

# Maternal Health Care Quality and Outcomes Under the Utkrisht Impact Bond: Midline Findings and Insights

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## ABOUT THIS REPORT

This midline report on quality and health outcomes from the Utkrisht Development Impact Bond (DIB) includes a series of standalone chapters to enable readers to choose the specific aspect of the DIB to learn about. Mathematica, the Independent Assessor for the Utkrisht DIB in India, developed this report sponsored by MSD for Mothers.<sup>1</sup> The views, thoughts, and opinions expressed in this report belong solely to the authors and reflect their current learning and understanding at the time of dissemination. The report contents do not necessarily reflect the official policy or position of Mathematica, or any other agency or organization.

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<sup>1</sup> MSD for Mothers is MSD's \$500 million initiative to help create a world where no woman has to die while giving life. MSD for Mothers is an initiative of Merck & Co., Inc., Kenilworth, NJ, U.S.A.

## ACKNOWLEDGMENTS

A development impact bond (DIB) requires coordination among several partners to make it a success and ultimately make progress and develop learning to forward our shared goals. We could not have developed the insights and understood the value of these insights without the help and different viewpoints of our partners. First, we acknowledge the unwavering support and principle-centered guidance of Scott Higgins at MSD for Mothers. We also thank Mary-Ann Etiebet at MSD for Mothers and Michael Quinlan for the external lens provided at critical junctures. Priya Sharma, Omer Imtiazuddin, and Amy Lin at the United States Agency for International Development for their commitment to discover the potential for innovative financing to improve social sector outcomes. Maya Ziswiler, Dhun Davar, and Sietse Wouters at UBS Optimus Foundation for asking the hard questions that caused us to consider the role of verification and the verification partner in a DIB. We are grateful to implementation partners, Ellen Smith, Christine Sow, Adesh Chaturvedi, and Sumana Brahman (Palladium), and countless Population Services International and Hindustan Latex Family Planning Promotion Trust staff for sharing data, assisting in the coordination of verification visits, and a willingness to solve healthy tensions engendered by the DIB. We also thank Pathfinder International for their thought partnership on the design and implementation of the mannequin-based simulations we conducted in our most recent round of verification, and especially Dr. Anupama Rao and Dr. Anuj Dandotia, who trained our field investigator team on these assessments. To the many private facilities across Rajasthan that allowed us to visit and conduct verification, we are grateful for the time and consideration provided to our field investigators on short notice to make data collection possible.

To all partners, we could not have gotten to where we are without your willingness to take on challenges and try to understand the potential of innovative financing as a mechanism to improve health. Through this document, we hope that we offer fresh and constructive learning for consideration to those working in social sector development.

Finally, at Mathematica, we thank Sheena Flowers, who created the report graphics and produced the report (and every single other one for this project) and Cindy George and Donovan Griffin, who copyedited this report; we are grateful for their assistance.

## EXECUTIVE SUMMARY

Social and development impact bonds have emerged in the past decade as a potential financing solution to motivate innovation, promote efficiency, and realize what have been elusive outcomes in the social sector. The first health-focused development impact bond (DIB) was the Utkrisht DIB, launched in 2017 in Rajasthan, India, by several partners, including UBS Optimus Foundation (UBS OF), MSD for Mothers, the United States Agency for International Development (USAID), Palladium, Hindustan Latex Family Planning Promotion Trust (HLFPPT), and Population Services International (PSI).

The three-year Utkrisht DIB focuses on outcomes related to maternal health quality of care in private facilities, building upon the global evidence base indicating that improved quality in the private sector could have a large impact on maternal and neonatal health outcomes. To measure quality improvement, DIB partners chose two existing sets of quality standards: the small health care organization (SHCO) pre-entry certification standards promoted by the National Accreditation Board for Hospitals & Healthcare Providers (NABH) and Manyata certification standards for safe delivery developed by the Federation of Obstetric & Gynaecological Societies of India (FOGSI) (NABH 2015; FOGSI n.d.). Under this model, HLFPPT and PSI provide technical assistance to help private facilities in Rajasthan meet quality standards. The investors, UBS OF, provide upfront capital to Palladium to manage and pay for technical assistance. Investors subsequently receive payments from the funders, MSD for Mothers and USAID, for every facility that meets the quality standards. Contracted by MSD for Mothers, Mathematica acts as an objective third party to verify the quality improvement outcomes that prompt payments.

To better understand progress toward improved facility quality and health outcomes under the Utkrisht DIB design, Mathematica used verification data on quality improvement and facilities' self-reported cost and maternal, neonatal, and infant outcomes data to assess whether (1) technical assistance provided to facilities under the DIB lead to quality improvement at facilities, (2) upfront capital investments provide a return commensurate with program costs, and (3) meeting quality standards results in better health outcomes. Below, we summarize the key findings.

**Quality improvement represents a journey that a point-in-time verification design might not capture.** DIB conditions seem to allow for overall quality improvement among assessed facilities, with many assessed facilities passing all of the NABH standards. Unsurprisingly, SHCOs were most likely to pass standards that involved signage and availability of key equipment and supplies, as well as chapters that relied heavily on the existence of written guidelines or standard operating procedures that serve as essential initial stepping stones on the quality improvement journey. They were less likely to pass chapters that focused more on behavior change and required them to implement new policies or procedures, such as those related to management or recordkeeping practices. The mixed performance on individual standards within NABH and Manyata might indicate that achieving and maintaining *all* quality improvement components might be difficult, especially in the long term—or that quality improvement is a journey whose desired outcomes require time to achieve consistently, and a snapshot cannot fully capture or reflect that journey.

**Outcome payments under the Utkrisht DIB exceed implementation costs for facilities that have met quality improvement standards.** At midline, the implementation partners and facilities spent approximately \$10,000 and \$7,500, respectively, to meet the DIB standards. In comparison, investors received payments of up to \$18,000 for each facility that met the DIB standards, in accordance with the DIB design. Under the DIB structure, implementation partners have received reimbursement for the costs of service provision, but participating facilities do not receive any reimbursement for the costs they incur for quality improvement activities. Thus, facilities' willingness to participate in such a DIB structure may depend on whether achieving quality standards and receiving certification through the DIB generates sufficient revenue to offset the costs of quality improvement. For example, if certification results in more patient traffic or enables facilities to participate in the Indian government's health insurance programs and thereby improve their reimbursement rates, facilities could be more willing to participate.

**At the midpoint of the Utkrisht DIB, it is too soon to tell whether improved quality at participating SHCOs has led to meaningful improvements in key health status outcomes.** Our analysis uncovered a small but consistent trend – achieving the Manyata level of certification was associated with small, though not statistically significant, reductions in Caesarean sections, delivery complications, high-risk deliveries, preterm births, and low birth weight births, as well as increased referrals to the facility's NICU. Meeting the certification level was also associated with a small and statistically non-significant decrease in administration of uterotonics during the third stage of labor. We examined the relationships between facilities' performance on individual Manyata standards and health status outcomes, and we did not uncover any statistically significant associations or consistent emerging story regarding these relationships. By the end of the DIB, we hope to have data on more facilities, which will allow us to further explore the trends identified in this report.

Overall, these findings suggest that technical assistance provided within the Utkrisht DIB structure lead to improvements in quality and that private capital leveraged for social good can also realize some return on investment. However, at the midline of the DIB, it remains unclear whether the observed quality improvement will generate changes in health outcomes.

## 1. THE UTKRISHT DEVELOPMENT IMPACT BOND: ARRIVING AT THE MIDLINE

Public health facilities in India must meet specific standards and requirements set forth by the state in which they operate and/or the Government of India (GOI). However, private facilities — which provide 80 percent of all outpatient and 60 percent of all inpatient care in the country and house the vast majority of Indian physicians — are not subject to the same regulations (Tripathi et al. 2019; Chakravarthi 2018). As a result, private facilities vary greatly in size, services, and quality. Private sector clients are subject to arbitrary costs, inconsistent clinical care, variable treatment by facility staff—and rarely have any formal means of seeking recourse or accountability should an issue occur in their care (Chakravarthi 2018; Shukla et al. 2018). Within this landscape, improving and standardizing the quality of care across private facilities offers a means to improve health for a majority of India’s populace and to make progress toward health-related Sustainable Development Goal 3.

Indian activists and civil society organizations have sought to expand standardization and accountability in the private sector through a combination of advocacy for governmental regulatory reform and private health system capacity building, such as supporting quality improvement (Shukla et al. 2018). Some organizations have expanded on the latter approach by developing quality standards for private facilities and encouraging these facilities to formally adopt them (Jhpiego 2017).

In 2017, the government of Rajasthan agreed that non-governmental organizations (NGOs) and private sector parties and advisors could further test this approach using a development impact bond (DIB) model. Under this model, experienced NGO partners provide technical assistance to help private facilities implement a standardized set of quality improvement practices. Investors subsequently receive payments from participating funders for every facility that went on to demonstrate an ability to meet a pre-determined set of quality standards.

### About Development Impact Bonds

This pay-for-results financing mechanism uses private sector financing and efficiency as a means to achieve public good. Payments are linked to outcomes rather than inputs, activities, or outputs.

The three-year DIB focuses on outcomes related to maternal health quality of care in private facilities, recognizing the large impact that improved quality in the private sector could have on maternal and neonatal health outcomes. The DIB also acknowledged that the health of mothers and their infants have served as accepted indicators of a population’s health, well-being, and—more recently—health equity (UNICEF 2016). As the specific measures of quality improvement, DIB partners chose small health care organization (SHCO) pre-entry certification standards promoted by the National Accreditation Board for Hospitals & Healthcare Providers (NABH) and Manyata certification standards for safe delivery developed by the Federation of Obstetric & Gynaecological Societies of India (FOGSI) (NABH 2015; FOGSI n.d.).

This chapter provides an overview of the DIB structure and underlying assumptions of its theory of change, which offers important context for understanding and interpreting findings in subsequent chapters. For example, a key assumption underlying the DIB model is that conditions at participating SHCOs will allow for quality improvement—but if the barriers to quality improvement cannot be addressed through the technical assistance provided through the DIB, facility practices and quality outcomes are unlikely to change substantially. This chapter also describes the current phase of the DIB

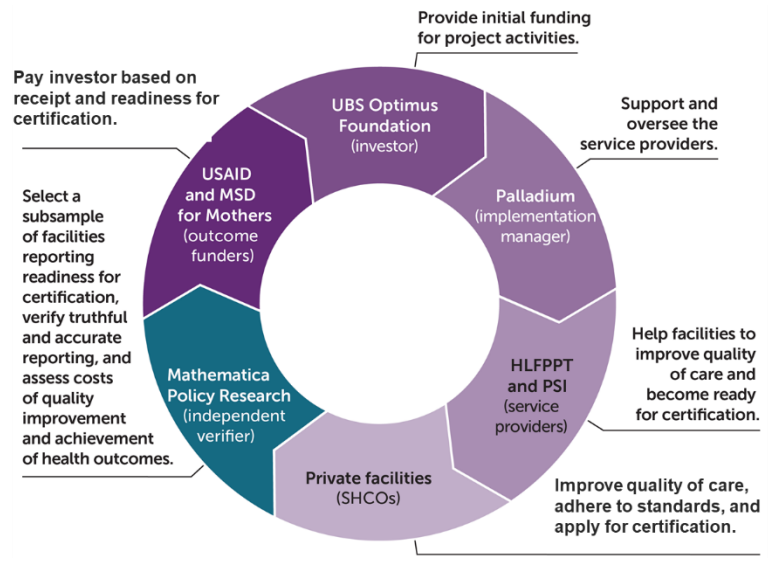


to inform interpretation of cost analyses in later chapters. For example, costs might decrease over time as service providers adapt to realize greater efficiency in delivery or might increase in the next year due to disruptions from the COVID-19 pandemic.

**A. Utkrisht DIB structure and theory of change**

Key partners in the DIB include investors, outcome funders, the implementation manager, service providers, and the verification partner (Exhibit 1.1). Each has a distinct role to play. The investor (UBS Optimus Foundation,) provides the initial upfront capital for the implementation team. The implementation team uses the capital to provide technical assistance to private SHCOs. The SHCOs then work toward improving quality of care and meeting standards set by the DIB. Contracted by MSD for Mothers, Mathematica acts as an objective third party to verify performance of SHCOs. Finally, outcome funders (MSD for Mothers and the United States Agency for International Development) make payments to the investors based on how many SHCOs improve quality of care to a sufficient degree, as measured by meeting the DIB standards.

**Exhibit 1.1. Utkrisht DIB partners and roles**



Within this DIB structure, the pathway to success includes several key components, including an acceptable financial risk model and return on investment for investors, efficient technical assistance by implementers, facilities’ ability to meet standards to improve health outcomes, affordable payments for outcome funders, and timely verification to trigger payments (Exhibit 1.2). Underlying these components are several assumptions or hypotheses for consideration:

- ① Conditions allow for quality improvement at facilities
  - Payment for outcomes appropriately incentivizes delivery of quality technical assistance and implementation of quality improvements.
  - Provision of technical assistance to meet quality standards bridges the major gap in private facilities’ ability to meet quality standards and provide quality maternal health care. That is, structural or other factors do not present a major impediment.
  - Private facilities selected do not meet quality improvement standards at outset and technical assistance adds value.
  - Metrics and process used for verification capture true facility quality improvement.
- ② The investment provides a return commensurate with the program risks
  - The program needs to achieve a critical mass to make investor participation worthwhile. In practice this entails a sufficient pool of facilities exists to trigger the volume outcome funds needed in excess of the program costs that allow for a (capped) return.

- 3 Meeting NABH and Manyata quality standards results in better maternal, neonatal, and infant health outcomes.
  - Adherence to quality standards results in meaningful improvements in health outcomes.
  - Facilities maintain quality standards after implementation partners exit, leading to long-term improvements in outcomes.

**Exhibit 1.2. Utkrisht DIB Theory of change**



**B. Current phase of the DIB**

As of October 2019, implementation partners signed agreements to provide technical assistance to 360 private facilities across Rajasthan, 167 of which have been verified as reaching DIB thresholds for quality or received official NABH and Manyata certification.<sup>2</sup> The implementation team began working in Rajasthan’s capital, Jaipur, and gradually expanded to additional districts. To date, about half of the participating SHCOs have received technical assistance from PSI and half from HLFPPPT.

Mathematica has conducted three rounds of verification: in November 2018, April/May 2019, and November 2019 (Exhibit 1.3). During each verification round, Mathematica assessed SHCOs that the implementation partners deemed were ready to meet the DIB quality standards, using the same standards on which the facilities were trained. The fourth round of verification was scheduled to take place in April 2020, but it was cancelled due to the COVID-19 pandemic. Two rounds of verification remain under the DIB: November 2020 and April 2021; the timing of these rounds may differ from the original plan depending on the course of the pandemic.

**Exhibit 1.3. Current phase of the Utkrisht DIB**



Note: Due to disruptions from COVID-19, the fourth and fifth verification rounds will be combined.

The DIB is scheduled to run through 2021 with the final round of verification occurring in April 2021. The design calls for 260-444 facilities to receive technical assistance and achieved NABH and Manyata

<sup>2</sup> The verification process used a lot quality assurance sampling approach, in which Mathematica assessed a portion of a group of facilities that implementation partners considered ready for certification and passed the entire pool as ready. To date, Mathematica has assessed 99 facilities directly. In the third round of verification, DIB partners decided that certification by Manyata and NABH would also trigger payments. Thirty-three sampled facilities received certification by FOGSI or NABH and were thus not assessed by Mathematica on these standards.

standards. Additional cost and outcomes data will also be available in 2021 to develop further insights and lessons learned from the world’s first health DIB.

**C. Assessments at the Midline of the Utkrisht DIB**

The insights and lessons learned from the DIB will fall into several categories, including using a DIB as a mechanism to address social sector issues, best practices and considerations for implementation, and achievable outcomes. In particular, testing the assumptions underlying the DIB’s theory of change will likely generate information most useful to partners and other practitioners, policymakers, and researchers interested in DIBs and improving health.

The process evaluation being conducted by Catalyst Management Services (CMS) in India and the verification process conducted by Mathematica will seek to understand the reality of the assumptions underlying the theory of change. CMS is assessing various aspects of DIB implementation to provide information to support real-time program improvement, such as approaches to strengthening relationships between partners and technical support provided to facilities. In contrast, Mathematica’s verification assesses results of the technical support, including those related to facility quality improvement, costs, and health status improvements. In this report, Mathematica addresses various aspects of the assumptions, as shown in Exhibit 1.4. Chapter 5 of the report presents our lessons learned based on our “lived experience” as the DIB verification partner.

**Exhibit 1.4. Testing of assumptions and information provided through the DIB midline assessment**

Chapter #	Theory of change assumptions addressed	DIB as a mechanism to address social sector issues	Best practices and considerations for quality improvement initiatives	Achievable outcomes
2	#1: Conditions allow for quality improvement	✓	✓	
3 <sup>a</sup>	#2: Returns on investments are adequate for risk	✓		
4 <sup>b</sup>	#3: Better quality leads to better outcomes			✓

<sup>a</sup> Mathematica data collection examines costs of quality improvement and outcome payments received. This understanding of costs only partially addresses the questions of whether returns on investments are sufficient to cover costs of implementation by partners. Investors committed an upfront payment of \$1.5 million to support the launch of DIB activities and have been paying incremental amounts to support further implementation as the DIB continues.

<sup>b</sup> The design limits our ability to isolate the contribution of the technical assistance in the DIB to achieve outcomes. However, we will discuss the association between outcomes and achievement of standards.

