-HSSP facilities, there was increased patient satisfaction as measured through the Likert score, and the proportion of the good things that the health workers did in pediatrics. The results also show that there was an increase in patient satisfaction in the percentage of positive behaviors displayed in obstetrics at HSSP facilities (and not at non-HSSP) for the aggregated and county level results. However, at both HSSP and non-HSSP facilities, the patients were less satisfied with qualities that are important to them and convenience. At county level, most of the measures of patient satisfaction in both Nimba and Lofa, increased at HSSP facilities while there was generally some reductions at non-HSSP facilities.

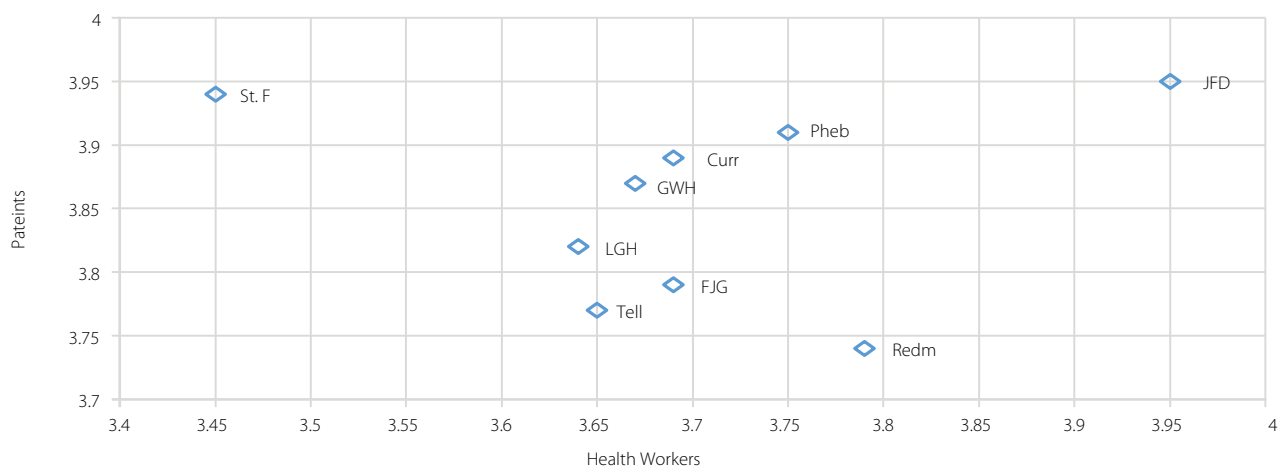
Table 10: Changes in Satisfaction Summary Scores

Scores	Nimba		Lofa		All Counties	
	HSSP	Non-HSSP	HSSP	Non-HSSP	HSSP	Non-HSSP
	JFD	GWH	Tell	Curran		
Quality	0.44*	-0.36	1.48*	-0.45	0.03	-0.84*
Convenience	0.06	-0.12	-0.43*	-0.21	-0.22*	-0.17*
Total Likert score	0.24*	0.28*	0.18*	0.05	0.11*	0.11*
Qualities that are important	-1.88*	-1.14*	-0.17	-2.47*	-2.49*	-2.14*
Percentage of positive behaviors displayed in obstetrics	0.19*	-0.04	0.31*	0	0.13*	0.04
Percentage of negative behaviors displayed in obstetrics	-0.02	0.06	-0.15*	-0.07	-0.05*	-0.01
Percentage of good things done in pediatrics	0.18*	0.12*	0.01	0.1	0.10*	0.11*

Source: Authors' calculations from 2015 and 2022 survey data. JFD=Jackson Fiah Doe, GWH= George Way Harley, Tell=Tellewoyan. All counties = results from all the six HSSP hospitals in six counties and all the three non-HSSP hospitals in three counties. *p<0.10

Figure 2 examines the correlation between what health workers think of their facility and what patients think. The figure plots the average overall score of health worker satisfaction (on the horizontal axis) and the overall score of patient satisfaction on the vertical axis. There is a strong correlation between these two scores except at two HSSP facilities, namely: St. Francis hospital and Redemption hospital. At St. Francis hospital, the patients thought highly of the facility but the health workers were not satisfied. At Redemption hospital, the health workers were satisfied but the patients were not.

