

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<u>http://bmjopen.bmj.com</u>).

If you have any questions on BMJ Open's open peer review process please email <u>info.bmjopen@bmj.com</u>

BMJ Open

BMJ Open

Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea

Journal:	BMJ Open
Manuscript ID	bmjopen-2021-050150
Article Type:	Original research
Date Submitted by the Author:	13-Feb-2021
Complete List of Authors:	Hou, Xiaohui ; World Bank Group, Health, Nutrition and Population Global Practice Khan, M. Mahmud ; University of Georgia College of Public Health Pulford, Justin; Liverpool School of Tropical Medicine, ; Papua New Guinea Institute of Medical Research, Saweri, Olga; Papua New Guinea Institute of Medical Research
Keywords:	OBSTETRICS, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT





I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our <u>licence</u>.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

reliez oni

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

1 2 3 4 5 6 7 8 9	
10 11 12 13 14 15 16 17 18 19	Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea
20 21 22 23 24 25 26 27 28 29	
30 31 32 33 34 35 36 37 38 39	
40 41 42 43 44 45 46 47 48 49 50	
51 52 53 54 55 56 57 58 59 60	1 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Readiness of health facilities to Provide Emergency Obstetric Care in Papua New Guinea

Xiaohui Hou, Ph.D.

Health, Nutrition, and Population Global Practice World Bank 1818 H. Street. NW, 20433 Washington DC xhou@worldbank.org

M. Mahmud Khan, Ph.D.

Health Policy and Management Department College of Public Health University of Georgia Wright Hall, Health Sciences Campus, 100 Foster Road, Athens, GA 30602 <u>Mahmud.Khan@uga.edu</u>

Justin Pulford, Ph.D.

Senior Lecturer Department of International Public Health Liverpool School of Tropical Medicine justin.pulford@lstmed.ac.uk

Olga P. M. Saweri MSc

Papua New Guinea Institute of Medical Research (PNGIMR) PO Box 60, Goroka, EHP 441, Papua New Guinea <u>olga.saweri@gmail.com</u>

Declarations of interest: none Corresponding Author: **M. Mahmud Khan, Ph.D.**

Key words

Maternal Health, Emergency Obstetric Care, Papua New Guinea

Total word count: 4135

Credit author statement

Xiaohui Hou: Conceptualization, Methodology, Supervision, Project Administration, Resources, Writing-Original Draft, Writing – review & editing

M. Mahmud Khan: Conceptualization, Methodology, Supervision, Formal Analysis, Writing-Original Draft, Writing – review & editing

Justin Pulford: Conceptualization, Methodology, Data Curation, Data Validation, Writing-Review & Editing.

Olga P. M. Saweri: Data Curation, Data Validation, Writing-Review & Editing

Details of funding source

This work was funded by World Bank's Trust Fund supported by Australia's Department of Foreign Affairs and Trade.

Abstract

Objective

To understand and measure the readiness of health facilities in Papua New Guinea to provide emergency obstetric care.

Methods

Data were collected via a national, cross-sectional health facility survey including all upper-level facilities (levels 5-7) and sixty lower-level (levels 3-4) facilities operational in Papua New Guinea at the time of survey. We defined four categories of readiness to provide obstetric care services: (1) facility readiness to provide clinical services; (2) availability of family planning items; (3) availability of maternal and neonatal equipment and materials; and (4) the ability of the facility to provide emergency obstetric care services.

Results

40% of level 3 and 4 facilities were not able to provide Basic Emergency Obstetric Care (BEmOC). Even among higher level facilities (levels 5, 6 and 7), 10% of facilities were not able to perform one or more of the necessary functions required to be considered a BEmOC provider. 11% of level 3 and 4 health facilities were able to provide comprehensive emergency obstetric care (CEmOC) as compared to 83% of higher level facilities.

Conclusion

Given the high fertility rate in PNG, lack of obstetric first aid and basic EmOC at level 3 and 4 facilities, the first level inpatient service providers, is a major concern. To improve access to emergency obstetric care, most of the level 3 and 4 facilities should be upgraded to provide at least BEmOC services.



Strengths and limitations of this study

- All the hospitals and randomly selected health centers in Papua New Guinea were surveyed;
- The quality of care evaluation method follows the Donabedian approach.
- The readiness and quality of providing obstetric care were assessed by constructing relevant indicators;
- The study did not try to connect the services availability and readiness measures with health outcomes of the population at the subnational level

to beet tellew only

Introduction

Emergency Obstetric Care(EmOC) is a cost-effective intervention vital to avert common adverse pregnancy and/or birth outcomes, which significantly contribute to maternal mortality in poor resource settings [1-4]. Basic Emergency Obstetric Care(BEmOC) alone can avert a significant proportion of maternal deaths and up to 40% of neonatal deaths [5]. A global assessment found that BEmOC facilities are consistently not available in sufficient numbers, both in countries with high and moderate levels of maternal mortality [6]. Comprehensive Emergency Obstetric Care (CEmOC) availability, which includes the provision of caesarean and blood transfusion services in addition to the key functions included in BEmOC, is also low in many low and middle income countries [7].

Maternal and child health remains a key priority area in Papua New Guinea (PNG) [8]; however, persistent maternal and neonatal deaths reflect numerous deficiencies. Maternal mortality in PNG is approximately 500 per 100 000 live births [9, 10], while neonatal mortality is 28 per 1000 live births [11]. Further, the World Health Organization model ranks PNG 130th in the world in terms of maternal mortality rate (MMR), which indicates a relatively high-risk of adverse outcomes in terms of maternal and child health[12]. The 2016-2018 PNG Demographic and Health Survey (DHS) report indicates that only 17% of pregnancies received a prenatal visit in the first trimester and 49% had four or more prenatal visits over the whole pregnancy[13]. On average 55% of deliveries were supervised by a trained health worker at a health facility between 2012-2017 [14].

Given the high MMR and low access to delivery services, it is important to assess the readiness of health facilities in the provision of emergency obstetric care in PNG. PNG has a relatively high total fertility rate [13], which implies that the demand for maternal health services will continue to increase rapidly, emphasizing the urgent need to strengthen maternal healthcare service delivery.

The purpose of this study is to measure health facility readiness to provide obstetric care and the quality of such services provided in PNG, through conducting a national health facility survey and deriving relevant indicators. These measures will inform specific approaches policy makers can adopt for improving the access and quality of obstetric care services.

Methods

Conceptual Framework

We use the Donabedian's approach to analyze the quality of obstetric care services offered through health care facilities in PNG. The Donabedian's approach is widely adopted to evaluate quality of care. It defines three broad components to understand quality differences across health care facilities [15]. These components are structure, process, and outcomes. The components are linearly linked. Structure measures affect processes and then processes affect outcomes, as shown in figure 1. This study will evaluate 'structure' and 'process' related to obstetric care services. The structure and process variables considered focus on the quality and quantity of the service-type produced. The health outcome of obstetric care services is demonstrated by maternal mortality and morbidity, which are both high in PNG.

To evaluate the provision of quality of obstetric care services, health facilities should have specific infrastructural characteristics and resources conducive for the provision of obstetric services. Some of the structural measures are quite general, related to provision of any clinical services, such as maternal services. In addition, specific personnel, supplies and drugs must be available at the facility level to be

able to offer the right type of services based on the clinical needs of patients. Availability of structural variables defines the "readiness" of the facility to provide effective health care services. Readiness alone does not necessarily imply actual provision of services. The infrastructural aspects act as the foundation for the provision of services, but relevant health care resources must be combined in the right proportions to be able to offer services to patients whenever needed. The process variables, therefore, reflect ability to offer different types of obstetric care services and functions.

Study Setting

PNG is remarkably diverse with respect to geography, language, and infrastructure. The country is divided into 22 provinces across four regions (Highlands, Momase and Southern, and the New Guinea Islands). Most of the country's 8 million people live in rural or peri-urban communities and are faced with significant challenges with regard to accessing equitable health, education and economic opportunities.

PNG has a government-funded health system throughout much of the country. It is supplemented by government-subsidized health services provided by various Christian missions. Overall, it is estimated that churches provide 47 percent of primary health services, particularly in rural areas [16].

Health facilities are categorized by the number and cadre of health workers employed and the services they provide; and are detailed in the National Health Services Standard (NHSS) of the Government of PNG (GoPNG) [17]. The levels of health facilities in PNG are numbered 1 through 7, where levels 1 and 2 provide basic primary health care, specifically outpatient services only. Level 3 health facilities, or health centers, also provide basic inpatient services for deliveries and minor ailments requiring observation. Level 4 health facilities, district and rural hospitals, provide general admissions, limited clinical support services including basic pharmacy and laboratory services, and depending on the employment of a medical officer, may provide obstetric and surgical intervention services. Level 5 to 7 health facilities provide secondary and tertiary health services as well as clinical support services, including pharmacy, laboratory, and radiology. The single level 7 health facility, the Port Moresby General Hospital, is the largest and most advanced health care facility of PNG, it employs the largest concentration of health care workers and provides comprehensive health care services.

Survey Design

We conducted a health sector efficiency survey at 73 health facilities in 2015. All operational level 5 to 7 health facilities nationwide, at the time of data collection (N=19) were surveyed, including the national referral hospital (Port Moresby General Hospital), the three regional hospitals, and 15 provincial hospitals. Sampling for level 3 and level 4 health facilities followed a two-step selection process to capture an equal amount of public- and church-run facilities. In step one, between six (New Guinea Islands) and eight (Southern, Highlands, and Momase) districts were randomly selected per region. In step two, the largest government- and church-administered health facilities (one of each type based on outpatient numbers per annum as reported by the National Health Information System) were purposely selected per district. This sampling procedure allowed selection of 30 publicly run and 30 church-run facilities from the selected districts; however, in reality not all selected facilities were operational. Where possible, closed health facilities were no functional level 3 or 4 facilities, resulting in less than 60 facilities surveyed (N=54). Figure 2 shows the location of the health facilities surveyed. The provinces shaded in green indicate where the survey was

carried out. The red squares represent level 5 to 7 health facilities, while the blue squares represent levels 3 and 4.

Survey Procedure

The survey comprised of a health facility assessment and costing instrument as well as interviews with healthcare providers, inpatients, and outpatients. Each instrument is detailed in the survey report [18]. Briefly, the health facility assessment collected information on various operational aspects of each health facility, while the costing instrument detailed expenditure on human resources, equipment, and consumables utilized for the provision of healthcare services. Both of which were completed with health facility managers and administrators. For the interviews with healthcare providers and patients (both inpatients and outpatients) written informed consent was obtained prior to interviewing. The healthcare provider interview included information on education, experience, services provided and general knowledge questions. The patient interviews covered socio-demographic information as well as patient experience and satisfaction. We conducted between one and five healthcare provider interviews, and between five and ten patient interviews per health facility. All instruments were completed by a team of 5 trained enumerators, who spent three to five days surveying each health facility. In total, 73 health facility assessments were completed, 72 costing instruments, 385 healthcare provider interviews, 385 inpatient interviews and 514 outpatient interviews.

Public Involvement

Stakeholder consultation were involved in the design and early dissemination of this research. During the feasibility stage, priority of research questions, choice of outcome measures, and methods were informed by discussions with stakeholders involving representatives from the National Department of Health, UN agencies, academics and other development partners in PNGs. The preliminary findings were also discussed with representatives from the National Department of Health Authorities, hospitals and development partners in a stakeholder consultation workshop held in Port Moresby, PNG.

Ethics approval

The study was approved by the PNG Institute of Medical Research (IMR) Institutional Review Board (IRB) and the PNG Medical Research Advisory Committee (MRAC). The following approval numbers were allocated to the study: IRB No. 1414, 7 August 2014; MRAC No 14.26, 10 November 2014.

Assessing readiness to provide maternal health services

We first examine the overall readiness of health facilities (structure variables) in the provision of clinical services and then examined three aspects related to obstetric services (process variables). Four categories of readiness are defined (1) facility readiness to provide clinical services; (2) availability of family planning items; (3) availability of maternal and neonatal equipment and materials; and for process measure, we evaluated the ability of the facility to provide emergency obstetric care services. If a functional equipment or instrument is present in the facility, we consider that the equipment or instrument is available for use. Availability of drugs and supplies is defined as having the item in stock at the time of the survey. Although the facility assessment asked about stockouts in the previous one month, the definition of availability considered current availability.

Structure variable type 1: facility readiness to provide clinical services

General facility-specific conditions and resources required to ensure the provision of quality services in a safe and effective manner as listed in Table 1.

Structure variable type 2: family planning items

Three supply categories were examined, oral pills, family planning injections and condoms, as listed in Table2. For each supply category, an index was constructed to show the average availability of the items.

Structure variable type 3: maternal and neonatal equipment and materials

Essential items required to provide pregnancy termination and other maternal health services as listed in Table 3. The items can be grouped into two subcategories: items and supplies related to antenatal care (ANC) and items and supplies related to maternal or neonatal service.

Process variables: Ability to provide emergency obstetric care services

Health care facilities that offer delivery of babies and other pregnancy-related services can be categorized into three groups depending upon the "signal functions" they are able to perform [19]. Signal functions have been defined to understand the ability of health facilities to offer routine to more complex obstetric services. If a facility has the capacity to administer antibiotic injections, oxytocics, and anticonvulsants (availability of the required injections and presence of relevant personnel to administer the injections), the facility is considered an "Obstetric First Aid" facility. A BEmOC facility is able to do all the functions required in an Obstetric First Aid facility plus the capacity to do assisted vaginal delivery, and the ability for manual removal of placenta. Comprehensive Emergency Obstetric Care (CEmOC) facilities are able to perform all the functions of a BEmOC plus ability to conduct caesarean section, and capacity to do safe blood transfusion. Note that all these signal functions are narrowly focused on the ability to perform specific functions pregnant women need at the time of delivery. Ability to perform the functions are defined by the availability and functionality of equipment needed, drugs, and personnel.

Data Analysis

The analysis has used the facility level data to derive the readiness indicators and ability to perform signal functions for each facility in the survey using stata version 12. The results are presented as descriptive tables (Tables 1-4) to indicate the proportion of facilities having the instruments or able to perform the specific functions.

An equally weighted index was constructed based on the availability of the items included in each of the categories of service delivery. It reflects the percent of all readiness aspects or variables satisfied by the health facilities in a specific category. For example, if a facility reports having an instrument, a value of 1.0 was assigned for the facility for that equipment. The availability index was constructed to show the percent of listed equipment and items available in each of the facility categories. For example, if the antenatal care (ANC) items availability index is 65 for level 3 and 4 facilities, it means that the facilities on the average had 65 percent of all the ANC equipment and items considered in the analysis.

Results

Facility readiness to provide clinical services

BMJ Open

Table 1 reports facility readiness in the provision of services. As shown, 95% of level 5 to 7 facilities were connected to the main electric supply grid but only about a third of level 3 and 4 facilities. However, more than 80% of all facilities connected to the electric supply experienced blackout at least for some time in the week before the survey. All level 5 to 7 facilities had functional backup generators, while the percentage of level 3 and 4 facilities with backup generators was 76% for church-run facilities and 48% for public facilities. Half of the level 3 and 4 facilities with backup generators reported problems in operating the generator in the previous month.

If supply line and water tanks are considered, all level 5 to 7 facilities and 83% of level 3 and level 4 public health facilities and 84% of level 3 and level 4 church health facilities reported having access to water on the day of the survey. However, less than 10% of level 3 and 4 facilities were connected with a supply line. Only 45% of level 3 and 4 public facilities had water connection to the delivery room (and water availability on the day of the survey) compared to 72% at church-run facilities.

A significant share of health facilities, 62%, 44% and 38% of level 3 and 4 public, level 3 and 4 church, and level 5 and 6 facilities, respectively, experienced water shortages in 2014. The survey asked facility respondents whether the facility was responsible for maintaining the water supply system and it was observed that about 45% of public level 3-4 facilities were responsible for maintaining the water supply system. The proportions were 64% for church-run level 3 and 4 facilities and 68% for level 5 to 7 facilities.

Both level 3 and 4 public and church-run health facilities show low readiness score for service delivery (Table 1). Readiness indexes were 40.3 for level 3 and 4 public sector facilities, 48.6 for level 3 and 4 church-run facilities, 84.6 for level 5 and 6 facilities, and 100 for the level 7 facility.

Family Planning Items

Table 2 presents the availability of family planning products and supplies in surveyed health facilities. The availability index of family planning items was 81.6 for level 3 and 4 public sector health facilities, 84.0 for level 3 and 4 church-run facilities, and 88.9 for level 5 and 6 facilities. Non-availability of family planning injections in the level 7 facility reduced the overall index of family planning item availability for the facility to 66.7. Since there is only one facility at level 7, non-availability of even a single item significantly reduces the overall index.

Maternal and Neonatal Equipment and Materials

A significant number of health facilities lacked very basic maternal and neonatal equipment as shown in Table 3. The index values for the availability of ANC-related equipment and supplies were 71.4 and 81.6 for level 3 and 4 public- and church-run facilities, respectively. The index was 81.1 for level 5 and 6 facilities and 100 for level 7 facility. The indexes of availability of delivery and neonatal equipment and supplies (excluding ANC-related equipment) were worse in level 3 and level 4 facilities, 64.7 and 76.0 respectively. The indexes were 89.9 for level 5 and 6 facilities.

Ability to provide emergency obstetric care services

Table 4 indicates that 18.6% of level 3 and 4 public health facilities and 20% of church health facilities providing maternal health services were not able to offer basic obstetric first aid. 40% of level 3 and 4 facilities were not able to perform the functions necessary under the Basic Emergency Obstetric Care

category (BEmOC). Even among higher level facilities (levels 5, 6 and 7), 10% of facilities were not able to perform one or more of the necessary functions required to be considered a BEmOC provider.

If the signal functions for comprehensive emergency obstetric care are considered, only about 11% of level 3 and 4 health facilities were found to be CEmOC units. Only 15% of level 3 and 4 facilities had the capacity to manage a caesarean section or do blood transfusion. The majority of facilities at all levels reported the capacity to remove a placenta manually (78% for level 3 and 4 public health facilities, 88% for level 3 and 4 church-run facilities, and 100% of level 5 to 7 facilities).

Discussion

 The overall health facility infrastructure condition in PNG is poor. Most facilities reported the need for major building repairs and emphasized the lack of adequate toilets, stable electrical supply, and consistent water supply. Most of the level 3 and 4 health facilities require better connectivity to electricity and clean water supply. One significant concern is the number of health facilities that did not have running water in the facility's delivery room. The quantity and quality of different types of service provision crucially depends on the facility's readiness to provide the clinical services. Overall, level 3 and 4 facilities, both public and church-run, scored quite low on the readiness index, which describes the extent to which facilities are capable of providing services. The survey also revealed the need for improving the supply of basic medical items to level 3 and 4 public health facilities. Level 3 and 4 public facilities show lower availability of different medical items compared to availability in church-run facilities.

PNG shows comparatively low values in terms of readiness in the provision of health services. Comparison of health facility readiness across countries is often tricky because of differences in the level and comprehensiveness of facilities in different countries of the world. A World Bank report [20] indicates that 98 percent of public hospitals in Indonesia had electricity; in Laos, the index of basic amenities was reported as 64 percent [21] compared to 58 percent for PNG (weighted mean of the values in table 1).

Access to family planning services are still limited in PNG. The results from the survey are consistent with the most recent findings from the PNG DHS. One quarter of currently married women (26%) have an unmet need for family planning, and only 59% of currently married women are satisfied with the demand of family planning. Among those who have received family planning, about 9 in 10 users obtained their modern family planning supplies from a public (government) source. Therefore, there is an urgent need to strengthen the government health facilities, especially at lower levels, in the provision of family planning items and services.

While 83% of level 5 to 7 facilities were found to be CEmOC providers, the fact that about a fifth were not able to provide comprehensive emergency obstetric care is a major concern given these are higher level referral facilities. The number of level 3 and 4 facilities surveyed was high enough to provide some national level estimates. Using the proportions of CEmOC facilities at different levels, the number of facilities providing comprehensive obstetric care in the country would be about 50. Even if we assume balanced geographic distribution of the facilities, an emergency obstetric case will have to travel 53 km each way, on average, to reach a CEmOC facility. The distance to the nearest CEmOC is so large that for many emergency cases this is virtually synonymous of not having access to comprehensive emergency obstetric care. In order to reduce maternal mortality and morbidity significantly, it is essential to reduce the average distance to the nearest CEmOC facility[22] implying that PNG will have to upgrade a significant number of levels 4 and 5 facilities to be able to provide comprehensive emergency obstetric care. Using geographical

BMJ Open

information systems and geographical modelling tools to optimize the location and referral can help improve timely access[23].

All facilities at level 3 or above should be able to provide obstetric first aid and BEmOC. To improve access to emergency obstetric care, most of the level 3 and 4 facilities should be upgraded to BEmOC facilities or better. The survey of facilities indicated that 20% of facilities at levels 3 and 4 were not prepared to provide even obstetric first aid and 40 percent were not ready to provide BEmOC. Despite this low readiness, equipping some targeted facilities at these levels to perform blood transfusions and cesarean section deliveries should be able to increase availability of CEmOC from 10% to 60%. Although maternal and child health is a priority area, PNG has not allocated enough resources to achieve improved access to MCH services. PNG spends more than 4.3% of its GDP on health (about \$109 per capita in PPP dollars). Total health expenditure is not low compared to other countries with similar level of income[24]. However, a significant part of health resources, including human resources, particularly doctors, are concentrated in a few major hospitals. Therefore, the resource allocation at the lower level health facilities, including level 3 and level 4 health facilities, are not sufficient. Reallocation of public sector resources to lower level health care facilities are needed to improve the access of obstetric care and other preventive services.

Public financial management is another challenge in PNG with subnational facilities constantly facing cash shortages[25]. Government of Papua New Guinea may consider allocating funds to facilities, both public and church facilities, based on quantities of priority health services delivered rather than paying them based on their personnel and administrative expenses [26]. While such output or performance based financing outcomes highly depend on how the schemes are implemented, evidence in low and middle income countries shows that the performance can be improved through links to financial incentives and other sources of motivation [27]. From the demand side, past research has found that providing pregnant women with health vouchers to ensure that they have financial protection for accessing services has increased utilization of health services [28]. The payments received through the vouchers will also encourage facilities to become more sensitive to the needs of pregnant women and would have incentives to invest to become fully functional EmOC providers.

Study Limitations

Several limitations of the study should be mentioned here. First, it is not possible to indicate overall geographic access to primary health care services in PNG using the survey data because the study did not collect information from level 1 and 2 health facilities. However, these facilities do not provide maternal health services although some basic services like family planning and ANC can potentially be organized at these levels. Second, the survey is not a nationally representative survey of level 3 and 4 facilities. The survey design selected fully functional level 3 and 4 facilities in target provinces and the definition of fully functional led to the choice of facilities that showed relatively high level of utilization. Therefore, if anything, the results are likely to be a significant overestimation of degree of readiness of the facilities, the percent of facilities able to perform BEmOC and CEmOC was quite low at levels 3 and 4 implying that the availability of obstetric care services availability and readiness measures with health outcomes of the population at the subnational level. In PNG, even the national level estimates of mortality and morbidity are considered unreliable and subnational level estimates would suffer from even higher degree of error in estimation. In any case, facility level information clearly indicates that many of the functional

facilities are not ready to provide obstetric health services and a significant proportion of facilities lack medical equipment, instruments and supplies for the provision of maternal health related essential services.

Conclusions

r Inability of a health facility, irrespective of whether it is a primary, secondary and tertiary care facility, to provide obstetric care is an important concern for any health care system. It is especially true for a country like PNG where maternal and infant mortality rates are still high alongside a high fertility rate. Improving and equipping targeted health facilities to improve the readiness of delivering the BEmOC and CEmOC are required to reduce the maternal mortality rate in PNG.