## 2. ACHIEVING QUALITY STANDARDS AMONG PRIVATE FACILITIES IN INDIA

Under the Utkrisht development impact bond (DIB), implementation partners, Population Services International (PSI), and Hindustan Latex Family Planning Promotion Trust (HLFPPT), provide technical assistance on quality standards set out by the National Accreditation Board for Hospitals & Healthcare Providers (NABH) for small health care organizations (SHCO) and Manyata Standards for Safe Delivery to private small health care organizations (SHCOs) in Rajasthan, India (NABH 2015; FOGSI n.d.). Reviewing facility performance across these standards will serve to illustrate the relative ease with which private facilities in India might achieve quality improvement and which aspects (such as documentation, infrastructure building, or provider practices and behaviors) might require more or less support.

To initiate DIB implementation, PSI and HLFPPT identified and recruited eligible private facilities. Then, as facilities join, implementation partners provide them with technical assistance and capacity building support to meet DIB quality standards. The broad approach to technical assistance and support includes an initial training or orientation, coaching or mentoring visits, and follow-up assistance. However, the assistance that PSI and HLFPPT provide differs slightly in terms of the timing and frequency of initial coaching sessions and follow-up visits. The content of the technical assistance, which is tied to the NABH and Manyata standards for quality improvement, is similar.

### Two models for providing training and technical assistance to SHCOs for quality improvement in maternal health care

The two DIB implementation service providers, PSI and HLFPPT, follow a broadly similar approach to identify facilities that are eligible to participate in the DIB, conduct a baseline assessment of the facilities' quality, and provide initial training and ongoing supportive visits to ensure that facilities meet the DIB quality improvement standards. However, the service providers' specific approaches to service provision differ. HLFPPT provides an intensive initial training on standards followed by continued outreach and mentoring visits. PSI uses its Engage, Launch and Support (ELS) quality improvement framework, which involves an initial orientation and intensive follow-up coaching visits. Below is a comparison of the two approaches.

<p><b>HLFPPT:</b></p> <ul style="list-style-type: none"> <li>• Initial 4-day training on standards</li> <li>• Two coaching visits within one month of training</li> <li>• Additional 5–10 monthly mentoring visits to help facilities reach interim "Progressive Level" standards</li> <li>• Additional 3 mentoring visits to help facilities reach final DIB standards, or "Certification Level"</li> <li>• Periodic quality assurance workshops for staff from all participating facilities</li> </ul>	<p><b>PSI:</b></p> <ul style="list-style-type: none"> <li>• Initial 2-day launch and orientation to standards</li> <li>• 12–24 weekly coaching visits</li> <li>• Up to 12 additional follow-up visits</li> <li>• Additional coaching visits to facilities that require more input, as needed</li> <li>• Designation of "quality champion" at each facility to ensure facility ownership of program</li> </ul>
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## A. About the quality standards and verification assessments conducted to date

The Utkrisht DIB promotes quality improvement by supporting facilities in meeting the SHCO pre-entry certification standards promoted by the NABH and Manyata certification standards for safe delivery (Exhibit 2.1).<sup>3</sup> The formats of these standards are as follows:

- **NABH standards** include five chapters with patient-centered standards to assess patients' experience with care, and five chapters with organization-centered standards to assess SHCO infrastructure, management practices, and service delivery. These 10 chapters include a total of 47 standards, which are further divided into 149 measurable elements.
- **Manyata standards** include 16 standards that address antenatal care, intranatal care, delivery, post-natal care, and Caesarean sections. These standards include a total of 57 objective elements, which are further divided into 111 measurable elements.

### Exhibit 2.1. Overview of quality standards used under the Utkrisht DIB

	NABH SHCO	Manyata
<b>Accrediting body</b>	NABH	Federation of Obstetric & Gynaecological Societies of India (FOGSI)
<b>Number of elements assessed</b>	<ul style="list-style-type: none"> <li>• 10 chapters</li> <li>• 47 standards</li> <li>• 149 measurable elements</li> </ul>	<ul style="list-style-type: none"> <li>• 16 standards</li> <li>• 57 objective elements</li> <li>• 111 measurable elements</li> </ul>
<b>Assessment methods</b>	<p><b>Documentation:</b> Assess whether the facility has the appropriate protocols and guidelines in place.</p> <p><b>Implementation:</b> Observe conditions or interview relevant facility personnel to determine whether practices are being implemented.</p>	<p><b>Observation:</b> Directly observe practices.</p> <p><b>Case records:</b> Review a randomly selected sample of 5 records to assess adherence to a standard.</p> <p><b>Provider interview:</b> Interview relevant facility personnel to determine whether practices are being implemented.</p> <p><b>Physical verification:</b> Observe the conditions at the facility or availability of key instruments and/or supplies.</p>
<b>Scoring</b>	<p>Facilities pass a chapter if they score at least <b>50 percent</b> of total points in the chapter.</p> <p>Facilities pass NABH portion of DIB standards if they <b>pass all chapters</b>.</p>	<p>Facilities pass a standard if they earn <b>all points</b> in the standard.</p> <p>Facilities pass Manyata portion of DIB standards if they <b>pass 11 standards</b>.</p>

Source: NABH 2015; FOGSI n.d.

Note: Appendix A, Exhibit A.1 provides a detailed list of topics covered by the NABH chapters and Manyata standards. These levels reflect those agreed upon by the DIB stakeholders during the DIB design process.

The practices and thresholds FOGSI and NABH use for their own certification are subject to change and therefore might not align with these definitions. In 2018, FOGSI began requiring facilities to meet 14 of the 16 Manyata standards to receive certification. DIB requirements had already been established when this change was made. Given that FOGSI and NABH standards could change further over time, DIB stakeholders agreed to adhere to the initially contracted criteria for "passing."

<sup>3</sup> NABH was launched in 2005 as a constituent board of the Quality Council of India, and it puts forth standards of patient safety and health care quality based on national and international guidelines (NABH n.d.). The Manyata standards were initiated in 2013 by the Federation of Obstetrics & Gynaecological Societies of India in collaboration with MSD for Mothers and Jhpiego. Manyata is a modified version of Jhpiego's Standard-Based Management and Recognition® standards (Memon et al. n.d.).

Participating facilities must earn at least 50 percent of the total points assessed in each of the 10 NABH chapters and earn all of the possible points in at least 11 of the 16 Manyata chapters in order to “pass” the Utkrisht DIB standards.<sup>4,5</sup> Outcome funders treat facilities’ ability to meet these standards as the outcome upon which to pay investors, who provided the upfront capital for the technical assistance to facilities. As the independent assessor, Mathematica conducts biannual verification assessments on a sample of facilities in a “ready pool” to confirm whether the entire “ready pool” of participating facilities meets the DIB standards and to determine whether outcome funders should issue payments.

To date, 113 facility assessments have been conducted across three rounds of verification.<sup>6</sup> In this report, we focus on the subset of 106 assessments conducted in facilities that provided data on health outcomes (discussed in more detail in Chapter 4). Among those 106 assessments, 55 (52 percent) passed the Manyata standards and 100 (94 percent) passed the NABH standards (Exhibit 2.2). In this chapter, we review average performance on each NABH chapter and Manyata standard according to our verification assessments and discuss factors that may influence this performance. We further examine whether facility characteristics are associated with performance on the Manyata standards.

### Exhibit 2.2. Facilities passing NABH and Manyata standards

	Total number of assessments	Passed Manyata	Passed NABH
Round 1	21	11	20
Round 2	42	10	38
Round 3	43	34	42
<b>Total</b>	<b>106</b>	<b>55</b>	<b>100</b>

Source: Mathematica verification assessment data.

## Verifying SHCO performance and assessing characteristics associated with performance

### The verification process

Mathematica verifies SHCO performance on the DIB standards every six months. For each verification visit, Mathematica randomly samples facilities to be assessed from the broader “ready pool” of facilities created by the implementation partners. Each verification assessment mirrors the official NABH and Manyata certification process as closely as possible, using the same assessment methods that each official body uses (as described in Exhibit 2.1). However, Mathematica’s process deviated from these official approaches in four key ways:

<sup>4</sup> These levels reflect those agreed upon by the DIB stakeholders during the DIB design process. The practices of and thresholds FOGSI and NABH use for their own certification are subject to change and therefore might not align with these definitions. In 2018, FOGSI began requiring facilities to meet 13 of the 16 Manyata standards to receive certification. However, this does not affect the requirements under the DIB.

<sup>5</sup> This threshold is known as the “Certification Standard” and is the highest level of quality targeted under the DIB. An interim threshold, called the “Progressive Standard,” is also assessed under the DIB, and investors are eligible for a partial payment for facilities that meet this interim standard. Throughout this report, we use the term “DIB standards” to refer to the Certification Standard.

<sup>6</sup> Some facilities were assessed in multiple rounds. A total of 99 unique facilities were assessed across the three rounds. Of these, 92 facilities, representing a total of 106 assessments, provided data on health outcomes.

### Verifying SHCO performance and assessing characteristics associated with performance

- Scope.** Many NABH chapters assess an SHCO's performance across all of its departments. To streamline the verification process, Mathematica's assessments focus only on the labor room, if standards might require a full physical survey of each facility department.
- Assessor background.** Once eligible health service professionals complete NABH trainings, they can become assessors. In addition to completing trainings, Manyata requires that assessors are obstetrician gynaecologists.<sup>7</sup> Due to logistical and financial constraints, Mathematica did not hire physicians or formally trained NABH assessors but instead selected field investigators who met all or most of the core competency requirements of NABH assessors.<sup>8</sup> Many had course work on NABH and/or training from NABH on quality assessments and experience working on quality improvement in hospital settings. Mathematica also provided a 5-day intensive training to ensure the objectivity, consistency, and confidentiality of field investigators' approaches to assessment.
- Approach to observation.** To preserve patients' privacy, the Mathematica field team did not observe providers conducting deliveries or related practices. During Round 1, we relied on other assessment methods available under Manyata verification guidelines and supplemented these methods with providers' responses to vignettes. In Round 2, we used a similar approach but did not include vignettes. In Round 3, if direct observation was not possible, Mathematica assessed these elements by asking providers to physically simulate the practice on mannequins, in accordance with current Manyata guidance and procedures.
- Requirements for passing.** NABH and DIB verification requirements for passing were the same; participating facilities must earn at least 50 percent of the total points in each chapter. At the time of the DIB's inception, facilities had to earn all possible points for at least 11 of the 14 Manyata chapters (about 80 percent) in order to "pass." However, as Manyata added two more chapters, the number of chapters required to pass changed from 11 to 13. Utkrisht DIB verification passing requirements reflected those agreed upon by the DIB stakeholders during the DIB design process (11 passing chapters).

### Examining SHCO characteristics associated with performance on DIB standards

To better understand what may be driving SHCOs' performance on individual NABH chapters and Manyata standards, we examined the association between certain SHCO characteristics and scores on these standards. Because nearly all assessed facilities passed all NABH chapters, it was not possible to conduct such an analysis for NABH. However, there was sufficient variation in performance on Manyata standards for this analysis. Specifically, we examined whether an SHCO's location in an urban or rural area, and the

<sup>7</sup> NABH requirements for assessors include: clinicians with a MBBS and at least 10 years of experience of which a minimum of 5 years should be in hospital or a MBBS with Post-graduate Degree or Diploma and at least 7 years of experience (post PG) of which a minimum of 3 years should be in hospital; administrators with a Post-graduate in healthcare management/administration (Degree or Diploma) or equivalent with at least 10 years of experience (post PG) of which a minimum of 5 years should be in healthcare management/ administration; nurses with a GNM and at least 15 years of experience of which minimum of 10 years should be in hospital or a BSc (Nursing) with at least 12 years of experience of which a minimum of 8 years should be in a hospital/academic setting, or a MSc (Nursing) with at least 10 years of experience (post PG) of which a minimum of 5 years should be in a hospital/academic setting. Desirable though not required is work experience in an NABH accredited hospital, training/ Course in Healthcare quality, and attendance at three day NABH program on Implementation course. Assessor must have the following core competencies: knowledge of hospital practices, understanding of NABH standards, computer and internet skills, physical and mental stamina (Add source <https://www.nabh.co/Images/PDF/Criteria4AssessorEmpanelment.pdf>).

<sup>8</sup> Although the majority of field investigators returned each round, a few did not. Those that did not return were replaced with others with similar qualifications.

**Verifying SHCO performance and assessing characteristics associated with performance**

district in which it was located, were associated with meeting the Manyata standards, using a simple regression framework with no adjustments for other variables.

**B. Performance on NABH standards**

The vast majority of all SHCOs passed every NABH chapter; this uniformity in scores limited our ability to analyze any association between facility characteristics and meeting overall standards (Exhibit 2.3). However, a review of scores revealed that facilities’ performance on specific chapters varied, suggesting that some chapters may have been easier to pass than others. All chapters were assessed using a combination of a review of the facility’s documentation and interviews with providers to understand facility practices; as such, performance on all chapters involves both documentation and implementation to some degree. Unsurprisingly, SHCOs were most likely to pass chapters that involved signage and other non-costly infrastructure changes, as well as chapters that relied heavily on the existence of written guidelines or standard operating procedures that are essential initial stepping stones to the quality improvement journey. They were less likely to pass chapters that focused more on behavior change and required them to implement new policies or procedures, such as those related to management or recordkeeping practices.

**Exhibit 2.3.** Mean scores by NABH chapter, Rounds 1 to 3 of DIB verification

	Average share of points earned (%)	SHCOs that passed chapter (%)
1. Access, Assessment and Continuity of Care	83	100
2. Care of Patients	77	100
3. Management of Medication	78	100
4. Patient Rights and Education	98	100
5. Hospital Infection Control	84	98
6. Continuous Quality Improvement	80	99
7. Responsibilities of Management	87	100
8. Facility Management and Safety	77	99
9. Human Resource Management	78	99
10. Information Management System	79	99

**Almost all SHCOs displayed patient rights prominently; staff adherence to these rights was not assessed**

**Common barriers: lack of fire detection mechanism, missing records on safety drills, missing staff training records**

Source: Mathematica verification assessment data.

Note: Calculations were based on 106 facility assessments of 92 unique facilities, including those in progressive stages, not quite considered ready to meet certification (14 facilities were assessed during two rounds of verification).

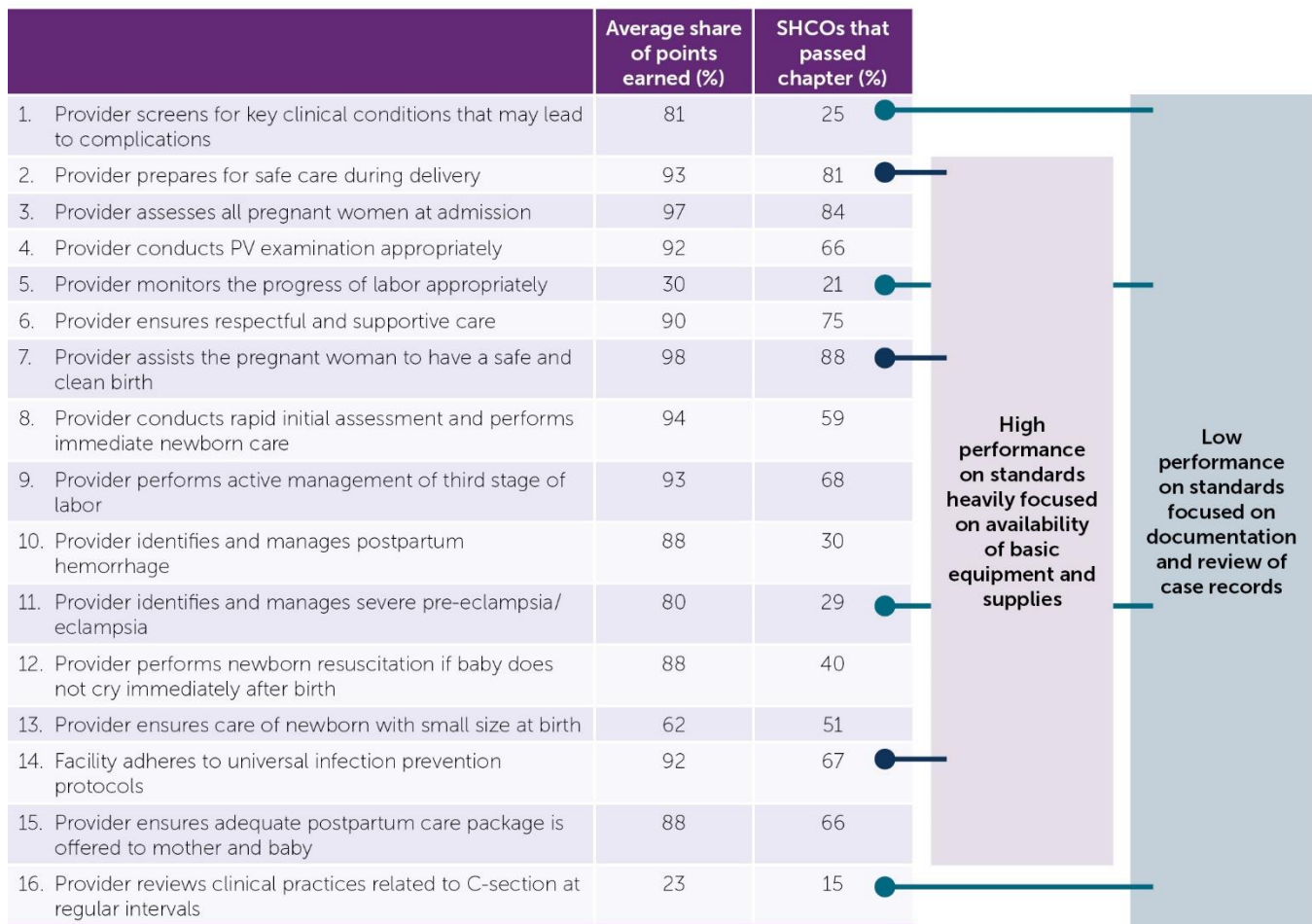
Appendix A, Exhibit A.2 provides NABH performance by chapter disaggregated by verification round.