Figure 2: Relationship Between Health Worker and Patient Satisfaction Scores



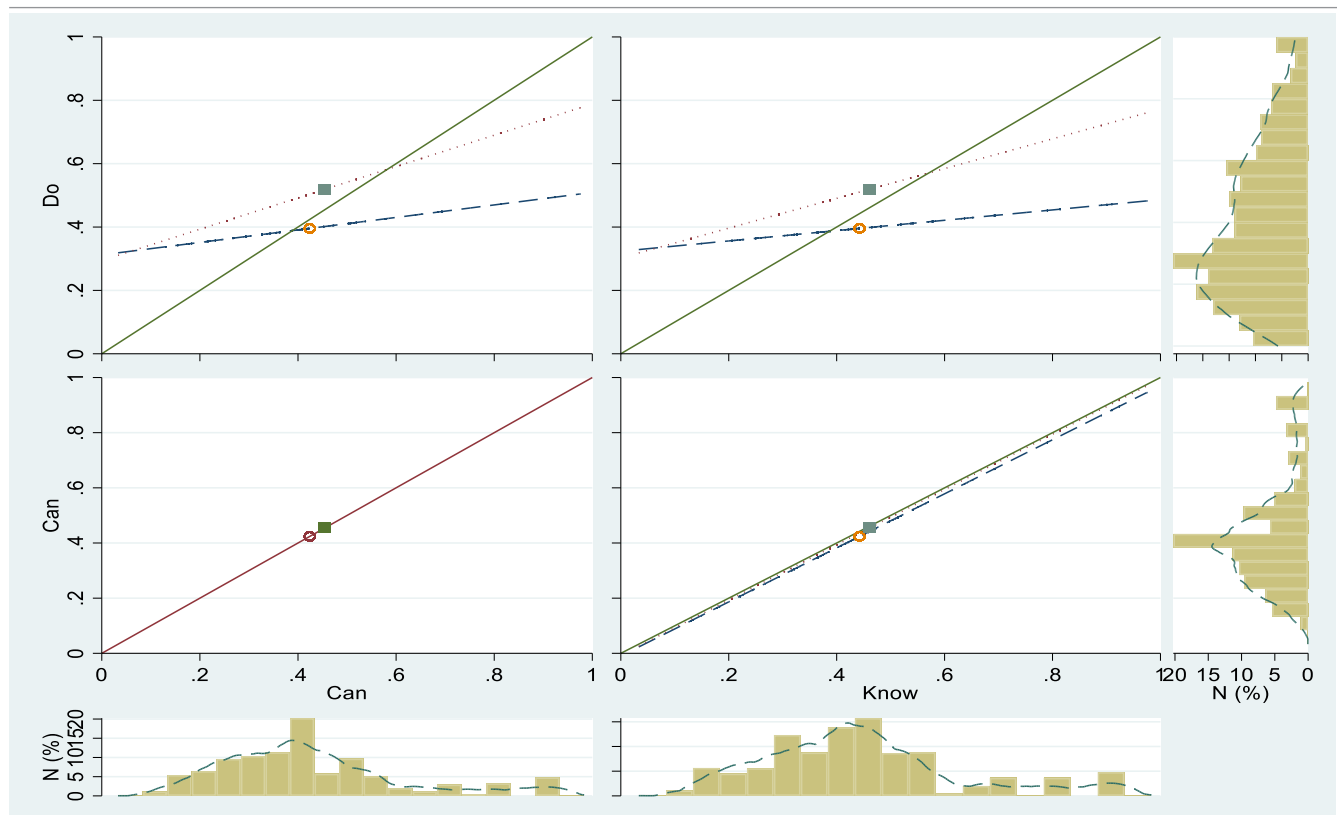
Source: Authors' calculations from survey data. JFD=Jackson Fiah Doe, Redm=Redemption, Pheb=Phebe, St. F=St. Francis, Tell=Tellewoyan, FJG=Francis Joseph Grante, LGH=Liberian Government Hospital, Curr=Curran, GWH= George Way Harley