> For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Table1. Service Provision Readiness Index, by Facility Level

Electricity connected to supply grid Backup generator Electricity availability (supply or	Public 10 14	% 34%	Church 7	% 28%	N	%	N	%
Electricity connected to supply grid Backup generator Electricity availability (supply or	10 14	34%	7	28%	4 -			
Backup generator Electricity availability (supply or	14			20/0	1/	94%	1	100
Electricity availability (supply or		48%	19	76%	18	100%	1	100
generator)	20	69%	21	84%	18	100%	1	100
Blackout last week	8	28%	6	24%	15	83%	0	0
Problem last month running generator due to fuel shortage	8	28%	10 2	40%	3	22%	0	0
Water non main me	۲ 10	6.20/	J 11	12/0	15	200/	1	100
Water shortage last year	10	02%	11	44% 010/	10	39% 100%	1	100
providers	24	0370	21	0470	10	100%	Т	100
Water available in delivery room	13	45%	18	72%	18	100%	1	100
Facility does direct blood transfusion	3	10%	3	12%	16	89%	1	100
Blood transfusions done last month	3	10%	3	12%	18	100%	1	100
Facility has designated space for clinicians to provide service	20	69%	20	80%	18	100%	1	100
Facility has on-call room or space for health care providers to take rest	3	10%	11	44%	10	56%	1	100
Facility has telephone or shortwave radio	14	48%	14	56%	15	83%	1	100
Facility has ambulance	26	90%	24	96%	17	94%	1	100
Ambulance out of service last year	11	38%	10	40%	6	33%	0	0
Facility has other vehicles	8	28%	5	20%	18	100%	1	100
Facility has operation theater	8	28%	9	36%	18	100%	1	100
Index of readiness	40.3		48.5		84.6		100	

Table 2. Availability of Family Planning by Facility Category

Family planning, vaccine and other items	Level 3	and 4			Level 5	and 6	Level 7	
	Public	% of Public	Church	% of Church	Public	% of Level 5 and 6	Public	% of Level 7
Family planning items								
Oral pills FP injections Condoms	26 22 23	90% 76% 79%	21 22 20	84% 88% 80%	17 15 16	94% 83% 89%	1 0 1	100% 0% 100%
Index of FP items	81.6		84.0		88.9		66.7	

Note: FP = family planning;

Page 17 of 23

ANC, delivery and neonatal equipment and		Level 3 and 4				Level 5 and 6		Level 7	
supplies	Publi	% of	Churc	% of					
	С	Public	h	Church	Public	%	Public	%	
Foetal stethoscope (or monitor)	27	93%	25	100%	14	78%	1	100%	
Stethoscope and blood pressure cuff	22	76%	25	100%	16	89%	1	100%	
Tape measure	23	79%	22	88%	16	89%	1	100%	
Scale	28	97%	25	100%	16	89%	1	100%	
Ultrasound machine (and gel)	28	97%	25	100%	17	94%	1	100%	
Facility has at least two skilled birth	า					100			
attendants covering 24 hours a day	21	72%	19	76%	18	%	1	100%	
						100			
Delivery kit (instruments, supplies)	25	86%	25	100%	18	%	1	100%	
Stethoscope	10	34%	11	44%	15	83%	1	100%	
Partograph	11	38%	13	52%	14	78%	1	100%	
Pelvic procedure instruments such as	S								
speculum	18	62%	22	88%	16	89%	1	100%	
· · · · · · · · · · · · · · · · · · ·						100			
Delivery light	24	83%	24	96%	18	%	1	100%	
Sterilizer	15	52%	16	64%	13	72%	1	1009	
						100	_		
Vacuum extractor	14	48%	21	84%	18	%	1	100%	
					-	100			
Forceps	25	86%	25	100%	18	%	1	100%	
Manual vacuum aspirator/suction bulb	27	93%	25	100%	17	94%	1	1009	
Resuscitation bag, newborn	4	14%	4	16%	15	83%	-	1009	
				20/0	20	100	-	2007	
Eve drops or ointment for newborn	27	93%	25	100%	18	%	1	100%	
	-/	3370		100/0	10	100	-	100/	
Needles and syringes	28	97%	25	100%	18	%	1	100%	
Needles and synnges	20	5770	23	10070	10	100	-	1007	
Sterile C-section instrument kits	28	97%	25	100%	18	%	1	100%	
Cord supplies for newborn clamps ties	20	5770	25	10070	10	70	Ŧ	1007	
scissors	, ,	7%	5	20%	12	67%	1	1009	
IV sets including sterilized needle and tube	2	03%	25	100%	17	Q1%	1	1007	
IV fluids, including normal saling and ringo	r 21	5370	25	10078	1/	100	T	100/	
lactato	20	100%	25	100%	10	200	1	1000	
Index ANC item availability	29	100%	2J 01 CO	100%	10 01 11	/0	⊥ 100.00	100/	
Index maternal and nonstal item	/1.41		01.00		01.11		100.00		
inuex maternal and neonatal item	¹⁵ 64.66		76.00		89.93		100.00		

Table 4. Percentage of Health Facilities Providing Obstetric First Aid, Basic Emergency Obstetric Care, and
Comprehensive Emergency Obstetric Care

Level of EmOC services provided by facilities	Level 3 and 4 public % (n)	Level 3 and 4 church % (n)	Level 5 to 7	Total % (n)
Obstetric first aid	70 (II)	/0 (11)	/0 (11)	70 (11)
Have the capacity to administer antibiotics.	81% (22)	80% (20)	94% (17)	84% (59)
Oxytocics, and anticonvulsants	,			()
BEmOC				
Have the capacity to do assisted vaginal delivery	63% (17)	72% (18)	94% (17)	74% (52)
Have the ability to use three drugs plus do	63% (17)	60% (15)	89% (16)	69% (48)
vacuum and forceps delivery				
Have the ability for manual removal of placenta	78% (21)	88% (22)	100% (18)	87% (61)
CEmOC				
Have the ability to manage caesarean section	15% (4)	16% (4)	100% (18)	37% (26)
Have the capacity to do safe blood transfusion	15% (4)	20% (5)	94% (17)	37% (26)
Have the capacity to use all drugs plus services	11% (3)	12% (3)	83% (15)	30% (21)
isted above				

Page 19 of 23

1

BMJ Open

2		
3		
4		
5	Refere	nces:
6	nerere	
7		
8		
0	1	Islam MT et al Improvement of covergge and utilization of EmOC services in southwestern
10	1.	Bandadash Int I Curpased Obstat. 2005. 01/2): n. 200. 205. discussion 282.4
10		Bungiudesn. Int J Gynaecol Obstet, 2005. 91(3): p. 298-305; discussion 283-4.
11	2.	Turab, A., et al., Improved accessibility of emergency obstetrics and newborn care (EmONC)
12		services for maternal and newborn health: a community based project. BMC Pregnancy
13		Childbirth, 2013. 13 : p. 136.
14	3	Chavula K et al Readiness of hospitals to provide Kanagroo Mother Care (KMC) and
15	5.	documentation of KMC convice delivery Anglysic of Malgui 2014 Emergency Obstatric and
16		documentation of kinc service delivery. Analysis of Malawi 2014 Emergency Obstetric and
17		Newborn Care (EmONC) survey data. J Glob Health, 2017. 7 (2): p. 020802.
18	4.	Ameh, C.A., et al., The effectiveness of training in emergency obstetric care: a systematic
19		literature review. Health Policy Plan, 2019, 34 (4); p. 257-270.
20	5	Lee ΔC et al. Care during labor and high for the prevention of intrapartum-related peopletal
21	5.	deather a systematic review and Dalahi estimation of mentality effect DNC Dublic Health 2011
27		dealins: a systematic review and Delphi estimation of mortality effect. BIVIC Public Health, 2011.
22		11 Suppl 3 (Suppl 3): p. S10.
23	6.	Paxton, A., et al., Global patterns in availability of emergency obstetric care. Int J Gynaecol
24		Obstet, 2006, 93 (3); p. 300-7.
25	7	Banke-Thomas A et al. Assessing emergency obstetric care provision in low- and middle-
26	7.	banke-momas, A., et al., Assessing emergency obstetile cure provision in low- and indule-
27		income countries: a systematic review of the application of global guidelines. Glob Health Action,
28		2016. 9 : p. 31880.
29	8.	Government of Papua New Guinea, National Health Plan 2011–2020, Volume 1: Policies and
30		Strategies, June 2010.
31	٩	Mola G and B Kirby Discremencies between national maternal mortality data and international
32	5.	wola, G. and B. Kirby, Discreptincies between national maternal moltality data and methational
33		estimates: The experience of Papua New Guinea. Reproductive health matters, 2013. 21: p. 191-
34		202.
35	10.	Robbers, G., et al., Maternal and newborn health indicators in Papua New Guinea – 2008–2018.
36		Sexual and Reproductive Health Matters, 2019, 27 (1); p. 52-68.
27	11	PNG National Department of Health Health Information Systems 2019
20	10	Trends in Maternal Martality 2000 to 2017, 2010, MUO, Conovo
38	12.	Trenas în Maternal Mortality: 2000 to 2017. 2019, WHO: Geneva.
39	13.	National Statistical Office (NSO) [Papua New Guinea] and ICF, Papua New Guinea Demographic
40		and Health Survey 2016-18. Port Moresby, Papua New Guinea, and Rockville, Maryland, USA:
41		NSO and ICF. 2019.
42	14	Panua New Guinea Demographic and Health Survey 2016-18, 2019, NSO and ICE: Port Moreshy
43	T .	Papua New Cuinea, and Deslaville. Mandand, USA
44		Papua New Guinea, and Rockville, Maryland, USA.
45	15.	Donabedian, A., <i>Evaluating the Quality of Medical Care.</i> The Milbank Quarterly, 2005 83 (4): p.
46		691-729 (reprint from 44(3): 166-203, 1966).
47	16.	NDOH, Christian Health Services Technical Assistance Mission Report 2013. National
48		Department of Health: Port Moreshy, Panua New Guinea
49	47	Department of meanin. For Woresby, Fapida New Gamea.
4 9 50	17.	Papua New Guinea and ICF, Papua New Guinea Demographic and Health Survey 2016-18. Port
50		Moresby, Papua New Guinea, and Rockville, Maryland, USA: NSO and ICF. 2019.
51	18.	Hou, X.K., M. Mahmud; Pulford, Justin; Saweri, Olga; Demir, Ibrahim; Haider, Rifat; Ahmed,
52		Shakil: Service delivery by health facilities in Papua New Guinea : report based on a countrywide
53		health facility curvey (English) 2019. The WorldPank Group
54	10	Manitaring analysis abstatic and a baselle all 2000. On the Weille bill of the
55	19.	wonitoring emergency obstetric care: a handbook. 2009, Geneva: World Health Organization.
56		
57		
58		18
59		
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

20. World Bank, Universal Maternal Health Coverage? Assessing the Readiness of Public Health Facilities to Provide Maternal Health Care in Indonesia. Washington, DC: World Bank. 2014.

- 21. World Bank, Maternal Health Out-of-Pocket Expenditure and Service Readiness in Lao PDR. Washington, DC: World Bank. 2013.
- 22. McKinnon, B., et al., *Distance to emergency obstetric services and early neonatal mortality in Ethiopia*. Trop Med Int Health, 2014. **19**(7): p. 780-90.
- 23. Ebener, S., et al., *Proposing standardised geographical indicators of physical access to emergency obstetric and newborn care in low-income and middle-income countries.* BMJ Glob Health, 2019. **4**(Suppl 5): p. e000778.
- 24. 2017, W.B.G., Health Financing System Assessment : Papua New Guinea. World Bank, Washington, . 2017.
- 25. Cairns, A. and X. Hou, Financing the frontline : an analytical review of provincial administrations' rural health expenditure 2006-2012 . Health, Nutrition, and Population (HNP) discussion paper. Washington, D.C. : World Bank Group. <u>https://hubs</u>. 2015, World Bank Washington DC.
- 26. Cairns, A.T.H., Xiaohui. , Financing the frontline : an analytical review of provincial administrations' rural health expenditure 2006-2012 . Health, Nutrition, and Population (HNP) discussion paper. Washington, D.C. : World Bank Group. , in 2015: https://hubs.worldbank.org/docs/ImageBank/Pages/DocProfile.aspx?nodeid=25991656.
- 27. Paul, E. and D. Renmans, *Performance-based financing in the heath sector in low- and middle-income countries: Is there anything whereof it may be said, see, this is new?* Int J Health Plann Manage, 2018. **33**(1): p. 51-66.
- 28. CM, B., et al., The impact of vouchers on the use and quality of health care in developing countries: a systematic review. Glob Public Health, 2013. 8(4): p. 363-88.



Structure

Physical, organizational and resources in the entity providing health care services

Proccess

Services provided to patients according to protocol (services, drugs & J05) supplies, diagnostics)

Outcome

Effect of services provided on health status

Source: Donabedian (2005)





Note: Red squares represent the level 5 to 7 facilities surveyed, while the blue squares represent the level 3 to 4 facilities.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml





Note: Red squares represent the level 5 to 7 facilities surveyed, while the blue squares represent the level 3 to 4 facilities.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

BMJ Open

Readiness of Health Facilities to Provide Emergency Obstetric Care and Other Related Services in Papua New Guinea

Journal:	BMJ Open
Manuscript ID	bmjopen-2021-050150.R1
Article Type:	Original research
Date Submitted by the Author:	09-Sep-2021
Complete List of Authors:	Hou, Xiaohui ; World Bank Group, Health, Nutrition and Population Global Practice Khan, M. Mahmud ; University of Georgia College of Public Health Pulford, Justin; Liverpool School of Tropical Medicine, ; Papua New Guinea Institute of Medical Research, Saweri, Olga; Papua New Guinea Institute of Medical Research
Primary Subject Heading :	Obstetrics and gynaecology
Secondary Subject Heading:	Global health, Health policy, Health services research, Obstetrics and gynaecology
Keywords:	OBSTETRICS, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Maternal medicine < OBSTETRICS

SCHOLARONE[™] Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our <u>licence</u>.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

Readiness of Health Facilities to Provide Emergency Obstetric Care and Other Related Services Guinea in Papua New Guinea

2	
3	Readiness of Health Facilities to Provide Emergency Obstetric Care and Other Related Services
4	in Panua New Guinea
5	in rapua New Guinea
6	
/ Q	Xiaohui Hou, Ph D
9	Health Nutrition and Deputation Clobal Dractice
10	
11	World Bank
12	1818 H. Street. NW, 20433
13	Washington DC
14	xhou@worldbank.org
15	
16	
17	NA Mahmud Khan Dh
18	
19	Health Policy and Management Department
20	College of Public Health
21	University of Georgia
22	Wright Hall, Health Sciences Campus, 100 Foster Road, Athens, GA 30602
23	Mahmud Khan@uga.edu
24 25	
25	
20	
28	Justin Pulford, Ph.D.
29	Senior Lecturer
30	Department of International Public Health
31	Liverpool School of Tropical Medicine
32	justin.pulford@lstmed.ac.uk
33	
34	
35	Olgo B. M. Soweri, MSc
30	Diga F. Ivi. Sawei I, Ivisc
38	Papua New Guinea Institute of Medical Research (PNGIMR)
39	PO Box 60, Goroka, EHP 441, Papua New Guinea
40	<u>olga.saweri@gmail.com</u>
41	
42	Declarations of interest: none
43	Corresponding Author: M. Mahmud Khan, Ph.D., Professor, Health Policy and Management,
44	College of Public Health, University of Georgia, 100 Foster Road, Wright Hall 116, Athens, GA
45	30602 Mahmud Khan@uga edu
46	50002. Mannud. Khane uga.euu
47	
48	Key words
49 50	
50	Maternal Health, Emergency Obstetric Care, Readiness of health facilities, signal functions for
52	
53	emergency obstetric care, Papua New Guinea
54	
55	Total word count: 5,017 (excluding references, figures and tables)
56	
57	
58	2
59	

Contributorship statement

Xiaohui Hou: Conceptualization, Methodology, Supervision, Project Administration, Resources, Writing-Original Draft, Writing – review & editing

M. Mahmud Khan: Conceptualization, Methodology, Supervision, Formal Analysis, Writing-Original Draft, Writing – review & editing

Justin Pulford: Conceptualization, Methodology, Data Curation, Data Validation, Writing-Review & Editing.

Olga P. M. Saweri: Data Curation, Data Validation, Writing-Review & Editing

Details of funding source

This work was funded by World Bank's Trust Fund supported by Australia's Department of Foreign Affairs and Trade. World Bank contract number: 7171956, Principal Investigator: M. Mahmud Khan. Date: July 1, 2014.

Data availability statement

No additional data is available. Researchers interested in 2015 PNG Facility Assessment Survey data can contact the PI of the project, Dr. M. Mahmud Khan, at the email address <u>Mahmud.Khan@uga.edu</u> with a statement on the reasons for requesting the dataset and types of analyses to be conducted.

Abstract

Objective

To measure readiness of health facilities in Papua New Guinea (PNG) to provide obstetric care and other related services.

Design

Cross-sectional study involving random sample of levels 3 and 4 health facilities and census of all upper level facilities that were operational at the time of survey. Structured questionnaires were used to collect data from health facilities.

Setting

Health facilities in PNG. Facility administrators and other facility personnel were interviewed during the survey.

Participants

19 upper-level facilities (levels 5-7) and 60 lower-level (levels 3-4) facilities.

Outcome measures

Four service-types were used to understand readiness of surveyed health facilities in the provision of maternity care including obstetric care services: (1) facility readiness to provide clinical services; (2) availability of family planning items; (3) availability of maternal and neonatal equipment and materials; and (4) ability to provide emergency obstetric care.

Results

56% of level 3 and 4 facilities were not able to provide Basic Emergency Obstetric Care (BEmOC). Even among higher level facilities (levels 5, 6 and 7), 16% were not able to perform one or more of the functions required to be considered a BEmOC provider. 11% of level 3 and 4 health facilities were able to provide comprehensive emergency obstetric care (CEmOC) as compared to 83% of higher level facilities.

Conclusion

Given the high fertility rate in PNG and high maternal mortality ratio (MMR), lack of BEmOC at level 3 and 4 facilities, the first level inpatient service providers, is a major concern. To improve access to EmOC, each of the level 3 and 4 facilities should immediately be upgraded to at least a BEmOC provider. Significant reduction in MMR will require improved access to CEmOC and optimal geographic location approach can identify facilities to be upgraded. Strengthening of family planning services will also help improve access to EmOC.

Strengths and limitations of this study

- This is the first empirical study that systematically examined availability of maternity • care in health facilities in Papua New Guinea (PNG).
- All level 5-7 hospitals and randomly selected functional health centers in PNG were surveyed using structured questionnaires.
- The readiness of facilities in the provision of obstetric care and actual provision of services were assessed by relevant indicators and signal functions.
- Service availability and readiness of facilities could not be linked with community level health outcomes.
- The sampling design selected level of 3 and 4 facilities that were fully functional in each of the surveyed districts implying that the results overestimate the readiness and availability of obstetric care and other related services.

Introduction

Effective antenatal, neonatal and Emergency Obstetric Care (EmOC) are highly cost-effective interventions vital to avert common adverse pregnancy and/or birth outcomes, which significantly contribute to maternal mortality in poor resource settings.¹⁻⁴ Basic Emergency Obstetric Care (BEmOC) alone can avert a significant proportion of maternal deaths and up to 40% of neonatal deaths.⁵ A global assessment found that BEmOC facilities are consistently not available in sufficient numbers in countries with high and moderate levels of maternal mortality.⁶ Comprehensive Emergency Obstetric Care (CEmOC) availability, which includes the provision of caesarean and blood transfusion services in addition to the key functions included in BEmOC, is also quite poor in many low and middle income countries.⁷

Maternal and child health remains a key priority area in Papua New Guinea (PNG);⁸ however, persistently high maternal and neonatal deaths reflect numerous deficiencies. The estimates of Maternal Mortality Ratio (MMR) in PNG vary considerably and one study by Mola and Kirby estimated the MMR for 2009 using facility-based national health information system records and survey data on maternal mortality among unsupervised births from one province. The estimates imply that the average MMR in PNG should be approximately 500 per 100 000 live births.^{9 10} The neonatal mortality in PNG is also high, around 28 per 1000 live births.¹¹ The World Health Organization model ranks PNG 130th in the world in terms of MMR.¹² The 2016-2018 PNG Demographic and Health Survey (DHS), using the sisterhood method, found that the MMR was about 205 per 100,000 live births.¹³ Even though new DHS estimate represents a significant improvement from the previous estimate of 733 per 100,000 live births in 2006, the maternal mortality in PNG remains about 24 times the MMR in neighboring Australia.¹² The DHS report also indicates that only 17% of pregnancies received a prenatal visit in the first trimester and 49% had four or more prenatal visits over the whole pregnancy. During 2012-2017, about 55% of deliveries in PNG were supervised by trained health workers at health facilities¹³ indicating limited access to modern maternal health care services.

To reduce the MMR in any country, it is important to understand the causes of death so that appropriate interventions can be designed and adopted. In PNG, the maternal mortality registry often does not report causes of death. Reviewing the causes of deaths mentioned in the general death registry and in maternal mortality registry, one study in early 1980s found that the main causes were puerperal sepsis, postpartum hemorrhage, medical and surgical complications, prolonged or obstructed labor, ruptured uterus, deaths associated with caesarean section.¹⁴ It is likely that many of these causes of deaths have remained important even today. Clearly, deaths due to the causes indicated above cannot be avoided without timely access to health facilities that are equipped to provide a range of obstetric care services. A recent article mentioned geographically dispersed population, shortage of health care providers, poverty, gender inequality and low level of education as important determinants of maternal deaths.¹⁵ These aspects are, however, directly related to access to care and readiness of health facilities in the provision of maternity care.

Lifetime risk of maternal death depends on the probability of maternal death per pregnancy and the average number of pregnancies per woman over the reproductive age. The 2016-2018 PNG DHS estimated that total fertility rate (TFR) was about 4.2 per woman, which is slightly lower than the TFR of 4.4 in 2006. Access to obstetric care and lifetime risk of maternal death can be improved by lowering the TFR as well.

Given the critical importance of timely access to appropriate obstetric care, it is essential to assess the ability and readiness of health facilities in the provision of emergency obstetric care in PNG. Due to high TFR of PNG, the demand for maternal health services will continue to increase rapidly, underscoring the urgent need for improving access to care and strengthening maternal healthcare service delivery.

Despite the high social value of maternal and newborn health care services in PNG, no macrolevel information is available on the ability or readiness of health facilities in the provision of the services. One recent study assessed the capacity of 21 health facilities in the provision of essential surgery and anesthesia services.¹⁶ No study on PNG, to date, has examined the readiness and ability of health facilities at the national level in the provision of obstetric care services. This study is the first attempt to understand the state of obstetric care availability in PNG.

The principal objective of this study is to measure health facility readiness to provide obstetric care and other related services. Some of the measures reflect not only the readiness of the facilities in the provision of target services but also the quality of services offered. The nationally representative health facility survey allows measurement of various indicators of obstetric care related services. These measures will be useful for policy makers to reform the health care delivery system to strengthen the provision of obstetric care and general clinical services.

Methods

Conceptual Framework

We use the Donabedian's framework to analyze the readiness of obstetric care and other related services offered through the health facilities in PNG. In general, the Donabedian's approach is used to evaluate quality of care by analyzing relevant structures, processes and outcomes.¹⁷ The structure measures affect processes and then processes affect outcomes, as shown in figure 1. In this study, our focus is on the evaluation of 'structure' and 'process' related measures relevant for maternity care. The structure and process variables help to better understand the ability of health facilities in the provision of different service-types. Although, the impact of service provision cannot be directly measured from the facility survey data, country-level estimates of maternal mortality and morbidity imply relatively poor outcomes indicating the need for improving infrastructure and processes associated with obstetric and other related services.

To evaluate the ability and readiness to provide general medical care services including obstetric care, health facilities should have several infrastructural characteristics and resources. Some of the structural measures are quite general, related to the provision of any clinical service, such as

BMJ Open

general inpatient services. In addition, specific personnel, supplies and drugs must be available at the facility to be able to offer the right type of services at the right time based on the clinical needs of patients. The structural characteristics, although not directly related to maternity care, are the necessary aspects defining the "readiness" of the facility in the provision of effective health care services. Readiness, however, does not necessarily imply actual provision of services. The infrastructural aspects act as the foundation for the provision of services, and relevant health care resources must be combined with the infrastructure to offer services to patients whenever needed. The process variables reflect ability to offer different types of obstetric care services and functions. The process variables for monitoring obstetric care service provision, the signal functions, are well defined and we will use the facility-level signal functions for understanding the readiness of facilities in PNG.¹⁸

Study Setting

PNG is remarkably diverse with respect to geography, language, and infrastructure. The country is divided into 22 provinces across four regions (Highlands, Momase and Southern, and the New Guinea Islands). Most of the country's 8 million people live in rural or peri-urban communities and are faced with significant challenges with regard to equitable access to health, education and economic opportunities.

PNG has a government-funded health system throughout much of the country. It is supplemented by government-subsidized health services provided by various Christian missions. Overall, it is estimated that churches provide 47 percent of primary health services, particularly in rural areas.¹⁹

Health facilities are categorized by the number and cadre of health workers employed and the services they provide and are detailed in the National Health Services Standard (NHSS) of the Government of PNG (GoPNG).²⁰ The levels of health facilities in PNG are numbered 1 through 7, where levels 1 and 2 provide basic primary health care, specifically outpatient services only. Level 3 health facilities, or health centers, provide outpatient and basic inpatient services for deliveries and minor ailments requiring observation. Level 4 health facilities, district and rural hospitals, provide general admissions, limited clinical support services including basic pharmacy and laboratory services. Levels 5 to 7 health facilities provide secondary and tertiary health services as well as clinical support services, including pharmacy, laboratory, and radiology. The only level 7 health facility, the Port Moresby General Hospital, is the largest and most advanced health care facility of PNG, employs the largest concentration of health care workers and provides comprehensive health care services.

Survey Design

We conducted a health facility survey of 73 health facilities in PNG in 2015. All operational upper level health facilities (levels 5 to 7) were selected for the survey. At the time of data collection,
PNG had 19 upper-level health facilities and all these 19 facilities were surveyed (although one of the facilities was not fully operational). The upper-level health facilities in the survey included the national referral hospital (Port Moresby General Hospital), three regional hospitals, and 15 provincial hospitals. At the national level, since about half of levels 3 and 4 were Church-run, the survey design intended to sample equal number of publicly-run and Church-run facilities. For selecting facilities at these two levels, between six (New Guinea Islands) and eight (Southern, Highlands, and Momase) districts were randomly selected per region. The largest governmentand Church-administered health facilities (one of each type based on outpatient numbers per annum as reported by the National Health Information System) were purposely selected per district. This sampling procedure allowed selection of 30 publicly run and 30 church-run facilities from the selected districts; however, during field visits, not all selected facilities were found to be operational. Where possible, closed health facilities were replaced by functional ones within the same district. In some districts there were no functional level 3 or 4 facilities, resulting in less than 60 facilities surveyed (N=54). Figure 2 shows the location of the health facilities surveyed for this study. The provinces shaded in green indicate where the survey was carried out. The red squares represent level 5 to 7 health facilities, while the blue squares represent levels 3 and 4.

Survey Procedure

The survey comprised of a health facility assessment and costing instrument as well as interviews with healthcare providers, inpatients, and outpatients. Each instrument is detailed in the survey report.²¹ Briefly, the health facility assessment collected information on various operational aspects of each health facility, while the costing instrument detailed expenditure on human resources, equipment, and consumables utilized for the provision of healthcare services. Both these instruments were completed with health facility managers and administrators. The data collection was done by a team of 5 trained enumerators, who spent three to five days surveying each health facility. In total, 73 health facilities were surveyed.

Public Involvement

Stakeholder consultations were involved in the design and early dissemination of this research. During the feasibility stage, priority of research questions, choice of outcome measures, and methods were informed by discussions with stakeholders involving representatives from the National Department of Health, UN agencies, academics and other development partners in PNGs. The preliminary findings were also discussed with representatives from the National Department of Health, Provincial Health Authorities, hospitals and development partners in a stakeholder consultation workshop held in Port Moresby, PNG.

Ethics approval

The study was approved by the PNG Institute of Medical Research (IMR) Institutional Review Board (IRB) and the PNG Medical Research Advisory Committee (MRAC). The following approval numbers were allocated to the study: IRB No. 1414, 7 August 2014; MRAC No 14.26, 10 November 2014.