### C. Performance on Manyata standards

Facilities did not perform as uniformly well on Manyata standards.<sup>9</sup> In general, facilities were more successful at meeting the Manyata standards related to the availability of key equipment and supplies, such as Manyata standards 2, 7, and 14 (Exhibit 2.4). Facilities did not fare as well on standards requiring strong recordkeeping processes and documentation of case records, which include appropriate documentation of the progress of labor (standard 5) and periodic reviews of C-section practices (standard 16). Some common challenges in meeting these standards included not using partographs and infrequent facility reviews of C-section practices.<sup>10</sup> In the end, we found no association between facilities’ performance and observable facility characteristics, such as urban or rural status and district (data not shown).

**Exhibit 2.4.** Mean scores by Manyata standard, Rounds 1 to 3 of DIB verification



<sup>9</sup> Differences in performance on NABH and Manyata standards may be driven in part by the different scoring approaches: Facilities can pass an NABH chapter if they score at least 50 percent of the points available in that chapter, but to meet a Manyata standard they must score all of the available points in that standard.

<sup>10</sup> In discussion with us, one service provider recounted providing no or limited technical assistance on Manyata standards that require more than three-months of support to achieve, such as intensive behavior change, or that may be more difficult to implement in rural geographies. Such standards included standards 1, 5, and 12–16 as shown in Exhibit 2.4. This was in recognition that facilities could fail to meet some of these standards and still pass the DIB passing criteria overall; lower performance on some standards may reflect this decision to focus technical assistance on specific standards that could be achieved in the shorter timeline of the DIB.

**Exhibit 2.4. continued**

Source: Mathematica verification assessment data.

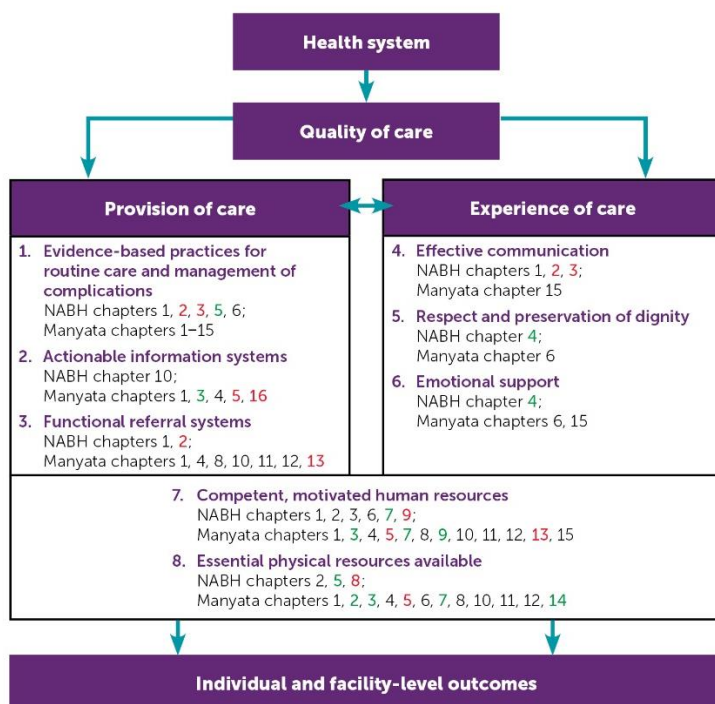
Notes: Calculations were based on 73 facility assessments of 67 unique facilities including those in progressive stages, not quite considered ready to meet certification (6 facilities were assessed during two rounds of verification). In Round 3, 33 of the 46 sampled facilities received official Manyata certification and were therefore not assessed for Manyata by Mathematica. We do not have access to their chapter-specific scores; their performance is not captured here. Appendix A, Exhibit A.3 provides facilities performance on Manyata standards disaggregated by verification round.

**D. Quality improvement in perspective**

To situate facility performance within a broader quality-of-care framework, NABH and Manyata standards were mapped to the overarching WHO framework for improving quality in maternal and newborn care (WHO 2016). The WHO framework divides the key elements of quality into eight key domains. Because it differentiates between provision and experience in care and it incorporates the classic Donabedian classification for quality of care (structure, process, outcome), experts in the field view the WHO framework as a comprehensive model for conceptualizing quality of maternal and newborn care (Donabedian 1988, 2005).

The evidence base underlying the WHO framework is the same as that underlying NABH and Manyata. Consequently, NABH and Manyata standards easily map to all eight of the framework’s quality domains. The vast majority of standards fall in domains related to provision of care, competency of personnel, and availability of physical resources (Exhibit 2.5). Manyata standards, in particular, are concentrated in provision of care (Domains 1–3), likely because they focus on clinical practices related to delivery. In contrast, NABH chapters are more evenly distributed across multiple quality domains. Interestingly, neither NABH nor Manyata have more than a few standards corresponding to the WHO domains that focus on clients’ experience of care—these standards address availability of appropriate signage and documentation, rather than assessing clients’ true experiences.

**Exhibit 2.5. Mapping of NABH and Manyata standards to WHO quality domains**



Source: Adapted from WHO (2016).

Note: Red numbers represent chapters/standards with the lowest average scores; green numbers represent those with the highest average scores. Black numbers represent chapters/standards with moderately high scores.

Within the eight domains of quality highlighted in the WHO framework, SHCOs tended to perform best on quality standards related to the availability of essential physical resources (Domain 8). In addition, SHCOs tended to perform well on standards related to use of evidence-based practices (Domain 1) or demonstration of respect and preservation of dignity (Domain 4), although these standards focus on the availability of relevant infrastructure or signage rather than more practice-oriented aspects of these domains. In contrast, SHCO performance was more variable on standards related to information or referral systems (Domains 2 and 3) and human resources (Domain 7)— especially if these standards focused heavily on client recordkeeping, management, or clinical practices. Thus, within the broad framework of quality improvement for maternal and newborn care, facilities can provide essential physical resources to support and provide quality care, but the journey to improving dimensions of quality that require changes to provider behaviors, management or recordkeeping practices, referral systems, and human resources might be longer term. In addition, it may be that the one-day visit conducted for the purposes of verification does not readily capture the improvements in behaviors and systems that facilities achieve over time.

### Does the program under the Utkrist DIB allow for quality improvement?

On the whole, DIB conditions seem to allow for overall quality improvement among assessed facilities. However, the mixed performance on individual standards might indicate that achieving and maintaining *all* quality improvement components might be difficult, especially in the long term—or that quality improvement is a journey whose desired outcomes require time to realize consistently and a snapshot cannot truly capture or reflect. In addition, lack of baseline data limits our ability to assess the magnitude of progress possible under the DIB model and whether outcomes reflect progress, baseline performance, or a combination of the two. For the endline report, we may be able to leverage baseline data collected by the implementation partners to estimate the magnitude of progress. The magnitude of quality improvement could have a large role in observable changes in outcomes.

### 3. COSTS OF MEETING QUALITY STANDARDS AMONG PRIVATE FACILITIES IN INDIA

Over two-thirds of India's total health expenditure—and over 70 percent of health service delivery—happens in private sector facilities (World Bank 2020). Given the volume of services and costs borne by the private sector, building capacity and improving practices in these facilities could have hefty societal benefits. In particular, averting adverse outcomes associated with maternal morbidity and reducing mortality in private facilities in India could prevent more than 150,000 maternal deaths and save \$1.5 billion in costs over five years (Goldie et al. 2010).

Given the potential for such large-scale benefits, many stakeholders and decision makers are searching for effective, yet affordable, health care quality improvement models to implement in private facilities. To decide which quality improvement intervention to support, stakeholders often—though not always—consider three key factors: (1) the cost of the intervention, (2) its effectiveness, and (3) relative costs and effectiveness of alternative options.

To assist stakeholders in assessing the first of these factors, we conducted a cost analysis for the Utkrisht Development Impact Bond (DIB). Investors, outcome funders, and facilities can weigh the costs of quality improvement against the relative value of outcomes in private facilities. Within the context of a DIB model, the costs of quality improvement can also help partners determine if payments for outcomes are set at a reasonable level. Specifically, we estimated the costs for:

- **Implementation partners'** (Palladium, Population Services International [PSI], and Hindustan Latex Family Planning Promotion Trust (HLFPPT)) technical assistance to support private facilities in meeting National Accreditation Board for Hospitals & Healthcare Providers (NABH) standards for small health care organizations (SHCO) and Manyata Standards for Safe Delivery. These costs include all labor time and materials devoted to administering and implementing the DIB (including time spent working on a pro bono basis), as well as capital expenses.
- **SHCOs'** structural improvements, process enhancements, and staff time to achieve NABH and Manyata standards. These costs include those associated with purchasing capital equipment, repairs and improvements, disposable equipment, outsourced services (for example, housekeeping or cafeteria services), and staff time.

#### Potential cost savings in preventing maternal morbidity and mortality in India

By averting costs associated with maternal morbidity and reducing mortality, improving access to and quality of reproductive health interventions in India could save an estimated US\$1.5 billion in five years (Goldie et al. 2010). More general investments in addressing maternal morbidity and mortality could save as much as US\$100 million in annual productivity loss, depending on the populations and interventions targeted (Islam et al. 2006; Verguet et al. 2016). Furthermore, these cost estimates do not capture the full value of preventing maternal losses to mothers and their families, which extend to surviving children's development and overall community health.

### Estimating Utkrisht DIB implementing partner and facility costs to meet DIB standards

To collect accurate cost data regardless of the quality of organizational accounting systems and overlapping purposes of costs, we used a method similar to the activity-based costing (ABC) method to assess implementation partners' costs for quality improvement ([World Health Organization 2003](#)). ABC identifies all the activities in which an organization engages and assigns costs—direct and indirect—to each of the activities. Our approach to collecting implementation partners' costs involved three key steps:

1. **Identify mutually exclusive and collectively exhaustive list of activities.** Activities conducted as part of each intervention component are referred to as cost centers.
2. **Identify the quantities and prices of inputs used for each activity.** Inputs include both capital and recurrent costs, such as personnel time, building space, equipment purchase and repair, materials, and overhead costs.
3. **Allocate costs to activities.** Cost workbooks guided the implementation partners in assigning direct and indirect costs to specific activities.

Due to limitations in available documentation, we interviewed implementation partners to collect information for the costing exercise. We collected actual accounting data on the costs implementation partners incurred from February 2018 to March 2019 to bring facilities up to the DIB standards by November 2019. Some of the costs are estimated based on projections and will be updated in subsequent verification rounds. All costs were converted to 2018 dollars to facilitate comparison across rounds and show costs from the perspective of someone evaluating costs in February 2018 (using a 3 percent discount rate).

For SHCOs, the in-depth ABC process was not feasible. Instead, we administered a cost survey to collect information on various cost drivers and determine the extent to which each could be attributed to quality improvement. Our approach and methods differ from that of CMS and have led to different cost estimates.

#### Estimating quality improvement technical assistance costs

We included the costs borne by the implementation partners to assist all SHCOs (treating costs for SHCOs that did not yet meet the DIB standards as collateral expenditures). Cost data from Palladium and the implementing partners were collected in April 2019 and included actual costs accrued from February 2018 through March 2019. Costs for these partners for April 2019 through October 2019 were estimated by assuming that costs for this period were equal to average monthly costs from February 2018 to March 2019. Other costs have been inflation-adjusted and capital costs were adjusted to account for the use versus actual cost of capital. Costs incurred by the implementation partners were classified as fixed costs, which do not change with the number of facilities assisted, and variable costs, which increase with the number of facilities served. Therefore, average costs could potentially decrease for implementation partners over time as more facilities meet DIB certification standards and average fixed costs per SHCO decline.

#### Estimating SHCO costs to implement quality improvement measures

To understand the costs borne specifically by SHCOs that achieved the DIB standards, we first estimated average SHCO costs using all SHCOs that were in the Round 3 verification sample (all of which were judged to have met standards). We then estimated the total cost incurred by SHCOs to meet the standards by multiplying this average cost by the total number of facilities that have been judged to have achieved the DIB standards to date. All costs incurred by SHCOs were considered variable.

### A. Costs borne by implementation partners and facilities to achieve DIB standards

From February 2018 through October 2019, DIB implementation activities cost approximately \$3.9 million. Palladium spent approximately \$630,000 as the coordinating hub for DIB activities and the implementation partners spent approximately \$1.1 million to support 167 SHCOs to meet the DIB

certification standards. These SHCOs spent approximately \$2.1 million on staff time and other resources to reach certification standards (Exhibit 3.1). Altogether, the average cost per SHCO meeting the DIB standards was \$23,094. Most of these costs were variable costs, such as those related to the time and travel associated with delivering technical assistance; less than one-third of costs were considered fixed costs, such as those associated with developing the technical assistance materials and approach.<sup>11</sup>

**Exhibit 3.1. Total and average costs for achieving DIB standards, February 2018–October 2019**

Cost	Total
<b>Total costs</b>	<b>\$3,856,646</b>
Costs borne by Palladium	\$629,770
Costs borne by HLPPT and PSI	\$1,126,633
Costs borne by SHCOs*	\$2,100,243
Total variable costs	\$2,790,170
Total fixed costs	\$1,066,476
<b>Total SHCOs that met DIB standards as of November 2019</b>	<b>167</b>
<b>Average cost per SHCO that met DIB standards</b>	<b>\$23,094</b>
Costs borne by Palladium	\$3,771
Costs borne by HLPPT and PSI	\$6,746
Costs borne by SHCOs	\$12,576
Average variable costs	\$16,708
Average fixed costs	\$6,386

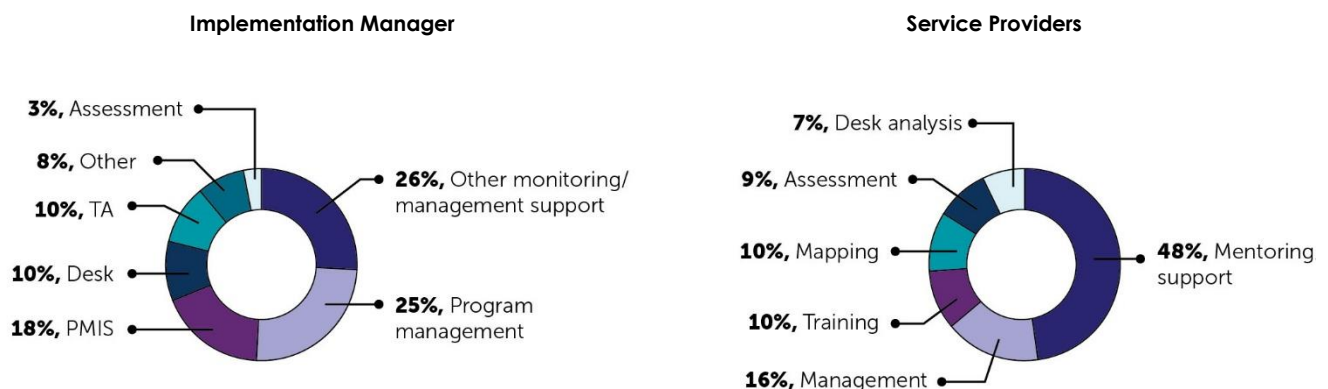
Source: Cost data provided by implementation partners and SHCOs.

\*Total was calculated by multiplying the average costs reported by facilities in the Round 3 verification sample by the total number of SHCOs considered to have met the DIB standards as of November 2019.

**B. Variation in implementation costs: findings from activity-based costing**

The activity-based costing approach provided detailed information about the sources of the costs incurred by the implementation partners (Exhibit 3.2). We found that costs incurred by these partners were allocated to the expected key activities, with the largest share of Palladium’s costs dedicated to program management and the largest shares of the service providers’ costs dedicated to delivering technical assistance.

**Exhibit 3.2. Implementation manager and service provider costs, by activity**



Source: Cost data provided by implementation partners.

<sup>11</sup> All costs incurred by SHCOs were classified as variable costs.

- **Implementation manager costs.** The bulk of Palladium’s costs were related to program management and other monitoring and management-related tasks (25 percent and 26 percent, respectively); setting up, maintaining, and pulling data from the Project Management Information System, or PMIS (18 percent); providing technical assistance for service providers and facilities (10 percent); and conducting desk analysis (10 percent).
- **Service provider costs.** HLPPT and PSI spent the most on providing the ongoing support and monitoring to SHCOs (nearly 50 percent of all service provider costs). There was some variation in individual service providers’ costs associated with different activities. These largely aligned with differences in their technical assistance approaches (see Appendix A, Exhibit A.4 for more details).

### C. Variation in costs by participating SHCOs: findings from facility cost surveys

To assess costs borne by any participating SHCOs (not only those that achieved standards), we examined cost data shared by all facilities that participated in Round 2 and Round 3 verification data collection, regardless of whether they met the DIB standards (Exhibit 3.3). (The analysis in the rest of this chapter only includes costs for facilities that met certification standards.) The largest contributor to these SHCO costs was labor, which averaged about \$6,600 per facility but was over \$45,000 in some facilities. The much smaller capital and material costs suggest that most facilities have or can obtain equipment and materials at relatively low cost compared to the investments in human resources necessary to improve quality.

Across all categories, costs were similar among facilities that did and did not meet the DIB standards, suggesting that facilities’ expenditures on quality improvement prior to verification are likely not strongly associated with their ability to meet standards during verification. Appendix A, Exhibit A.5 provides a breakdown of these costs by the service provider supporting the SHCO.