3.2 The Know-do and Can-do Gaps

Figure 3 shows the relationship between know, can and do in the pediatric ward before the PBF scheme was implemented (2015) and at the time of the data collection in 2022, with health workers who were part of the HSSP marked as “treated.” Performance originates with knowledge, education, and skills as measured by competence (“know”), shown on the vertical axis extending below the origin: increases in competence are shown by points closer to the bottom of the figure (further from the origin). Capacity (“can”) comes from competence, taking into account the infrastructure, equipment, and medicines needed to appropriately use training, education, and skill, shown on the horizontal axis to the right of the origin. Finally, performance (“do”) comes from combining capacity with effort: health workers must choose to use their knowledge and equipment to perform, as shown on the vertical axis above the origin.

Two important patterns are visible in Figure 3. Firstly, in 2015, the relationship between knowledge (know) or capacity (can) and performance (do) is very weak. Large increases in either knowledge or capacity led to only small changes in performance. This can be interpreted as coming from a lack of motivation i.e. health workers know what they need to do and are capable of doing so, but they choose not to do it. Secondly, the HSSP lead to a rotation of this relationship (the dotted line in the two top quadrants has a steeper slope than the dashed lines in those same quadrants). If we interpret the almost flat pattern seen in the dashed lines as a lack of motivation, then the HSSP lead to an increase in motivation. The slope of the dashed and dotted lines are directly related to the know-do and can-do gaps. As such, the steeper the slope, the smaller the overall gap because of knowledge and performance.

Figure 3: Changes in the Know-do and Can-do Gap



Source: Authors' calculations based on data collection in 2013, 2015 and 2022. The dashed line (and circle) represents the Non-HSSP hospitals in 2015 and 2022, and the HSSP hospitals in 2013 and 2015. The dotted line (and square) represents the HSSP hospitals in 2022.

The link between motivation and performance in 2015 and 2022 are described more clearly in Table 11. Each column represents a regression explaining performance as a function of knowledge (odd numbered columns) and capacity (even numbered columns). Interaction terms reflect the slope of the relationship, with a positive term indicating that increases in knowledge or capacity leads to increases in performance and a negative slope indicating that increases in knowledge or capacity leads to a reduction in performance. Columns 1-4 show all the nine hospitals (HSSP and Non-HSSP) and columns 5-8 only show HSSP hospitals. The results show that for health workers who indicated that they were self-motivated, on average, the quality was lower, but there was a strong positive slope with knowledge and capacity. This implies that self-satisfied health workers work harder to transform their ability into performance. Nonetheless, the health workers who were self-satisfied in 2015 were no more likely than other health workers to provide high performance. This suggests that self-satisfaction is not a durable trait but an indication of current conditions. Furthermore, in HSSP hospitals alone, self-satisfaction seems to play no role in performance.

For the health workers who reported that the facility valued them, there was an interesting twist in behavior. If the health workers felt valued in 2015, they exhibited a steeper slope (both overall and in the HSSP), which implies that they were motivated to turn their ability into performance. However, this pattern was not observed for contemporaneous motivation. The one type of motivation that appears to have a constant impact across all the hospitals and within HSSP hospitals is ‘facility characteristics.’ Health workers who felt they worked in well run and supported facilities were much more likely to use their knowledge and skills.