Outcome measures

The handbook on monitoring emergency obstetric care¹⁸ identified a set of indicators to measure availability, access and provision of EmOC in a country or a region. Two types of measures were defined -the first type focuses on availability, adequate coverage and utilization of services at national or sub-national levels and the second type measures obstetric care related functions performed by health facilities. The functions identified to define the level of EmOC services offered from a health facility are: (1) Administer parenteral antibiotics, (2) Administer uterotonic drugs, (3) Administer parenteral anticonvulsants, (4) Manually remove the placenta, (5) Remove retained products, (6) Perform assisted vaginal delivery, (7) Perform basic neonatal resuscitation, (8) Perform surgery (e.g., caesarean section), and (9) Perform blood transfusion. When a facility can perform all the functions listed under 1-7, it is considered a Basic EmOC (BEmOC) provider while ability to perform all the nine functions defines the comprehensive EmOC (CEmOC) provider. This study will use these nine measures to categorize health facilities as either a BEmOC or a CEmOC. Note that all these signal functions are defined by the ability to perform specific functions pregnant women need at the time of delivery. Ability to perform the functions does not necessarily imply that the facilities actually provided the services in the recent past.

Since this study is based on facility-level survey data, community or patient related health outcome measures are not directly observable. To compensate for this, we have used additional measures to understand readiness of health facilities in the provision of general inpatient care. Availability of basic medical equipment and supplies and physical condition of the facility (infrastructural variables) may affect willingness of clients to utilize services from the facilities. Another important intervention that improves access to obstetric care is through effective provision of family planning services, which reduce the demand for EmOC. Therefore, in addition to nine EmOC functions listed above, other outcome variables considered in this analysis are: (a) readiness of facilities to provide clinical services; (b) availability of family planning items; and (c) availability of maternity care related equipment and materials. Availability of drugs and supplies is defined as having the item in stock at the time of the survey.

For the availability of equipment, instruments and supplies, several indexes were calculated to indicate degree of availability of the items. The index values range from 0 to 100, 100 implying that all the items used for the construction of the index were available in all the facilities surveyed.

Calculating readiness or availability index

The analysis has used facility level data to derive the readiness indicators and ability to perform signal functions for each facility in the survey (Stata version 12 was used). The results are presented as descriptive tables (Tables 1-4) to indicate the proportion of facilities having the instruments or able to perform the specific functions.

An equally weighted index was constructed based on the availability of the items included in each of the categories of service delivery. It reflects the percent of all readiness aspects or variables satisfied by the health facilities in a specific category. For example, if a facility reports having an

instrument, a value of 1.0 was assigned for the facility for that equipment. The availability index was constructed to show the percent of listed equipment and items available in each of the facility categories. For example, if the family planning items availability index is 65 for level 3 and 4 facilities, it means that the facilities on the average had 65 percent of all the family planning equipment and items considered in the analysis.

Results

Facility readiness to provide clinical services

Table 1 reports facility readiness in the provision of services. As shown, 95% of level 5 to 7 facilities were connected to the main electric supply grid but only about a third of level 3 and 4 facilities. However, more than 80% of all facilities connected to the electric supply experienced blackout at least for some time in the week before the survey. All level 5 to 7 facilities had functional backup generators, while the percentage of level 3 and 4 facilities with backup generators was 76% for church-run facilities and 48% for public facilities. Half of the level 3 and 4 facilities with backup generators reported problems in operating the generator in the previous month.

If supply line and water tanks are considered, all level 5 to 7 facilities and 83% of level 3 and level 4 public health facilities and 84% of level 3 and level 4 church health facilities reported having access to water on the day of the survey. However, less than 10% of level 3 and 4 facilities were connected with water supply lines. Only 45% of level 3 and 4 public facilities had water connection to the delivery room (and water availability on the day of the survey) compared to 72% at church-run facilities.

A significant share of health facilities, 62%, 44% and 38% of level 3 and 4 public, level 3 and 4 church, and level 5 and 6 facilities, respectively, experienced water shortages in 2014. The survey asked facility respondents whether the facility was responsible for maintaining the water supply system and it was observed that about 45% of public level 3-4 facilities were responsible for maintaining the water supply system. The proportions were 64% for church-run level 3 and 4 facilities and 68% for level 5 to 7 facilities.

Both level 3 and 4 public and church-run health facilities show low readiness score for service delivery (Table 1). Readiness indexes were 40.3 for level 3 and 4 public sector facilities, 48.6 for level 3 and 4 church-run facilities, 84.6 for level 5 and 6 facilities, and 100 for the level 7 facility.

Availability of Family Planning Items

Table 2 presents the availability of family planning products and supplies in surveyed health facilities. The availability index of family planning items was 81.6 for level 3 and 4 public sector health facilities, 84.0 for level 3 and 4 church-run facilities, and 88.9 for level 5 and 6 facilities. Non-availability of family planning injections in the level 7 facility reduced the overall index of family planning item availability for the facility to 66.7. Since there is only one facility at level 7, non-availability of even a single item significantly reduces the overall index.

Availability of supplies and equipment for maternity care

A relatively large proportion of health facilities lacked very basic pregnancy and antenatal care related supplies and equipment as shown in Table 3. The index values for the availability of antenatal and pregnancy care items were 71.4 and 81.6 for level 3 and 4 public- and Church-run facilities, respectively. The index was 81.1 for level 5 and 6 facilities and 100 for level 7 facility. The index of availability of obstetric and post-natal care items were worse in level 3 and level 4 facilities, 64.7 and 76.0 respectively for public and church facilities. The index was 89.9 for level 5 and 6 facilities. Although many facilities stated having forceps when asked about availability of instruments for deliveries, it appears that non-obstetric forceps were reported. Health facilities in PNG, in general, do not use forceps for deliveries.

Ability to provide emergency obstetric care services

Table 4 indicates the percent of facilities able to perform different obstetric functions. As mentioned earlier, WHO has defined nine functions to understand the level of obstetric services provided from the facilities. The survey questionnaire combined first three signal functions (capacity to administer parenteral antibiotics, uterotonic drugs, parenteral anticonvulsants) into one and asked the respondents to report if the facility was able to perform all the three functions, two of the three or one of the three functions. Most level 3-4 facilities (about 80%) reported the ability to perform all these three functions. Two facilities at upper levels (levels 5-7) were not able to perform these three basic obstetric functions. One of the upper level facilities in the sample was not fully functional at the time of the survey. Ability to perform the signal functions 1 to 7 defines the "Basic EmOC" provider and table 4 shows that 38% of Church-run level 3-4 facilities and 52% of government-run level 3-4 facilities were BEmOC providers. Even among higher level facilities (levels 5, 6 and 7), 16% of facilities were not able to perform one or more of the necessary functions required to be considered a BEmOC provider.

If the signal functions for comprehensive emergency obstetric care are considered (all nine signal functions), only about 11% of level 3 and 4 health facilities were found to be CEmOC units. About 15% of level 3 and 4 facilities had the capacity to manage a caesarean section or do blood transfusion. Not all level 5 to 7 facilities were CEmOC providers – four of the 19 upper level facilities were not able to perform at least one of the nine signal functions.

Discussion

The overall health facility infrastructural condition in PNG is quite poor. Most facilities reported the need for major building repairs and emphasized the lack of adequate toilets, stable electrical supply, and consistent water supply. Many level 3 and 4 health facilities required better connectivity to electricity and clean water supply. One significant concern is the number of health facilities that did not have running water in the facility's delivery room. The quantity and quality of different types of clinical services provided crucially depends on the facility's readiness to offer services in general. Overall, level 3 and 4 facilities, both public and Church-run, scored low on the

readiness index, implying that these facilities were not very reliable providers of services and patient-confidence in these facilities are likely to be low. The survey also revealed the need for improving the supply of basic medical items at level 3 and 4 public health facilities. Level 3 and 4 public facilities show lower availability of different medical items compared to those in Church-run facilities.

Comparison of health facility readiness across countries is often tricky because of differences in the level and comprehensiveness of facilities in different countries of the world. A World Bank report²² indicates that 98 percent of public hospitals in Indonesia had electricity; in Laos, the index of basic amenities was reported as 64 percent²³ compared to 58 percent for PNG (weighted mean of the values in table 1).

Access to family planning services is still limited in PNG. The results from the survey are consistent with the most recent findings from the PNG DHS. One quarter of currently married women (26%) have an unmet need for family planning, and only 59% of currently married women are satisfied with family planning services. Among those who have received family planning, about 9 in 10 users obtained their modern family planning supplies from a public (government) source. Therefore, there is an urgent need to strengthen the government health facilities, especially at lower levels, in the provision of family planning items and services to reduce maternal mortality and to improve access to obstetric care services. Several studies found strong positive effect of increased use of family planning on maternal and child mortality.²⁴⁻²⁶

While 79% of level 5 to 7 facilities were found to be CEmOC providers, the fact that about a fifth were not able to provide comprehensive emergency obstetric care is a major concern, given that these are the higher level referral hospitals in PNG. Consistent with the findings of this study, another study using a much smaller sample of facilities, concluded that the "Capacity for essential surgery and anaesthesia services is severely limited in PNG due to shortfalls in physical infrastructure, human resources, and basic equipment and supplies."¹⁶

The number of level 3 and 4 facilities surveyed for this study was high enough to provide national level estimates on obstetric care availability. Using the proportions of CEmOC facilities at different levels and the total number of facilities in the country at these levels, we have derived the number of facilities providing comprehensive obstetric care in PNG at the time of the survey. The number turns out to be only 50 for the country. Even if we arbitrarily assume balanced geographic distribution of these facilities, an emergency obstetric case will have to travel 53 km each way, on average, to reach a CEmOC facility. The distance to the nearest CEmOC facility is so large that for many emergency cases this is virtually synonymous of not having access to CEmOC. To reduce maternal mortality and morbidity significantly, it is essential to lower the average distance to the nearest CEmOC facility²⁷ implying that PNG will have to upgrade a significant number of levels 3, 4 and 5 facilities. Using geographic information systems and geographical modelling tools to optimize the location of CEmOC facilities, PNG can identify specific existing facilities to be upgraded.²⁸

BMJ Open

All facilities at level 3 or above should be able to provide basic EmOC. To improve access to emergency obstetric care, most level 3 and 4 facilities should be considered for immediate upgrading to BEmOC provider or better. The survey of facilities indicated that about 45 percent of levels 3 and 4 facilities were not ready to provide BEmOC. Despite this low readiness, equipping about 15 to 20% of these facilities to perform signal functions 5 and 6 can improve BEmOC availability from 55% of the facilities to about 80%. Although maternal and child health is a priority area, PNG has not allocated enough resources to achieve improved access to maternity and neonatal services. PNG spends more than 4.3% of its GDP on health (about \$109 per capita in PPP dollars). Total health expenditure is not low compared to other countries with similar level of per capita income.²⁹ However, a significant part of health resources, including human resources, particularly doctors, are concentrated in a few major hospitals. Therefore, the resource allocation at the lower level health facilities (level 3 and level 4 facilities) are not sufficient. Reallocation of public sector resources to lower level health facilities are needed to expand access to obstetric care and other preventive services.

To improve availability and access to quality maternity services in PNG, especially in remote rural areas, a program of training and upskilling of Community Health Workers was adopted.³⁰ Although the upskilling has increased utilization of basic maternity services, significant reductions in maternal mortality will require access to hospital-based obstetric care. Government of PNG may consider allocating funds to facilities, both public and church facilities, based on quantities of priority health services delivered rather than on number and mix of human resources and other administrative needs.³¹ While the effectiveness of such performance based financing depend on how the schemes are implemented, evidence in low and middle income countries shows that the performance can be improved through financial incentives.³² From the demand side, past research has found that providing pregnant women with health vouchers to ensure financial protection for accessing medical care has increased utilization of health services.³³ The payments received through the vouchers will also encourage facilities to become more sensitive to the needs of pregnant women and would have incentives to invest to become fully functional EmOC providers. An initiative in two provinces in PNG that provided incentive packages to pregnant women increased facility-based supervised birth rates by 80%³⁴ indicating that enhancing facility readiness combined with incentivizing pregnant women to utilize health facilities will be very effective in improving maternal and neonatal health.

Study Limitations

Several limitations of the study should be mentioned here. First, it is not possible to indicate overall geographic access to primary health care services in PNG using the survey data because the study did not collect information from level 1 and 2 health facilities. However, these facilities do not provide obstetric care services although some basic services like family planning and antenatal care can potentially be organized at these levels. Second, the survey, strictly speaking, is not a representative survey of level 3 and 4 facilities. The survey design selected high-demand fully functional level 3 and 4 facilities in target districts and the definition of fully functional led

to the choice of facilities that showed relatively high level of utilization. Therefore, if anything, the results are likely to be significant overestimations of degree of readiness of the facilities in the provision of obstetric care and other related services in PNG. Even with this favorable selection of facilities, the percent of facilities able to perform BEmOC and CEmOC was quite low at levels 3 and 4 implying that the availability of obstetric care services could be significantly worse than what has been reported in this study. Third, the study did not try to connect the service availability and readiness with health outcomes of the population at the subnational level. In PNG, even the national level estimates of mortality and morbidity are considered unreliable and subnational level estimates would suffer from even higher degree of error in estimation. In any case, facility level information clearly indicates that many of the functional facilities are not ready to provide obstetric health services and a significant proportion of facilities lack medical equipment, instruments and supplies for the provision of quality maternity and neonatal services.

Conclusions

Inability of a health facility, irrespective of whether it is a primary, secondary and tertiary care facility, to provide obstetric care and other related services is an important concern for any health care system. It is especially true for a country like PNG where maternal and infant mortalities are high alongside a high fertility rate. Better access and utilization of family planning services can help reduce the demand for EmOC, lower maternal and neonatal mortality/morbidity and improve access to maternity services. Lowering the need for maternity services through interventions like family planning, however, is unlikely to improve access to maternity care significantly in the short-run. Supply-side interventions are necessary to ensure that the services are available in strategically located health facilities. Improving facility infrastructure, equipping the facilities with essential medical equipment and supplies and ensuring the presence of trained personnel in health facilities are needed to make the facilities BEmOC or CEmOC providers. Since the number of facilities in PNG offering EmOC is quite low compared to the needs, all level 3 and 4 facilities should be upgraded to at least the BEmOC level. Survey-based estimates suggest that only 50 facilities in PNG can be considered CEmOC providers and this number is inadequate to ensure equitable access to emergency obstetric cases. Increasing the number of CEmOC providers is urgently needed.

BMJ Open

Figure caption

Figure 1. Three components of Donabedian approach of evaluating quality of care

Figure 2. Map of PNG with Districts Visited (green) and Location of Surveyed Facilities

to beer terien only

References:

- Islam, M.T., et al., Improvement of coverage and utilization of EmOC services in southwestern Bangladesh. Int J Gynaecol Obstet, 2005. 91(3): p. 298-305; discussion 283-4.
- 2. Turab, A., et al., *Improved accessibility of emergency obstetrics and newborn care* (*EmONC*) services for maternal and newborn health: a community based project. BMC Pregnancy Childbirth, 2013. **13**: p. 136.
- 3. Chavula, K., et al., *Readiness of hospitals to provide Kangaroo Mother Care (KMC) and documentation of KMC service delivery: Analysis of Malawi 2014 Emergency Obstetric and Newborn Care (EmONC) survey data.* J Glob Health, 2017. **7**(2): p. 020802.
- 4. Ameh, C.A., et al., *The effectiveness of training in emergency obstetric care: a systematic literature review.* Health Policy Plan, 2019. **34**(4): p. 257-270.
- 5. Lee, A.C., et al., *Care during labor and birth for the prevention of intrapartum-related neonatal deaths: a systematic review and Delphi estimation of mortality effect.* BMC Public Health, 2011. **11 Suppl 3**(Suppl 3): p. S10.
- 6. Paxton, A., et al., *Global patterns in availability of emergency obstetric care.* Int J Gynaecol Obstet, 2006. **93**(3): p. 300-7.
- 7. Banke-Thomas, A., et al., *Assessing emergency obstetric care provision in low- and middle-income countries: a systematic review of the application of global guidelines.* Glob Health Action, 2016. **9**: p. 31880.
- 8. Government of Papua New Guinea, *National Health Plan 2011–2020, Volume 1: Policies and Strategies.* June 2010,.
- 9. Mola, G. and B. Kirby, *Discrepancies between national maternal mortality data and international estimates: The experience of Papua New Guinea.* Reproductive health matters, 2013. 21: p. 191-202.
- 10. Robbers, G., et al., *Maternal and newborn health indicators in Papua New Guinea* 2008–2018. Sexual and Reproductive Health Matters, 2019. **27**(1): p. 52-68.
- 11. PNG National Department of Health, *Health Information Systems*. 2019.
- 12. WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. *Trends in Maternal Mortality: 2000 to 2017.* Geneva, World Health Organization, 2019.
- 13. National Statistical Office (NSO) [Papua New Guinea] and ICF, Papua New Guinea Demographic and Health Survey 2016-18. Port Moresby, Papua New Guinea, and Rockville, Maryland, USA: NSO and ICF. 2019.
- 14. Mola, G., I Aitken, *Maternal mortality in Papua New Guinea 1976-1983*. PNG Medical Journal, 1984. 27(2): p. 65-71.
- 15. Dennis, A.T., *Reducing Maternal Mortality in Papua New Guinea: Contextualizing Access to Safe Surgery and Anesthesia*. Anesthesia & Analgesia: January 2018. 126(1): p 252-259. doi: 10.1213/ANE.00000000002550
- 16. Martin, J., Goa Tau, Meena Nathan Cherian, Jennifer Vergel de Dios, David Mills, Jane Fitzpatrick, William Adu-Krow & Davy Cheng, *Survey of the capacity for essential surgery and anaesthesia services in Papua New Guinea*. BMJ Open 2015;5: e009841. doi:10.1136/bmjopen-2015-009841.

1		
2		
3 4	17.	Donabedian, A., Evaluating the Quality of Medical Care. The Milbank Quarterly, 2005
5		83(4): p. 691-729 (reprint from 44(3): 166-203 <i>,</i> 1966).
6	18.	WHO, UNFPA, UNCEF, & AMDD, Monitoring emergency obstetric care: a handbook.
7		2009, Geneva: World Health Organization.
8	19.	NDOH, Christian Health Services Technical Assistance Mission Report. 2013, National
9		Department of Health: Port Moresby, Papua New Guinea.
10	20.	Government of PNG (GoPNG). National Health Service Standards for Papua New Guinea
11		2011-2020 Volume 1 June 2011
12	21	Khan M Mahmud Xiaohui Hou Olga PM Saweri Ibrahim Demir Rifat Haider Shakil
14	21.	Abmod and Justin Pulford, Service Delivery by Health Facilities in Danua New Guinea:
15		Annieu and Justin Funoru, Service Denvery by Hearin Fucinities in Fupuu New Guineu.
16		Report based on a countrywide nearth jacinity survey, wasnington DC. The world Bank
17	~~	Group. December 2017.
18	22.	World Bank, Universal Maternal Health Coverage? Assessing the Readiness of Public
19		Health Facilities to Provide Maternal Health Care in Indonesia. Washington, DC: World
20		Bank. 2014.
22	23.	World Bank, Maternal Health Out-of-Pocket Expenditure and Service Readiness in Lao
23		PDR. Washington, DC: World Bank. 2013.
24	24.	Chola L, McGee S, Tugendhaft A, Buchmann E, Hofman K. Scaling Up Family Planning to
25		Reduce Maternal and Child Mortality: The Potential Costs and Benefits of Modern
26		Contraceptive Use in South Africa, PLoS ONE 2015, 10(6); e0130077.
2/		doi:10.1371/iournal.pone.0130077
20 29	25	Budi Utomo B. Purwa Kurnia Sucahya Nohan Arum Romadlona. Annette Sachs
30	25.	Robertson Biznawaty Imma Arvanty and Robert Josenh Magnani. The immact of family
31		nobert son, Mizhawaty minia Alyanty and Nobert soseph Maghani, the impact of juliny
32		planning on maternal mortality in maonesia. What jutare contribution can be expected?
33	26	Population Health Metrics (2021) 19:2, https://doi.org/10.1186/s12963-020-00245-w
34	26.	Winikott, B. & Maureen Sullivan. Assessing the Role of Family Planning in Reducing
35 26	_	Maternal Mortality, Studies in Family Planning , May - Jun., 1987, 18(3), p. 128-143
30 37	27.	McKinnon, B., et al., Distance to emergency obstetric services and early neonatal
38		<i>mortality in Ethiopia.</i> Trop Med Int Health, 2014. 19 (7): p. 780-90.
39	28.	Ebener, S., et al., Proposing standardised geographical indicators of physical access to
40		emergency obstetric and newborn care in low-income and middle-income countries. BMJ
41		Glob Health, 2019. 4 (Suppl 5): p. e000778.
42	29.	World Bank, Health Financing System Assessment : Papua New Guinea. World Bank,
43		Washington, 2017.
44 45	30.	Mola, G., Upskilling experienced female CHWs currently working in maternity care in
46		rural health facilities in maternity care skills unpublished memory December 2020
47	21	Cairns A and Viaobui Hou. <i>Financing the frontline : an analytical review of provincial</i>
48	51.	administrations' rural health expenditure 2006 2012 Health Nutrition and Population
49		(UND) discussion paper. Washington, D.C.: World Paper Group, in 2015.
50		(HNP) discussion paper. Washington, D.C.: World Bank Group., III 2015.
51		nttps://nubs.worldbank.org/docs/imageBank/Pages/DocProfile.aspx?nodeld=25991656.
52 53	32.	Paul, E. and D. Renmans, Performance-based financing in the heath sector in low- and
54		middle-income countries: Is there anything whereof it may be said, see, this is new? Int J
55		Health Plann Manage, 2018. 33 (1): p. 51-66.
56		
57		
58		18
59 60		For peer review only - http://bmionen.hmi.com/site/about/quidelines.yhtml
00		. of peer terter only integration peer only and and guidelines. And in

- 33. CM, B., et al., *The impact of vouchers on the use and quality of health care in developing countries: a systematic review.* Glob Public Health, 2013. **8**(4): p. 363-88.
 - 34. Mola, G., A pioneering approach to birthing, PNG Attitude, December 2019. https://www.pngattitude.com/2019/12/a-pioneering-approach-to-birthing.html

tor peer terier only

Table 1. Readiness Index for provision of genera	I clinical services by Facility Level in Papua New Guinea
--	---

Readiness indicators		Level	Leve	l 5 and 6	Level 7			
	Public	%	Church	%	N	%	N	%
Electricity connected to supply grid	10	34%	7	28%	17	94%	1	100%
Backup generator	14	48%	19	76%	18	100%	1	100%
Electricity availability (supply or generator)	20	69%	21	84%	18	100%	1	100%
Blackout last week	8	28%	6	24%	15	83%	0	0
Problem last month running generator due to fuel shortage	8	28%	10	40%	3	17%	0	0
Water from main line	2	7%	3	12%	15	83%	1	100%
Water shortage last year	18	62%	11	44%	7	39%	0	0
Water available for use by health care providers	24	83%	21	84%	18	100%	1	100%
Water available in delivery room	13	45%	18	72%	18	100%	1	100%
Facility does direct blood transfusion	3	10%	3	12%	16	89%	1	100%
Blood transfusions done last month	3	10%	3	12%	18	100%	1	100%
Facility has designated space for clinicians to provide service	20	69%	20	80%	18	100%	1	100%
Facility has on-call room or space for health care providers to take rest	3	10%	11	44%	10	56%	1	100%
Facility has telephone or shortwave radio	14	48%	14	56%	15	83%	1	100%
Facility has ambulance	26	90%	24	96%	17	94%	1	100%
Ambulance out of service last year	11	38%	10	40%	6	33%	0	0
Facility has other vehicles	8	28%	5	20%	18	100%	1	100%
Facility has operation theatre	8	28%	9	36%	18	100%	1	100%
Index of readiness	40	.3	48	8.5		84.6		100

Source: 2015 Survey of health facilities in PNG (survey conducted by this study)

Table 2. Availability of Family Planning Items by Facility Level in Papua New Guinea

Family planning (FP) items		Level 3 and	l 4 facilitie	lities Level 5 and 6 facilities			Level 7 facilities	
	Public	% of Public	Church	% of Church	Public	% of Level 5 and 6	Public	% of Level 7
Oral pills	26	90%	21	84%	17	94%	1	100%
FP injections	22	76%	22	88%	15	83%	0	0%
Condoms	23	79%	20	80%	16	89%	1	100%
Index of FP items	8	1.6	84	1.0		88.9	6	6.7

Source: 2015 Survey of health facilities in PNG (survey conducted by this study)

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Antenatal, pregr	Antenatal, pregnancy, obstetric and		Leve	3 and 4		Level	5 and 6	Level 7	
neonatal care re	lated equipment and		% of		% of				
supplies		Public	Public	Church	Church	Public	%	Public	%
Foetal stethosco	pe (or monitor)	27	93%	25	100%	14	78%	1	100%
Stethoscope and	blood pressure cuff	22	76%	25	100%	16	89%	1	100%
Tape measure		23	79%	22	88%	16	89%	1	100%
Scale		28	97%	25	100%	16	89%	1	100%
Ultrasound mach	ine (and gel)	28	97%	25	100%	17	94%	1	100%
Facility has at lea	st two skilled birth								
attendants cover	ing 24 hours a day	21	72%	19	76%	18	100%	1	100%
Delivery kit (insti	uments, supplies)	25	86%	25	100%	18	100%	1	100%
Stethoscope		10	34%	11	44%	15	83%	1	100%
Partograph		11	38%	13	52%	14	78%	1	100%
Pelvic procedure	instruments such as								
speculum		18	62%	22	88%	16	89%	1	100%
Delivery light		24	83%	24	96%	18	100%	1	100%
Sterilizer		15	52%	16	64%	13	72%	1	100%
Vacuum extracto	r 🗸	14	48%	21	84%	18	100%	1	100%
Forceps		25	86%	25	100%	18	100%	1	100%
Manual vacuum	aspirator/suction bulb	27	93%	25	100%	17	94%	1	100%
Resuscitation ba	z. newborn	4	14%	4	16%	15	83%	1	100%
Eve drops or oint	ment for newborn	27	93%	25	100%	18	100%	1	100%
Needles and svri	nges	28	97%	25	100%	18	100%	1	100%
Sterile C-section	instrument kits	28	97%	25	100%	18	100%	1	100%
Cord supplies for	newborn: clamps, ties.								
scissors		2	7%	5	20%	12	67%	1	100%
IV sets, including	sterilized needle and								
tube		27	93%	25	100%	17	94%	1	100%
IV fluids includir	g normal saline and		5570		100/0		5170	-	100/0
ringer lactate	B normal sume and	29	100%	25	100%	18	100%	1	100%
Index: availabilit	v of antenatal and	25	10070	25	100/0		100/0	1	100/0
nregnancy care i	toms	71	41	8	81.60	81	.11	10	0.00
Index: availabilit	v of obstatric and								
neonatal care ite		64	.66	7	6.00	89	.93	10	0.00
neonatal care ite	:115								

Table 4. Percentage of Health Facilities Able to Perform Signal Functions with Categorization of Facilities into Basic Emergency Obstetric Care and Comprehensive Emergency Obstetric Care Providers

Signal functions for obstetric and neonatal care	Ability to perform	Level 3 and 4 public	Level 3 and 4 church	Level 5 to 7	Total
		% (n)	% (n)	% (n)	% (n)
Signal functions 1-3: Have	Yes, all three	76% (22)	80% (20)	89% (17)	81% (59)
parenteral antibiotics,	Yes, two of the three	10% (3)	16% (4)	5% (1)	11% (8)
anticonvulsants?	Yes, one of the three	3% (1)	4% (1)	0% (0)	3% (2)
Signal function 4: Have the ability for manual removal of placenta?	Yes	72% (21)	88% (22)	95% (18)	84% (61)
Signal function 5: Have ability to remove retained products?	Yes	59% (17)	80% (20)	95% (18)	75% (55)
Signal function 6: Have the capacity to perform assisted vaginal delivery?	Yes	59% (17)	72% (18)	89% (17)	71% (52)
Signal function 7: Have ability to Perform basic neonatal resuscitation	Yes	72% (21)	96% (24)	95% (18)	86% (63)
Signal function 8: Have ability to perform surgery and manage caesarean section	Yes	14% (4)	16% (4)	95% (18)	36% (26)
Signal function 9: Have capacity to do safe blood transfusion	Yes	14% (4)	20% (5)	89% (17)	36% (26)
Ability to perform first seven signal functions	Basic EmOC	38% (11)	52% (13)	84% (16)	55% (40)
Ability to perform all nine signal functions	Comprehensive EmOC	10% (3)	12% (3)	79% (15)	29% (21)







Note: Red squares represent the level 5 to 7 facilities while the blue squares represent the level 3 to 4 facilities surveyed.