**Exhibit 3.3.** Average SHCO costs by type (in dollars)

Cost type	Overall			Met DIB standards			Did not meet DIB standards		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
<b>Overall</b>	<b>7,489</b>	<b>1</b>	<b>45,733</b>	<b>7,702</b>	<b>13</b>	<b>36,064</b>	<b>7,076</b>	<b>1</b>	<b>45,733</b>
Capital	302	0	4,755	366	0	4,755	179	0	1,565
Labor	6,577	0	45,725	6,709	0	35,276	6,328	0	45,725
Materials	1,007	3	9,012	1,046	3	9,012	909	58	4,096

Source: Cost data provided by SHCOs.

### Spotlight: Has quality improvement been delivered at these costs before?

The Matrika social franchising model spent about \$3.2 million on an expansion effort in India that included a large quality improvement component—training and supporting 146 public and private health facilities at a cost of \$22,000 per facility (Tougher et al. 2018). The quality improvement technical assistance to participating facilities was similar to that of the Utkrisht DIB, such as individual training to health providers and distribution of key equipment and supplies. Although the Matrika program was similar to the DIB in terms of the scope of quality improvement activities and in magnitude of costs per DIB facility at \$17,500, it provided resources for additional activities, including assistance for joining the social franchise network, awareness campaigns to increase traffic to the facilities, and community health worker trainings to complement clinician skills enhancements. A process study of this model found that quality improvement strategies were the most difficult activity to implement successfully. Moreover, evidence of these activities' impact on quality was mixed—although staff at participating facilities showed improved knowledge of maternal health best practices, they said they did not find quality improvement activities such as trainings and supportive supervision helpful (Penn-Kekana et al. 2018).

#### D. Early implications for the business case for SHCOs

Limited evidence from maternal health quality improvement programs in African and South Asian countries shows that the cost of quality improvement efforts can range widely—from \$22,000 to over \$2 million per facility. This variation reflects differences in intensity and type of quality improvement efforts (including differences in initial quality of facilities and the extent of change targeted), size of facilities undergoing quality improvement, and methods for accounting for expenditures (Fox-Rushby and Foord 1996; Goodman et al. 2017). Given the small size of private facilities engaged under the DIB, it is not surprising that the quality improvement costs fell at the lower end of the spectrum.

Unfortunately, lower costs of quality improvement do not necessarily translate to quick recovery of these expenditures because smaller entities often lack the revenue-generating capacity of larger institutions. In particular, Utkrisht DIB facilities expect to recoup these expenses by attracting more patients and improving reimbursement rates with their certification of quality, as well as by reducing costs due to quality improvements. NABH certification provides eligibility to participate in the Indian government's health insurance programs—particularly the Janani Suraksha Yojana (JSY) program and Ayushman Bharat Mahatma Gandhi Rajasthan Swasthya Bima Yojana (AB-MGRSBY).<sup>12</sup> Participating in these public insurance schemes opens up access to a larger pool of clientele who might otherwise have gone to a public facility or

<sup>12</sup> Average entitlement from JSY is about USD \$23, which includes transportation, antenatal, and postpartum visits (Goli et al. 2016). Initial consultation with providers in Rajasthan indicates that accredited private facilities can charge up to \$6.70 (Rs. 500) per delivery. The previous rates list for Bhamashah Swasthya Bima Yojana (BSBY), the predecessor to AB-MGRSBY, indicates that reimbursement ranges from Rs. 100 to Rs. 21,500 for clinical services (Government of Rajasthan n.d.).



another certified private facility.<sup>13</sup> However, the ability of SHCOs to recoup these investments will depend on their ability to generate a profit. Participating SHCOs have an average of 46 deliveries per month, and current average household spending of approximately \$260 on maternity care per pregnancy, of which \$160 is for the delivery alone (Goli et al. 2016). These are important factors for the facilities to consider as they assess how much they can charge per client and how many clients they can serve. Furthermore, facilities that make significant quality improvements through the DIB but fail to qualify for full NABH or Manyata certification may see small or no benefits. Ultimately, undertaking the intensive quality improvement process laid out by the Utkrisht DIB may be a risky financial proposition for SHCOs as, unlike the implementation partners, they might not see an immediate return on investment.<sup>14</sup>

Making a persuasive business case to SHCOs will require understanding the parameters under which each SHCO will recover its investments, including the volume of patients needed, cost of services provided, reimbursement rates from participation in government programs, and pricing at which these services will be taken up to generate the needed volume. At the completion of the DIB, we will have more data to conduct an analysis to assess the level of increased client load an average SHCO would need to see in order to recover its costs. This could help similar facilities understand the true financial implications of participating in quality improvement programs.

### Will SHCOs' revenue exceed costs after quality improvement?\*

A facility is **profitable** after quality improvement when Revenue > Costs, where:

$$\text{Revenue} = (\text{number of births} * \text{payment per birth})$$

$$\text{Cost} = (\text{costs of quality improvement}) + (\text{number of births} * \text{costs per birth})$$

However, if a facility wants to know whether quality improvement is a **good investment**, the question then becomes whether the Change in Revenue > the Change in Costs, where:

$$\text{Change in Revenue} = (\text{number of additional births} * \text{new payment per birth}) + (\text{previous number of births} * \text{additional payment per birth})$$

$$\text{Change in Costs} = \text{Cost of quality improvement} + (\text{number of additional births} * \text{new cost per birth}) + (\text{previous number of births} * \text{additional cost per birth})$$

To be a good investment, the change in profit will be positive depending on the amount that SHCOs can charge, as well as any reimbursement they are able to receive from government programs.

\*This is a simplified framework for understanding revenues and costs. Other factors might contribute nominally to costs and revenues.

<sup>13</sup> JSY provides conditional cash transfers to women delivering in qualified health facilities and BSBY was a government-supported health insurance program. Studies have shown that JSY increases institutional deliveries between 16 and 23 percentage points (Rahman and Pallikadavath 2018).

<sup>14</sup> It should, however, be noted that the DIB provides technical assistance to SHCOs free of cost, while other avenues of obtaining certification could be more costly. For example, without the DIB, an SHCO might have to hire an NABH consultant to help it get ready for NABH certification.

It is important to remember that the practical considerations for individual SHCOs' operational viability in monetary gain or loss cannot capture the full value of quality improvement for the well-being of women, children, their families, communities, and society. Even if quality improvement is costly, if it results in significantly improved maternal and child health outcomes, other decision makers may find the costs worthwhile to support within a larger system of societal and economic burden. Cost-effectiveness analyses of maternal health programs generally find that, although interventions focused on the availability and quality of facility-based maternal health services are often quite expensive, they are cost-effective from the perspective of national governments—even if that is not the case from the perspective of the facilities in the absence of compensation (Mangham-Jeffries et al. 2014). Thus, if the program demonstrates a high level of effectiveness, and hence high cost-effectiveness, state governments might be willing to invest the capital, even in an environment where government expenditures on health have been historically low (Vora et al. 2009).

### How do DIB payments compare to costs?

Under the Utkrisht DIB, investors can receive payments of up to \$18,000 for each facility that meets the DIB standards. To date, the implementation partners have spent an average of approximately \$10,000 for each facility that met the DIB standards, indicating that, on average, investors are able to receive a substantial return on their investment. However, as of October 2019, implementation partners had signed agreements and begun working with an additional 142 facilities that had not yet qualified for full payment, meaning that investors are still carrying some costs for implementation. To date, outcome funders have provided a total payout of \$3.09 million across the three verification rounds, against \$3.44 million spent by the investors, of which \$2.89 million was spent through Round 3 and more than half a million was spent on Round 4 implementation. The viability of the DIB model depends upon the timing and size of payments, as cash must flow in at a rate that allows maintenance of implementation partner and investor operations. The rate of cash flow is one transfer per six months. However, the size of that cash flow depends on how quickly implementation partners are able to support facilities and how quickly facilities are able to reach the DIB quality standards.

## 4. WHERE TO INVEST IN QUALITY TO IMPROVE OUTCOMES AMONG PRIVATE FACILITIES IN INDIA: EARLY FINDINGS FROM UTKRISHT DIB VERIFICATION

Improving health care quality on a broad and sustained scale remains elusive in both developed and developing country contexts (Braithwaite 2018; Chassin 2013). Research has been inconclusive on whether increasing investments in quality results in better or faster quality improvement (Hussey et al. 2013). Similarly, the linkage between better quality care and better outcomes remains mostly theoretical, though systematic reviews have shown a positive association between patient experiences—a core dimension of quality care—and clinical effectiveness (Bastemeijer et al. 2019; Doyle et al. 2013).

The Manyata standards adopted by Utkrisht DIB facilities are based on high-impact, evidence-based practices for improving the quality of antenatal, intrapartum, and immediate postpartum care. These standards draw from existing quality improvement efforts such as the Safe Childbirth Checklist (SCC) and the Government of India’s Dakshata initiative for public facilities (Jhpiego 2017). Dakshata and the SCC have been shown to be effective in improving providers’ adherence to evidence-based standards, and some studies have also shown that these approaches can improve maternal and neonatal health outcomes (Jhpiego 2017; Kumar et al. 2016). However, no studies to date have assessed whether the suite of Manyata standards improves maternal and child health outcomes.

Although the Utkrisht DIB was not designed to rigorously assess the *impact* of meeting Manyata standards on maternal and neonatal health outcomes, participating facilities’ regular collection of outcomes data provided an opportunity to examine the relationship between quality improvement and outcomes. To do this, we compared data on key maternal and neonatal health outcomes between participating facilities that met the DIB standards and those that did not. At the midline of the DIB, our analysis uncovered a small but consistent trend—achieving the Manyata level of certification (passing 14 standards) was associated with small, though not statistically significant, reductions in Caesarean sections, delivery complications, high-risk deliveries, preterm births, and low birth weight births, as well as increased referrals to the facility’s NICU (Exhibit 4.1).

Meeting the certification level was also associated with a small and statistically non-significant decrease in administration of uterotonics during the third stage of labor. Similarly, examination of the relationship between facilities’ performance on *individual* Manyata standards and health status outcomes did not uncover any statistically significant associations between achieving a particular standard and a particular health status outcome, nor any consistent emerging story regarding the relationship between the achievement of specific standards and improvements in specific health outcomes (see Appendix A, Exhibits A.7 and A.8 for details).

Comparing Utkrisht facility outcomes to national and Rajasthan facility outcomes from other studies provides some context for how Utkrisht facilities performed relative to the rest of the state or country, even if the methodologies used to generate estimates of facility outcomes in these other studies may not be entirely consistent with ours. Uterotonics are correctly administered during the third stage of labor in 99 percent of deliveries in Utkrisht facilities, and although national and Rajasthan-specific estimates of this metric are not available, a recent study in the state of Jharkhand estimated that uterotonics are only administered in about 44 percent of deliveries (Ricca et al. 2015). The national preterm birth rate is

about 14 percent (Chawanpaiboon et al. 2019), whereas the rate in Utkrisht facilities was only 3 percent. It is also important to note that it may be hard to interpret whether differences between facilities and changes in rates of these outcomes in any facility truly reflect improvements, because other factors may drive these observed rates. For instance, a reduction in the preterm delivery rate might result from higher-quality antenatal care, or from a reluctance to serve clients at higher risk of preterm delivery. Similarly, a higher internal SNCU/NICU referral rate might reflect lower-quality practices during delivery, facilities' adoption of correct referral practices resulting in an appropriate increase of referrals, or facilities' willingness to take on more challenging cases that are likely to require SNCU/NICU care.

## Data and methods for assessing association between Manyata performance and health outcomes

### Data sources

Our analysis relied on data on achievement of the Manyata standards collected from three rounds of verification assessments between November 2018 and November 2019. A total of 113 facility assessments were conducted in 99 unique facilities; some facilities were assessed more than once. In December 2019, Palladium, the DIB implementation manager, provided facility-level data on key health outcomes that corresponded to 106 of these facility assessments in 92 unique facilities. Descriptive analyses assessed the frequency at which the eight key health outcomes occurred across all facilities. Results were disaggregated by urban/rural location (as captured by their designation as a "headquarters" facility). For further details on these outcomes, including disaggregation by service provider, see Appendix A, Exhibit A.6.

### Health status outcomes

Outcome	Definition	Total (min, max)	Urban (min, max)	Rural (min, max)
Caesarean rate (%)	Proportion of live births delivered via Caesarean section	40 (3, 73)	48 (17, 73)	27 (3, 63)
Complication rate (%)	Proportion of deliveries that involved complications	3 (0, 21)	2 (0, 21)	3 (0, 19)
Uterotonics administered during TSL (%)	Proportion of deliveries in which uterotonics were administered during TSL	99 (94, 100)	99 (94, 100)	99 (96, 100)
High-risk delivery rate (%)	Proportion of deliveries classified as high risk	4 (0, 43)	3 (0, 22)	5 (0, 43)
Preterm rate (%)	Proportion of deliveries that were preterm ( $\leq 36$ weeks)	3 (0, 19)	3 (0, 15)	3 (0, 19)
LBW rate (%)	Proportion of live births classified as low birth weight ( $\leq 1,800$ g)	2 (0, 16)	2 (0, 10)	3 (0, 16)
Internal SNCU/NICU referral rate (%)	Proportion of live births referred to internal SNCU/NICU	4 (0, 44)	3 (0, 22)	5 (0, 44)
Number of neonatal deaths	Number of facilities with any neonatal deaths	6	4	2

Source: Health outcomes data provided by Palladium.

Note: Data provided already classified whether a delivery was high risk. No specifics of conditions included in the definition of "high-risk" were provided.

TSL = third stage of labor; LBW = low birth weight.

### Analysis approach

Multivariate regression models were used to assess the association between performance on Manyata standards and health outcomes. The regression model adjusted for specific facility-level characteristics (the facility's quality improvement service provider [HLFPPT or PSI], urban/rural location, and the district). The model also controlled for the round in which the facility assessment was conducted, and all standard errors were adjusted to account for multiple assessments in some facilities. To reduce the risk of finding statistically significant differences that arise due to chance and do not reflect true relationships, we applied a Bonferroni correction (Schochet 2008).<sup>a</sup>

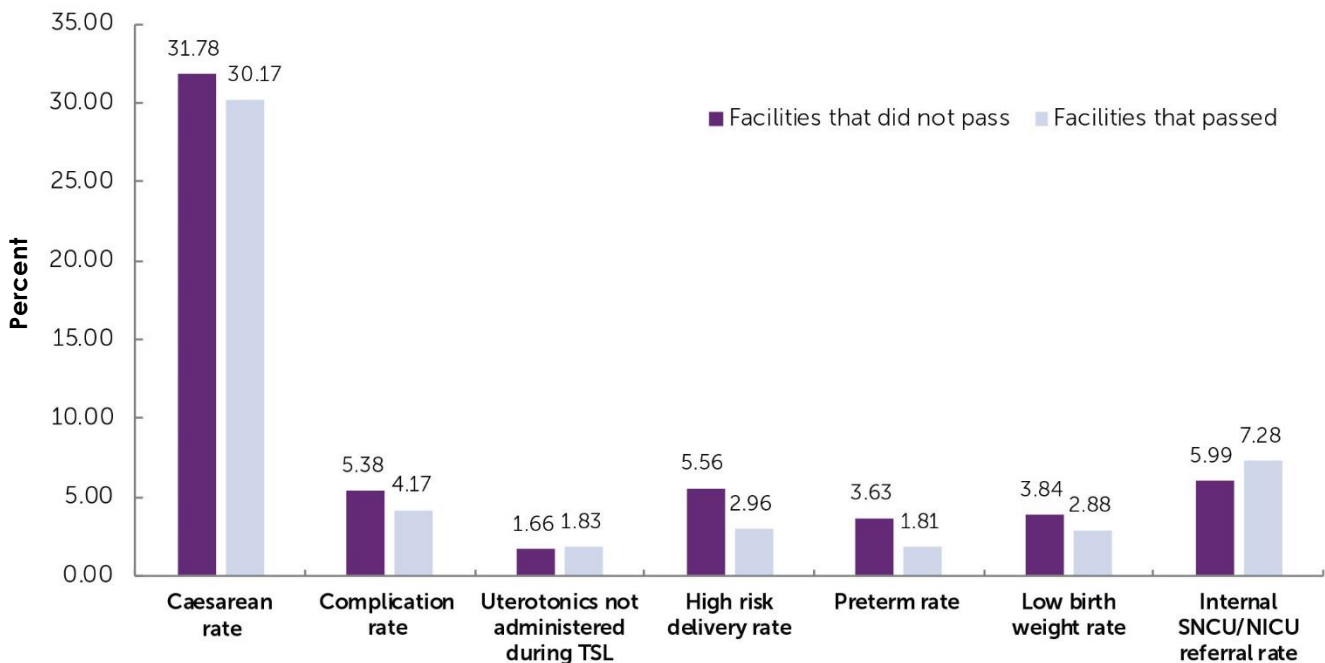
**Data and methods for assessing association between Manyata performance and health outcomes**

We first examined the relationship between passing the Manyata standards overall and achieving key health outcomes. For the purposes of these analyses, we defined “passing” as achieving a passing score on 14 of the 16 standards. Although this differs from the DIB passing threshold (which requires that facilities meet 11 standards), it reflects the current official Manyata passing threshold. This was specified prior to analysis based on our belief that it would be more likely to be associated with clinical outcomes. (A sensitivity analysis conducted using the lower DIB threshold did not change the findings.)

We also examined the relationship between meeting individual Manyata standards and achievement of the same key health outcomes. For these analyses, we used the same regression specifications described above, but also included variables to control for scores on all other Manyata standards.