Table 11: Motivation and Observed Quality

	Know do current motiva-tion	Can do current motiva-tion	Know do baseline motiva-tion	Can do baseline motiva-tion	Know do current motiva-tion	Can do current motiva-tion	Know do baseline motiva-tion	Can do baseline motiva-tion
	All facilities				Only HSSP facilities (2022 vs 2015)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated	0.23	0.24*	0.12	0.11	0.34*	0.32*	0.14	0.13
Know/can	-0.97	-0.90	-0.80*	-0.90	-0.77	-0.66	-1.10*	-1.00*
Treated vs know/can	-0.11	-0.10	0.16	0.16	-0.24	-0.19	0.15	0.18
Direct terms								
Self-satisfaction	-1.19*	-1.04*	0.21	0.15	-0.22	-0.22	0.07	0.01
Job satisfaction	0.32	0.01	0.55	0.55	0.09	-0.08	0.29	0.23
Facility values worker	0.20	0.22	-0.84*	-0.86*	-0.67	-0.52	-1.08*	-0.85
Facility characteristics	-0.42	-0.41	-0.79*	-0.81*	-0.29	-0.29	-0.62*	-0.61*
Worker behavior	0.41*	0.54*	0.13	0.17	0.48*	0.55*	0.31	0.28
Interaction terms								
Self-satisfaction vs know/can	2.33*	2.01*	-0.36	-0.22	0.06	0.05	-0.11	0.00
Job satisfaction vs know/can	-1.04	-0.25	-1.49	-1.55	-0.38	0.04	-1.27	-1.22
Facility values worker vs know/can	-0.63	-0.78	1.42*	1.50*	1.20	0.85	1.86*	1.48
Facility characteristics vs know/can	1.62*	1.54*	1.98*	2.04*	1.07	1.08	1.65*	1.68*
Worker behavior vs know/can	-0.61	-0.95*	0.04	-0.01	-0.67	-0.89	-0.25	-0.15
Constant	0.86*	0.86*	0.80*	0.83*	0.79*	0.76*	1.04*	0.97*
Number	921	921	1193	1193	598	598	838	838

Source: Authors' calculations based on data collection in 2013, 2015 and 2022. Standard errors (not shown) are clustered at the health worker level. *p<0.10

3.3 Interviews with the Head of Hospitals

Results from interviews with the heads of hospitals revealed that there were several problems in the health system in Liberia which were impeding the provision of quality healthcare. For example, many hospitals rely on generators which required expensive fuel to keep the lights and equipment functioning. In addition, due to the COVID-19 pandemic, the Government of Liberia implemented a hiring freeze and reduced the salaries for health workers countrywide. This affected health workers at both the HSSP and non-HSSP facilities. Due to the hiring freeze, a significant number of staff were working as volunteers i.e. without pay. This was frustrating for heads of hospitals as they had to work with underpaid and unpaid staff. As such, all the heads of hospitals supported under the HSSP stated that they relied heavily on the labor of “volunteers” and that PBF funds were used to pay the volunteers. This implies that the PBF program through the HSSP was instrumental in solving human resource problems that would have otherwise been worse. Nonetheless, unless the volunteers and existing staff were paid a meaningful wage and compensated for the full loss in income, respectively, staff motivation was bound to have been affected by the hiring freeze and change in the salary structure. This was explored further by looking at results from the staff motivation survey.

During the staff motivation survey, the health workers were not asked if they were satisfied with their salary conditions. The study team was not aware that the government had cut the salaries for health workers and that some health workers were working as volunteers. This was only established after the data collection was completed. However, there were some proxy questions which had been collected already which show evidence that staff motivation had decreased between 2015 and 2022. Table 12 shows that, between 2015 and 2022, health workers were less likely to say that the facility had a fair system for rewarding staff for both HSSP and non-HSSP hospitals. In addition, all health workers were less likely to say that good performance is recognized by their superiors, but the result is not statistically significant. Other than salary, the heads of hospitals cited lack of functioning equipment and erratic supply of medicines as major sources of dissatisfaction. They did not believe that lack of training was a source of demotivation, although many said they appreciated the in-person training and hoped for more. One head