BMJ Open

BMJ Open

Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea – Evidence from a Cross-Sectional Survey

Journal:	BMJ Open
Manuscript ID	bmjopen-2021-050150.R2
Article Type:	Original research
Date Submitted by the Author:	21-Dec-2021
Complete List of Authors:	Hou, Xiaohui ; World Bank Group, Health, Nutrition and Population Global Practice Khan, M. Mahmud ; University of Georgia College of Public Health Pulford, Justin; Liverpool School of Tropical Medicine, ; Papua New Guinea Institute of Medical Research, Saweri, Olga; Papua New Guinea Institute of Medical Research
Primary Subject Heading :	Obstetrics and gynaecology
Secondary Subject Heading:	Global health, Health policy, Health services research, Obstetrics and gynaecology
Keywords:	OBSTETRICS, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Maternal medicine < OBSTETRICS

SCHOLARONE[™] Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our <u>licence</u>.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

reliez oni

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

1		
2		
4	1	
6	2	
8	3	
9 10	4	
11 12	5	
13	6	Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea –
14	7	Evidence from a Cross-Sectional Survey
16 17	8	
18 19	9	
20		
21		
22		
23 24		
25		
26		
27		
28		
29		
30 31		
32		
33		
34		
35		
36		
37 38		
39		
40		
41		
42		
43 44		
45		
46		
47		
48		
49 50		
50 51		
52		
53		
54		
55 56		
50 57		
58		1
59 60		For peer review only - http://bmiopen.bmi.com/site/about/auidelines.xhtml
00		, , , , , , , , , , , , , , , , , , ,

1		
2		
3 4	1	Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea -
5	2	Evidence from a Cross-Sectional Survey
6	2	
7	3	
8	4	Xiaohui Hou, Ph.D.
9	5	Health, Nutrition, and Population Global Practice
10	6	World Bank
12	7	1818 H. Street. NW, 20433
13	8	Washington DC
14	9	xhou@worldbank.org
15	10	
16	11	
1/ 10	12	M. Mahmud Khan, Ph.D.
10	13	Health Policy and Management Department
20	14	College of Public Health
21	15	University of Georgia
22	16	Wright Hall Health Sciences Campus 100 Foster Road, Athens, GA 30602
23	10	Mahmud Khan@uga odu
24	10	Mannud.Khan@uga.euu
25 26	10	
27	10	Latis D. Rad Dk D
28	19	Justin Pulford, Ph.D.
29	20	Senior Lecturer
30	21	Department of International Public Health
31	22	Liverpool School of Tropical Medicine
32 33	23	justin.pulford@lstmed.ac.uk
34	24	
35		
36	25	Olga P. M. Saweri, MSc
37	26	Papua New Guinea Institute of Medical Research (PNGIMR)
38	27	PO Box 60, Goroka, EHP 441, Papua New Guinea
39 40	28	olga.saweri@gmail.com
40 41	29	
42	30	Declarations of interest: none
43	31	Corresponding Author: M. Mahmud Khan, Ph.D., Professor, Health Policy and Management,
44	32	College of Public Health. University of Georgia. 100 Foster Road. Wright Hall 116. Athens. GA
45	33	30602. Mahmud.Khan@uga.edu
46 47	34	
47 48	25	Key words
49	55	ixey worus
50 51	36	Maternal Health, Emergency Obstetric Care, Readiness of health facilities, signal functions for
52 53	37	emergency obstetric care, Papua New Guinea
54 55	38	Total word count: 5,350 (excluding references, figures and tables)
56 57 58		2
59		_
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

1 Contributorship statement

- 3 Xiaohui Hou: Conceptualization, Methodology, Supervision, Project Administration, Resources,
- 4 Writing-Original Draft, Writing review & editing
- **M. Mahmud Khan**: Conceptualization, Methodology, Supervision, Formal Analysis, Writing-6 Original Draft, Writing – review & editing
- Justin Pulford: Conceptualization, Methodology, Data Curation, Data Validation, Writing-Review
 & Editing.
 - **Olga P. M. Saweri:** Data Curation, Data Validation, Writing-Review & Editing
- 12 Details of funding source

This work was funded by World Bank's Trust Fund supported by Australia's Department of Foreign Affairs and Trade. World Bank contract number: 7171956, Principal Investigator: M. Mahmud Khan. Date: July 1, 2014.

- 18 Data availability statement
- ⁰ 19 No additional data is available. Researchers interested in 2015 PNG Facility Assessment Survey
 - 20 data can contact the PI of the project, Dr. M. Mahmud Khan, at the email address
- 21 <u>Mahmud.Khan@uga.edu</u> with a statement on the reasons for requesting the dataset and types
- 1 22 of analyses to be conducted.

1 2		
_ 3 ⊿	1	Abstract
5	2	Objective
7 8 9	3 4	To measure readiness of health facilities in Papua New Guinea (PNG) to provide obstetric care and other maternal health services.
10 11	5	Design
12 13 14 15 16	6 7 8	Cross-sectional study involving random sample of health centers, district/rural hospitals (levels 3 and 4 facilities) and all upper level hospitals operational at the time of survey. Structured questionnaires were used to collect data from health facilities.
17	9	Setting
19 20 21 22	10 11 12	Health facilities in PNG. Facility administrators and other facility personnel were interviewed. Number of facility personnel interviewed was usually one for health centers and two or more for hospitals.
23 24	13	Participants
25 26 27	14 15	19 upper-level facilities (levels 5-7, provincial, regional and national hospitals) and 60 lower-level facilities (levels 3 and 4, health centers and district/rural hospitals)
28 29 30	16	Outcome measures
30 31 32 33 34 35	17 18 19 20	Four service-types were used to understand readiness of surveyed health facilities in the provision of maternity care including obstetric care services: (1) facility readiness to provide clinical services; (2) availability of family planning items; (3) availability of maternal and neonatal equipment and materials; and (4) ability to provide emergency obstetric care.
36 37	21	Results
38 39 40 41 42 43 44 45	22 23 24 25 26	56% of lower level facilities were not able to provide Basic Emergency Obstetric Care (BEmOC). Even among higher level facilities, 16% were not able to perform one or more of the functions required to be considered a BEmOC provider. 11% of level 3 and 4 health facilities were able to provide comprehensive emergency obstetric care (CEmOC) as compared to 83% of higher level facilities.
46 47	27	Conclusion
48 49 50 51	28 29 30	Given the high fertility rate and maternal mortality ratio (MMR) in PNG, lack of BEmOC at the first level inpatient service providers is a major concern. To improve access to EmOC, level 3 and 4 facilities should be upgraded to at least BEmOC providers. Significant reduction in MMR will
52 53 54	31 32	require improved access to CEmOC and optimal geographic location approach can identify facilities to be upgraded.
55 56 57	33	
58 59		4
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

2		
3	1	Strengths and limitations of this study
4 5	2	
6	3	• This is the first empirical study that systematically examined availability of maternity
7	4	care in health facilities in Papua New Guinea (PNG).
8	5	All upper level hospitals and randomly selected fully functional health centers were
9 10	6	surveyed
11	7	 The readiness of facilities in the provision of obstatric care and actual provision of services
12	, 0	• The readiness of facilities in the provision of obstetric care and actual provision of services
13	0	were assessed using relevant indicators and signal functions.
14 15	9	Service availability and readiness of facilities could not be linked with community level
16	10	nearth outcomes.
17	11	The sampling design selected fully functional health centers and district/rural hospitals in
18	12	each of the surveyed districts implying overestimation of readiness and availability of
19 20	13	obstetric care.
21	14	
22		
23		
24 25		
26		
27		
28		
30		
31		
32		
33 24		
35		
36		
37		
38 30		
40		
41		
42		
43 44		
45		
46		
47 49		
40 49		
50		
51		
52 53		
54		
55		
56		
57 58		ς
59		
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Introduction

Effective antenatal, neonatal and Emergency Obstetric Care (EmOC) are highly cost-effective interventions vital to avert common adverse pregnancy and/or birth outcomes, which significantly contribute to maternal mortality in poor resource settings.¹⁻⁴ Basic Emergency Obstetric Care (BEmOC) alone can avert a significant proportion of maternal deaths and up to 40% of neonatal deaths.⁵ A global assessment found that BEmOC facilities are consistently not available in sufficient numbers in countries with high and moderate levels of maternal mortality.⁶ Comprehensive Emergency Obstetric Care (CEmOC) availability, which includes the provision of caesarean and blood transfusion services in addition to the key functions included in BEmOC, is also guite poor in many low and middle income countries.⁷

Maternal and child health remains a key priority area in Papua New Guinea (PNG);⁸ however, persistently high maternal and neonatal deaths reflect numerous deficiencies. The estimates of Maternal Mortality Ratio (MMR) in PNG vary considerably. One study by Mola and Kirby estimated the MMR for 2009 using facility-based health information system records and survey data on maternal mortality among unsupervised births from one province. The estimates imply that the average MMR in PNG should be approximately 500 per 100 000 live births.^{9 10} The neonatal mortality in PNG is also high, around 28 per 1000 live births.¹¹ The World Health Organization model ranks PNG 130th in the world in terms of MMR.¹² The 2016-2018 PNG Demographic and Health Survey (DHS), using the sisterhood method, found that the MMR was about 205 per 100,000 live births.¹³ Even though new DHS estimate represents a significant improvement from the previous estimate of 733 per 100,000 live births in 2006, the maternal mortality in PNG remains about 24 times the MMR in neighboring Australia.¹² The DHS report also indicates that only 17% of pregnancies received a prenatal visit in the first trimester and 49% had four or more prenatal visits over the whole pregnancy. During 2012-2017, about 55% of deliveries in PNG were supervised by trained health workers at health facilities¹³ indicating limited access to modern maternal health care services.

To reduce the MMR in any country, it is important to understand the causes of death so that appropriate interventions can be designed and adopted. In PNG, the maternal mortality registry often does not report causes of death. Reviewing the causes of deaths mentioned in the general death registry and in maternal mortality registry, one study in early 1980s found that the main causes were puerperal sepsis, postpartum hemorrhage, medical and surgical complications, prolonged or obstructed labor, ruptured uterus, deaths associated with caesarean section.¹⁴ It is likely that many of these causes of deaths have remained important even today. Clearly, deaths due to the causes indicated above cannot be avoided without timely access to health facilities that are equipped to provide a range of obstetric care services. A recent article mentioned geographically dispersed population, shortage of health care providers, poverty, gender inequality and low level of education as important determinants of maternal deaths.¹⁵ These aspects are, however, directly related to access to care and readiness of health facilities in the provision of maternity care.

1 Lifetime risk of maternal death depends on the probability of maternal death per pregnancy and

- 2 the average number of pregnancies per woman over the reproductive age. The 2016-2018 PNG
- 3 DHS estimated that total fertility rate (TFR) was about 4.2 per woman, which is slightly lower than
- 4 the TFR of 4.4 in 2006. Access to obstetric care and lifetime risk of maternal death can be
- 5 improved by lowering the TFR as well.

Given the critical importance of timely access to appropriate obstetric care, it is essential to assess the ability and readiness of health facilities in the provision of emergency obstetric care in PNG. Due to high TFR of PNG, the demand for maternal health services will continue to increase rapidly, underscoring the urgent need for improving access to care and strengthening maternal healthcare service delivery.

Despite the high social value of maternal and newborn health care services in PNG, no macro-level information is available on the ability or readiness of health facilities in the provision of the services. One recent study assessed the capacity of 21 health facilities in the provision of essential surgery and anesthesia services.¹⁶ No study on PNG, to date, has examined the readiness and ability of health facilities at the national level in the provision of obstetric care services. This study is the first attempt to understand the state of obstetric care availability in PNG.

The principal objective of this study is to measure health facility readiness to provide obstetric care and other maternal health services. Some of the measures reflect not only the readiness of the facilities in the provision of target services but also the quality of services offered. The nationally representative health facility survey allows measurement of various indicators of obstetric care services. These measures will be useful for policy makers to reform the health care delivery system to strengthen the provision of obstetric care and general clinical services.

23 Methods

37 24 Conceptual Framework

We use the Donabedian's framework to analyze the readiness of obstetric care and other related services offered through the health facilities in PNG. In general, the Donabedian's approach is used to evaluate quality of care by analyzing relevant structures, processes and outcomes.¹⁷ The structure measures affect processes and then processes affect outcomes, as shown in figure 1. In this study, our focus is on the evaluation of 'structure' and 'process' measures relevant for maternity care. The structure and process variables help to better understand the ability of health facilities in the provision of different service-types. Although, the impact of service provision cannot be directly measured from the facility survey data, country-level estimates of maternal mortality and morbidity imply relatively poor outcomes indicating the need for improving infrastructure and processes associated with obstetric and other maternity services.

To evaluate the ability and readiness to provide general medical care services including obstetric
 care, health facilities should have several infrastructural characteristics and resources. Some of
 the structural measures are quite general, related to the provision of any clinical service, such as

general inpatient services. In addition, specific personnel, supplies and drugs must be available at the facility to be able to offer the right type of services at the right time based on the clinical needs of patients. The structural characteristics, although not directly related to maternity care, are the necessary aspects defining the "readiness" of the facility in the provision of effective health care services. Readiness, however, does not necessarily imply actual provision of services. The infrastructural aspects act as the foundation for the provision of services, and relevant health care resources must be combined with the infrastructure to offer services to patients whenever needed. The process variables reflect ability to offer different types of obstetric care services and functions. The process variables for monitoring obstetric care service provision, the signal functions, are well defined and we will use the facility-level signal functions for understanding the readiness of facilities in PNG.¹⁸

12 Study Setting

PNG is remarkably diverse with respect to geography, language, and infrastructure. The country is divided into 22 provinces across four regions (Highlands, Momase and Southern, and the New Guinea Islands). Most of the country's 8 million people live in rural or peri-urban communities and are faced with significant challenges with regard to equitable access to health, education and economic opportunities.

PNG has a government-funded health system throughout much of the country. It is
 supplemented by government-subsidized health services provided by various Christian missions.
 Overall, it is estimated that churches provide 47 percent of primary health services, particularly
 in rural areas.¹⁹

Health facilities are categorized by the number and cadre of health workers employed and the services they provide and are detailed in the National Health Services Standard (NHSS) of the Government of PNG (GoPNG).²⁰ The levels of health facilities in PNG are numbered 1 through 7, where levels 1 and 2 provide basic primary health care, specifically outpatient services only. Level 3 health facilities, or health centers, provide outpatient and basic inpatient services for deliveries and minor ailments requiring observation. Level 4 health facilities, district and rural hospitals, provide general admissions, limited clinical support services including basic pharmacy and laboratory services, and depending on the employment of a medical officer, may provide surgical intervention services. Levels 5 to 7 health facilities provide secondary and tertiary health services as well as clinical support services, including pharmacy, laboratory, and radiology. The only level 7 health facility, the Port Moresby General Hospital, is the largest and most advanced health care facility of PNG, employs the largest concentration of health care workers and provides comprehensive health care services.

52 35 Survey Design

We conducted a health facility survey of 73 health facilities in PNG in 2015. All operational upper
 level health facilities (levels 5 to 7) were selected for the survey. At the time of data collection,

PNG had 19 upper-level health facilities and all these 19 facilities were surveyed (although one of the facilities was not fully operational). The upper-level health facilities in the survey included the national referral hospital (Port Moresby General Hospital), three regional hospitals, and 15 provincial hospitals. At the national level, since about half of health centers and district/rural hospitals (levels 3 and 4) were Church-run, the survey design intended to sample equal number of publicly-run and Church-run facilities. For selecting facilities at these two levels, between six (New Guinea Islands) and eight (Southern, Highlands, and Momase) districts were randomly selected per region. The largest government- and Church-administered health facilities (one of each type based on outpatient numbers per annum as reported by the National Health Information System) were purposely selected per district. This sampling procedure allowed selection of 30 publicly run and 30 church-run facilities from the selected districts; however, during field visits, not all selected facilities were found to be operational. Where possible, closed health facilities were replaced by functional ones within the same district. In some districts there were no functional level 3 or 4 facilities, resulting in less than 60 facilities surveyed (N=54). Figure 2 shows the location of the health facilities surveyed for this study. The provinces shaded in green indicate where the survey was carried out. The red squares represent level 5 to 7 health facilities, while the blue squares represent levels 3 and 4.

Survey Procedure

The survey comprised of a health facility assessment and costing instrument as well as interviews with healthcare providers, inpatients, and outpatients. Each instrument is detailed in the survey report.²¹ The facility assessment questionnaire can be found in the supplementary file of the article. Briefly, the health facility assessment collected information on various operational aspects of each health facility, while the costing instrument detailed expenditure on human resources, equipment, and consumables utilized for the provision of healthcare services. Both these instruments were completed with health facility managers and administrators. Upper level facilities offered many different types of specialized services and data collection at these levels required interviewing multiple facility personnel. The data collection was done by a team of 5 trained enumerators, who spent three to five days surveying each health facility. In total, 73 health facilities were surveyed.

Informed consents for the survey

For health facility costing and assessment, the survey team requested consent via email from the provincial, district and church health services, depending upon the facility to be surveyed. In addition, consent was requested from the officer in charge of each of the health facilities. The travel plan to the facilities was finalized after the consents were granted. Upon the team's arrival in the facility, the supervisor of the team met the officer in charge to confirm the consent received earlier and to get verbal consent to initiate the interviews.

For interviews with health care workers and patients, informed consent was requested in writing. The interviews were conducted only after the consents were granted. As much as possible, visual

BMJ Open

and audible privacy was ensured for the interviews. All interview questionnaires were deidentified by assigning a code number. The code numbers are saved on a secure server at the
PNGIMR.

4 Public Involvement

5 Stakeholder consultations were involved in the design and early dissemination of this research. 6 During the feasibility stage, priority of research questions, choice of outcome measures, and 7 methods were informed by discussions with stakeholders involving representatives from the 8 National Department of Health, UN agencies, academics and other development partners in 9 PNGs. The preliminary findings were also discussed with representatives from the National 10 Department of Health, Provincial Health Authorities, hospitals and development partners in a 11 stakeholder consultation workshop held in Port Moresby, PNG.

20 12 Ethics approval

The study was approved by the PNG Institute of Medical Research (IMR) Institutional Review
Board (IRB) and the PNG Medical Research Advisory Committee (MRAC). The following approval
numbers were allocated to the study: IRB No. 1414, 7 August 2014; MRAC No 14.26, 10
November 2014.

28 17 Outcome measures

The handbook on monitoring emergency obstetric care¹⁸ identified a set of indicators to measure availability, access and provision of EmOC in a country or a region. Two types of measures were defined -the first type focuses on availability, adequate coverage and utilization of services at national or sub-national levels and the second type measures obstetric care related functions performed by health facilities. The functions identified to define the level of EmOC services offered from a health facility are: (1) Administer parenteral antibiotics, (2) Administer uterotonic drugs, (3) Administer parenteral anticonvulsants, (4) Manually remove the placenta, (5) Remove retained products, (6) Perform assisted vaginal delivery, (7) Perform basic neonatal resuscitation, (8) Perform surgery (e.g., caesarean section), and (9) Perform blood transfusion. When a facility can perform all the functions listed under 1-7, it is considered a Basic EmOC (BEmOC) provider while ability to perform all the nine functions defines the comprehensive EmOC (CEmOC) provider. This study has used these nine measures to categorize health facilities as either a BEmOC or a CEmOC. Note that all these signal functions are defined by the ability to perform specific functions pregnant women need at the time of delivery. Ability to perform the functions does not necessarily imply that the facilities actually provided the services in the recent past.

Since this study is based on facility-level survey data, community or patient related health outcome measures are not directly observable. To compensate for this, we have used additional measures to understand readiness of health facilities in the provision of general inpatient care. Availability of basic medical equipment and supplies and physical condition of the facility (infrastructural variables) may affect willingness of clients to utilize services from the facilities.

Another important intervention that may affect the demand for EmOC is the provision of family
 planning services. Family planning in PNG is expected to reduce total fertility rate implying that
 need for maternity services should decline with family planning. Therefore, in addition to nine
 EmOC functions listed above, other outcome variables considered in this analysis are: (a)
 readiness of facilities to provide clinical services; (b) availability of family planning items; and (c)
 availability of maternity care related equipment and materials. Availability of drugs and supplies

is defined as having the item in stock at the time of the survey.

For the availability of equipment, instruments and supplies, several indexes were calculated to
indicate degree of availability of the items. The index values range from 0 to 100, 100 implying
that all the items used for the construction of the index were available in all the facilities surveyed.

18 11 Calculating readiness or availability index

The analysis has used facility level data to derive the readiness indicators and ability to perform signal functions for each facility in the survey (Stata version 12 was used). The results are presented as descriptive tables (Tables 1-4) to indicate the proportion of facilities having the instruments or able to perform the specific functions.

An equally weighted index was constructed based on the availability of the items included in each of the categories of service delivery. It reflects the percent of all readiness aspects or variables satisfied by the health facilities in a specific category. For example, if a facility reports having an instrument, a value of 1.0 was assigned for the facility for that equipment. The availability index was constructed to show the percent of listed equipment and items available in each of the facility categories. For example, if the family planning items availability index is 65 for level 3 and 4 facilities, it means that the facilities on the average had 65 percent of all the family planning equipment and items considered in the analysis.

24 Results

39 25 Facility readiness to provide clinical services

Table 1 reports facility readiness in the provision of services. As shown, 95% of level 5 to 7 facilities were connected to the main electric supply grid but only about a third of level 3 and 4 facilities. However, more than 80% of all facilities connected to the electric supply experienced blackout at least for some time in the week before the survey. All level 5 to 7 facilities had functional backup generators, while the percentage of level 3 and 4 facilities with backup generators was 76% for church-run facilities and 48% for public facilities. Half of the level 3 and 4 facilities with backup generators reported problems in operating the generator in the previous month.

If supply line and water tanks are considered, all level 5 to 7 facilities and 83% of level 3 and level
4 public health facilities and 84% of level 3 and level 4 church health facilities reported having
access to water on the day of the survey. However, less than 10% of level 3 and 4 facilities were
connected with water supply lines. Only 45% of level 3 and 4 public facilities had water

connection to the delivery room (and water availability on the day of the survey) compared to 72%
 at church-run facilities.

- A significant share of health facilities, 62%, 44% and 38% of level 3 and 4 public, level 3 and 4 church, and level 5 and 6 facilities, respectively, experienced water shortages in 2014. The survey asked facility respondents whether the facility was responsible for maintaining the water supply system and it was observed that about 45% of public level 3-4 facilities were responsible for maintaining the water supply system. The proportions were 64% for church-run level 3 and 4 facilities and 68% for level 5 to 7 facilities.
- Only 3 public (10%) and 3 church (12%) level 3 and 4 health facilities had ability to do direct blood
 transfusion. Proportion of facilities which could do blood transfusion was much higher, 89%
 among level 5 and 6 facilities and 100% for level 7. Percentage of health facilities that had
 operations theatre were much higher. 28% and 36% level of public and church level 3-4 health
 facilities and all level 5-7 health facilities had at least one operation theatre.
- Both level 3 and 4 public and church-run health facilities show low readiness score for service
 delivery (Table 1). Readiness indexes were 40.3 for level 3 and 4 public sector facilities, 48.6 for
 level 3 and 4 church run facilities, 84.6 for level 5 and 6 facilities, and 100 for the level 7 facilities
- ¹⁵ 16 level 3 and 4 church-run facilities, 84.6 for level 5 and 6 facilities, and 100 for the level 7 facility.
- 27 17 Availability of Family Planning Items
- Table 2 presents the availability of family planning products and supplies in surveyed health facilities. The availability index of family planning items was 81.6 for level 3 and 4 public sector health facilities, 84.0 for level 3 and 4 church-run facilities, and 88.9 for level 5 and 6 facilities. Non-availability of family planning injections in the level 7 facility reduced the overall index of family planning item availability for the facility to 66.7. Since there is only one facility at level 7, non-availability of even a single item significantly reduces the overall index.
- 36 24 37 24
 - 25 Availability of supplies and equipment for maternity care

A relatively large proportion of health facilities lacked very basic pregnancy and antenatal care related supplies and equipment as shown in table 3. The index values for the availability of antenatal care items were 76.9 and 88.6 for level 3 and 4 public- and Church-run facilities, respectively. The index was 87.3 for level 5 and 6 facilities and 100 for level 7 facility. The index of availability of obstetric and neonatal care items were worse in level 3 and level 4 facilities, 70.6 and 80.5 respectively for public and church facilities. The index was 95.52 for level 5 and 6 facilities. The survey also asked about the availability of vacuum extractors and forceps in the facilities for conducting deliveries. It is interesting that 74% of facilities reported having vacuum extractors and 95% reported having forceps although forceps are not used in PNG for deliveries.