<sup>a</sup> Specifically, we considered a finding statistically significant only if it had a *p*-value of less than 0.0006, which is equivalent to the standard significance threshold of 0.05 divided by 8 (the number of key health outcomes we examined). In practice, this made no difference to our results; as shown in Exhibit 4.1, no findings were significant even at the higher 0.05 level.

**Exhibit 4.1. Association between Manyata performance and health outcomes**



Source: Health outcomes data provided by Palladium and Mathematica verification data.

Note: Graph shows adjusted means for facilities that did and did not pass Manyata standards.

Data provide already classified whether a delivery was high risk. No specifics of conditions included in the definition of “high-risk” were provided.

We also examined the association between passing Manyata standards and number of neonatal deaths. We found that facilities that passed the standards showed a small, statistically non-significant increase in neonatal deaths compared with facilities that did not pass; see Appendix A, Exhibit A.7 for details.

\* / \*\*\* significant at the 0.05/0.0006 level.

Several possibilities might underlie these observed results. First, facilities' ability to deliver high-quality services is unlikely to translate to immediate improvements in health outcomes. These impacts could require a longer timeframe to manifest. Other studies examining the impact of maternal health quality standards in India found that, although achieving these standards improved adherence to safe practices, it did not lead to observable improvements in maternal health outcomes within a short timeframe (Dettrick 2013; Delaney 2019). Second, it is possible that quality improvements might improve health outcomes only slightly, if at all. Quality of care represents one of many systemic factors that affect health outcomes, and improving maternal health is likely a complex and multifaceted process (Government of South Australia and WHO 2017). In fact, although clinical care is an important determinant of health, it accounts for only 10 to 20 percent of factors affecting a population's health (Magnan 2017). The remaining 80 to 90 percent is influenced by social determinants of health—behavioral, socioeconomic, and environmental factors, such as education, employment, housing stability, food security, physical safety, and social inclusion—that govern a person's ability to maintain their well-being. Third, it is important to note that our analyses compare facilities that did and did not reach DIB standards – but all facilities in our sample did receive extensive technical assistance in order to help them meet these standards. It is possible that the majority of participating facilities were able to improve quality significantly, and the true difference in quality between facilities that did and did not achieve the standards is small – which may help explain why outcomes were similar across both types of facilities.

The fourth potential explanation for our findings is that our data did not enable us to truly assess whether better quality causes improvements in health outcomes. One way to attempt to assess this would have been to examine facility outcomes before and after quality improvement. Although this pre-post approach could not account for broader trends in health outcomes over time, it would provide a better indication of whether improved health outcomes follow quality improvements. However, we had health status data for only a single period in time after the intervention had already begun. Having data on health outcomes and performance on the DIB standards in participating facilities before and after the start of the intervention would have enabled us to detect the association between changes in facility quality and health outcomes over time. Another way to assess this causal link would be to compare health outcomes among a group of facilities that achieved the quality standards and a comparable group of facilities that did not achieve the standards. Although our analysis approach attempted to adjust for any systematic differences between the facilities that did and did not achieve standards, there are likely important unobserved differences between these groups that may be driving the results. The relatively small sample size also made it difficult to detect significant but small improvements in health outcomes. This was especially true for outcomes that are very rare, such as deaths—in particular, there were no maternal deaths in any of the assessed facilities.

The final synthesis report, which will be produced after all six rounds of the DIB have been completed, can help to provide further insight. At that time, after subsequent verification rounds, we will have access to information about performance on the DIB standards and health outcomes for a larger overall sample of facilities—which may provide the statistical power needed to detect any associations between private facility quality and some key outcomes. Based on the magnitude of the outcomes observed in the present analyses and the observed differences in outcomes between facilities that did and did not pass Manyata standards, we estimate that the number of facilities required to detect true changes in these outcomes ranges from 199 to nearly 3,000. Although we may have a sufficiently large sample at the time of the final report to detect impacts for some outcomes, in many cases, the required sample size is much larger than the number of facilities expected to participate in the DIB.

In addition, at endline, we will use the Lives Saved Tool (LiST) to model the impacts of the DIB on maternal and neonatal mortality in Rajasthan. To generate the estimate, the model will leverage the number of facilities reached under the DIB, the level of quality improvement they were able to achieve (based on their performance on the DIB standards), and the number of deliveries conducted in these facilities. Although the calculated impact is only a rough approximation, it can be used to make a case for the extent to which the Utkrisht model could contribute to reductions in maternal and neonatal mortality.

### Estimated number of facilities required to detect associations between quality improvement and outcomes

**Caesarean rate:** 2,810

**Complication rate:** 542

**Uterotonics administered during TSL:** 1,000

**High-risk delivery rate:** 290

**Preterm birth rate:** 199

**LBW rate:** 467

**Internal SNCU/NICU referral rate:** 2,007

**Neonatal deaths:** 822

Note: These calculations are based on the assumption that 80 percent of facilities would pass the quality standards and 20 percent would not pass.

### Does better quality lead to better outcomes?

At the midpoint of the Utkrisht DIB, it is too soon to tell whether improved quality at participating SHCOs has led to meaningful improvements in key health status outcomes. Because we do not intend to track facilities over time, it will not be possible to know whether SHCOs continue to maintain an improved level of quality after meeting the DIB standards and whether health outcomes improve over time in their facilities. However, by the end of the DIB, we will have data on a larger number of facilities, which will allow for further exploration of the trends identified in this report.

## 5. LESSONS LEARNED FROM VERIFICATION OF A DEVELOPMENT IMPACT BOND

Development impact bonds (DIBs) offer an innovative financing mechanism that leverages upfront private capital to achieve social impact. Private investors provide the upfront capital and earn a financial return when the social program meets pre-specified outcomes. Service providers implement a specified intervention using this upfront capital. The return on investment is paid by a third-party donor or “outcome funder,” who agrees to repay investors on achievement of outcomes. On the surface, the scenario seems to offer a “win-win” situation, in which the investor earns a return, the third-party donor pays only when the results they care about are achieved, implementers are compensated as they would be in a traditional donor model and have more room for innovation, and social good is advanced.

However, the success of a DIB’s implementation depends on many factors, including incentive structures, partner lines of accountability and chemistry, and investors’ tolerance for the risk assumed by providing upfront funding. Verifying DIB outcomes requires that the outcomes triggering repayments are clearly defined, appropriately measured, and agreed upon by all parties. Based on our experience as the external verification partner for the Utkrisht DIB, Mathematica offers our lessons learned to provide insights into key considerations for structuring and conducting outcomes verification in a DIB model. In particular, we discuss selecting appropriate measures, choosing the verification methods and approach, and managing the ongoing verification process.

### A. Selecting measures

Health interventions often target distal outcomes, such as morbidity and mortality. Because the structure of a DIB requires that investors are repaid on a relatively short time scale, health-focused DIBs typically must be based on achieving more proximal—but still meaningful—outcome measures. Identifying outcome measures that strike the appropriate balance between these two needs can be particularly challenging for health-focused DIBs. Lessons learned from previous DIBs highlight the following key criteria for good DIB outcome measures (Gustafsson-Wright et al. 2017):

1. **Measurable.** Able to be assessed objectively and consistently.
2. **Meaningful.** Aligned with the ultimate changes that outcome funders wish to see.
3. **Set at an appropriate level.** Ambitious enough that meeting them would be meaningful to the outcome funder (and the field at large), but not so high that investors are dissuaded from participating.
4. **Timed appropriately.** Measured on a time frame that is sufficiently long to demonstrate results, but also short enough that corresponding outcome payments are made on a time scale that is acceptable to investors. In some cases, measuring outcomes at a single point in time, followed by a single outcome payment at the end of the DIB, may be acceptable to both



investors and outcome funders. However, health-focused DIBs typically require a relatively long timeline because health outcomes often take a long time to manifest, and thus measuring outcomes at multiple time points and providing multiple interim payouts may be necessary.

For the Utkrisht DIB, partners selected outcome metrics that aligned with these criteria. Partners chose NABH and Manyata standards, which are widely used quality standards across India. The standards draw on best practices that have been shown to be effective at improving maternal and neonatal outcomes in a variety of contexts (Darmstadt et al. 2005). And, given the widespread acceptability and use of NABH standards for SHCOs and Manyata standards for private facilities more broadly, the standards are at the correct level for the providers the DIB engages in Rajasthan. Based on NABH Internal Auditor verification staff and discussions with Manyata-certified facilities, the quality improvements targeted by the NABH and Manyata standards have also shown to be achievable within a six-month period between verification rounds. However, applying the NABH and Manyata standards as the outcome metrics for the Utkrisht DIB surfaced another key criterion for consideration when selecting DIB outcome measures:

5. **Underlying evidence.** If the ultimate outcome of interest cannot be measured in a timely manner, an interim outcome for triggering outcome payments should have sufficient underlying evidence available that achieving the interim outcome leads to long-term goals. Impacts on the most meaningful social sector outcomes can take months to years to observe (e.g., long-term cure from a disease, stable and permanent housing, or sustained prevention of recidivism). However, investors' limited risk tolerance often means choosing more proximal outcomes as the triggers of payments. In the case of the Utkrisht DIB, achieving NABH and Manyata standards serves as the interim outcome on the pathway to reducing maternal and neonatal morbidity and mortality, as well as stillbirths. Although NABH draws on global best practices in clinical management and Manyata on the WHO's Safe Childbirth Checklist, and although both are aligned with evidence-based interventions that have been shown to improve maternal and neonatal health outcomes (Boschi-Pinto et al. 2010), few studies have assessed whether adherence to the standards, especially as a packaged suite, leads to improved maternal and infant health outcomes in India's context (Spector et al. 2013). For example, the recent BetterBirth study in India found that a coaching-based intervention to improve adherence to the Safe Childbirth Checklist resulted in improved provider compliance with these practices, but the changes in provider behavior did not affect maternal or perinatal mortality or maternal morbidity (Semrau et al. 2017).

In cases such as the Utkrisht DIB, when the evidence base linking selected DIB outcome metrics to the longer-term goals of interest is limited or incomplete, an accompanying study to assess the impact of the intervention can be conducted to provide such information. However, conducting such rigorous studies can be cost prohibitive, as well as logistically and ethically challenging. Thus, the Utkrisht DIB does not include an impact study and will likely not be able to say whether and how much the intervention will move the needle on maternal and infant morbidity or mortality. Instead, it will only provide a prediction based on the Lives Saved Tool as a proxy for estimating impacts. In such cases, outcomes funders

must be comfortable paying for interim metrics that may or may not lead to the ultimate outcomes of interest but may have other benefits, such as better patient care and experiences.

## B. Determining the verification measurement approach

Once outcome measures are chosen, the approach to measurement—that is, the methods of collecting and analyzing data for the selected measures—should be agreed to by all partners. Experiences from large U.S.-based quality measurement efforts indicate that adhering to the following criteria will assist in developing an effective and indisputable measurement approach. These criteria for developing the measurement approach are likely to be relevant in the context of DIB verification (Centers for Medicare & Medicaid Services 2019):

1. **Valid.** The measurement approach should be proven to yield the exact information about the outcome that partners require.
2. **Reliably reproducible.** The approach should consistently produce the same result across time and across data collection staff.
3. **Timely.** The approach should allow for data to be collected and analyzed on a timeframe that is suitable to investors, implementers, and outcome funders.
4. **Ethical.** The approach maintains confidentiality and does not bring stress, harm, or disadvantage to beneficiaries.
5. **Unbiased.** The approach does not unduly favor one type of respondent, answer, or conclusion.

In the early stage of the project, Mathematica, as the verification partner, attended a training with an NABH lead assessor and consulted with Manyata developers to understand their measurement approach for assessing each of their standards. Because specifications for the individual measurable elements within each standard were not available, Mathematica developed a detailed verification plan specifying each measure definition, data source, and methods for measurement, and shared this plan with partners. With partners, we agreed to a six-week verification timeline for conducting the verifications semiannually (Appendix A, Exhibit A. 9).

### Multiple verification bodies and replicability of verification results

Allowing multiple organizations to conduct outcome verification might appeal to investors, as it expedites the verification process. However, each organization may vary slightly in verification measurement approach, introducing potential inconsistency in how outcomes are assessed and how payments are triggered. As the Utkrisht DIB evolved, outcome funders allowed for facilities' direct achievement of Manyata and NABH certification to serve as a means of verification alongside Mathematica's verification process. In this case, partners carefully considered the pros and cons, and purposefully agreed to accept the potential variation across verification agencies.

To ensure that we complied with best practices for ethical data collection and use, we sought institutional review board approval in both the United States and India.<sup>15</sup> We informed facilities' staff of their rights and the benefits and risks of participating in the verification, and obtained their informed consent to conduct verification. To enable us to triangulate results and minimize biases introduced by specific data collection methods, we used multiple methods of data collection (observation, provider and staff interviews, and client record reviews), in accordance with NABH's and Manyata's guidance on acceptable assessment methods for each standard and element. Our overall approach to verification was designed to ensure that our findings were valid, reproducible, and collected in a timely, ethical, and unbiased manner—but our experiences over three rounds of verification surfaced an additional criterion to consider when developing a measurement approach for a DIB:

6. **Measurement approach “fit-for-purpose.”** Clearly articulating the purpose(s) that a particular measure is supposed to serve will influence decisions about how it is used. Often, a measure that seems like it can be used for multiple purposes— such as program implementation and monitoring, as well as verification—might need to apply different approaches to serve each purpose. For example, in the interest of promoting better quality among facilities, official NABH and Manyata certification visits often include an element of supportive coaching, and both NABH and Manyata assessors have indicated a willingness to approach these assessments as opportunities to guide facilities on their “quality journey” rather than adhering to strict definitions of what constitutes “passing” performance on an element or standard. NABH offers facilities an opportunity to correct issues uncovered during an initial assessment and, if they do so, the facilities receive certification.

In contrast, verification field investigators receive standardized training that stresses the importance of and need for consistency in assessing each measure—so that there is no difference in performance of facilities upon which payment occurs. Because verification serves as an audit to prompt outcome payments, field investigators are explicitly instructed not to coach facilities or inadvertently treat facilities differently. In addition, verification visits are conducted under the premise that facilities have already met these standards in order to be eligible for verification, and they do not allow for correction after the visit. These differences between purposes for NABH and Manyata certification and DIB verification have led to continuing discussions between partners regarding the purposes of a DIB's verification. Considering the measurement purpose for verification and potential measurement approaches for the Utkrisht DIB at the outset could have avoided the large amount of transaction time dedicated to these discussions.

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<sup>15</sup> Both institutional review boards (IRBs) in the United States (Health Media Labs) and India (Sigma Research and Consulting) determined that our verification activities were not exempt from review. Both of these organizations are independent regulatory institutions that review research protocols to ensure that they are ethical and protect human subjects touched by research. IRB agreements ensure that research protocols and the ways in which the data are used are ethical.

7. **Threshold for outcomes verification and payment.** As mentioned earlier, health care quality improvement reflects a journey and sustained achievement of standards might require more time than the three to four months allotted for quality improvement through the DIB. With such outcomes, it is helpful to consider whether a payment threshold based on a one-time assessment or a tiered payment approach might be most suitable. The Utkrisht DIB allowed for smaller payments to facilities reaching an interim, “progressive” level of the quality standards that had less stringent requirements than those for achieving full certification. However, outcome funders provided no payments to facilities achieving a level of quality improvement that fell between the progressive and certification tiers. As a result, investors were not eligible to receive any additional payment for facilities that received a payment for meeting the progressive standard and went on to improve quality further, but ultimately failed to meet the certification standard. Although this approach may be appropriate given the risk and incentive structure of the DIB, it requires careful consideration.

### C. Management of the verification process and role of a verification partner

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The verification partner in a DIB manages an ongoing verification process in close consultation with other DIB partners. Although the verification team is external to the DIB, collaboration and coordination with other partners are key to the success of the verification process. For example, Utkrisht DIB verification depended on partners to provide contact information and introduction to facility staff to enable a smooth assessment. Learnings generated from the field of clinical audits point to common factors influencing the success of such audits, which may be relevant to the context of managing a DIB verification process (Johnston et al. 2000):

1. **Shared vision.** Continual cultivation of, communication about, and confirmation on the goals and purposes of the verification to all actors in the DIB.
2. **Efficiency.** Minimum burden on the staff responding to interviews or providing requested documentation.
3. **Trust.** Belief among all partners that everyone is acting in good faith and with a shared sense of purpose.
4. **Shared results.** Dissemination and discussion of results, factors underlying reports, and limitations in measurement approach.

All partners entered the Utkrisht DIB with a shared vision to improve maternal health in India and assess the proof of concept for a DIB in health. However, partners’ approaches to putting the vision into practice inevitably varied, as their roles and incentives vary. From our vantage point as the verification partner, we humbly offer reflections about factors that shape the success for managing the verification process.

5. **Open and continuous communication and coordination among partners.** As the objective third party, the verification partner might face scrutiny from investors, implementers, and outcomes if the results of the verification process are not favorable to one group or another or are different from expectations. As part of DIB transaction costs, verification partners

should set aside sufficient resources and plan for ongoing communication and engagement in potential dispute resolution activities. As the Utkrisht DIB progressed, we engaged in ongoing activities that were not originally anticipated, such as qualitative analysis of field notes, comparison analyses to assess differences between implementation program and verification data, consultation with clinical experts on practices and nuances of implementing the standards, and significantly updating the verification methods. Although some of these additional activities could be considered necessary steps in DIB stakeholders' learning and adapting as the DIB progresses, the scope and number of these activities could be limited with regular communication and strong mechanisms to coordinate and hold all partners accountable.