Table 12: Change in the Motivation of Health Workers with Respect to Salary Conditions

	2022 vs 2015	
	HSSP	Non-HSSP
Good performance is recognized by our superiors	-0.02	-0.15
This facility has a fair system for rewarding staff	-0.34***	-0.14

Sources: Authors' calculations based on 2015 and 2022 survey data. ***p<0.001

of hospital stated that the arrival of trained doctors (part of the HSSP) was a major source of inspiration.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary of the Results and Conclusion

The aggregated results from the seven counties (six HSSP vs three non-HSSP hospitals) show improved capacity at both the HSSP and non-HSSP between 2015 and 2022 with regards to the availability and status of medical equipment. In other words, there were more equipment in 2022 than in 2015, and most of the equipment were working; but this was for both HSSP and non-HSSP facilities. Secondly, there was less absenteeism among nurses at HSSP facilities in 2022 than in 2015. Thirdly, health workers at HSSP hospitals had more knowledge and were more motivated in 2022 than in 2015. For health workers at non-HSSP hospitals, there was reduced knowledge and motivation between 2015 and 2022. Fourth, health workers at non-HSSP hospitals performed better than those at HSSP hospitals on obstetrics. The performance of the health workers on pediatrics and surgery at both HSSP and non-HSSP was relatively the same. For infection prevention and control, there was reduced performance between 2015 and 2022 for health workers at both HSSP and non-HSSP facilities in almost all the measures of infection prevention and control.

These results suggest that even though there was reduced absenteeism (nurses), and increased knowledge and motivation of health workers at HSSP hospitals between 2015 and 2022; this did not translate into improved quality of service provision. As a matter of fact, the performance of the health workers at HSSP hospitals went down on the second and third stages of obstetrics quality; and infection prevention and control. Furthermore, results from the patient exit interviews show that at both HSSP and non-HSSP facilities, there was an increase in patient satisfaction as measured through the Likert score, and the proportion of the good things that the health workers did in pediatrics. However, there was reduced patient satisfaction at both HSSP and non-HSSP facilities on the qualities that are important to patients, and convenience.

The results from county-specific analyses in Nimba and Lofa counties show that quality of healthcare was better at the HSSP than at the non-HSSP hospitals in Nimba and Lofa counties (Table 1). In particular, health workers in HSSP hospitals performed better than those in non-HSSP hospitals on obstetrics and surgery, while the performance of the health workers on pediatrics at both HSSP and non-HSSP hospitals was relatively the same. For infection prevention and control, there was improved performance by health workers at HSSP hospitals in Nimba county, while the opposite is true for Lofa county. Lastly, patient satisfaction was better at HSSP facilities than at non-HSSP facilities in Nimba and Lofa counties.

Though the results on performance from the county-specific analysis are positively leaning towards the HSSP facilities as compared to the aggregated analysis; the results on capacity, knowledge and motivation from the county-specific analysis are mixed. For example, in Nimba county, health workers at both HSSP and non-HSSP hospitals had more knowledge and were more motivated in 2022 than in 2015. This was not the case in Lofa county where knowledge among health workers increased more at the non-HSSP hospital as compared to the HSSP hospital. Further, there was reduced motivation among health workers at both the HSSP and non-HSSP hospitals in 2022 as compared to 2015. These results suggest that there is no clear relationship between increased knowledge and motivation, and performance of health workers.

Overall, results from the study show a mixed picture for the HSSP regarding its contribution towards the provision of quality healthcare—and consistent with a program that was bedevilled by two major health crises. All the heads of hospitals who were part of the HSSP program were unequivocal in stating that the money provided by the PBF aspect of the program was important to maintaining the quality of healthcare at their hospitals. If the money was used as an incentive to provide higher quality care, then we should have observed a contemporaneous relationship between “facility values the worker.” Instead, we see that only the baseline measure of this source of motivation leads to a decreased know-do and can-do gap. In contrast, there is a strong relationship between the characteristics of the facility and the performance of health workers. This result is less about incentives to work hard but more about the motivation that is inherent in working in a facility that is well run. Further, satisfied health workers were not more resilient to shocks than other health workers. Higher performance by health workers depends on the current state of affairs.