⁵² 35 Ability to provide emergency obstetric care services

Table 4 indicates the percent of facilities able to perform different obstetric functions. As mentioned earlier, WHO has defined nine functions to understand the level of obstetric services

provided from the facilities. The survey questionnaire combined first three signal functions (capacity to administer parenteral antibiotics, uterotonic drugs, parenteral anticonvulsants) into one and asked the respondents to report if the facility was able to perform all the three functions, two of the three or one of the three functions. Most level 3-4 facilities (about 80%) reported the ability to perform all these three functions. Two facilities at upper levels (levels 5-7) were not able to perform these three basic obstetric functions. One of the upper level facilities in the sample was not fully functional at the time of the survey. Ability to perform the signal functions 1 to 7 defines the "Basic EmOC" provider and table 4 shows that 38% of Church-run level 3-4 facilities and 52% of government-run level 3-4 facilities were BEmOC providers. Even among higher level facilities (levels 5, 6 and 7), 16% of facilities were not able to perform one or more of the necessary functions required to be considered a BEmOC provider.

If the signal functions for comprehensive emergency obstetric care are considered (all nine signal functions), only about 11% of level 3 and 4 health facilities were found to be CEmOC units. About 15% of level 3 and 4 facilities had the capacity to manage a caesarean section or do blood transfusion. Not all level 5 to 7 facilities were CEmOC providers – four of the 19 upper level facilities were not able to perform at least one of the nine signal functions.

2526 17 Discussion

The overall health facility infrastructural condition in PNG is quite poor. Most facilities reported the need for major building repairs and emphasized the lack of adequate toilets, stable electrical supply, and consistent water supply. Many level 3 and 4 health facilities required better connectivity to electricity and clean water supply. One significant concern is the number of health facilities that did not have running water in the facility's delivery room. The quantity and quality of different types of clinical services provided crucially depends on the facility's readiness to offer services in general. Overall, level 3 and 4 facilities, both public and Church-run, scored low on the readiness index, implying that these facilities were not very reliable providers of services and patient-confidence in these facilities are likely to be low. The survey also revealed the need for improving the supply of basic medical items at level 3 and 4 public health facilities. Level 3 and 4 public facilities show lower availability of different medical items compared to those in Church-run facilities.

Comparison of health facility readiness across countries is often tricky because of differences in the level and comprehensiveness of facilities in different countries of the world. A World Bank report²² indicates that 98 percent of public hospitals in Indonesia had electricity; in Laos, the index of basic amenities was reported as 64 percent²³ compared to 58 percent for PNG (weighted mean of the values in table 1).

This study showed that the index of availability of family planning supplies in levels 3 and 4 was about 83%. Family planning supplies should be available in all facilities, especially at the lower levels, to ensure uninterrupted access at all times, which is clearly not the case for PNG. In addition, availability of family planning supplies does not necessarily mean utilization of services.

BMJ Open

The findings from the most recent PNG DHS survey showed access to family planning services

quite limited. One quarter of currently married women (26%) have an unmet need for family

planning, and only 59% of currently married women are satisfied with family planning services.

Among those who have received family planning, about 9 in 10 users obtained their modern

family planning supplies from a public (government) source. Therefore, there is an urgent need

to identify potential gaps in the provision and utilization of family planning services to strengthen service provision from the government health facilities, especially at lower levels. Better access and utilization of family planning services can help reduce maternal and child mortality.²⁴⁻²⁶ While 79% of level 5 to 7 facilities were found to be CEmOC providers, the fact that about a fifth were not able to provide comprehensive emergency obstetric care is a major concern, given that these are the higher level referral hospitals in PNG. Consistent with the findings of this study, another study using a much smaller sample of facilities, concluded that the "Capacity for essential surgery and anesthesia services is severely limited in PNG due to shortfalls in physical infrastructure, human resources, and basic equipment and supplies."¹⁶

The results from the survey can be used to derive national level estimates of obstetric care availability. Using the proportions of CEmOC facilities at different levels and the total number of facilities in PNG at these levels, the total number of facilities ready to provide comprehensive obstetric care was only 50 at the time of the survey in 2015. Even if we arbitrarily assume balanced geographic distribution of these facilities, an emergency obstetric case will have to travel 53 km each way, on average, to reach a CEmOC facility. The distance to the nearest CEmOC facility is so large that for many emergency cases this is virtually synonymous of not having access to CEmOC. To reduce maternal mortality and morbidity significantly, it is essential to lower the average distance to the nearest CEmOC facility²⁷ implying that PNG will have to upgrade a significant number of levels 3, 4 and 5 facilities. Geographic information systems and geographical modelling tools can help identify the optimal location of CEmOC facilities and existing facilities closest to the optimal locations can be upgraded in the short-run to improve access.28

All facilities at level 3 or above should be able to provide basic EmOC. To improve access to emergency obstetric care, most level 3 and 4 facilities should be considered for immediate upgrading to BEmOC provider or better. The survey of facilities indicated that about 45 percent of levels 3 and 4 facilities were not ready to provide BEmOC. Despite this low readiness, equipping about 15 to 20% of these facilities to perform signal functions 5 and 6 can improve BEmOC availability from 55% of the facilities to about 80%. Although maternal and child health is a priority area, PNG has not allocated enough resources to achieve improved access to maternity and neonatal services. PNG spends more than 4.3% of its GDP on health (about \$109 per capita in PPP dollars). Total health expenditure is not low compared to other countries with similar level of per capita income.²⁹ However, a significant part of health resources, including human resources, particularly doctors, are concentrated in a few major hospitals. Therefore, the resource allocation at the lower level health facilities (level 3 and level 4 facilities) are not

sufficient. Reallocation of public sector resources to lower level health facilities are needed to expand access to obstetric care and other preventive services.

To improve availability and access to quality maternity services in PNG, especially in remote rural areas, a program of training and upskilling of Community Health Workers was adopted.³⁰ Although the upskilling has increased utilization of basic maternity services, significant reductions in maternal mortality will require access to hospital-based obstetric care. Government of PNG may consider allocating funds to facilities, both public and church facilities, based on quantities of priority health services delivered rather than on number and mix of human resources and other administrative needs.³¹ While the effectiveness of such performance based financing depend on how the schemes are implemented, evidence in low and middle income countries shows that the performance can be improved through financial incentives.³² From the demand side, past research has found that providing pregnant women with health vouchers to ensure financial protection for accessing medical care has increased utilization of health services.³³ The payments received through the vouchers will also encourage facilities to become more sensitive to the needs of pregnant women and would have incentives to invest to become fully functional EmOC providers. An initiative in two provinces in PNG that provided incentive packages to pregnant women increased facility-based supervised birth rates by 80%³⁴ indicating that enhancing facility readiness combined with incentivizing pregnant women to utilize health facilities will be very effective in improving maternal and neonatal health.

Study Limitations

Several limitations of the study should be mentioned here. First, it is not possible to indicate overall geographic access to primary health care services in PNG using the survey data because the study did not collect information from level 1 and 2 health facilities. However, these facilities do not provide obstetric care services although some basic services like family planning and antenatal care can potentially be organized at these levels. Second, the survey, strictly speaking, is not a representative survey of level 3 and 4 facilities. The survey design selected high-demand fully functional level 3 and 4 facilities in target districts and the definition of fully functional led to the choice of facilities that showed relatively high level of utilization. Therefore, if anything, the results are likely to be significant overestimations of degree of readiness of the facilities in the provision of obstetric care and other related services in PNG. Even with this favorable selection of facilities, the percent of facilities able to perform BEmOC and CEmOC was quite low at levels 3 and 4 implying that the availability of obstetric care services could be significantly worse than what has been reported in this study. Third, the study did not try to connect the service availability and readiness with health outcomes of the population at the subnational level. In PNG, even the national level estimates of mortality and morbidity are considered unreliable and subnational level estimates would suffer from even higher degree of error in estimation. In any case, facility level information clearly indicates that many of the functional facilities are not ready to provide obstetric health services and a significant proportion of facilities lack medical equipment, instruments and supplies for the provision of quality maternity and neonatal services.

Conclusions

Inability of a health facility, irrespective of whether it is a primary, secondary and tertiary care facility, to provide obstetric care and other related services is an important concern for any health care system. It is especially true for a country like PNG where maternal and infant mortalities are high alongside a high fertility rate. Improved availability and utilization of family planning services can help reduce the demand for EmOC, lower maternal and neonatal mortality/morbidity and improve access to maternity services. Lowering the need for maternity services through interventions like family planning, however, is unlikely to improve access to maternity care significantly in the short-run. Supply-side interventions are necessary to ensure that the services are available in strategically located health facilities. Improving facility infrastructure, equipping the facilities with essential medical equipment and supplies and ensuring the presence of trained personnel in health facilities are needed to make the facilities BEmOC or CEmOC providers. Since the number of facilities in PNG offering EmOC is quite low compared to the needs, all level 3 and 4 facilities should be upgraded to at least the BEmOC level. Survey-based estimates suggest that only 50 facilities in PNG can be considered CEmOC providers and this number is inadequate to ensure equitable access to emergency obstetric cases. Increasing the number of CEmOC providers is urgently needed.

1			
2			
3 4	1		
5	2	Figure caption	
6 7	3		
8 9	4	Figure 1. Three components of Dependion enpresses of evoluting quality of ears	
10	4	righte 1. Three components of Donabedian approach of evaluating quanty of care	
12	5		
13 14	6	Figure 2. Map of PNG with Districts Visited (green) and Location of Surveyed Facilities	
15 16	7		
10			
18			
19			
20			
21			
22			
24			
25			
26			
27			
28 20			
30			
31			
32			
33			
34 35			
36			
37			
38			
39 40			
41			
42			
43			
44 45			
46			
47			
48			
49 50			
50			
52			
53			
54 55			
55 56			
57			
58		17	
59 60		For peer review only - http://bmiopen.hmi.com/site/about/quidelines.yhtml	
60		for peer review only intep.//onljopen.onlj.com/site/about/guidentes.kittill	
1			
----------	----	-------	--
2 3	4	Defe	
4	T	Refer	rences:
5	2	1.	Islam, M.T., et al., Improvement of coverage and utilization of EmOC services in
6 7	3		<i>southwestern Bangladesh.</i> Int J Gynaecol Obstet, 2005. 91 (3): p. 298-305; discussion
8	4		283-4.
9	5	2.	Turab, A., et al., Improved accessibility of emergency obstetrics and newborn care
10	6		(EmONC) services for maternal and newborn health: a community based project. BMC
11 12	7		Pregnancy Childbirth, 2013. 13 : p. 136.
13	8	3.	Chavula, K., et al., Readiness of hospitals to provide Kangaroo Mother Care (KMC) and
14	9		documentation of KMC service delivery: Analysis of Malawi 2014 Emergency Obstetric
15	10		and Newborn Care (EmONC) survey data. J Glob Health, 2017. 7(2): p. 020802.
16 17	11	4.	Ameh, C.A., et al., The effectiveness of training in emergency obstetric care: a systematic
17	12		<i>literature review</i> . Health Policy Plan, 2019. 34 (4): p. 257-270.
19	13	5.	Lee, A.C., et al., Care during labor and birth for the prevention of intrapartum-related
20	14		neonatal deaths: a systematic review and Delphi estimation of mortality effect. BMC
21	15		Public Health, 2011. 11 Suppl 3 (Suppl 3): p. S10.
22	16	6.	Paxton, A., et al., Global patterns in availability of emergency obstetric care. Int J
24	17		Gynaecol Obstet, 2006. 93 (3): p. 300-7.
25	18	7.	Banke-Thomas, A., et al., Assessing emergency obstetric care provision in low- and
26	19		middle-income countries: a systematic review of the application of global guidelines.
27 28	20		Glob Health Action, 2016. 9 : p. 31880.
29	21	8.	Government of Papua New Guinea, National Health Plan 2011–2020, Volume 1: Policies
30	22		and Strategies. June 2010,.
31	23	9.	Mola, G. and B. Kirby, Discrepancies between national maternal mortality data and
32 33	24		international estimates: The experience of Papua New Guinea. Reproductive health
34	25		matters, 2013. 21: p. 191-202.
35	26	10.	Robbers, G., et al., Maternal and newborn health indicators in Papua New Guinea –
36	27		2008–2018. Sexual and Reproductive Health Matters, 2019. 27(1): p. 52-68.
3/	28	11.	PNG National Department of Health, Health Information Systems. 2019.
39	29	12.	WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division.
40	30	4.2	Trends in Maternal Mortality: 2000 to 2017. Geneva, World Health Organization, 2019.
41	31	13.	National Statistical Office (NSO) [Papua New Guinea] and ICF, Papua New Guinea
42 42	32		Demographic and Health Survey 2016-18. Port Moresby, Papua New Guinea, and
43 44	33		Rockville, Maryland, USA: NSO and ICF. 2019.
45	34	14.	Mola, G., I Altken, Maternal mortality in Papua New Guinea 1976-1983. PNG Medical
46	35	45	Journal, 1984. 27(2): p. 65-71.
47	36	15.	Dennis, A.I., Reducing Maternal Mortality in Papua New Guinea: Contextualizing Access
48 49	37		to Safe Surgery and Anestnesia. Anestnesia & Anaigesia: January 2018. 126(1): p 252-
50	38	10	259. dol: 10.1213/ANE.00000000002550
51	39	16.	Martin, J., Goa Tau, Meena Nathan Cherian, Jennifer Vergel de Dios, David Millis, Jane
52	40		Fitzpatrick, William Adu-Krow & Davy Cheng, Survey of the capacity for essential surgery
53 54	41		daia andestriesia services in Papua New Guinea. Bivij Open 2015;5: e009841.
55	42		dol:10.1136/bmjopen-2015-009841.
56			
57			10
58 50			18
60			For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

3	1	17.	Donabedian, A., <i>Evaluating the Quality of Medical Care.</i> The Milbank Quarterly, 2005
4	2		83(4): p. 691-729 (reprint from 44(3): 166-203, 1966).
5	3	18.	WHO, UNEPA, UNCEF, & AMDD, Monitoring emergency obstetric care: a handbook.
7	4		2009 Geneva: World Health Organization
8	5	19	NDOH Christian Health Services Technical Assistance Mission Report 2013 National
9	5	15.	Department of Health: Port Moreshy, Panua New Guinea
10	7	20	Covernment of Thealth. Fort Moresby, Fapua New Guinea.
11	/	20.	2011 2020 Volume 1, lune 2011
12	ð	24	2011-2020, Volume 1, June 2011. Khan M. Mahmud Visahui Hau Olas DM Gaussi Ikushim Damin Difat Haidar Shahil
13 14	9	21.	Knan, IVI. IVIanmud, Xlaonul Hou, Olga PIVI Saweri, Ibrahim Demir, Rifat Halder, Shakil
15	10		Anmed and Justin Pulford, Service Delivery by Health Facilities in Papua New Guined:
16	11		Report based on a countrywide health facility survey, Washington DC: The World Bank
17	12		Group. December 2017.
18	13	22.	World Bank, Universal Maternal Health Coverage? Assessing the Readiness of Public
19 20	14		Health Facilities to Provide Maternal Health Care in Indonesia. Washington, DC: World
20 21	15		Bank. 2014.
21	16	23.	World Bank, Maternal Health Out-of-Pocket Expenditure and Service Readiness in Lao
23	17		PDR. Washington, DC: World Bank. 2013.
24	18	24.	Chola L, McGee S, Tugendhaft A, Buchmann E, Hofman K. Scaling Up Family Planning to
25	19		Reduce Maternal and Child Mortality: The Potential Costs and Benefits of Modern
26	20		Contraceptive Use in South Africa. PLoS ONE 2015, 10(6): e0130077.
27 28	21		doi:10.1371/iournal.pone.0130077
20 29	22	25.	Budi Utomo, B., Purwa Kurnia Sucahya, Nohan Arum Romadlona, Annette Sachs
30	23	201	Robertson Biznawaty Imma Arvanty and Robert Joseph Magnani. The impact of family
31	20		nlanning on maternal mortality in Indonesia: what future contribution can be expected?
32	24		Population Health Metrics (2021) 19:2 https://doi.org/10.1186/s12963-020-00245-w
33	25	26	Winkoff P. & Mauroon Sullivan, Accessing the Pole of Equily Dianning in Peducing
34 25	20	20.	Maternal Mortality Studies in Family Planning, May Jun, 1097, 19(2), p. 129, 142
36	27	27	Matternar Mortality, Studies in Family Planning, May - Jun., 1987, 18(3), p. 128-143
37	28	27.	Wickinnon, B., et al., Distance to emergency obstetric services and early neonatal
38	29	• •	mortality in Ethiopia. Trop Med Int Health, 2014. 19 (7): p. 780-90.
39	30	28.	Ebener, S., et al., Proposing standardised geographical indicators of physical access to
40	31		emergency obstetric and newborn care in low-income and middle-income countries. BMJ
41	32		Glob Health, 2019. 4 (Suppl 5): p. e000778.
42 43	33	29.	World Bank, Health Financing System Assessment : Papua New Guinea. World Bank,
44	34		Washington, . 2017.
45	35	30.	Mola, G., Upskilling experienced female CHWs currently working in maternity care in
46	36		rural health facilities in maternity care skills, unpublished memeo, December 2020.
47	37	31.	Cairns, A. and Xiaohui Hou , Financing the frontline : an analytical review of provincial
48	38		administrations' rural health expenditure 2006-2012 . Health, Nutrition, and Population
49 50	39		(HNP) discussion paper. Washington, D.C. : World Bank Group. , in 2015:
51	40		https://hubs.worldbank.org/docs/ImageBank/Pages/DocProfile.aspx?nodeid=25991656.
52	41	32.	Paul, F. and D. Renmans, Performance-based financing in the heath sector in low- and
53	42	01	middle-income countries: Is there anything whereof it may be said see this is new? Int I
54	43		Health Plann Manage 2018 33 (1): n 51-66
55 56	- J		
50 57			
58			19
59			
60			For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

1 2 3 4 5 6 7 8 9 10 11	1 2 3 4 5 6	33. 34.	CM, B., et al., <i>The impact of vouchers on the use and quality of health care in developing countries: a systematic review.</i> Glob Public Health, 2013. 8 (4): p. 363-88. Mola, G., A pioneering approach to birthing, PNG Attitude, December 2019. https://www.pngattitude.com/2019/12/a-pioneering-approach-to-birthing.html
12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28			
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45			
46 47 48 49 50 51 52 53 54 55 56 57 58 59 60			20 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Table 1. Readiness Index for provision of general clinical services by Facility Level in Papua New Guinea

Readiness indicators		Level 3 and 4			Leve	Level 5 and 6		Level 7	
	Public	%	Church	%	N	%	N	%	
Electricity connected to supply grid	10	34%	7	28%	17	94%	1	100	
Backup generator	14	48%	19	76%	18	100%	1	1009	
Electricity availability (supply or generator)	20	69%	21	84%	18	100%	1	100	
Blackout last week	8	28%	6	24%	15	83%	0	0	
Problem last month running generator due to fuel shortage	8	28%	10	40%	3	17%	0	0	
Water from main line	2	7%	3	12%	15	83%	1	100	
Water shortage last year	18	62%	11	44%	7	39%	0	0	
Water available for use by health care providers	24	83%	21	84%	18	100%	1	100	
Water available in delivery room	13	45%	18	72%	18	100%	1	100	
Facility does direct blood transfusion	3	10%	3	12%	16	89%	1	100	
Blood transfusions done last month	3	10%	3	12%	18	100%	1	100	
Facility has designated space for clinicians to provide service	20	69%	20	80%	18	100%	1	100	
Facility has on-call room or space for health care providers to take rest	3	10%	11	44%	10	56%	1	100	
Facility has telephone or shortwave radio	14	48%	14	56%	15	83%	1	100	
Facility has ambulance	26	90%	24	96%	17	94%	1	100	
Ambulance out of service last year	11	38%	10	40%	6	33%	0	0	
Facility has other vehicles	8	28%	5	20%	18	100%	1	100	
Facility has operation theatre	8	28%	9	36%	18	100%	1	100	
	40).3	48	.5		84.6		100	

Family planning (FP) items		Level 3 and	4 facilitie	S	Leve	el 5 and 6	Level 7 facilities		
	# of Public	% of Public	# of Church	% of Church	# of Public	% of Level	# of Public	% of	
Oral pills	26	90%	21	84%	17	94%	1	100%	
FP injections	22	76%	22	88%	15	83%	0	0%	
Condoms	23	79%	20	80%	16	89%	1	100%	
Index of FP items	8	31.6	84	4.0		88.9	6	6.7	
ource: 2015 Survey of health	h facilities in PN	IG (survey d	conducted	by this stu	dy)				
			12						
			22						

2 Table 3. Availability of Supplies and Equipment for Maternity Care in PNG by Health Facility Level

Antenatal, pregnancy, obstetric and		Level 3 and 4 facilities				and 6 ities	Level 7 facility	
supplies	# of Public	% of Public	# of Church	% of Church	# of Public	%	# of Public	%
Foetal stethoscope (or monitor)	27	93%	25	100%	14	78%	1	100%
Stethoscope and blood pressure cuff	22	76%	25	100%	16	89%	1	100%
Tape measure	23	79%	22	88%	16	89%	1	100%
Scale	28	97%	25	100%	16	89%	1	100%
Ultrasound machine (and gel)	28	97%	25	100%	17	94%	1	100%
Stethoscope	10	34%	11	44%	15	83%	1	100%
Pelvic procedure instruments such as speculum	18	62%	22	88%	16	89%	1	100%
Index: availability of antenatal care items	76	.85	88	.57	87.	30	10	00
Delivery light	24	83%	24	96%	18	100%	1	100%
Partograph	11	38%	13	52%	14	78%	1	100%
Sterilizer	15	52%	16	64%	13	72%	1	100%
Vacuum extractor	14	48%	21	84%	18	100%	1	100%
Forceps	25	86%	25	100%	18	100%	1	100%
Manual vacuum aspirator/suction bulb	27	93%	25	100%	17	94%	1	100%
Facility has at least two skilled birth attendants covering 24 hours a day	21	72%	19	76%	18	100%	1	100%
Delivery kit (instruments, supplies)	25	86%	25	100%	18	100%	1	100%
Resuscitation bag, newborn	4	14%	4	16%	15	83%	1	100%
Eye drops or ointment for newborn	27	93%	25	100%	18	100%	1	100%
Needles and syringes	28	97%	25	100%	18	100%	1	100%
Sterile C-section instrument kits	28	97%	25	100%	18	100%	1	100%
Cord supplies for newborn: clamps, ties, scissors	2	7%	5	20%	12	67%	1	100%
IV sets, including sterilized needle and tube	27	93%	25	100%	17	94%	1	100%
IV fluids, including normal saline and ringer lactate	29	100%	25	100%	18	100%	1	100%
Index: availability of obstetric and neonatal care items	70	.57	80	.53	92.	52	10	00

Table 4. Percentage of Health Facilities Able to Perform Signal Functions with Categorization of Facilities

into Basic Emergency Obstetric Care and Comprehensive Emergency Obstetric Care Providers

Signal functions for obstetric and neonatal care	Ability to perform	Level 3 and 4 public	Level 3 and 4 church	Level 5 to 7	Total
		% (n)	% (n)	% (n)	% (n)
Signal functions 1-3: Have	Yes, all three	76% (22)	80% (20)	89% (17)	81% (59
capacity to administer parenteral antibiotics,	Yes, two of the three	10% (3)	16% (4)	5% (1)	11% (8)
anticonvulsants?	Yes, one of the three	3% (1)	4% (1)	0% (0)	3% (2)
Signal function 4: Have the ability for manual removal of placenta?	Yes	72% (21)	88% (22)	95% (18)	84% (6
Signal function 5: Have ability to remove retained products?	Yes	59% (17)	80% (20)	95% (18)	75% (5
Signal function 6: Have the capacity to perform assisted vaginal delivery?	Yes	59% (17)	72% (18)	89% (17)	71% (5
Signal function 7: Have ability to Perform basic neonatal resuscitation	Yes	72% (21)	96% (24)	95% (18)	86% (6
Signal function 8: Have ability to perform surgery and manage caesarean section	Yes	14% (4)	16% (4)	95% (18)	36% (2
Signal function 9: Have capacity to do safe blood transfusion	Yes	14% (4)	20% (5)	89% (17)	36% (2
Ability to perform first seven signal functions	Basic EmOC	38% (11)	52% (13)	84% (16)	55% (4
Ability to perform all nine signal functions	Comprehensive EmOC	10% (3)	12% (3)	79% (15)	29% (2
Source: 2015 Survey of health fa	cilities in PNG (sur	vey conducted b	y this study)		

Figure 1. Three components of Donabedian approach of evaluating quality of care



BMJ Open

Figure 2. Map of PNG with Districts Visited (green) and Location of Surveyed Facilities



Note: Red squares represent the level 5 to 7 facilities while the blue squares represent the level 3 to 4 facilities surveyed.

Health Facility Efficiency Study in PNG with a Focus on Secondary Care

Health Facility Assessment 2014

Papua New Guinea Institute of Medical Research, PO Box 60 Goroka, Papua New Guinea; University of South Carolina, Columbia, South Carolina, USA; and Nossal Institute for Global Health, Melbourne, Australia.