6. **A dedicated independent verification process for the DIB.** Even if other methods of verifying outcomes exist, having the verification process managed by a fully disinterested party, and ensuring that all partners agree to trust the findings of that party, may help ensure that DIB outcomes are measured on an acceptable timeframe and can lend credibility to the measurement of DIB outcomes. In the design phase of the Utkrisht DIB, partners considered basing outcome payments on whether facilities received NABH and Manyata certification through the official certification processes. Official receipt of these certifications seemed to be an appropriately objective third-party assessment of the quality of care available in a facility, but the timeline for requesting an assessment by either body and obtaining the relevant certification proved to be too long and variable. DIB partners also believed that it would be valuable to include a separate verification process implemented by a neutral party.
7. **Mutually reinforcing monitoring, evaluation, and learning.** Within the DIB structure, verification partners can be asked to play multiple roles: auditor, evaluator, and learning partner. As the auditor, the verification partner provides objective assessments to let outcome funders know whether to release payments to investors. An evaluator assesses the effectiveness of the intervention for achieving the longer-term goals that DIB partners have targeted, such as changes in mortality and morbidity. A learning partner synthesizes and provides insights for continual program improvement. Verification data, insights, and learning offer opportunities to leverage the verification partner for multiple roles or work with other partners in complementary functions for monitoring, evaluation, and learning. Deciding in advance which roles the verification partner or the data the partner collects will play can assist in setting up the structure and processes needed, such as the data elements for collection, data use agreements needed, and procedures for protection and security of the data. Our scoping for the Utkrisht DIB heavily emphasized the auditor aspect of the verification partner role, but allowed for some interim input for DIB evaluation and learning, such as the evaluation of maternal health outcomes in the context of facility achievement of quality standards.

## **D. Planning a strong verification process**

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Our experiences with verification for the Utkrisht DIB to date highlight the additional core principles for consideration when selecting metrics, developing measurement approaches, and specifying the verification protocol within a DIB's unique context. Measures provide the foundation against which performance will be assessed, while the measurement approach offers the logistical details on how assessment will happen. Finally, the protocol for conducting verification creates the enabling environment to provide accurate, timely, and useful results to DIB stakeholders. There is still much to be learned about how to maximize value of the verification process to DIB partners and the field, especially given the multitude of roles a verification partner may play within the scope of being an independent third party.

## REFERENCES

- Bastemeijer, Carla M., Hileen Boosman, Hans van Ewijk, Lisanne M. Verweij, Lennard Voogt, and Jan A. Hazelzet. "Patient Experiences: A Systematic Review of Quality Improvement Interventions in a Hospital Setting." *Patient Related Outcome Measures*, vol. 10, 2019, pp. 157.
- Boschi-Pinto, C., Young, M., and Black, R. E. The Child Health Epidemiology Reference Group Reviews of the Effectiveness of Interventions to Reduce Maternal, Neonatal and Child Mortality. *International Journal of Epidemiology*, vol. 39, suppl. 1, pp., i3–i6, 2010.
- Braithwaite, Jeffrey. "Changing How We Think About Healthcare Improvement." *BMJ*, vol. 361, 2018.
- Centers for Medicare & Medicaid Services. "Blueprint for the CMS Measures Management System." Version 15.0. Woodlawn, MD: Centers for Medicare & Medicaid Services, September 2019. Available at <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/Downloads/Blueprint.pdf>.
- Chakravarthi, Indira. "Regulation of Private Health Care Providers in India: Current Status, Future Directions." *Indian Journal of Public Administration*, vol. 64, no. 4, 2018, pp. 587–598.
- Chassin, Mark R. "Improving the Quality of Health Care: What's Taking So Long?" *Health Affairs*, vol. 32, no. 10, 2013, pp. 1761–1765.
- Chawanpaiboon, S., J. Vogel, A-B. Moller, P. Lumbiganon, M. Petzold, and D. Hogan. "Global, Regional, and National Estimates of Levels of Preterm Birth in 2014: A Systematic Review and Modelling Analysis." *The Lancet Global Health*, vol. 7, no. 1, 2019. Available at [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30451-0/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30451-0/fulltext).
- Darmstadt, Gary L., Zulfiqar A. Bhutta, Simon Cousens, Taghreed Adam, Neff Walker, Luc De Bernis, and Lancet Neonatal Survival Steering Team. "Evidence-based, cost-effective interventions: how many newborn babies can we save?." *The Lancet*, vol. 365, no. 9463, 2005, pp. 977–988.
- Delaney, Megan Marx, Kate A. Miller, Lauren Bobanski, Shambhavi Singh, Vishwajeet Kumar, Ami Karlage, Danielle E. Tuller, et al. "Unpacking the Null: A Post-Hoc Analysis of a Cluster-Randomised Controlled Trial of the WHO Safe Childbirth Checklist in Uttar Pradesh, India (BetterBirth)." *The Lancet Global Health*, vol. 7, no. 8, 2019, pp. e1088–e1096.
- Detrick, Zoe, Sonja Firth, and Eliana Jimenez Soto. "Do Strategies to Improve Quality of Maternal and Child Health Care in Lower and Middle Income Countries Lead to Improved Outcomes? A Review of the Evidence." *PLOS One*, vol. 8, no. 12, 2013, pp. e83070.
- Donabedian, A. "The Quality of Care: How Can It Be Assessed?" *JAMA*, vol. 260, no. 12, 1988, pp. 1743–1748.
- Donabedian, A. "Evaluating the Quality of Medical Care. 1966." *The Milbank Quarterly*, vol. 83, no. 4, 2005, pp. 691–729. doi:10.1111/j.1468-0009.2005.00397.x. PMC 2690293. PMID 16279964.
- Doyle, Cathal, Laura Lennox, and Derek Bell. "A Systematic Review of Evidence on the Links Between Patient Experience and Clinical Safety and Effectiveness." *BMJ Open*, vol. 3, no. 1, 2013.
- FOGSI. "FOGSI Accreditation Standards." Available at <https://www.fogsi.org/wp-content/uploads/2016/12/FOGSI-CLINICAL-STANDARDS-for-accreditation-to-ensure-SAFE-DELIVERY.pdf>. Accessed July 2, 2020.

- Fox-Rushby, Julia A., and Frances Foord. "Costs, Effects and Cost-Effectiveness Analysis of a Mobile Maternal Health Care Service in West Kiang, The Gambia." *Health Policy*, vol. 35, no. 2, 1996, pp. 123–143.
- Goldie, Sue J., Steve Sweet, Natalie Carvalho, Uma Chandra Mouli Natchu, and Delphine Hu. "Alternative Strategies to Reduce Maternal Mortality in India: A Cost-Effectiveness Analysis." *PLOS Medicine*, vol. 7, no. 4, 2010, e1000264.
- Goli, Srinivas, Anu Rammohan, and Jalandhar Pradhan. "High Spending on Maternity Care in India: What Are the Factors Explaining It?" *PLOS One*, vol. 11, no. 6, 2016, e0156437.
- Goodman, David M., Rohit Ramaswamy, Marc Jeuland, Emmanuel K. Srofenyoh, Cyril M. Engmann, Adeyemi J. Olufolabi, and Medge D. Owen. "The Cost Effectiveness of a Quality Improvement Program to Reduce Maternal and Fetal Mortality in AaRegional Referral Hospital in Accra, Ghana." *PLOS One*, vol. 12, no. 7, 2017, e0180929.
- Government of Rajasthan. "Bhamashah Swasthya Bima Yojana 2017-2019." Rajasthan, India: Government of India. Available at <https://health.rajasthan.gov.in/content/dam/doiassets/Medical-and-Health-Portal/Bhamashah-Swasthya-Bima-Yojana/pdf/New%20Secondary%20Packages.pdf>.
- Government of South Australia and World Health Organization. "Progressing the Sustainable Development Goals Through Health in All Policies: Case Studies from Around the World." Adelaide, Australia: Government of South Australia, 2017. Available at [https://www.who.int/social\\_determinants/publications/Hiap-case-studies-2017/en/](https://www.who.int/social_determinants/publications/Hiap-case-studies-2017/en/).
- Gustafsson-Wright, Emily, Izzy Boggild-Jones, Dean Segell, and Justice Durland. "Impact Bonds in Developing Countries: Early Learning from the Field." Washington, DC: Brookings Institution, 2017.
- Hussey, Peter S., Samuel Wertheimer, and Ateev Mehrotra. "The Association Between Health Care Quality and Cost: A Systematic Review." *Annals of Internal Medicine*, vol. 158, no. 1, 2013, pp. 27–34.
- Islam, M. Kamrul, Ulf-G. Gerdtham, and World Health Organization. "The costs of maternal-newborn illness and mortality." Geneva, Switzerland: World Health Organization, 2006.
- Jhpiego. "Improving Quality of Maternal and Newborn Health in India." Baltimore, MD: Jhpiego, 2017. Available at <https://www.jhpiego.org/wp-content/uploads/2017/07/mnh-factsheet-april-2017.pdf>.
- Johnston, G., I.K. Crombie, E.M. Alder, H.T.O. Davies, and A. Millard. "Reviewing Audit: Barriers and Facilitating Factors for Effective Clinical Audit." *BMJ Quality & Safety*, vol. 9, no. 1, 2000, pp. 23–36.
- Kumar, Somesh, Vikas Yadav, Sudharsanam Balasubramaniam, Yashpal Jain, Chandra Shekhar Joshi, Kailash Saran, and Bulbul Sood. "Effectiveness of the WHO SCC on Improving Adherence to Essential Practices During Childbirth, in Resource Constrained Settings." *BMC Pregnancy and Childbirth*, vol. 16, no. 1, 2016, pp. 345.
- Magnam, Sanne. "Social Determinants of Health 101 for Health Care: Five Plus Five." Discussion paper. Washington, DC: National Academy of Medicine, 2017. Available at <https://nam.edu/social-determinants-of-health-101-for-health-care-five-plus-five/>.



- Mangham-Jefferies, Lindsay, Catherine Pitt, Simon Cousens, Anne Mills, and Joanna Schellenberg. "Cost-Effectiveness of Strategies to Improve the Utilization and Provision of Maternal and Newborn Health Care in Low-Income and Lower-Middle-Income Countries: A Systematic Review." *BMC Pregnancy and Childbirth*, vol. 14, no. 1, 2014, pp. 243.
- Memon, Parvez, Suranjeen Pallipamula, Dinesh Singh, Shivani Singh, Hema Divakar, and Yeshey Wangmo, Vikas Yadav, et al. "Quality Improved. Lessons Learned from a Quality Improvement Program for Private Maternity Care Facilities in India." Baltimore, MD: Jhpiego, n.d. Available at [https://www.merckformothers.com/docs/White\\_Paper\\_Merck\\_for\\_Mothers.pdf](https://www.merckformothers.com/docs/White_Paper_Merck_for_Mothers.pdf). Accessed July 2, 2020.
- National Accreditation Board for Hospitals and Healthcare Providers (NABH). "About Us." n.d. Available at <https://nabh.co/introduction.aspx#a1>. Accessed July 2, 2020.
- NABH. "National Accreditation Board for Hospitals and Healthcare Providers (NABH) Guide Book to Accreditation Standards for Hospitals (4th Edition)." New Delhi, India: NABH, December 2015. Available at [http://www.herai.in/admin/upload/resouce/4612066057Guidebook\\_for\\_Hospitals.pdf](http://www.herai.in/admin/upload/resouce/4612066057Guidebook_for_Hospitals.pdf).
- Penn-Kekana, Loveday, Timothy Powell-Jackson, Manon Haemmerli, Varun Dutt, Isabelle L. Lange, Aniva Mahapatra, Gaurav Sharma, et al. "Process Evaluation of a Social Franchising Model to Improve Maternal Health: Evidence from a Multi-Methods Study in Uttar Pradesh, India." *Implementation Science*, vol. 13, no. 1, 2018, pp. 124.
- Rahman, Mohammad Mahbubur, and Saseendran Pallikadavath. "How Much Do Conditional Cash Transfers Increase the Utilization of Maternal and Child Health Care Services? New Evidence from Janani Suraksha Yojana in India." *Economics & Human Biology*, vol. 31, 2018, pp. 164–183.
- Ricca, J. et al. "Uterotonic Use Immediately Following Birth: Using a Novel Methodology to Estimate Population Coverage in Four Countries." *BMC Health Services Research*, vol. 15, no. 9, 2015. Available at <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-014-0667-1#Tab3>.
- Schochet, Peter Z. "Technical Methods Report: Guidelines for Multiple Testing in Impact Evaluations." NCEE 2008-4018. Washington, DC: National Center for Education Evaluation and Regional Assistance, 2008.
- Semrau, Katherine E.A., Lisa R. Hirschhorn, Megan Marx Delaney, Vinay P. Singh, Rajiv Saurastri, Narender Sharma, Danielle E. Tuller, et al. "Outcomes of a Coaching-Based WHO Safe Childbirth Checklist Program in India." *New England Journal of Medicine*, vol. 377, no. 24, 2017, pp. 2313–2324.
- Shukla, Abhay, Abhijit More, and Shweta Marathe. "Making Private Health Care Accountable: Mobilising Civil Society and Ethical Doctors in India." *IDS Bulletin*, vol. 49, no. 2, 2018.
- Spector, Jonathan M., Angela Lashoer, Priya Agrawal, Claire Lemer, Gerald Dziekan, Rajiv Bahl, Matthews Mathai, et al. "Designing the WHO Safe Childbirth Checklist Program to Improve Quality of Care at Childbirth." *International Journal of Gynecology & Obstetrics*, vol. 122, no. 2, 2013, pp. 164–168.
- Tougher, Sarah, Varun Dutt, Shreya Pereira, Kaveri Haldar, Vasudha Shukla, Kultar Singh, Paresh Kumar, et al. "Effect of a Multifaceted Social Franchising Model on Quality and Coverage of Maternal, Newborn, and Reproductive Health-Care Services in Uttar Pradesh, India: A Quasi-Experimental Study." *The Lancet Global Health*, vol. 6, no. 2, 2018, pp. e211–e221.

- Tripathi, S., A. Srivastava, P. Memon, et al. "Quality of Maternity Care Provided by Private Sector Healthcare Facilities in Three States of India: A Situational Analysis." *BMC Health Services Research*, vol. 19, art. 971, 2019.
- UNICEF. *Health Equity Report 2016: Analysis of Reproductive, Maternal, Newborn, Child and Adolescent Health Inequities in Latin America and the Caribbean to Inform Policymaking*. Panama City, Panam: UNICEF, 2016. Available at [https://www.unicef.org/lac/sites/unicef.org/lac/files/2018-03/20161207\\_LACRO\\_APR\\_Informe\\_sobre\\_equidad\\_en\\_salud\\_EN\\_LR\\_0.pdf](https://www.unicef.org/lac/sites/unicef.org/lac/files/2018-03/20161207_LACRO_APR_Informe_sobre_equidad_en_salud_EN_LR_0.pdf)
- Verguet, Stéphane, Arindam Nandi, Véronique Filippi, and Donald A.P. Bundy. "Maternal-related Deaths and Impoverishment Among Adolescent Girls in India and Niger: Findings from a Modelling Study." *BMJ Open*, vol. 6, no. 9, 2016, e011586.
- Vora, Kranti S., Dileep V. Mavalankar, K.V. Ramani, Mudita Upadhyaya, Bharati Sharma, Sharad Iyengar, Vikram Gupta, et al. "Maternal Health Situation in India: A Case Study." *Journal of Health, Population, and Nutrition*, vol. 27, no. 2, 2009, pp. 184.
- World Bank Group. "External Health Expenditure Per Capita, PPP (Current International \$) – India." 2020. Available at <https://data.worldbank.org/indicator/SH.XPD.EHEX.PP.CD?locations=IN>.
- World Health Organization. *Making Choices in Health: WHO Guide to Cost-Effectiveness Analysis*, volume 1. Geneva, Switzerland: World Health Organization, 2003. Available at <https://www.who.int/choice/book/en/>.
- World Health Organization. *Standards for Improving Quality of Maternal and Newborn Care in Health Facilities*. Geneva, Switzerland: WHO, 2016. Available at <https://apps.who.int/iris/bitstream/handle/10665/249155/9789241511216-eng.pdf;jsessionid=2DC060D16405957F9C0AD41D42AEADD6?sequence=1>.