There is an important distinction between direct incentives to improve performance and incentives that come from general increases in spending. The data support the latter interpretation of the HSSP program: increased spending in well managed facilities improved the performance of health workers, but health workers were not responding to direct incentives. Overall, this suggests that programs like the HSSP can do better in facilities that are already well run; and that increases in funding (in the climate of a crisis) can close the know-do and know-can gap.

4.2 Limitations of the Study

Given the non-random assignment of the HSSP and non-HSSP hospitals, the delayed final evaluation, and the large and unknown effects of the EVD and COVID-19 outbreaks; it was very difficult to do a rigorous evaluation. Therefore, this evaluation cannot validate the success of the HSSP with a high degree of certainty, given that project implementation was disturbed by the EVD and COVID-19 outbreaks. But whatever the case, what is clear is that Liberia still has gaps in capacity, performance, and quality. To overcome the limitations in this study, future evaluations in fragile states like Liberia, could combine routine data with primary data to account for the effect of time. Recent evidence has shown the potential of using routine data for robust impact evaluation of health intervention programs in low-income settings (Kuunibe, 2023). In addition, where randomization is intended, like in the case of the HSSP in Liberia, care should be taken to allow for an equal chance of selection into either the intervention or control groups. However, there was no randomization and hospitals were deliberately selected for the intervention and/or the control. This can lead to selection bias, even in the absence of the EVD and COVID-19 outbreaks. If it is necessary to handpick intervention facilities, quasi-experimental approaches such as the interrupted time series design with multiple groups can account for the time effect (Linden, 2015). Combining this with primary data presents a perfect opportunity for robustness checks using alternative estimation procedures (i.e., the difference-in-difference regression and segmented regression).

4.3 Recommendations

Based on the results, our recommendation is that health system challenges in Liberia should be addressed at the sub-systems level. The Government of Liberia should focus on a systematic improvement of each of the six health system building blocks. WHO (2010) breaks down a health system in six core components, namely: (i) service delivery, (ii) health workforce, (iii) health information systems, (iv) access to essential medicines, (v) financing, and (vi) leadership/governance. In this regard, service delivery, health workforce, financing, and leadership/governance needs to be improved through deliberately targeted policy actions. For example, general service readiness, including the cumulative availability of components required to provide services, were lacking. Major domains such as

infrastructure/amenities, basic supplies/equipment including small surgery, standard precautions, laboratory tests, medicines, and commodities were also lacking. The Government of Liberia needs to provide significant resources to build a robust health infrastructure, including equipment and machines that will ensure the responsiveness of the country's health system to the needs of the population.

We further recommend improvement in communication at the intrahospital level and human resources management at the national level since this affects administrators at hospitals and the motivation of health workers. The delivery process of quality healthcare involves numerous interfaces among multiple healthcare providers with varying levels of education and responsibilities. To be effective, clinical information must be communicated effectively in a collaborative manner. Lack of communication or insufficient communication puts patient safety at risk since information may be misinterpreted or even overlooked.

Health workers are capable of improved quality of care but are demotivated by many of the frustrating aspects of serving in the health system, particularly in rural areas. Health workers in rural areas are demotivated by the poor conditions of the roads which means that the referral and laboratory system is less effective and useful. We recommend that incentives such as rural retention allowances, opportunities for study leave, staff housing and so forth are introduced. These incentives are likely to attract young professionals to opt for facilities in rural and hard-to-reach areas, and for them to work there for a considerable period of time. In the long run, health workers would be distributed evenly across the country, not the current situation where most of the health workers are concentrated in a few health facilities in urban areas.

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