		IDENTIFICATION		71	
PROVINCE					
DISTRICT					
LOCAL LEVEL GOVERNMENT AREA	۹				
NAME AND TYPE/ID OF THE FACIL	ITY				
(HC=03, DLH =04, PH =05, RH=06,	NH=07)				
OWNERSHIP OF THE FACILITY (PUBLIC =01, CHURCH CATHOLIC	=02, CHURCH LUT	THERAN=03, CHURCH S	SDA =04)		
NAME AND DESIGNATION OF THE	RESPONDENT				
Consultant =01, OIC/Head Administr Extension Officer =05, Nurse =06, N worker = 09)	ator = 02, Medical C lidwife=07, Commur	Officer =03, Dental Office hity Health Worker =08, 0	=04, Health Dther Allied Health		
SEX OF THE RESPONDENT' MALE	1 FEMALE 2				
1. 2. 3. 4		1 2 3 4 5 6 NTERVIEWER VISITS			
	1	2	3	FINAL \	/ISIT (DDMMYYY
DATE					
INTERVIEWER'S NAME & CODE				CODE	
RESULT CODE*				RESUL	T CODE
*RESULT CODES:1: COMPLETED, 2:	REFUSED, 3: PAR	TLY COMPLETED, 8: OTH	IER	_(SPECI	FY)
SUPERVISOR	FIE		OFFICE EDIT		KEYED E
NAME	NAME		NAME		NAME
					D.4.75

r
Z
3
4
-
5
6
7
/
8
9
10
10
11
12
12
15
14
15
10
10
17
18
10
19
20
21
<u> </u>
22
23
21
24
25
26
27
27
28
29
20
30
31
32
22
33
34
35
55
36
37
28
50
39
40
<u>،</u>
71
42
43
ΔΛ
45
45
46
47
4/
48
49
50
50
51
52
52
22
54
55
55
30
57
58
50
27

No	Questions and Filters	Coding categories	Response	Skip
101	Name and position of the person	Interviewee name		
	interviewed for the survey (transfer			
	information from cover page)	Position		
102	Type of health facility (transfer information	HC03		
	from cover page)	DLH04		
		PH05		
		RH06		
		06		
		Other		
103	Ownership of the facility (transfer	Pubic1		
	information from cover page)	Church Catholic2		
		Church Lutheran3		
		Church SDA4		
104	Is there a signboard/sign with the facility	Yes1		
	name?	No2		
105	Is this facility open 24 hours a day, seven	Yes1		
	days a week?	No2		
106	The services available 24/7 from this facility	A. Inpatient hospital services		-
		B. Emergency room services		-
	HOURS RECORD "1" OTHERWISE	C. Outpatient clinics for adults		-
	RECORD "2"	D. Outpatient clinics for children		-
		E. Outpatient chilics for women		-
		C. Pharmacy Services		-
		H Snake-bite clinic services		-
		1. Other Services (specify)		-
107	How many days in a week the outpatient	Days		
	facility is open on weekdays?			
108	Opening time on Weekdays (Mon-Fri)	Hour : Min		
109	Closing time on Weekdays (Mon-Fri)	Hour : Min		
110	Does this facility provide outpatient services	Only Saturdays1		
	on Saturdays and Sundays?	Poth Saturdays		IF A
		Not open on weekends		11 4 →11
111	Opening time on Weekends	Hour : Min		
112	Closing time on Weekends	Hour : Min		
113	Is the facility is connected to electric supply	Yes1		lf 2
	grid?	No2		→ 1′
114	Is the electricity available 24 hours a day	Yes1		
	from the grid in a normal week?	No2		
115	Was electricity available through the grid all	Yes1		
	the time during the past one week?	No2		
116	In last one week, how many hours the	Hours		
	electricity was not available through the			
	arid?			1
				1

	Questions and Filters	Coding categories	Response	Skip
118	Does the facility face problems with operating the backup system/generator due to lack of fuel in last one month?	Yes1 No2		
119	What is the health facility's <u>main</u> source of water now?	Piped		
120	If water comes from supply line, how many hours the water is normally available in a day?	Hours		
121	In 2014, has water been available from this source all year?	Yes1 No2		
122	Are health workers able to use this water source today when treating patients?	Yes1 No2		
123	Is the water supply connected to the delivery room and working today?	Yes1 No2		
124	If there is a problem with the water supply (fixtures and lines), who is responsible for fixing it?	Province		
125	How are expenses for fixing problems with the water supply met?	Request province1 Request district2 Own budget3 Referral health facility4		
126	Do you think that the facility has adequate number of toilets?	Adequate1 Need few additional2 Not adequate at all3		
127	Is there a private pharmacy within walking distance from this facility?	Yes1 No2		
128	How many buildings are used to provide services in the facility?	Number of buildings		
129	Total land area of the facility	Land area in decimals		
130	Construction materials used in the construction of the main building of the facility	Cement/brick1 Tin/other metals/tile2 Wood3 Leaves/other low-cost materials4 Others8	Roof Wall Floor	
131	Condition of the infrastructure	Most buildings/ building need major repairs1 In general, minor repairs needed2 Does not require much repairs		
132	Is the land area around the health facility clean?	Yes1 No2		
133	Is the main building raised?	Yes1 No2		lf 2 ➔135
134	How many meters the building is raised?	Meters (MM.M)		
405	Are there living quarters on campus?	Yes 1		lf 2

No	Questions and Filters	Coding categories	Response	Skip
136	How many families can live on campus (No.	If more than 98 families, enter 98.		
	of separate quarters)	Not known= 99		
137	Does the facility have a blood bank?	Yes1		
		No2		
138	Does the health unit have blood transfusion	Yes1		lf 2
	facility?	No2		→14
139	Were there any blood transfusions done in	Yes1		
	the last one month?	No2		
		Not applicable3		
140	Does this facility have designated spaces	Yes1		
	for each of the doctors/key service providers	No2		
	to provide services after initial triage/examination?	Not applicable3		
141	Is there an on-call room/space where health	Yes1		
	care professionals can rest during their on-	No2		
	call?	Not applicable3		
142	Does this facility have working telephone or	Yes1		
	shortwave radio to call outside?	No2		
143	Does this facility have ambulances?	Yes1		lf 2
-	,	No2		→14
144	How many ambulances does the facility	Number		
	have?			
145	Was there any time this year when the	Yes1		
	ambulance was not in service?	No2		
146	If yes, how many ambulances remained out	A How many were out of service even		
140	of service and for how long on average over	temporarily?		
	the last one year?	B Average weeks of out-of-service		
147	Does the facility have any other vehicles like	Yes 1		lf 2
	cars. motorcycles etc.?	No		→201
148	How many vehicles does the facility have?	Car		
		Motorcycles		
149	Principal use of vehicles and ambulances in	Transporting patients to facility	Ambulance	
	past seven days	Transporting patients from village/local area to		
		facility		
		For use by health facility administrators	Cars	
		For conducting outreach		
		service 4		
		Transporting healthcare providers to the	Motorcycles	
		facility 5		
			Boats	
150	Who meets the costs for maintenance /	Province	1	
100	servicing of the vehicles?	District		
	Servicing of the vehicles?	Own hudget		
		$\Box \alpha \alpha$		

2
2
5
4
5
6
7
/
8
9
10
10
11
12
12
13
14
15
16
10
17
18
10
19
20
21
22
~~
23
24
25
20
26
27
28
20
29
30
31
22
52
33
34
25
55
36
37
38
20
39
40
41
 د ۸
42
43
44
45
46
47
48
40
49
50
51
50
52
53
54
55
22
56
57
58
50
L ()

60

Section 2.1: Information on each of the buildings

No	Questions/ Items	Responses and codes	Building/ Structure #1	Building/ Structure #2
201	Name of the structure/ building			
202	Principal activities normally performed in the building/ structure	Inpatient services		
203	Total floor space of the building	Floor space in sq meters		
204	Number of rooms in the structure (not including toilets, closets, hallways)	Number Don't know: 998		
205	Do windows and doors of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
206	Do interior walls and roof of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
207	Does electric supply system of the facility need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
208	Does water supply system of the facility need repair works?	No repairs needed		
209	Does toilet (latrine) for clients' use of the facility need repair works?	No repairs needed		
210	Number of toilets	Number Don't know: 98		
211	Are most of the toilets functional?	Yes1 No2		
212	Are the toilets clean?	Yes, all the toilets are clean1 Yes, most of the toilets are clean2 No, most are not clean	2	
213	How many rooms or areas in the building have water connection?	Number Don't know: 98		
214	Are the water outlets are functional in toilet?	Yes1 No2		
215	Floor space of waiting rooms/space for clients	Floor space in sq meters		
216	How many seating spaces are there in waiting rooms/spaces?	Number Don't know: 98		
217	Are the waiting areas/rooms clean?	Yes1 No2		
218	Floor space of outpatient consultation (not including consultant's offices)	Floor space in sq meters		

No	Questions/ Items	Responses and codes	Building/ Structure #1	Building/ Structure #2
219	Is there at least one site in the outpatient clinic area where both auditory and visual privacy can be maintained for client services?	Yes1 No2		
220	Is the building is accessible to persons with disabilities (e.g., wheel chair ramps, elevators if more than one floor, hand rails etc.)	Yes1 No2		
221	Floor space in the emergency department including waiting space	Floor space in sq meters		
222	Floor space for blood bank, blood donation space, etc.	Floor space in sq meters		
223	Number of observation beds in the building/ Structure (not including inpatient beds)	Number Don't know: 998		
224	Number of inpatient wards in the	Number Don't know: 998		
225	Floor space of general adult wards	Floor space in sq meters		
226	Number of inpatient beds in general adult wards (according to National Medical Standards)	Number Don't know: 998		
227	How many patients are in the general ward today?	Number // Don't know: 998		
228	Floor space of pediatric wards	Floor space in sq meters		
229	Number of inpatient beds in pediatric wards	Number Don't know: 998		
230	Number of beds in pediatric wards (according to National Medical Standards)	Number Don't know: 998		
231	How many patients are in the pediatric ward today?	Number Don't know: 998		
232	Floor space of surgery wards	Floor space in sq meters		
233	Number of inpatient beds in surgery wards (according to National Medical Standards)	Number Don't know: 998		
234	How many patients are in the surgery ward today?	Number 🛛 🔪		
235	Other wards (specify) ward	Floor space in sq meters		
236	Number of inpatient beds in ward	Number Don't know: 998		
237	How many patients are in the ward today?	Number Don't know: 998		
238	Other wards (specify) ward	Floor space in sq meters		
239	Number of inpatient beds in ward	Number Don't know: 998		
240	How many patients are in the	Number		

3 4	No	Questions/ Items	Responses and codes	Bui Str	ilding uctur	g/ re #1	Building/ Structure #2
5	241	Condition of the mattresses on the	Good1				
6 7		beds?	Not so good/not so bad2 Bad3]	
8	242	Are there patients on floors in any of	Yes1			1	
9		the wards or any other areas?	No2				
10 11	243	Are the inpatient areas clean?	Yes1 No2]	
12 13	244	Area of laboratory and diagnostic services including waiting areas	Floor space in sq meters		1		
14	245	Are the lab/diagnostic services areas clean?	Yes1]	
16	246	Area used for drug, supply and medical	Floor space in sq meters			<u>-</u> 	
17 18	247	Floor space in sq meters used for drug	Floor space in sq meters		_	· <u> </u>	
19 20	248	Floor space in sq meters of delivery	Floor space in sq meters		_	·	
21	240	rooms	Number		_	<u> </u>	<u> </u>
22 23	249	this building?	Don't know: 998				<u> </u>
24 25	250	Are the delivery rooms equipped with delivery beds, lights, etc.?	Yes1 No2				
26	251	Did the facility deliver babies in last seven days?	Yes1 No				
27 28	252	Are the delivery rooms clean?	Yes1			<u>.</u>	
29 30	253	Floor space in sq meters of operation theaters	Floor space in sq meters				
31 32	254	How many operation theaters are there in the building?	Number		_!	· <u>·</u> ii	
33 34	255	Are the operation theaters functional	Yes1		_!	-	
35	256	Floor space in sq meters used by	Floor space in sq meters				
30		administrative personnel					
38	257	Floor space in sq meters used by laundry services	Floor space in sq meters		_		
39 40	258	Floor space in sq meters used by food services and kitchen	Floor space in sq meters				
41 42	259	Floor space in sq meters of cafeteria for employees and clients	Floor space in sq meters		1		
43 44	260	Meeting and other common areas for	Floor space in sq meters			·	
45 46	261	Floor space used by research projects/	Floor space in sq meters		_	· · · ·	
47	262	Floor space in sq meters used by	Floor space in sq meters		_	. <u> </u>	
48 40		security personnel			_		
49 50	263	Floor space in sq meters used by mortuary	Floor space in sq meters				
51 52	264	How many private rooms are there for inpatient stays?	Number of rooms Don't know: 98		_L		
53	265	How many beds are there in the private	Number			•	
54		rooms?	Don't know: 998				
55 56	266	Floor space in sq meters used by private rooms	Floor space in sq meters		_L		
57	·				-1		, ,- <u></u> ,,

3	
4	
5	
6	
7	
/	
8	
9	
1	0
1	1
1	2
1	3
1	4
1	5
1	6
1	7
1	/
1	8
1	9
2	0
2	1
2	2
2	3
2	Δ
2	-
2	د د
2	6
2	/
2	8
2	9
3	0
3	1
3	2
3	3
2	Δ
2	-
с 2	5 c
3	0
3	/
3	8
3	9
4	0
4	1
4	2
4	3
4	4
1	5
4	ر م
4	0
4	/
4	8
4	9
5	0
5	1
5	2
5	R
5	Δ
J F	-+
2	2
5	6
5	7
5	8
5	9
6	0

Section 2: Information on each of the buildings (USE ADDITIONAL FORMS IF NEEDED)

No	Questions/ Items	Responses and codes	Building/ Structure #I	Building/ Structure #I
201	Name of the structure/ building			
202	Principal activities normally performed in the building/ structure	Inpatient services. 1 Outpatient services. 2 Both inpatient and outpatient. 3 Lab/ diagnostic services. 4 Administrative offices. 5 Not used now. 6 Others 8 Specify 8		
203	Total floor space of the building	Floor space in sq meters		
204	Number of rooms in the structure (not including toilets, closets, hallways)	Number Don't know: 998		
205	Do windows and doors of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
206	Do interior walls and roof of the building need repairs?	No repairs needed		
207	Does electric supply system of the facility need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
208	Does water supply system of the facility need repair works?	No repairs needed1 Few repairs needed2 Many repairs needed3		
209	Does toilet (latrine) for clients' use of the facility need repair works?	No repairs needed		
210	Number of toilets	Number Don't know: 98		
211	Are most of the toilets functional?	Yes1 No2		
212	Are the toilets clean?	Yes, all the toilets are clean1 Yes, most of the toilets are clean2 No, most are not clean3 No, all are unclean4		
213	How many rooms or areas in the building have water connection?	Number Don't know: 98		
214	Are the water outlets are functional in toilet?	Yes1 No2		
215	Floor space of waiting rooms/space for clients	Floor space in sq meters		
216	How many seating spaces are there in waiting rooms/spaces?	Number Don't know: 98		
217	Are the waiting areas/rooms clean?	Yes1 No2		
218	Floor space of outpatient consultation (not including consultant's offices)	Floor space in sq meters		

No	Questions/ Items	Responses and codes	Building/ Structure #	Building/ Structure #
219	Is there at least one site in the outpatient clinic area where both auditory and visual privacy can be maintained for client services?	Yes1 No2		
220	Is the building is accessible to persons with disabilities (e.g., wheel chair ramps, elevators if more than one floor, hand rails etc.)	Yes1 No2		
221	Floor space in the emergency department including waiting space	Floor space in sq meters		
222	Floor space for blood bank, blood donation space, etc.	Floor space in sq meters		
223	Number of observation beds in the building/ Structure (not including inpatient beds)	Number Don't know: 998		
224	Number of inpatient wards in the	Number Don't know: 998		
225	Floor space of general adult wards	Floor space in sq meters		
226	Number of inpatient beds in general adult wards (according to National Medical Standards)	Number Don't know: 998		
227	How many patients are in the general ward today?	Number 🖉 Don't know: 998		
228	Floor space of pediatric wards	Floor space in sq meters		
229	Number of inpatient beds in pediatric wards	Number Don't know: 998		
230	Number of beds in pediatric wards (according to National Medical Standards)	Number Don't know: 998		
231	How many patients are in the pediatric ward today?	Number Don't know: 998		
232	Floor space of surgery wards	Floor space in sq meters		
233	Number of inpatient beds in surgery wards (according to National Medical Standards)	Number Don't know: 998		
234	How many patients are in the surgery ward today?	Number 🛁 🛁 Number 🛁		
235	Other wards (specify) ward	Floor space in sq meters		
236	Number of inpatient beds inward	Number Don't know: 998		
237	How many patients are in theward today?	Number Don't know: 998		
238	Other wards (specify) ward	Floor space in sq meters		
239	Number of inpatient beds inward	Number Don't know: 998		
240	How many patients are in the ward today?	Number		

No	Questions/ Items	Responses and codes	Building/	Building/
241	Condition of the mattresses on the beds?	Good1 Not so good/not so bad2		
242	Are there patients on floors in any of	Bad		
243	Are the inpatient areas clean?	No		
244	Area of laboratory and diagnostic	Floor space in sq meters		
245	Are the lab/diagnostic services areas	Yes1		
246	Area used for drug, supply and medical	Floor space in sq meters		
247	Floor space in sq meters used for drug dispensing (if separate from storage)	Floor space in sq meters		
248	Floor space in sq meters of delivery rooms	Floor space in sq meters		
249	How many delivery rooms are there in this building?	Number Don't know: 998		
250	Are the delivery rooms equipped with delivery beds, lights, etc.?	Yes1 No2		
251	Did the facility deliver babies in last seven days?	Yes1 No2		
252	Are the delivery rooms clean?	Yes1 No2		
253	Floor space in sq meters of operation theaters	Floor space in sq meters		
254	How many operation theaters are there in the building?	Number Don't know: 998		
255	Are the operation theaters functional and used regularly?	Yes1 No2		
256	Floor space in sq meters used by administrative personnel	Floor space in sq meters		
257	Floor space in sq meters used by laundry services	Floor space in sq meters		
258	Floor space in sq meters used by food services and kitchen	Floor space in sq meters		
259	Floor space in sq meters of cafeteria for employees and clients	Floor space in sq meters		
260	Meeting and other common areas for the use of facility personnel	Floor space in sq meters		
261	Floor space used by research projects/ NGOs and other external entities	Floor space in sq meters (EXCLUDE DIRECT PATIENT CARE AREAS)		
262	Floor space in sq meters used by security personnel	Floor space in sq meters		
263	Floor space in sq meters used by mortuary	Floor space in sq meters		
264	How many private rooms are there for inpatient stays?	Number of rooms Don't know: 98		
265	How many beds are there in the private rooms?	Number Don't know: 998		
266	Floor space in sq meters used by private rooms	Floor space in so meters		

No	Questions and Filters	Coding categories	Response	Skip
301	How far is the closest referral facility from this facility?	Kilometers Don't know		
302	What type of facility is that (the referral facility)?	NH		
303	On the average, how many patients are referred to other facilities in a month from this facility?	Number of patients referred Don't know998		
304	How long does it take to transfer sick patients to the referral hospital if transported by ambulance (hours and days)	Hours and/or days	hours days	
305	What is the average cost per trip for the patients, please specify	A. Travel person: PNG kina B. Accommodation per person: PNG kina C. Per diem per person PNG kina		
306	Do you budget specifically for patient transfers?	Yes1 No		
307	Were the referred patients treated at the referral facility?	Yes1 No2 Some, but not all3 Don't know		
308	Did the referral facilities refer some of the referred patients to another facility?	Yes1 No2 Don't know		
309	What is the mode of communication between this facility and the usual referral center?	No formal communication system		
310	What is the most common form of transport when referring patients?	Using the facility's ambulance/vehicle1 Using commercially available cars2 Using vans		
311	Does a health worker travel with a sick patient to the referral hospital?	Yes		
312	Does the referral hospital have to verbally confirm they will accept the patient before they can be transferred?	Yes		

Section 3: Communications between this health facility and a referral facility



Section 4. Repair and medical waste management	Section 4: Re	pair and Medica	al Waste Manag	ement
--	---------------	-----------------	----------------	-------

No	Questions and Filters	Coding categories	Response	Skin
401	Who should be responsible for ensuring	Province 1		P
-01	infrastructure maintenance is carried out?	P District 2		
		Church agency 3		
		This facility.		
		Referral health facility		
402	Is it desirable for other maintenance (i.e.	Yes 1		lf 2
	anything other than really simple tasks)	No 2		→404
	being managed at a higher level?	110		
403	If yes, by who?	Province1		
		District2		
		Church agency		
		This facility4		
		Referral health facility		
404	Who should be responsible for ensuring	Province1		
	basic utilities are maintained at the health	District2		
	facility?5 Comments on repair needs or types of re	Church agency3		
		This facility4		
		Referral health facility5		ļ
405	Comments on repair needs or types of re	pair problems of the facility:		
	Martin durante to a transformer to the state			
	weaical waste treatment Verity use if in	ncinerator use log is available		
406	Is there any incinerator (high	Available and used 1		
	temperature) available in the facility?	Available but not used 2		
		Not available3		
407	Is there any incinerator (1 chamber	Available and used 1		
	drum/brick) available in the facility?	Available but not used2		
		Not available3		
408	Is there any burial pit for waste	Available and used1		
	available in the facility?	Available but not used2		
		Not available		
409	Is there any system of segregating	Available and used1		
	medical wastes into three colored	Available but not used 2		
	waste baskets available in the facility?	Not available		ļ
410	Disposal practice of sharps (needles,	Incinerator		
	glass, surgical instruments, etc.)	Burn and bury2		
		Bury but do not burn		
		Burn but do not bury		
		Put in a covered pit (could be latrine)		
		Put in an open pit		
		Store, collect and move offsite		
		Just throw out in the open8		
		Other9		
<u>4</u> 11	Disposal practice of biomedical wastes	Incinerator 1		
	(nlacenta, human body parts	Burn and hurv 2		
	laboratory waste etc.)	Bury but do not burn 3		
		Burn but do not bury 4		
		Put in a covered pit (could be latrine) 5		
		Put in an open pit		
	 Facility? Comments on repair needs or types Medical waste treatment Verify use Is there any incinerator (high temperature) available in the facility? Is there any incinerator (1 chamber drum/brick) available in the facility? Is there any burial pit for waste available in the facility? Is there any system of segregating medical wastes into three colored waste baskets available in the facility Disposal practice of sharps (needles, glass, surgical instruments, etc.) Disposal practice of biomedical waste (placenta, human body parts, laboratory waste, etc.) 	Store collect and move offsite 7		
		Just throw out in the open 8		
		Other q		
		<u> </u>		1

Section 5: Food Services and Kitchen Area

NO	Questions and Filters	Coding categories	Response	Sk
501	Do you provide food service to inpatients?	Yes1 No2		lf 2 ➔
502	Do you charge inpatients any money for food?	Yes1 No2		
503	How much do you charge for food per person per day?	PGKina. (000 if patients are not charged)		
504	What is the cost of food per person per day?	PGKina		
505	Number of patients who were served with food yesterday?	Number of patients#		
506	Is there a protocol for feeding hospitalized infants (<1 year)?	Yes1 No2		
507	How many meals are typically provided for infants in 24 hours?	Two to three times1 Four to five times2 Six times or more3		
508	Is the budget allocated for food service enough for buying groceries and other needs for all patients in the facility?	Yes		
509	Does the facility contract out food services?	Yes, only grocery procurement contracted out1 Yes, cooking +other food services contracted out2 No3		
510	Is the food prepared on-site or prepared outside the facility?	Prepared in the facility1 Not prepared in the facility2		-
511	Is there a chimney or working exhaust fan in cooking area?	Yes		
512	Is soap/detergent present in cooking area for washing hands?	Yes1 No2		
513	Is soap/detergent present for washing pots, pans, plates, utensils	Yes1 No2		
514	Is the kitchen floor clean (no garbage on floor)?	Yes1 No2		
515	Is the wiping cloth used in the kitchen is clean, not smelly?	Yes1 No2		
516	Are there signs of cockroach/mice infestation in the kitchen area?	Yes1 No2		
517	Do cooking personnel tie hair back and/or wear caps?	Yes		
518	Do cooks wear gloves while handling food?	Yes		
519	Are prepared foods covered?	Yes		

	Questions and Filters	Coding categories	Response	Skip
601	Are Antenatal services provided at this facility?	Yes1 No2		lf 2 → 604
602	How many days in a week the facility provide ANC?	#Days in a week		
603	Number of antenatal outreach clinics held in the last 3 months?	Number of outreach clinics held Don't know998		
Antena	atal clinic equipment and supplies: check	to see whether the following items are present and fu	inctional in or near	
the are	ea where antenatal services are provided			
604	Fetal stethoscope (or foetal monitor)	A. Number		
		B. Number Working		
		C. Number regularly used		
605	Stethoscope and blood pressure cuff	A. Number		
		B. Number Working		
		C. Number regularly used		
606	Tape measure	A. Number		
		B. Number Working		
		C. Number regularly used		
607	Scale	A. Number		
		B. Number working		
600	Littrace and Machine (and cal)	C. Number regularly used		
608	Ultrasound Machine (and gel)	A. Number		
		B. Number Working		
		(Number requierly used		
		C. Number regularly used		
MATE	RNAL AND NEONATAL CARE: Deliveries	C. Number regularly used		
MATEI Ask the	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the	C. Number regularly used	 	lf 2-611
MATEI Ask the 609	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the	C. Number regularly used		lf 2 → 611
MATEI Ask the 609	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community?	C. Number regularly used is section. Yes		lf 2 → 611
MATEI Ask the 609	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with	C. Number regularly used		lf 2 → 611
MATEI <u>Ask the</u> 609 610	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the	C. Number regularly used		lf 2 → 611
MATEI <u>Ask the</u> 609 610	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and	C. Number regularly used		lf 2 → 611
MATEI <u>Ask the</u> 609 610	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community?	C. Number regularly used		lf 2 → 611
MATEI Ask the 609 610 611	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in th Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to	C. Number regularly used inis section. Yes		lf 2 → 611
MATEI Ask the 609 610 611	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in th Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and	C. Number regularly used inis section. Yes Only in facility		lf 2 → 611
MATEI Ask the 609 610 611	RNAL AND NEONATAL CARE: Deliveries RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies?	C. Number regularly used is section. Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3		lf 2 → 611
MATEI Ask the 609 610 611	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? 	C. Number regularly used is section. Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4		lf 2 -> 611
MATEI Ask the 609 610 611 612	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the	C. Number regularly used <i>inis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1		If 2 -≯ 611
MATEI Ask the 609 610 611 612	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of	C. Number regularly used <i>inis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2		If 2 → 611
MATEI Ask the 609 610 611 612	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 2 Does not have the capacity 3		lf 2 → 611
MATEI Ask the 609 610 611 612 613	RNAL AND NEONATAL CARE: Deliveries RNAL AND NEONATAL CARE: Deliveries Reliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 2 Does not have the capacity 3 Yes, can do now 1		If 2 → 611
MATEI Ask the 609 610 611 612 613	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2		lf 2 → 611
MATEI Ask the 609 610 611 612 613	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? 	C. Number regularly used <i>nis section.</i> Yes Only in facility Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No. 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3		lf 2 → 611
MATEI Ask the 609 610 611 612 613 614	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1		If 2 → 611
MATEI Ask the 609 610 611 612 613 614	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do two of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2		If 2- ≫ 611
MATEI Ask the 609 610 611 612 613 614	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? 	C. Number regularly used <i>his section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3		If 2 → 611
MATEI Ask the 609 610 611 612 613 614 615	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1		If 2 → 611
MATEI Ask the 609 610 611 612 613 614 615	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does the facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 <td></td> <td>If 2→611</td>		If 2 → 611
MATEI Ask the 609 610 611 612 613 614 615	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2		If 2 → 611
MATEI Ask the 609 610 611 612 613 614 615 616	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3		If 2 → 611
MATEI Ask the 609 610 611 612 613 614 615 616	 RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? Does the facility have the capacity to manage caesarean section? 	C. Number regularly used <i>his section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2		If 2 → 611