## APPENDIX A: SUPPLEMENTAL EXHIBITS

**Exhibit A.1. NABH and Manyata standards****NABH Standards:**

Acronym	Chapter
AAC	Access, Assessment and Continuity of Care
COP	Care of Patients (COP)
MOM	Management of Medication (MOM)
PRE	Patient Rights and Education (PRE)
HIC	Hospital Infection Control (HIC)
CQI	Continuous Quality Improvement (CQI)
ROM	Responsibilities of Management (ROM)
FMS	Facility Management and Safety (FMS)
HRM	Human Resource Management (HRM)
IMS	Information Management System (IMS)

Chapter	No	Standard	Objective elements
AAC	1	The SCHO defines and displays the services that it can provide.	<p>The services being provided are clearly defined.</p> <p>The defined services are prominently displayed.</p> <p>The relevant staff are oriented to these services.</p>
AAC	2	The SCHO has a documented registration, admission and transfer process.	<p>Process addresses registering and admitting outpatients, inpatients, and emergency patients.</p> <p>Process addresses mechanism for transfer or referral of patients who do not match the SHCO's resources.</p>
AAC	3	Patients cared for by the SHCO undergo an established initial assessment.	<p>The SHCO defines the content of the assessments for inpatients and emergency patients.</p> <p>The SHCO determines who can perform the assessments.</p> <p>The initial assessment for inpatients is documented within 24 hours or earlier.</p> <p>During all phases of care, there is a qualified individual identified as responsible for the patient's care, who coordinate the care in all the setting within the organization.</p>
AAC	4	Patient's care is continuous and all patients cared for by the SHCO undergo a regular assessment.	<p>All patients are reassessed at appropriate intervals.</p> <p>Staff involved in direct clinical care document reassessments</p> <p>Patients are reassessed to determine their response to treatment and to plan further treatment or discharge.</p>
AAC	5	Laboratory services are provided as per the scope of the SCHO's services and laboratory safety requirements.	<p>Scope of the laboratory services are commensurate with the services provided by the SHCO.</p> <p>Procedures guide collection, identification, handling, safe transportation, processing and disposal of specimens.</p> <p>Laboratory results are available within a defined time frame and critical results are intimated immediately to the concerned personnel.</p> <p>Laboratory personnel are trained in safe practices and are provided with appropriate safety equipment or devices.</p>

Chapter	No	Standard	Objective elements
<b>AAC</b>	6	Imaging services are provided as per the scope of the hospital's services and established radiation safety program.	<p>Imaging services comply with legal and other requirements.</p> <p>Scope of the imaging services are commensurate to the services provided by the SHCO.</p> <p>Imaging results are available within a defined time frame and critical results are intimated immediately to the concerned personnel.</p> <p>Imaging personnel are trained in safe practices and are provided with appropriate safety equipment / devices.</p>
<b>AAC</b>	7	The SHCO has a defined discharge process.	<p>Process addresses discharge of all patients including medico-legal cases (MLCs) and patients leaving against medical advice.</p> <p>A discharge summary is given to all the patients leaving the SHCO (including patients leaving against medical advice).</p> <p>Discharge summary contains the reasons for admission, significant findings, investigations results, diagnosis, procedure performed (if any), treatment given, and the patient's condition at the time of discharge.</p> <p>Discharge summary contains follow-up advice, medication and other instructions in an understandable manner.</p> <p>Discharge summary incorporates information about when and how to obtain urgent care.</p> <p>In case of death the summary of the case also includes the cause of death.</p>
<b>COP</b>	8	Care of patients is guided by accepted norms and practice.	<p>The care and treatment order are signed and dated by the concerned doctor.</p> <p>Clinical Practice Guidelines are adopted to guide patient care wherever possible.</p>
<b>COP</b>	9	Emergency services including ambulance and guided by documented procedures and applicable laws and regulations.	<p>Documented procedures address care of patients arriving in the emergency including handling of medico-legal cases.</p> <p>Staff should be well versed in the care of Emergency patients in consonance with the scope of the services of hospital.</p> <p>Admission or discharge to home or transfer to another organization is also documented.</p>
<b>COP</b>	10	Documented procedures define rational use of blood and blood products.	<p>The transfusion services are governed by the applicable laws and regulations.</p> <p>Informed consent is obtained for donation and transfusion of blood and blood products.</p> <p>Procedure addresses documenting and reporting of transfusion reactions.</p>
<b>COP</b>	11	Documented procedures guide the care of patients as per the scope of services provided by the SCHO in intensive care and high dependency units.	<p>Care of patients is in consonance with the documented procedures.</p> <p>Adequate staff and equipment are available.</p>
<b>COP</b>	12	Documented procedures guide the care of obstetrical patients as per the scope of services provided by the SCHO.	<p>The SHCO defines the scope of obstetric services.</p> <p>Obstetric patient's care includes regular antenatal check-ups, maternal nutrition, and postnatal care.</p> <p>The SHCO has the facilities to take care of neonates.</p>

Chapter	No	Standard	Objective elements
<b>COP</b>	13	Documented procedures guide the care of pediatric patients as per the scope of services provided by the SCHO.	<p>The SHCO defines the scope of its paediatric services.</p> <p>Provisions are made for special care of children by competent staff.</p> <p>Patient assessment includes detailed nutritional growth and immunization assessment.</p>
<b>COP</b>	13	Documented procedures guide the care of pediatric patients as per the scope of services provided by the SCHO (continued)	<p>Procedure addresses identification and security measures to prevent child or neonate abduction and abuse.</p> <p>The children's family members are educated about nutrition, immunization and safe parenting.</p>
<b>COP</b>	14	Documented procedures guide the administration of anaesthesia.	<p>There is a documented policy and procedure for the administration of anaesthesia.</p> <p>All patients for anaesthesia have a pre-anaesthesia assessment by a qualified or trained individual.</p> <p>The pre-anaesthesia assessment results in formulation of an anaesthesia plan which is documented.</p> <p>An immediate preoperative reevaluation is documented.</p> <p>Informed consent for administration of anaesthesia is obtained by the anesthetist.</p> <p>Anaesthesia monitoring includes regular and periodic recording of heart rate, cardiac rhythm, respiratory rate, blood pressure, oxygen saturation, airway security, and potency and level of anaesthesia.</p> <p>Each patient's post anaesthesia status is monitored and documented.</p>
<b>COP</b>	15	Documented procedures guide the care of patients undergoing surgical procedures.	<p>Surgical patients have a preoperative assessment and a provisional diagnosis documented prior to surgery.</p> <p>Informed consent is obtained by a surgeon prior to the procedure.</p> <p>Documented procedures address the prevention of adverse events like wrong site, wrong patient, and wrong surgery.</p> <p>Qualified persons are permitted to perform the procedures that they are entitled to perform.</p> <p>The operating surgeon documents the operative notes and postoperative plan of care.</p> <p>The operation theatre is adequately equipped and monitored for infection control practices.</p>
<b>MOM</b>	16	Documented procedures that guide the organization of pharmacy services and usage of medication.	<p>Documented procedures incorporate purchase, storage, prescription, and dispensation of medications.</p> <p>These comply with the applicable laws and regulations.</p> <p>Sound alike and look alike medications are stored separately.</p> <p>Medications beyond the expiry date are not stored or used.</p> <p>Documented procedures address procurement and usage of implantable prosthesis.</p>

Chapter	No	Standard	Objective elements
MOM	17	Documented procedures guide the prescription of medications.	<p>The SHCO determines who can write orders.</p> <p>Orders are written in a uniform location in the medical records.</p> <p>Medication orders are clear, legible, dated and signed.</p> <p>The SHCO defines a list of high-risk medication and process to prescribe them.</p>
MOM	18	Policies and procedures guide the safe dispensing of medications.	<p>Medications are checked prior to dispensing including expiry date to ensure that they are fit for use.</p> <p>High risk medication orders are verified prior to dispensing.</p>
MOM	19	There are defined procedures for medication administration.	<p>Medications are administered by trained personnel.</p> <p>High risk medication orders are verified prior to administration, medication order including patient, dosage, route and timing are verified.</p> <p>Prepared medication is labelled prior to preparation of second drug.</p> <p>Medication administration is documented.</p> <p>A proper record is kept of the usage administration and disposal of narcotics and psychotropic medication.</p>
MOM	20	Adverse drug events are monitored.	<p>Adverse drug event are defined and monitored.</p> <p>Adverse drug events are documented and reported within a specified time frame.</p>
PRE	21	Patient rights are documented displayed and support individual beliefs, values and involve the patient and family in decision making process.	<p>Patient rights include respect for personal dignity and privacy during examination procedures and treatment.</p> <p>Patient rights include protection from physical abuse or neglect.</p> <p>Patient rights include treating patient information as confidential.</p> <p>Patient rights include obtaining informed consent before carrying out procedures.</p> <p>Patient rights include information on how to voice a complaint.</p> <p>Patient rights include on the expected cost of the treatment.</p> <p>Patient has a right to have an access to his / her clinical records.</p>
PRE	22	Patient families have a right to information and education about their healthcare needs.	<p>Patients and families are educated on plan of care, preventive aspects, possible complications, medications, the expected results and cost as applicable.</p> <p>Patients are taught in a language and format that they can understand.</p>
HIC	23	The SCHO has an infection control manual which it periodically updates; the SHCO conducts surveillance activities.	<p>It focuses on adherence to standard precautions at all times.</p> <p>Cleanliness and general hygiene of facilities will be maintained and monitored.</p> <p>Cleaning and disinfection practices are defined and monitored as appropriate.</p> <p>Equipment cleaning, disinfection and sterilization practices are included.</p> <p>Laundry and linen management processes are also included.</p>

Chapter	No	Standard	Objective elements
HIC	24	The SCHO takes actions to prevent or reduce the risks of hospital associated infections (HAI) in patient and employees.	<p>Hand hygiene facilities in all patient care areas are accessible to health care provide.</p> <p>Adequate gloves, masks, soaps, and disinfectants are available and used correctly.</p> <p>Appropriate pre and post exposure prophylaxis is provided to all concerned staff members.</p>
HIC	25	Bio-medical management practices are followed.	<p>The hospital is authorized by prescribed authority for management and handling of bio-medical waste.</p> <p>Proper segregation and collection of bio-medical waste from all patient care areas of the hospital is implemented and monitored.</p> <p>Bio-medical waste treatment facility is managed as per statutory provisions (if in-house) or outsourced to authorized contractors.</p> <p>Requisite fees, documents and reports are submitted to competent authorities on stipulated dates.</p>
HIC	25	Bio-medical management practices are followed (continued).	<p>Appropriate personal protective measures are used by all categories of staff handling bio-medical waste.</p>
CQI	26	There is a structures quality improvement and continuous monitoring programme in the organisation.	<p>There is a designated individual for coordinating and implementing the quality improvement program.</p> <p>The quality improvement programme is a continuous process and updated at least once in a year.</p> <p>Hospital Management makes available adequate resources required for quality improvement program.</p>
CQI	27	The SCHO identifies key indicators to monitor the structures, processes, and outcomes which are used as tools for continuous improvement.	<p>The SHCO identifies the appropriate key performance indicators in both clinical and managerial areas.</p> <p>These indicators shall be monitored.</p>
ROM	28	The responsibilities of management are defined.	<p>The SHCO has a documented organogram.</p> <p>The SHCO is registered with appropriate authorities as applicable.</p> <p>The SHCO has a designated individual(s) to oversee the hospital-wide safety program.</p>
ROM	29	The organization is managed by the leaders in an ethical manner.	<p>The management makes public the mission statement of the organization.</p> <p>The leaders/management guide the organization to function in an ethical manner.</p> <p>The organization discloses its ownership.</p> <p>The organization's billing process is accurate and ethical.</p>
FMS	30	The SHCO's environment and facilities operate to ensure safety of patients, their families, staff and visitors.	<p>Internal and external signage shall be displayed in a language understood by the patients or families and communities.</p> <p>Maintenance staff is contactable round the clock for emergency repairs.</p> <p>The SHCO has a system to identify the potential safety and security risks including hazardous materials.</p> <p>Facility inspection rounds to ensure safety are conducted periodically.</p> <p>There is a safety education programme for relevant staff.</p>



Chapter	No	Standard	Objective elements
<b>FMS</b>	31	The SCHO has a program for clinical and support service equipment management.	The SHCO plans for equipment in accordance with its services. There is a documented operational and maintenance (preventive and breakdown) plan.
<b>FMS</b>	32	The SCHO has provisions for safe water, electricity, medical gas, and vacuum systems.	Potable water and electricity are available round the clock. Alternate sources are provided for in case of failure and tested regularly. There is a maintenance plan for medical gas and vacuum systems.
<b>FMS</b>	33	The SCHO has plans for fire and non-fire emergencies within the facilities.	The SHCO has plans and provisions for early detection, abatement, and containment of fire and non-fire emergencies. The SHCO has a documented safe exit plan in case of fire and non-fire emergencies. Staff is trained for their role in case of such emergencies. Mock drills are held at least twice in a year.
<b>HRM</b>	34	The SCHO has an ongoing programme for professional training and development of the staff.	All staff is trained on the relevant risks within the hospital environment. Staff members can demonstrate and take actions to report, eliminate/ minimize risks. Training also occurs when job responsibilities change/ new equipment is introduced.
<b>HRM</b>	35	The SCHO has a well-documented disciplinary and grievance handling procedure.	A documented procedure regarding disciplinary and grievance handling is in place. The documented procedure is known to all categories of employees in the SHCO. Actions are taken to redress the grievance.
<b>HRM</b>	36	The SCHO addresses the health needs of employees.	Health problems of the employees are taken care of in accordance with the SHCO's policy. Occupational health hazards are adequately addressed.
<b>HRM</b>	37	There is documented personal record for each staff member.	Personal files are maintained in respect of all employees. The personal files contain personal information regarding the employee's qualification, disciplinary actions and health status.
<b>IMS</b>	38	The SCHO has a complete and accurate medical record for every patient.	Every medical record has a unique identifier. The SHCO identifies those authorized to make entries in medical record. Every medical record entry is dated and timed. The author of the entry can be identified. The contents of medical records are identified and documented.

Chapter	No	Standard	Objective elements
IMS	39	The medical record reflects continuity of care.	<p>The records provides an up-to-date and chronological account of patient care.</p> <p>The medical record contains information regarding reasons of admission, diagnosis and plan of care.</p> <p>Operative and other procedures performed are incorporated in the medical record.</p> <p>The medical record contains a copy of the discharge note duly signed by the appropriate and qualified personnel.</p> <p>In case of death, the medical records contain a copy of the death certificate indicating the cause, date and time of death.</p> <p>Care providers have access to current and past medical record.</p>
IMS	40	Documented policies and procedures are in place for maintaining confidentiality, security, and integrity of records, data and information.	<p>Documented procedures exist for maintaining confidentiality, security and integrity of information.</p> <p>Privileged health information is used for the purposes identified or as required by law and not disclosed without the patient's authorization.</p>
IMS	41	Documented procedures exist for retention of the patient's records, data and information.	<p>Documented procedures exist for retention time of the patient's clinical records, data and information.</p> <p>The retention process provides expected confidentiality and security.</p> <p>The destruction of medical records, data, and information is in accordance with the laid down procedure.</p>

**Manyata Standards:**

No	Standard	No	Objective elements
1	Provider screens for key clinical conditions that may lead to complications during pregnancy	1	Screens for anemia
		2	Screens for hypertensive disorders of pregnancy
		3	Screens for DM
		4	Screens for HIV
		5	Screens for syphilis
		6	Screens for malaria
		7	Establishes blood group and Rh type during first ANC visit
2	Provider prepares for safe care during delivery (to be checked every day)	1	Ensures sterile/ HLD delivery tray is available
		2	Ensures functional items for newborn care and resuscitation
3	Provider assesses all pregnant women at admission	1	Takes obstetric, medical and surgical history
		2	Assesses gestational age correctly
		3	Records fetal heart rate
		4	Records mother's BP and temperature
4	Provider conducts PV examination appropriately	1	Conducts PV examination as per indication
		2	Conducts PV examination following infection prevention practices and records findings
5	Undertakes timely assessment of cervical dilatation and descent to monitor the progress of labour	1	Undertakes timely assessment of cervical dilatation and descent to monitor the progress of labour
		2	Interprets partograph (condition of mother and fetus and progress of labour) correctly and adjusts care according to findings
6	Provider ensures respectful and supportive care	1	Encourages and welcomes the presence of a birth companion during labour
		2	Treats pregnant woman and her companion cordially and respectfully (RMC), ensures privacy and confidentiality for pregnant woman during her stay
		3	Explains danger signs and important care activities to mother and her companion
7	Provider assists the woman to have a safe and clean birth	1	Provider ensures six 'cleans' while conducting delivery
		2	Performs episiotomy only when indicated with the use of appropriate local anesthetic
		3	Provider allows spontaneous delivery of head by flexing it and giving perineal support; manages cord round the neck; assists delivery of shoulders and body
8	Provider conducts a rapid initial assessment and performs immediate newborn care (if baby cried immediately)	1	Delivers the baby on mother's abdomen
		2	Ensures immediate drying, and asses breathing
		3	Performs delayed cord clamping and cutting
		4	Ensures early initiation of breastfeeding
		5	Assesses the newborn for any congenital anomalies
		6	Weighs the baby and administers Vitamin K
9	Provider performs Active Management of Third Stage of Labour (AMTSL)	1	Performs AMTSL and examines placenta thoroughly

No	Standard	No	Objective elements
10	Provider identifies and manages Post-Partum Hemorrhage (PPH)	1	Assesses uterine tone and bleeding per vaginum regularly after delivery
		2	Identifies shock
		3	Manages shock
		4	Manages atonic PPH
		5	Manages PPH due to retained placenta/ placental bits
11	Provider identifies and manages severe Pre-eclampsia/Eclampsia (PE/E)	1	Identifies mothers with severe PE/E
		2	Gives correct regimen of Inj. MgSO <sub>4</sub> for prevention and management of convulsions
		3	Facilitates prescription of anti- hypertensives
		4	Ensures specialist attention for care of mother and newborn
		5	Performs nursing care
12	Provider performs newborn resuscitation if baby does not cry immediately after birth	1	Performs steps for resuscitation within first 30 seconds
		2	Initiates bag and mask ventilation for 30 seconds if baby still not breathing
		3	Takes appropriate action if baby doesn't respond to ambu bag ventilation after golden minute
		4	Performs advanced resuscitation in babies not responding to basic resuscitation when chest is rising and heart rate is < 60 per minute
13	Provider ensures care of newborn with small size at birth	1	Facilitate specialist care in newborn weighing <1800 gm
		2	Facilitates assisted feeding whenever required
		3	Facilitates thermal management including kangaroo mother care (KMC)
14	The facility adheres to universal infection prevention protocols	1	Instruments and re-usable items are adequately and appropriately processed after each use
		2	Biomedical waste is segregated and disposed of as per the guidelines
		3	Performs hand hygiene before and after each procedure, and sterile gloves are worn during delivery and internal examination
15	Provider ensures adequate postpartum care package is offered to the mother and the baby - at discharge	1	Conducts proper physical examination of mother and newborn during postpartum visits
		2	Identifies and appropriately manages maternal and neonatal sepsis
		3	Correctly diagnoses postpartum depression based on history and symptoms
		4	Counsels on importance of exclusive breast feeding
		5	Counsels on danger signs, post- partum family planning
16	Provider reviews clinical practices related to C-section at regular intervals	1	Ensures classification as per Robson's criteria and reviews indications and complications of C-section at regular intervals

**Exhibit A.2.** Mean scores by NABH chapter, by round

NABH Chapter	Round 1 (N = 21 facilities)		Round 2 (N = 42 facilities)		Round 3 (N = 43 facilities)	
	Average share of points earned (%)	SHCOs that passed chapter (%)	Average share of points earned (%)	SHCOs that passed chapter (%)	Average share of points earned (%)	SHCOs that passed chapter (%)
1	85%	100%	79%	100%	86%	100%
2	85%	100%	74%	100%	77%	100%
3	80%	100%	75%	100%	80%	100%
4	99%	100%	96%	100%	99%	100%
5	88%	100%	80%	98%	86%	98%
6	80%	100%	72%	98%	87%	100%
7	88%	100%	85%	100%	89%	100%
8	79%	100%	73%	98%	79%	100%
9	79%	95%	70%	100%	85%	100%
10	83%	100%	75%	98%	80%	100%

Source: Mathematica verification assessment data.