Section 6: Services and other supplies Section 6.1: Maternal and neonatal care: Antenatal care

617	Does the facility have the capacity to	Yes, can do now1		
	do safe blood transfusion?	Usually, but not now		
		Does not have the capacity		
618	Does the facility have the capacity to	Yes, can do now1		
	administer anesthesia?	Usually, but not now		
		Does not have the capacity 3		
619	Does the facility have the capacity to	Yes can do now 1		
010	care for sick and low-birth weight	Lisually, but not now 2		
	newborns including resuscitation?	Does not have the canacity 3		
620	Deep the facility have at least two			
020	Does the facility have at least two			
	skilled allendarits covering 24 hours a	NOZ		
	day and seven days a week, assisted			
	by trained support staff?			
MATE	RNAL AND NEONATAL CARE: Delivery	room equipment and supplies		
Check	to see whether the following items are pre-	sent and functional in or near the delivery room.	1	
621	Delivery kit (instruments, supplies)	Present and complete1		
		Present but not complete2		
		Not present3		
check t	o see whether the following items are pres	ent and functional in or near the area where antenatal	services are	
provide	d			
622	Stethoscope	A. Number		
		B. Number Working		
		C. Number regularly used		
623	Partograph	A Number		
		B Number Working		
		C. Number regularly used		
624	Pelvic procedure instrumente like			
UZ4		D. Number Working		
	specululi	D. Number regularly used		
005	Delivery light	Number regularly used		
025		A. Number		
		C. Number regularly used		
626	Sterilizer	A. Number		
		B. Number Working		
		C. Number regularly used		
627	Vacuum extractor	A. Number		
		B. Number Working		
		C. Number regularly used		
628	Forceps	A. Number		
-		B. Number Working		
		C. Number regularly used		
629	Manual vacuum aspirator/suction	A Number		
JLJ		B Number Working		
		C Number regularly used		
620	Dequesitation has reachers			
030	Resuscitation bag , newborn	A. Number D. Number Warking		
		B. Number vvorking		
		C. Number regularly used		
631	Eye drops or ointment for newborn	A. Number		
		B. Number Working		
		C. Number regularly used		
632	Needles and syringes (10-20 cc)	A. Number		-
		B. Number Working		
		C. Number regularly used		

000	Sterile C-section ir	Sterile C-section instrument kits B. Number Working C. Number regularly used			
634	Cord supplies for new born: clamps, ties, scissors			A. Number B. Number C. Number Working C. Number regularly used	
635	IV sets, including s and tube	sterilized r	needle	A. Number B. Number Working C. Number regularly used	
636	IV fluids, including ringer lactate	normal sa	aline and	A. Number B. Number Working C. Number regularly used	
MATER	RNAL AND NEONAT	AL CARE	: Postpartı	um Care	
637	Are postpartum care services offered routinely?	Yes, in t Yes, in t NO, not NO, not	the facility a the facility a as part of r offered at t	s part of routine services only1 s part of routine services and in special clinics2 outine services but only in special clinics3 his facility4	lf 4 ➔645
Are the	following services	provided	?		
638	Maternal examinat treatment	tion &	Yes No		
639	Breast feeding cou	unseling	Yes No		
640	Newborn examination treatment	tion &	Yes No	1	
641	Growth Monitoring promotion	&	Yes No		
642	Vaccination counseling Yes				
643	Family planning Yes 1 counseling No				
	Treatment of seve	re	Yes		

Section 6.2: Protocols, Guidelines and Templates

No	Questions and Filters	Coding categories	Response	Skip
645	IMCI chart book or wall chart	Present		
646	ARI (NOT PART OF IMCI)	Present		
647	Diagnosis and treatment of diarrhea (NOT PART OF IMCI)	Present		
648	Graphs for growth monitoring	Present		
649	Treatment of severe malnutrition	Present		
650	Tuberculosis diagnosis and treatment	Present		
651	NHIS guidelines	Present		

1
י ר
2
3
4
5
6
7
, 0
8
9
10
11
12
13
14
14
15
16
17
18
19
20
20
21
22
23
24
25
25
20
27
28
29
30
31
22
32
33
34
35
36
37
20
38
39
40
41
42
43
11
44
45
46
47
48
49
50
50
51
52
53
54
55
56
50
5/
58

60

652	Malaria Protocol	Present1 Not Present2	
653	Immunization schedule	Present	
654	Family planning	Present	
655	Are patient education materials displayed?	Present	

Section 6.3: Laboratory tests

10/ 10 00		neck to see which of the following are present.		
No	Questions and Filters	Coding categories	Response	Skip
656	Malaria tests (Malaria RDT)	Able to do this test today1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
657	Does this facility perform	Yes 1		lf 2
	laboratory tests other than	No2		→ 670
	malaria test?			
658	Anemia testing	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
659	Urine for R/M/E	Able to do this test today1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
660	Blood Glucose	Able to do this test today1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
661	Stool for RE	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test3		
662	HIV Testing	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
663	TB Smears	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
664	Gram Stains	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
665	Blood Typing and cross	Able to do this test today 1		
	matching	Able to do this test in past 6 months but not today2		
	, i i i i i i i i i i i i i i i i i i i	Cannot do this test		
666	Syphilis testing	Able to do this test today1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
667	Liver function testing	Able to do this test today 1		
	, i i i i i i i i i i i i i i i i i i i	Able to do this test in past 6 months but not today2		
		Cannot do this test		
668	Pregnancy testing	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
669	Hepatitis	Able to do this test today 1		
		Able to do this test in past 6 months but not today2		
		Cannot do this test 3		

No	Questions and Filters	Coding categories	Response	Skip
670	Is there a separate room/space for	Yes1		lf 2
	drug storage?	No 2		→749
671	Are doors and windows secured in	Yes1		
	the drug storage area?	No2		
672	Drug storage area has ventilation?	Yes1		
		No2		
673	Are there enough shelves for storing	Yes1		
	drugs/other supplies (nothing on the	No2		
	floor)?			
674	Are the stored items protected from	Yes1		
	sun?	No		
675	Are the stored items protected from	Voc 1		
0/5	Are the stored items protected from	No 2		
		N0		
676	Is/are there functioning refrigerator/s	Yes1		
	for storing drugs?	No 2		
677	How many boxes of drugs did you	Number of Boxes		
	receive in the last six months (Push			
	system)?		·	
678	When do you think you might get	Less than 2 weeks1		
	next batch of boxes (Push system)?	2 weeks to 1 month2		
		1 to 2 months		
		More than 2 months4		
679	Currently, do you or your staff order	Yes		
	medicines for the health facility?	No. 2		
	······································	N.		
680	If ves, from where do you order	Referral health facility / Hospital1		
	most of the drugs used in the	Provincial / district health office2		
	facility?	Area Medical store		
	,	Provincial Medical Store		
		NDoH5		
681	When did you order drugs last time?	Less than a month ago1		
	,	1 month to less than 2 months		
		2 months to less than 3 months		
		3 months to less than 4 months4		
		4 months to less than 6 months		
		6 months to less than 9 months		
		9 months to less than 1 year7		
		More than 1 year ago8		
682	Where did you order for the drug	Referral health facility / Hospital1		
	last time?	Provincial / district health office		
		Area Medical store		
		Provincial Medical Store4		
		NDoH5		
683	The previous order you received	Less than 2 weeks		
	(not the last order), how long it took	2 weeks to 1 month2		
	for the drugs to arrive after the	1 to 2 months		
	placement of order?	More than 2 months		
684	Do you always get the drugs you	Yes 1		lf 2
	ordered?	No		→691
COF		Dereent of druge ordered received		2 001
000	on average, what percentage of	Percent of drugs ordered received		
		•		

Section 6.4: Pharmacy room, drug storage area and supply system

686 Who normally makes the collection from the facility? Community health worker					
687 How is the drug delivered to the facility of the drug from medical store/NDOH1 Image: Store/NDOH1 688 How do you pay the expenses for collecting drugs ordered? Province 1 688 How much does it cost (all expenses for collecting drugs ordered? Province 1 689 How much does it cost (all expenses for collecting drugs ordered? Province 4 680 How much does it cost (all expenses) on one average pick up? Please specify 4 690 Where did you go last time to collect medical supplies? Please specify 4 691 What month and year did you receive your last round of medical supply kits? Month	686	Who normally makes the collection from the facility?	Community health worker1 Volunteer2 Nurse3 Brought to the facility by suppliers4		
688 How do you pay the expenses for collecting drugs ordered? Province	687	How is the drug delivered to the facility?	Facility gets the drug from medical store/NDoH1 Medical store/NDoH delivers to the facility2 Others deliver to the facility3		
689 How much does it cost (all expenses) on one average pick up? PNG Kina 690 Where did you go last time to collect medical supplies? Please specify 691 What month and year did you receive your last round of medical supply kits? Please specify 691 What month and year did you receive your last round of medical supply kits? Month 692 Were the medical supply kits? Delivered 693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A 694 List three drugs that you think are not enough based on needs in the facility? A WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A 694 List three drugs that you think are not enough based on needs in the facility? Medical supplies WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A	688	How do you pay the expenses for collecting drugs ordered?	Province		
690 Where did you go last time to collect medical supplies? Please specify 691 What month and year did you receive your last round of medical supply kits? Month 692 Were the medical supply kits delivered directly or did the facility pick up the kits? Month 693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A 694 List three drugs that you think are not enough based on needs in the facility? A 695 Have you purchased additional medicines or medical supplies this year? Yes 695 Have you purchased additional medicines or medical supplies this year? Yes 696 If yes, how did you pay for this purchase? Request province	689	How much does it cost (all expenses) on one average pick up?	PNG Kina Don't Know: 99999		
Medical Supply Kits (Push System) Month 691 What month and year did you receive your last round of medical supply kits? Month 692 Were the medical supply kits Delivered delivered directly or did the facility pick up the kits? Delivered 693 List three drugs that you think are more than enough based on needs here in the facility A 993 List three drugs that you think are more than enough based on needs here in the facility B 994 URGS FROM THE SUPPLY KITS DRUG LIST C 994 List three drugs that you think are not enough based on needs in the facility? A 994 List three drugs that you think are not enough based on needs in the facility? A 994 List three drugs that you think are not enough based on needs in the facility? A 994 List three drugs that you think are not enough based on needs in the facility? A 995 Have you purchased additional medicines or medical supplies this year? A 695 Have you purchased additional medicines or medical supplies this year? No 2 696 If yes, how did you pay for this purchase? Request province	690	Where did you go last time to collect medical supplies?	Please specify		
691 What month and year did you receive your last round of medical supply kits? Month	Medica	al Supply Kits (Push System)			
supply kits? Year I	691	What month and year did you receive your last round of medical	Month		
692 Were the medical supply kits delivered directly or did the facility pick up the kits? Delivered 1 693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A		supply kits?	Year		
693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A	692	Were the medical supply kits delivered directly or did the facility pick up the kits?	Delivered1 Picked up2		
694 List three drugs that you think are not enough based on needs in the facility? A	693	List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST	A B C		
Purchased Drugs 695 Have you purchased additional medicines or medical supplies this year? Yes 1 696 If yes, how did you pay for this purchase? Request province 2 697 How much did you spend on additional drugs in 2014? PNG Kina	694	List three drugs that you think are not enough based on needs in the facility? WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST	ABC		
695 Have you purchased additional medicines or medical supplies this year? Yes 1 No 1 <td>Purcha</td> <td>ased Drugs</td> <td>U,</td> <td></td> <td></td>	Purcha	ased Drugs	U,		
696 If yes, how did you pay for this purchase? Request province1 Own budget	695	Have you purchased additional medicines or medical supplies this year?	Yes1 No2		
697 How much did you spend on additional drugs in 2014? PNG Kina	696	If yes, how did you pay for this purchase?	Request province1 Own budget2 Referral health facility3		
698 Are you planning on purchasing additional drugs in 2015? Yes	697	How much did you spend on additional drugs in 2014?	PNG Kina	 	
	698	Are you planning on purchasing additional drugs in 2015?	Yes1 No2		

3
4
5
6
7
/
8
9
10
11
12
13
14
15
16
17
10
10
19 20
20
21
22
23
24
25
26
27
28
29
20
30 21
51
32
33
34
35
36
37
38
39
40
41
42
<u>ז∠</u> ⊿२
ربـ ۸۸
44
45
46
47
48
49
50
51
52
53
54
55
56
50
57
58
59

1 2

Section 7.1: Availability of Essential Drugs or supplies

SL #	Drug	Question	Response	Question	Response
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	В
701	Panadol/ Paracetamol tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
702	Paracetamol liquid	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
703	Diclofenac (pain/inflammation) capsule or tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
704	Pethidine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
705	Chloroquine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
706	Quinine Injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
707	Primaquine	Yes1 No2	Ū2	Yes1 No2 No expiratory date3 Drug is not present4	
708	Amodiaquine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
709	Artemisinin combination	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
710	Fansidar	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
711	Sulfadoxine tab.	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
712	Pyrimethamine tab.	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

SL #	Drug	Question	Response	Question	Response
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	В
713	Rifampicin	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
714	Isoniazid	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
715	Ethambutol	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
716	Pyrazinamide	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
717	Streptomycin	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
718	TB blister packs	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
719	Oxytocin	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
720	Ergometrine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
721	Lignocaine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
722	Depo-provera	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
723	Ferrous sulphate	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
724	Liniment	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

SL #	Drug	Question	Response	Question	Response
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	В
725	Flagyl/ Metronidazole	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
726	Amoxicillin capsule or tablets	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
727	Co-trimoxazole oral susp or tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
728	Diazepam capsule or tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
729	Amitriptyline 25 mg, capsule or tablet (depression medicine)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
730	Paraldehyde	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
731	Albendazole tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
732	Tinidazole tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
733	Ciprofloxacin capsule or tablet (usually 500 mg)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
734	Crystalline penicillin injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
735	Ceftriaxone 1g/vial injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
736	Chloramphenicol injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

	Drug	Question	Response	Question	Resp
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	B
737	Mala wan (1)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
738	Captopril, 25 mg, capsule or tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
739	Atenolol 50 mg, capsule or tablet (Cardiovascular disease drug)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
740	Simvastatin 20 mg, capsule or tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
741	Glibenclamide 5mg, capsule or tablet (for diabetes)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
742	Salbutamol tab 4 mg	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
743	CMP(Chlorpheniramine maleate) tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present 4	
744	Omeprazole (capsule or tablet)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present 4	
745	ART for HIV/AIDS	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

SL #		Available for use today	Continuously available in the last 30 days
	<u> </u>	(Yes=1, No=2)	without any stock-outs? (Yes=1, No=2)
Family	Planning items		
749	Family planning: Oral pills		
750	Family planning Injections		
751	Condoms		
Vaccin	es and related items		
752	BCG		
753	НЕР В		
754	Vitamin A		
755	Sabin		
756	DTP/Hib	*	
757	Measles		
758	Tetanus Toxoid	R	
759	Iron tablet or folic acid	R	
Availab	ility of Kits for Malaria, TB and HIV/AIDS	3	
760	HIV/AIDS Test Kit		
761	RDT Test kit for Malaria	Ĉ	
762	TB Category 1 kit		
762	TB Category 2 kit		
Other i	tems		
763	ORS for diarrhea	L	
764	HS Darrows	•	
765	Oxygen		0,
766	Baby/scale book		21
767	Mother's health book		
768	Quarterly TB report book		
769	Monthly report forms		
770	Health center record books		
771	Daily summary book		

Table 7 0. Availabilit

No	Questions and Filters	Coding categories	Response	S
772	Does this facility provide EPI services?	Yes		
773	Does this facility provide opportunistic immunizations (i.e., immunization provided when an unimmunized child shows up)?	Yes		
774	Are child immunizations regularly given to children at this facility or in outreach EPI activities?	Yes, at facility only1 Yes, at outreach only2 Yes, both facilities & outreach3		lf F
775	How many EPI outreach activities were conducted in the past 3 months?	Number EPI outreach activities		
776	How many children were vaccinated during past three months and what proportion of total children was vaccinated through outreach activities?	A. Total immunized B. % immunize through outreach		
777	How is the main vaccine refrigerator powered?	None 1 Fuel 2 Electric 3 Solar 4 Gas 5 Other 6		lf -
778	Is the main vaccine refrigerator working?	Yes		
779	Is the main vaccine thermometer present and working?	Yes		
780	Is a temperature log kept	At least twice a day for past 30 days		lf
781	# of days in the past month in which refrigerator temp over 8°C or under 0°C	Number of days Don't know98		
782	Are most of the cold boxes/vaccine carriers functional /working?	Almost all working1 Most not working2 Do not have		
783	Are ice packs present and in good condition?	Present, good condition1 Present, not good condition2 Not present3		
784	Are adequate immunization cards present for at least 30 days? (Based on estimation by in-charge)	Yes		

Section 8.1 Health Outreach Patrols

SL No	Questions and Filters	Coding categories	Response	Skip
801	Does this facility conduct outreach patrols in the community?	Yes1 No2		lf 2 →822
802	How many health outreach patrols to villages were planned in 2014?	Number of days Don't know		
803	How many health outreach patrols to villages were conducted in 2014?	Number of days Don't know998		
804	How many for each of the following types conducted in 2014?	A. Maternal and child health (MCH) B. Immunization C. Joint outreach clinics		
805	If the number conducted is less than the number planned, what are the reasons?	Lack of funds		
806	How many villages/patrol sites are reached on a typical patrol?	Number Don't know		
807	What is the typical average time taken to conduct one patrol? i.e., how long are health workers normally away from the facility at a time.	Half day		
808	Do health workers receive an allowance to go out on patrol?	Yes		
809	If yes, how much per typical patrol?	PNG Kina Don't know998		
810	Are porters / volunteers / casual health staff used to help this facility carry out patrols?	Yes1 No2		
811	Is the health information gathered from conducting a patrol incorporated into monthly reporting for this health facility?	Yes2		
812	What proportion of total catchment population is served either through the facility or the outreach patrols in a quarter?	Almost all served 1 Majority served 2 More than quarter served 3 Less than quarter served 4 None served 5		
813	What proportion of total catchment population do you think live in "remote areas" (at least a day's walk from an operational road)?	% of population		
814	What proportion of the "remote areas" population covered?	% of population		
815	Do you receive support and involvement from 'higher levels' (i.e. hospitals, district health office) such as doctors, specialists accompanying you on patrols?	Yes2		
SL No	Questions and Filters	Coding categories	Response	Skip
-------	------------------------------------	---	----------	------
816	If yes, please specify the	A. Doctor		
	designation of that personnel	B. Specialist		
	RECORD 1 IF THE PERSONNEL	C. Administrators/ Managers		
		D. Other health personnel		
	ACCOMPANIED	E. Security personnel		
		F. Other		
817	In your opinion, has the system of	Specity 1		
	conducting regular outreach	Stagnated 2		
	patrols to rural and remote	Worse		
	communities in the past five years			
	gotten better, worse or stagnated?			
818	The reasons for this change over	A. Availability of funds		
	the last five years	B. Availability of transportation		
	MENTIONED AND 2 IE NOT	C. Availability of staff		
	MENTIONED	D. Weather		
		E. Other		
		Specify		
819	If a health natrol finds very sick	Ask community for help 1		
015	patients in remote areas, what	Call health centre		
	action is normally taken?	Report back to health facility		
		Other, specify4		
820	Do you have the means to	Yes1		If 2
	emergency?	No		➡822
821	How do you respond to health	A. Call ambulance or vehicle to transport patient		
	emergencies	B. Call specialist from the local hospital		
	RECORD 1 IF THE WAY IS	C. Inform emergency situation to NDOH		
	MENTIONED AND 2 IF NOT	D. Other		

SL No	Questions and Filters	Coding categories	Response	Skip
822	How many health care providers arrived at the facility on time today (+/- 10 minutes)	Number of days Don't know9998		
823	How many HEOs, nurses, midwives, and CHWs arrived on time at the facility today?	Number of days Don't know		
824	How many doctors are present now? RECORD "98" FOR THE NUMBER IF NOT KNOWN	A. Time now: Hour and Minute C. Number present:		
825	Are there enough official registers, stationery and other supplies?	Yes		
826	Are there enough forms for the admission and discharge?	Yes		
827	How many meetings of the facility staff were held in past three months?	Number Don't know		
828	Is there a Hospital/facility community advisory committee/Village Health Committees in this area?	Yes		lf 2 ➔831
829	How many meetings of the Hospital/facility community advisory committee were held in past three months?	Number held in past year Don't know		
830	Does the facility have written records of activities carried out by the Hospital/facility community advisory committee?	Yes		
831	Is there an asset registry (equipment and furniture inventory)? Ask to see the inventory; if health staff report having list but do not show it to you, circle 4.	Yes1 Present, not complete2 Not present3 Staff report having inventory but do not show it to surveyor4		
832	When was the last time inventory updated?	Within last one month1 1 With last three months2 2 Within last six months3 3 More than six months ago4		
833	Did the health facility have to close for any reason this year?	Yes1 No2		lf 2 →835
834	If yes, how long and the reason for disruption in operations.	A. Days remaining closed last year: B. Reason (please specify):		

Section 8.2: Administration and management



SL No	Questions and Filters	Coding categories	Response	5
835	Is there at least one officially assigned	Yes1		
000	external supervisor for this health facility?	N0Z		-
836	What are the designations of the supervisors	A. Doctor		_
	who visited the health facility in the last one	B. PHO		
	year and how many times did they visit?	C. DHA		
	RECORD THE NUMBER OF VISITS FOR	D. PDCO		
	EACH KIND OF SUPERVISOR IN	E. Maternal and Child Health		
	RESPONSE COLUMN AND RECORD 00 IF	E Church Health Secretary		
	NO SUPERVISION DONE BY THAT TYPE	G Other		
	OF PERSONNEL	Specify		
837	What were the purposed reasons for latest	A Overall activities in the facility		-
037	superviser's visit?	A. Overall activities in the facility		_
		B. Drug Storage and Distribution		_
		C. Auditing the finance		_
	AND Z IF NOT MENTIONED	D. Maternal/Child health Services		
		E. Immunization program		
		F. Other		
		Specify		
838	Does a doctor work at this health facility?	Yes1		
		No2		
830	If no, how many times has a dector visited this	Number		-
039	health facility in 2014?	Don't know		
8/0	Does a Health Extension Officer work at this	Ves 1		
040	health facility?	No		-
841	If no, how many times did a Health Extension	Number		
	Officer (HEO) visit this health facility in 2014?	Don't know		
842	Does this health facility supervise aid posts /	Yes 1		
0.2	sub-health centers?	No 2		
040		Number		_
843	If yes, now many?	Number		
		Don't know998		
844	How many supervisory visits were made to	Number		
	these clinics in 2014?	Don't know998		
845	How are the costs for supervisory visits paid	Request province		+
040	for at the health facility?	Request district 2		
		Own budget		
		Deforral health facility		
040	Are any other tooks corried out in conting them	A Consultation to nation to		+
040	Are any other tasks carried out in conjunction	A. Consultation to patients		-
		B. NICH SERVICES		_
		C. Care in Well baby Clinic		
	ZIF NUT MENTIONED	D. Immunization services		
		E. Other		
		Specify		
847	Were recommendations written in a	Book present, recommendations written		+
	supervision book from last supervision?	Book present. No recommendations 2		
				1

2
2
ر ۸
4
5
6
7
8
9
10
10
11
12
13
14
15
16
17
10
10
19
20
21
22
23
24
25
25
20
27
28
29
30
31
32
22
22
34
35
36
37
38
39
40
40 // 1
41
42
43
44
45
46
47
48
10
50
50
21
52
53
54
55
56
57
57
20
59
60

Section 8.4: Autonomy [Respondent: Health Facility Manager only]