Notes: Calculations were based on 106 facility assessments of 92 unique facilities, including those in progressive stages, not quite considered ready to meet certification (14 facilities were assessed during two rounds of verification).

**Exhibit A.3.** Mean scores by Manyata standard, by round

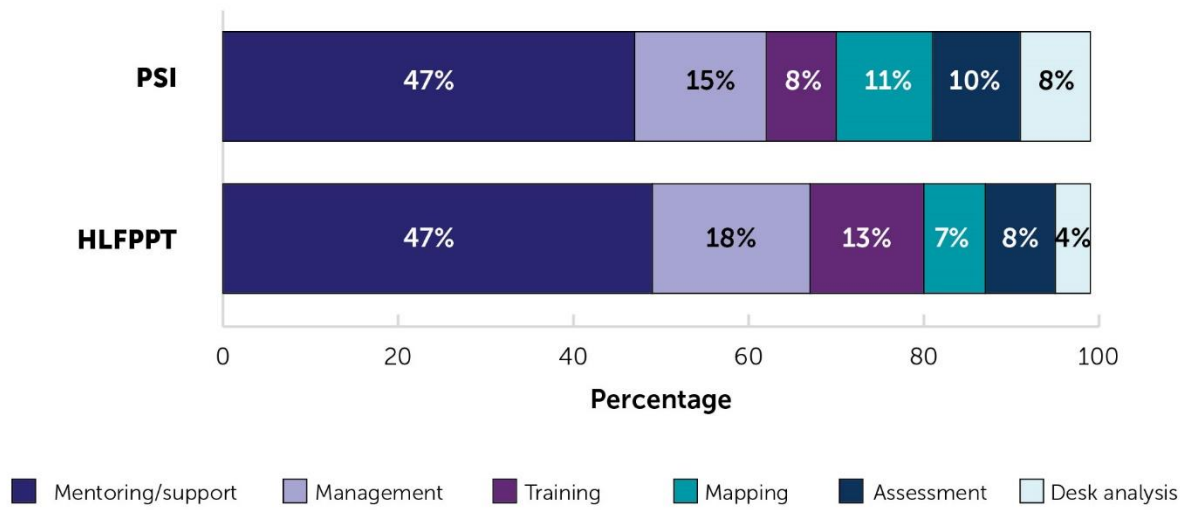
Manyata Standard	Round 1 (N = 21 facilities)		Round 2 (N = 42 facilities)		Round 3 (N = 10 facilities**)	
	Average share of points earned (%)	SHCOs that passed standard (%)	Average share of points earned (%)	SHCOs that passed standard (%)	Average share of points earned (%)	SHCOs that passed standard (%)
1	90%	48%	76%	17%	79%	10%
2	100%	100%	91%	76%	85%	60%
3	97%	86%	95%	81%	99%	90%
4*	100%	100%	87%	52%	88%	50%
5	23%	19%	26%	17%	59%	40%
6	98%	90%	85%	71%	90%	60%
7	100%	100%	97%	88%	94%	60%
8*	98%	81%	91%	50%	89%	50%
9*	98%	95%	92%	64%	86%	30%
10*	95%	48%	83%	19%	89%	40%
11*	89%	43%	74%	21%	82%	30%
12*	97%	62%	85%	38%	76%	0%
13	73%	52%	59%	52%	49%	40%
14	93%	81%	90%	62%	94%	60%
15	96%	81%	81%	62%	83%	50%
16	24%	14%	26%	17%	10%	10%
Simulation standards	96%	N/A	85%	N/A	85%	N/A
Non-sim. standards	86%	N/A	78%	N/A	80%	N/A

Source: Mathematica verification assessment data.

Notes: \* indicates that Manyata standard was assessed using simulations in Round 3. All facilities in Round 1 were progressive.

\*\* In Round 3, only 10 facilities for which outcomes data were provided were assessed on Manyata standards; the other facilities received official Manyata verification. Source: Mathematica verification assessment data.

**Exhibit A.4.** Service provider costs, by activity



Source: Cost data provided by implementation partners.

**Exhibit A.5. Average facility costs by type**

Cost type	Group	Overall			Met DIB Certification Level			Did not meet DIB Certification Level		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
<b>Total</b>	<b>Overall</b>	7,488.87	1.06	45,732.81	7,702.09	13.17	36,064.41	7,075.75	1.06	45,732.81
	HLFPPT	9,988.25	1.06	45,732.81	9,102.15	13.17	36,064.41	11,871.21	1.06	45,732.81
	PSI	4,648.67	138.34	16,872.13	6,002.03	268.05	16,872.13	2,280.29	138.34	8,123.92
<b>Capital</b>	<b>Overall</b>	302.26	-	4,755.16	365.86	-	4,755.16	179.05	0.20	1,565.16
	HLFPPT	427.70	-	4,755.16	491.39	-	4,755.16	292.37	1.06	1,565.16
	PSI	159.71	-	1,339.46	213.42	-	1,339.46	65.73	0.20	322.17
<b>Labor</b>	<b>Overall</b>	8,240.82	-	84,793.88	9,227.95	-	84,793.88	6,328.25	-	45,724.97
	HLFPPT	8,867.29	-	45,724.97	7,697.62	-	35,276.25	11,352.83	-	45,724.97
	PSI	7,528.92	-	84,793.88	11,086.21	-	84,793.88	1,303.66	44.66	8,119.93
<b>Materials</b>	<b>Overall</b>	1,007.03	2.77	9,011.59	1,046.03	2.77	9,011.59	909.53	57.52	4,096.18
	HLFPPT	1,019.49	2.77	4,842.08	1,194.09	2.77	4,842.08	452.02	140.78	710.03
	PSI	1052.46	995.26	24.81	9,011.59	885.62	24.81	9,011.59	1,214.54	57.52

Source: Cost data provided by implementation partners.

Notes: Units in 2018 USD.

**Exhibit A.6. Health status outcomes (mean, min, max)**

Outcome	Total	PSI	HLFPPT	HQ	Non-HQ
Caesarean rate (%)	0.40 (0.03, 0.73)	0.43 (0.03, 0.73)	0.37 (0.07, 0.69)	0.48 (0.17, 0.73)	0.27 (0.03, 0.63)
Complication rate (%)	0.03 (0, 0.21)	0.03 (0, 0.21)	0.03 (0, 0.21)	0.02 (0, 0.21)	0.03 (0, 0.19)
Uterotonics administered during TSL (%)	0.99 (0.94, 1)	0.99 (0.94, 1)	1 (0.94, 1)	0.99 (0.94, 1)	0.99 (0.96, 1)
High risk delivery rate (%)	0.04 (0, 0.43)	0.03 (0, 0.20)	0.05 (0, 0.43)	0.03 (0, 0.22)	0.05 (0, 0.43)
Preterm rate (%)	0.03 (0, 0.19)	0.02 (0, 0.15)	0.03 (0, 0.19)	0.03 (0, 0.15)	0.03 (0, 0.19)
LBW rate (%)	0.02 (0, 0.16)	0.02 (0, 0.10)	0.03 (0, 0.16)	0.02 (0, 0.10)	0.03 (0, 0.16)
Internal SNCU/NICU referral rate (%)	0.04 (0, 0.44)	0.02 (0, 0.28)	0.06 (0, 0.44)	0.03 (0, 0.22)	0.05 (0, 0.44)
Number of neonatal deaths	6	5	1	4	2

Source: Health outcomes data provided by Palladium.

**Exhibit A.7. Association between overarching scores and health outcomes**

Independent variable (passing level)	Caesarean rate (live births)			Complication rate (total deliveries)			Uterotonics administered during TSL (total deliveries)			High risk delivery rate (total deliveries)			Preterm rate (total deliveries)			Low birth weight rate			Proportion of live births referred to internal SNCU/NICU			Facility had any neonatal deaths		
	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail Mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.
Progressive (overall)	41.9	39.21	<b>-2.42</b>	3.2	2.51	<b>-.45</b>	99.04	99.23	<b>0</b>	6.47	3.31	<b>-3.58</b>	2.93	2.6	<b>-.43</b>	3.02	2.17	<b>-.67</b>	3.49	4.08	<b>.93</b>	5.26	5.75	<b>10.84</b>
Certification (overall)	40.49	38.27	<b>-1.61</b>	2.58	2.73	<b>-1.21</b>	99.25	99.1	<b>-.17</b>	4.19	3.32	<b>-2.6</b>	2.77	2.46	<b>-1.82</b>	2.5	2.01	<b>-.95</b>	4.18	3.61	<b>1.28</b>	5.88	5.26	<b>4.81</b>
Manyata progressive	42.04	39.28	<b>-3.34</b>	3.59	2.47	<b>-.3</b>	99.13	99.21	<b>-.06</b>	5.72	3.55	<b>-1.7</b>	2.65	2.66	<b>.11</b>	3.26	2.16	<b>-.79</b>	3.7	4.02	<b>.07</b>	6.25	5.56	<b>11.16</b>
Manyata certification	40.49	38.27	<b>-1.61</b>	2.58	2.73	<b>-1.21</b>	99.25	99.1	<b>-.17</b>	4.19	3.32	<b>-2.6</b>	2.77	2.46	<b>-1.82</b>	2.5	2.01	<b>-.95</b>	4.18	3.61	<b>1.28</b>	5.88	5.26	<b>4.81</b>

Source: Mathematica verification assessment data and health outcomes data provided by Palladium.

Note: For a given outcome and overarching score, the table reports the unadjusted mean of the outcome among facilities that did not achieve (“fail mean”) the overall score (e.g., passing Manyata at certification level) and the unadjusted mean for those that did achieve the overall score (“pass mean”), as well as the adjusted difference between the two means (“adj. diff.”).  
 \* / \*\*\* significant at the 0.05/0.0006 level.

**Exhibit A.8. Association between passing individual Manyata standards and health outcomes**

Manyata Standard	Caesarean rate (live births)			Complication rate (total deliveries)			Uterotonics administered during TSL (total deliveries)			High risk delivery rate (total deliveries)			Preterm rate (total deliveries)			Low birth weight rate			Proportion of live births referred to internal SNCU/NICU			Facility had any neonatal deaths		
	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.	Fail mean	Pass mean	Adj. diff.
1	40.19	37.28	<b>-6.76</b>	3.03	.72	<b>-2.05*</b>	99.26	98.88	<b>-.34</b>	4.1	2.79	<b>-2.89</b>	2.57	3.09	<b>-.03</b>	2.25	2.71	<b>-.19</b>	3.98	3.96	<b>-2.12</b>	4.55	11.11	<b>-1.74</b>
2	38.47	40.67	<b>-1.37</b>	2.84	2.48	<b>1.78</b>	99.31	99.1	<b>-.14</b>	5.18	2.83	<b>-.79</b>	2.69	2.64	<b>-.83</b>	2.38	2.28	<b>-.37</b>	3.3	4.51	<b>-.32</b>	4.26	6.78	<b>-8.12</b>
3	39.42	39.9	<b>-1.43</b>	2.39	2.82	<b>2.71</b>	99.06	99.29	<b>.04</b>	3.28	4.32	<b>1.39</b>	2.28	2.94	<b>.78</b>	1.89	2.64	<b>.49</b>	3.48	4.34	<b>-1.35</b>	4.44	6.56	<b>.79</b>
4	39.86	39.49	<b>-.31</b>	3.44	1.67	<b>-2.69</b>	99.23	99.15	<b>-.15</b>	3.68	4.12	<b>1.85</b>	2.11	3.32	<b>1.18</b>	2.09	2.61	<b>-.21</b>	3.24	4.87	<b>.65</b>	6.9	4.17	<b>-8.46</b>
5	40.4	35.38	<b>-4.78</b>	2.7	2.25	<b>-.6</b>	99.17	99.33	<b>.14</b>	3.57	5.74	<b>2.96</b>	2.08	6.15	<b>4.47***</b>	2	4.28	<b>2.99*</b>	3.44	7.19	<b>5.26</b>	5.49	6.67	<b>-3.03</b>
6	37.87	41.38	<b>3.12</b>	2.58	2.69	<b>.86</b>	99.18	99.21	<b>.06</b>	4.86	2.97	<b>-4.19*</b>	2.75	2.58	<b>-1.12</b>	2.23	2.41	<b>.24</b>	3.03	4.85	<b>2.12</b>	3.92	7.27	<b>-1.27</b>
7	40.12	39.41	<b>-2.18</b>	2.54	2.7	<b>.06</b>	99.15	99.22	<b>-.08</b>	3.92	3.85	<b>2.27</b>	2.33	2.88	<b>2.77</b>	2.14	2.45	<b>1.23</b>	3.52	4.27	<b>-3.72</b>	4.76	6.25	<b>13</b>
8	38.44	41.53	<b>.32</b>	2.8	2.4	<b>.22</b>	99.21	99.17	<b>.11</b>	4.65	2.74	<b>-2.49</b>	2.66	2.66	<b>-1.02</b>	2.4	2.22	<b>-.25</b>	4.44	3.3	<b>-3.05</b>	4.76	6.98	<b>.38</b>
9	39.41	40.01	<b>-2.95</b>	2.87	2.37	<b>-.7</b>	99.17	99.22	<b>.2</b>	3.52	4.27	<b>3.36</b>	2.53	2.8	<b>1.18</b>	2.22	2.44	<b>1.06</b>	3.18	4.87	<b>2.86</b>	7.14	4	<b>-14.69</b>
10	39.33	41.09	<b>3.61</b>	2.71	2.34	<b>.25</b>	99.19	99.19	<b>-.3</b>	3.66	4.68	<b>1.36</b>	2.4	3.66	<b>1</b>	2.25	2.61	<b>.41</b>	3.22	6.87	<b>5.03</b>	5.95	4.55	<b>-1.59</b>
11	39.95	38.66	<b>-5.49</b>	2.6	2.79	<b>.92</b>	99.17	99.28	<b>.28</b>	3.76	4.34	<b>1.13</b>	2.43	3.59	<b>.31</b>	2.27	2.56	<b>-.1</b>	3.98	3.94	<b>-1.03</b>	2.35	19.05	<b>19.77*</b>
12	39.21	40.97	<b>3.1</b>	2.79	2.24	<b>-.24</b>	99.18	99.22	<b>-.18</b>	4.06	3.4	<b>2.06</b>	2.61	2.8	<b>.12</b>	2.31	2.35	<b>.37</b>	3.28	5.83	<b>3.48</b>	5.19	6.9	<b>-2.09</b>
13	39.69	39.7	<b>-.11</b>	2.39	3.1	<b>1.29</b>	99.18	99.23	<b>-.09</b>	2.84	5.81	<b>2.14</b>	2.58	2.81	<b>-.5</b>	2.16	2.62	<b>-.66</b>	3.4	5.05	<b>-2.27</b>	2.9	10.81	<b>10.48</b>
14	37.37	42.39	<b>2.24</b>	3.02	2.19	<b>-.76</b>	99.12	99.28	<b>-.13</b>	5.14	2.4	<b>-2.65</b>	3.14	2.1	<b>-1.38</b>	2.46	2.17	<b>-.35</b>	3.93	4.03	<b>-2.39</b>	5.26	6.12	<b>-2.8</b>
15	38.8	40.77	<b>7.28*</b>	2.94	2.27	<b>.93</b>	99.15	99.25	<b>.41</b>	3.63	4.18	<b>.25</b>	2.47	2.89	<b>-.32</b>	2.44	2.18	<b>-1.44</b>	3.78	4.21	<b>-2.74</b>	3.45	8.33	<b>.74</b>
16	38.89	46.64	<b>3.25</b>	2.46	4.13	<b>2.14</b>	99.2	99.09	<b>-.36</b>	4.08	2.15	<b>-.37</b>	2.69	2.42	<b>-.46</b>	2.3	2.52	<b>.61</b>	3.86	4.98	<b>1.08</b>	4.21	18.18	<b>1.86</b>

Source: Mathematica verification assessment data and health outcomes data provided by Palladium.

Note: For a given outcome and score, the table reports the unadjusted mean of the outcome among facilities that did not achieve (“fail mean”) the overall score (e.g., passing Manyata at certification level) and the unadjusted mean for those that did achieve the overall score (“pass mean”), as well as the adjusted difference between the two means (“adj. diff.”).  
 \* / \*\*\* significant at the 0.05/0.0006 level.



**Exhibit A.9.** Six-week verification timeline