SL No	Questions and Filters	Coding categories	Response	Skip
848	What authority do you have to	A. Total amount to be spent		
	make decision on expenditure	B. Reallocation of money within same category		
	of funds provided to your	C. Reallocation between exp categories		
	facility?	D. Months in which expenditures can be made		
	2 IF NOT MENTIONED AND	E. Can sign cheques to pay suppliers and other vendors		-
849	Do you need preapprovals for exercising the authorities you have related to fund allocation?	Yes		
850	What authority do you have in	A. Disciplinary action/reporting for poor performance		
	decisions related to facility	B. Identify needs for additional / new staff		
	personnel?	C. Hiring of new staff		
		D. Determine level of payment for staff		
	RECORD 1 IF THE	E. Allocating tasks/duties to existing staff		
	DECISION MENTIONED AND	F. Commending staff for good performance		
	2 IF NOT MENTIONED	G. Promoting staff to higher position		
		H. Dismissal of staff		
		I. Other		
		Specify		
851	Do you need preapprovals for exercising the authorities you have related to fund allocation?	Yes		
852	What authority do you have in	A. Planning the schedule of services		
	decisions on the	B. Changing the content of services delivered	-	
	type/organizations of service	C. Quality of services		
	provision?	D. Operating procedures		
		E. Procedures for accessing services		
	RECORD 1 IF THE	F. Charges for services]	
	DECISION MENTIONED AND	G. Addition of new services		
	ZIF NOT MENTIONED	H. Other	1	
		Specify		
853	For each area of authority: are you satisfied with the level of authority you have?	Yes1 No2		
854	If not what type of authority	A. Authority to generate revenue for facility		
	you think you need for	B. Authority to allocate budget		
	improving performance of the	C. Authority to hire and fire staff		
	health facility?	D. Authority to give reward/punishment		1
		E. Authority to plan		1
	RECORD 1 IF THE	F. Authority of guality assurance		1
	AUTHROITY MENTIONED	G. Other		1
	I AND 2 IF NOT MENTIONED	Onesify	1	1

2	
3	
4	
5	
ر ح	
0	
7	
8	
9	
10	
11	
12	
12	
13	
14	
15	
16	
17	
18	
19	
20	
20	
21	
22	
23	
24	
25	
26	
27	
28	
20	
29	
30	
31	
32	
33	
34	
35	
36	
20	
57	
38	
39	
40	
41	
42	
43	
11	
- + // E	
45	
46	
47	
48	
49	
50	
51	
57	
52	
22	
54	
55	
56	
57	
58	

59

60

Section 8.5: Barriers to managing facility

856	What are the three main constraints you face in managing this facility effectively?	1.	
		2.	
		3.	
		No problem9	
857	Please identify three ways in which the government or your organization could	1.	
	help you do your job better.	2.	
		3.	
		No problem9	
858	Suggest three ways of better involving the community with the health facility	1.	
	activities.	2.	
		3.	
		No problem9	

Section 8.6: Facility health information systems

		Record	the appropriat	e number in the	e "Response" colu	ımn	Response
Povi	ow records for the last completed	1. Do not	2. Register	3. Register	4. Report	5. Not	
17641	month	provide the	Present,	Present,	having but	present	
	monui.	service, no	fully	not fully	did not show		
		register	completed	completed	it to surveyor		
859	ANC register	1	2	3	4	5	
860	Delivery/maternity register	1	2	3	4	5	
861	OT register	1	2	3	4	5	
862	Blood bank register	1	2	3	4	5	
863	HIV Register	1	2	3	4	5	
864	TB Register	1	2	3	4	5	
865	Hospital activity report	1	2	3	4	5	
866	EPI report	1	2	3	4	5	
867	Family Planning report	1	2	3	4	5	
868	Leprosy report	1	2	3	4	5	
869	Lab register	1	2	3	4	5	
870	Morbidity/ Mortality report	1	2	3	4	5	
871	Malaria, Kala-azar report	1	2	3	4	5	
872	Notifiable Disease report	1	2	3	4	5	
873	IMCI report	1	2	3	4	5	
874	Equipment status report	1	2	3	4	5	
875	Other	1	2	3	4	5	
876	Other	1	2	3	4	5	
877	Other	1	2	3	4	5	
878	Other	1	2	3	4	5	
879	Other	1	2	3	4	5	

Section 9: Number of cases by disease or medical conditions for the latest month (based on the latest Health Center Monthly Summary Report available)

SL#	Question or items	Response instructions	Record Response	Skip
901	Does the facility have monthly reports available for review (either from facility or elsewhere)?	Yes1 No2		lf 2 ➔904
902	The month and year of latest monthly report available in the facility or obtained from upper administrative level	Month (MM) and Year (YY)		
903	Is the latest monthly report complete?	All fields are recorded/completed1 Most of the fields completed2 Most of the fields not completed3 Only very few items are recorded4		

Table 9.1: Outpatients (from monthly report)

SL No	Diseases	Male (Number of cases)	Female (Number of cases)
		A	В
904	Measles (suspected)		
905	Pertussis		
906	Simple cough		
907	Pneumonia (<1 year)		
908	Pneumonia (1-4 yrs)		
909	Pneumonia (5 yrs+)		
910	Chronic Obstructive Pulmonary Diseases		
911	Asthma		
912	Other upper respiratory tract infections		
913	Diarrhea (<1 year)		
914	Diarrhea (1-4 yrs)		
915	Diarrhea (5 yrs+)		
916	Malaria (<1 year)		
917	Malaria (1-4 yrs)		
918	Malaria (5 yrs+)		
919	Malaria (Pregnant women)		
920	Pyrexia (Fever) of unknown cause (PUO)		
921	Anaemia		
922	Malnutrition (<1 yr)		
923	Malnutrition (1-4 yrs)		
924	Accident /injuries		
925	Genital ulcers		
926	Urethral discharge		
927	Vaginal discharge		
928	Pelvic Inflammatory Disease		
929	Genital warts		
930	Latent syphilis (blood test)		
931	Other STI		

SL No	Diseases or medical conditions	Male (Number of cases) A	Female (Number of case B
932	Pulmonary TB suspect		
933	Pulmonary TB confirmed by sputum test		
934	Leprosy		
935	Yaws		
936	Other skin diseases		
937	Ear infections (including both middle and outer ear infections)		
938	Eye infections		<u> </u>
939	All other new cases		
Table 9.2	: Inpatients (Number of discharges from monthly r	eport) Mala (diasharras)	Formala (dia aborrana)
SL NO	Diseases of medical conditions	A Male (discharges)	Female (discharges)
940	Diphtheria		
941	Neonatal Tetanus		
942	Acute Flaccid Paralysis		
943	Measles (suspected)		
944	Pertussis		
945	Neonatal sepsis		
946	Pneumonia (<1 year)		
947	Pneumonia (1-4 yrs)		
948	Pneumonia (5 yrs+)		
949	Chronic Obstructive Pulmonary Diseases		
950	Asthma		
951	Other respiratory		
952	Diarrhea (<1 year)		
953	Diarrhea (1-4 yrs)		
954	Diarrhea (5 yrs+)		
955	Malaria (Clinical diagnosis) (0-4 years)		
956	Malaria (Clinical diagnosis) (5-14 years)		
957	Malaria (Clinical diagnosis) (15 yrs+)		
958	Malaria (Clinical diagnosis) (Pregnant)		
959	Malaria (Slide or RDT diagnosis) (0-4 years)		
960	Malaria (Slide or RDT diagnosis) (5-14 years)		
961	Malaria (Slide or RDT diagnosis) (15 yrs +)		
962	Malaria (Slide or RDT diagnosis) (Pregnant)		
963	Anemia		
964	Malnutrition (<1 yr)		
965	Malnutrition (1-4 yrs)		
966	All accidents/injuries		

SL No	o Dise	eases or medical condition	ons	Male (disch	narges)	Female (discharges)
967	Typhoid					
968	TB					
969	Leprosy					
970	Meningitis (<	(1 year)				
971	Meningitis (1	-4 years)				
972	Meningitis (5 years+)				
973	Snakebite					
974	Skin disease	9S				
975	HIV/AIDS (<	5 years)				
976	HIV/AIDS (5	-14 years)				
977	HIV/AIDS (1	5-24 years)				
978	HIV/AIDS (2	5 years+)				
979	TB-HIV Patie	ents				
980	Ischemic hea	art diseases				
981	Cancer		0			
982	Hypertension	n				
983	Diabetes					
984	Other discha	arges not included above				
Tabla 0) 3. Family Dlanni	n a Comula on Ducuidod				
SI	FP Methods	New attendance in	Re-atten	dance in No	w attendanc	e in Re-attendance in
SL No	FP Methods and services	New attendance in facility	Re-atten faci	dance in No lity	ew attendanc Aidpost	e in Re-attendance in Aidpost
SL No	FP Methods and services	New attendance in facility A	Re-atten faci	dance in No lity	ew attendanc Aidpost C	e in Re-attendance in Aidpost
SL No 985	FP Methods and services Breast feeding	New attendance in facility A	Re-atten faci	dance in Ne lity	ew attendanc Aidpost C	e in Re-attendance in Aidpost D
SL No 985 986	FP Methods and services Breast feeding Com. Pill (OCP)	New attendance in facility A	Re-atten faci	dance in Ne lity 3 	ew attendanc Aidpost C	e in Re-attendance in Aidpost D
SL No 985 986 987 987	FP Methods and services Breast feeding Com. Pill (OCP) Injection	A Image: services provided New attendance in facility A Image: services provided Image:	Re-atten faci	dance in Ne lity 	ew attendanc Aidpost C	e in Re-attendance in Aidpost D
SL No 985 986 987 988	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation	New attendance in facility A	Re-atten faci	dance in Ne lity 3 / / / /	ew attendanc Aidpost C I	e in Re-attendance in Aidpost D
SL No 985 986 987 988 988 989	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom	New attendance in facility A I <	Re-atten faci	dance in Ne lity - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc Aidpost C	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D
SL No 985 986 987 988 989 990	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD	New attendance in facility A I <	Re-atten faci	dance in No lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc Aidpost C	e in Re-attendance in Aidpost D U U U U U U U U U U U U U U U U U U
SL No 985 9 986 9 988 9 989 990 991 9	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation	New attendance in facility A I <	Re-atten faci I <td< td=""><td>dance in Ne lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -</td><td>ew attendanc Aidpost C</td><td>e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D</td></td<>	dance in Ne lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc Aidpost C	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D
SL No 985 9 986 9 987 9 989 990 991 992	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy	New attendance in facility A I	Re-atten faci -	dance in Ne lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D I
SL No 985 9 986 9 987 9 988 9 990 9 991 992 993 9	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities	New attendance in facility A I	Re-atten faci I I I I I I	dance in No lity - - -	ew attendanc Aidpost C	e in Re-attendance in Aidpost D I
SL No 985 9 986 9 987 9 988 9 990 9 991 9 992 9 993 Table 9	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities 0.4: Maternal, Nec	New attendance in facility A I <	Re-atten faci E I <td< td=""><td>dance in Ne lity - - -</td><td>ew attendanc <u>Aidpost</u> C <u> </u> </td><td>e in Re-attendance in Aidpost D D Image: A straight of the straight of th</td></td<>	dance in Ne lity - - -	ew attendanc <u>Aidpost</u> C <u> </u>	e in Re-attendance in Aidpost D D Image: A straight of the straight of th
Pable 3 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities 0.4: Maternal, Nec Antenatal car	New attendance in facility A I	Re-atten faci E I	dance in No lity - - -	ew attendanc Aidpost C 	e in Re-attendance in Aidpost D D
SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities O.4: Maternal, Nec Antenatal car First visit	New attendance in facility A A A A A A A A A A A A A A A A A A A	Re-atten faci E I	dance in Ne lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D
Pable 3 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities O.4: Maternal, Nec Antenatal car First visit Fourth visit	New attendance in facility A I	Re-atten faci I	dance in lity No	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D
SL 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995 996	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities Other facilities Antenatal care First visit Fourth visit Other	New attendance in facility A A A A A A A A A A A A A A A A A A A	Re-atten faci E I	dance in Ne lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D
SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995 996 997 2006	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities O.4: Maternal, Nec Antenatal carr First visit Fourth visit Other First dose TT	New attendance in facility A I	Re-atten faci E	dance in lity No	ew attendanc <u>Aidpost</u> C _	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D
SL No 985 986 987 988 989 989 990 991 992 993 Table 9 SL No 994 995 996 997 998 2000	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities Other facilities At: Maternal, Neo Antenatal card First visit Fourth visit Other First dose TT Second dose T	New attendance in facility A I I I	Re-atten faci I	dance in lity Ne	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D

58 59

60

	Deliveries							Nι	ımbe	er		
1000	Uncomplicated deliveries in health facility											
1001	Deliveries with complications in health facility											
1002	Transferred to hospital for pregnancy and delivery	complie	cations									
1003	Birth weight <2500 grams											
1004	Still births											
1005	Born before arrival							;				
1006	Village births attended (total)											
							II					
Table 9	.5 Well Baby Clinic			No	w atte	nd			P	o-at	tond	-
Number	Type of service				A					B		•
1007	Clinic Attendances (<1 year)									_	_	
1008	Clinic Attendances (1 4 years)				<u> </u>		1	-	1	-		
1000					-				_	_		
Table 9.0	6: Immunizations administered											_
Serial	Vaccine type administered	Adr	niniste	red in	1 Clini	c or in	Adr	nini	stere	ed b	y Ai	d
NO				A						В		
1009	BCG (Within 24 hours of birth)								I			1
					· · ·	I			l	ا <u></u> ا	 	
1010	I BCG (<1 week but not within 24 hours of birth)	S I			1 1							
1010	BCG (<1 week but not within 24 hours of birth)			_ 	<u> </u> 	 I		 	. 	 		
1010 1011 1012	BCG (<1 week but not within 24 hours of birth) BCG (> 1 week) Henatitis B (Within 24 hours of birth)		 	_ _	_ _ 	 		 	 	 		
1010 1011 1012 1013	BCG (<1 week but not within 24 hours of birth) BCG (> 1 week) Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours)			_ _	- - 	 		 	 	 		
1010 1011 1012 1013 1014	BCG (<1 week but not within 24 hours of birth)			_ _ _				 	 	 	 	
1010 1011 1012 1013 1014 1015	BCG (<1 week but not within 24 hours of birth)							! ! !				
1010 1011 1012 1013 1014 1015 1016	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025	BCG (<1 week but not within 24 hours of birth)											
1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026	BCG (<1 week but not within 24 hours of birth)											

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

BMJ Open

Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea – Evidence from a Cross-Sectional Survey

Journal:	BMJ Open
Manuscript ID	bmjopen-2021-050150.R3
Article Type:	Original research
Date Submitted by the Author:	25-Jan-2022
Complete List of Authors:	Hou, Xiaohui ; World Bank Group, Health, Nutrition and Population Global Practice Khan, M. Mahmud ; University of Georgia College of Public Health Pulford, Justin; Liverpool School of Tropical Medicine, ; Papua New Guinea Institute of Medical Research, Saweri, Olga; Papua New Guinea Institute of Medical Research
Primary Subject Heading :	Obstetrics and gynaecology
Secondary Subject Heading:	Global health, Health policy, Health services research, Obstetrics and gynaecology
Keywords:	OBSTETRICS, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Maternal medicine < OBSTETRICS
	1

SCHOLARONE[™] Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our <u>licence</u>.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

reliez oni

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

1 ว		
2 3	1	
4	Т	
5 6	2	
7	3	
8 9	_	
10	4	
11 12	5	
13	6	Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea –
14 15	7	Evidence from a Cross-Sectional Survey
16	0	
17	8	
18 19	9	
20		
21 22		
23		
24 25		
25 26		
27		
28 29		
30		
31		
32 33		
34		
35 36		
37		
38 30		
40		
41		
42 43		
44		
45 46		
47		
48 40		
49 50		
51		
52 53		
54		
55 56		
57		
58 50		1
59 60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

2		
3	1	Readiness of Health Facilities to Provide Emergency Obstetric Care in Papua New Guinea -
4	- ว	Evidence from a Croce Sectional Survey
5	Z	Evidence from a cross-sectional survey
6	С	
7	5	
8	4	Xiaonul Hou, Ph.D.
9	5	Health, Nutrition, and Population Global Practice
10	6	World Bank
11	7	1818 H. Street, NW. 20433
12	8	Washington DC
13	0	when Queridhank arg
14 15	9	xnou@wondbank.org
15	10	
10	11	
17	12	M. Mahmud Khan, Ph.D.
10	13	Health Policy and Management Department
20	11	Collogo of Public Hoalth
20	14	
22	15	University of Georgia
23	16	Wright Hall, Health Sciences Campus, 100 Foster Road, Athens, GA 30602
24	17	Mahmud.Khan@uga.edu
25	18	
26		
27	10	lustin Bulford Dh D
28	19	
29	20	Senior Lecturer
30	21	Department of International Public Health
31	22	Liverpool School of Tropical Medicine
32	23	justin.pulford@lstmed.ac.uk
33	24	
34		
35	25	
30 27	25	
27 20	26	Papua New Guinea Institute of Medical Research (PNGIMR)
30	27	PO Box 60, Goroka, EHP 441, Papua New Guinea
40	28	olga.saweri@gmail.com
41	29	
42	30	Declarations of interest: none
43	31	Corresponding Author: M. Mahmud Khan, Ph.D., Professor, Health Policy and Management
44	22	College of Public Health University of Coorgia 100 Foster Boad Wright Hall 116 Athans CA
45	52	
46	33	30602. <u>Mahmud.Khan@uga.edu</u>
47	34	
48	35	Key words
49		
50	36	Maternal Health, Emergency Obstetric Care, Readiness of health facilities, signal functions for
51 52		
53	37	emergency obstetric care, Papua New Guinea
54 55	20	Total word county 5,250 (avaluding references, figures and tables)
55 56	38	rotar word count. 5,550 (excluding references, figures and tables)
57		_
58 59		2
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

Contributorship statement Xiaohui Hou: Conceptualization, Methodology, Supervision, Project Administration, Resources, Writing-Original Draft, Writing – review & editing M. Mahmud Khan: Conceptualization, Methodology, Supervision, Formal Analysis, Writing-Original Draft, Writing – review & editing Justin Pulford: Conceptualization, Methodology, Data Curation, Data Validation, Writing-Review & Editing. Olga P. M. Saweri: Data Curation, Data Validation, Writing-Review & Editing **Details of funding source** This work was funded by World Bank's Trust Fund supported by Australia's Department of Foreign Affairs and Trade. World Bank contract number: 7171956, Principal Investigator: M. Mahmud Khan. Date: July 1, 2014. Data availability statement No additional data is available. Researchers interested in 2015 PNG Facility Assessment Survey data can contact Dr. Xiaohui Hou at xhou@worldbank.org and copy the PI of the project, Dr. M. Mahmud Khan, at the email address Mahmud.Khan@uga.edu, with a statement on the reasons for requesting the dataset and types of analyses to be conducted. **Competing Interest statement** There is no competing interest.

1 2		
- 3 4	1	Abstract
5	2	Objective
7 8 9	3 4	To measure readiness of health facilities in Papua New Guinea (PNG) to provide obstetric care and other maternal health services.
10 11	5	Design
12 13 14 15 16	6 7 8	Cross-sectional study involving random sample of health centers, district/rural hospitals (levels 3 and 4 facilities) and all upper level hospitals operational at the time of survey. Structured questionnaires were used to collect data from health facilities.
17 18	9	Setting
19 20 21 22	10 11 12	Health facilities in PNG. Facility administrators and other facility personnel were interviewed. Number of facility personnel interviewed was usually one for health centers and two or more for hospitals.
23 24	13	Participants
25 26 27	14 15	19 upper-level facilities (levels 5-7, provincial, regional and national hospitals) and 60 lower-level facilities (levels 3 and 4, health centers and district/rural hospitals)
28 29 30	16	Outcome measures
30 31 32 33 34 35	17 18 19 20	Four service-types were used to understand readiness of surveyed health facilities in the provision of maternity care including obstetric care services: (1) facility readiness to provide clinical services; (2) availability of family planning items; (3) availability of maternal and neonatal equipment and materials; and (4) ability to provide emergency obstetric care.
30 37	21	Results
38 39 40 41 42 43 44 45	22 23 24 25 26	56% of lower level facilities were not able to provide Basic Emergency Obstetric Care (BEmOC). Even among higher level facilities, 16% were not able to perform one or more of the functions required to be considered a BEmOC provider. 11% of level 3 and 4 health facilities were able to provide comprehensive emergency obstetric care (CEmOC) as compared to 83% of higher level facilities.
46 47	27	Conclusion
48 49 50	28 29	Given the high fertility rate and maternal mortality ratio (MMR) in PNG, lack of BEmOC at the first level inpatient service providers is a major concern. To improve access to EmOC, level 3 and
51 52	30 31	4 facilities should be upgraded to at least BEmOC providers. Significant reduction in MMR will require improved access to CEmOC and optimal geographic location approach can identify
53 54	32	facilities to be upgraded.
55 56 57	33	
58 59		4
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

2		
3	1	Strengths and limitations of this study
4 5	2	
6	3	• This is the first empirical study that systematically examined availability of maternity
7	4	care in health facilities in Papua New Guinea (PNG).
8	5	All upper level hospitals and randomly selected fully functional health centers were
9 10	6	surveyed
11	7	 The readiness of facilities in the provision of obstatric care and actual provision of services
12	, 0	• The readiness of facilities in the provision of obstetric care and actual provision of services
13	0	were assessed using relevant indicators and signal functions.
14 15	9	Service availability and readiness of facilities could not be linked with community level
16	10	nearth outcomes.
17	11	The sampling design selected fully functional health centers and district/rural hospitals in
18	12	each of the surveyed districts implying overestimation of readiness and availability of
19 20	13	obstetric care.
21	14	
22		
23		
24 25		
26		
27		
28		
30		
31		
32		
33 24		
35		
36		
37		
38 30		
40		
41		
42		
43 44		
45		
46		
47 49		
40 49		
50		
51		
52 53		
54		
55		
56		
57 58		ς
59		
60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Introduction

Effective antenatal, neonatal and Emergency Obstetric Care (EmOC) are highly cost-effective interventions vital to avert common adverse pregnancy and/or birth outcomes, which significantly contribute to maternal mortality in poor resource settings.¹⁻⁴ Basic Emergency Obstetric Care (BEmOC) alone can avert a significant proportion of maternal deaths and up to 40% of neonatal deaths.⁵ A global assessment found that BEmOC facilities are consistently not available in sufficient numbers in countries with high and moderate levels of maternal mortality.⁶ Comprehensive Emergency Obstetric Care (CEmOC) availability, which includes the provision of caesarean and blood transfusion services in addition to the key functions included in BEmOC, is also guite poor in many low and middle income countries.⁷

Maternal and child health remains a key priority area in Papua New Guinea (PNG);⁸ however, persistently high maternal and neonatal deaths reflect numerous deficiencies. The estimates of Maternal Mortality Ratio (MMR) in PNG vary considerably. One study by Mola and Kirby estimated the MMR for 2009 using facility-based health information system records and survey data on maternal mortality among unsupervised births from one province. The estimates imply that the average MMR in PNG should be approximately 500 per 100 000 live births.^{9 10} The neonatal mortality in PNG is also high, around 28 per 1000 live births.¹¹ The World Health Organization model ranks PNG 130th in the world in terms of MMR.¹² The 2016-2018 PNG Demographic and Health Survey (DHS), using the sisterhood method, found that the MMR was about 205 per 100,000 live births.¹³ Even though new DHS estimate represents a significant improvement from the previous estimate of 733 per 100,000 live births in 2006, the maternal mortality in PNG remains about 24 times the MMR in neighboring Australia.¹² The DHS report also indicates that only 17% of pregnancies received a prenatal visit in the first trimester and 49% had four or more prenatal visits over the whole pregnancy. During 2012-2017, about 55% of deliveries in PNG were supervised by trained health workers at health facilities¹³ indicating limited access to modern maternal health care services.

To reduce the MMR in any country, it is important to understand the causes of death so that appropriate interventions can be designed and adopted. In PNG, the maternal mortality registry often does not report causes of death. Reviewing the causes of deaths mentioned in the general death registry and in maternal mortality registry, one study in early 1980s found that the main causes were puerperal sepsis, postpartum hemorrhage, medical and surgical complications, prolonged or obstructed labor, ruptured uterus, deaths associated with caesarean section.¹⁴ It is likely that many of these causes of deaths have remained important even today. Clearly, deaths due to the causes indicated above cannot be avoided without timely access to health facilities that are equipped to provide a range of obstetric care services. A recent article mentioned geographically dispersed population, shortage of health care providers, poverty, gender inequality and low level of education as important determinants of maternal deaths.¹⁵ These aspects are, however, directly related to access to care and readiness of health facilities in the provision of maternity care.

1 Lifetime risk of maternal death depends on the probability of maternal death per pregnancy and

- 2 the average number of pregnancies per woman over the reproductive age. The 2016-2018 PNG
- 3 DHS estimated that total fertility rate (TFR) was about 4.2 per woman, which is slightly lower than
- 4 the TFR of 4.4 in 2006. Access to obstetric care and lifetime risk of maternal death can be
- 5 improved by lowering the TFR as well.

Given the critical importance of timely access to appropriate obstetric care, it is essential to assess the ability and readiness of health facilities in the provision of emergency obstetric care in PNG. Due to high TFR of PNG, the demand for maternal health services will continue to increase rapidly, underscoring the urgent need for improving access to care and strengthening maternal healthcare service delivery.

Despite the high social value of maternal and newborn health care services in PNG, no macro-level information is available on the ability or readiness of health facilities in the provision of the services. One recent study assessed the capacity of 21 health facilities in the provision of essential surgery and anesthesia services.¹⁶ No study on PNG, to date, has examined the readiness and ability of health facilities at the national level in the provision of obstetric care services. This study is the first attempt to understand the state of obstetric care availability in PNG.

The principal objective of this study is to measure health facility readiness to provide obstetric care and other maternal health services. Some of the measures reflect not only the readiness of the facilities in the provision of target services but also the quality of services offered. The nationally representative health facility survey allows measurement of various indicators of obstetric care services. These measures will be useful for policy makers to reform the health care delivery system to strengthen the provision of obstetric care and general clinical services.

23 Methods

37 24 Conceptual Framework

We use the Donabedian's framework to analyze the readiness of obstetric care and other related services offered through the health facilities in PNG. In general, the Donabedian's approach is used to evaluate quality of care by analyzing relevant structures, processes and outcomes.¹⁷ The structure measures affect processes and then processes affect outcomes, as shown in figure 1. In this study, our focus is on the evaluation of 'structure' and 'process' measures relevant for maternity care. The structure and process variables help to better understand the ability of health facilities in the provision of different service-types. Although, the impact of service provision cannot be directly measured from the facility survey data, country-level estimates of maternal mortality and morbidity imply relatively poor outcomes indicating the need for improving infrastructure and processes associated with obstetric and other maternity services.

To evaluate the ability and readiness to provide general medical care services including obstetric
 care, health facilities should have several infrastructural characteristics and resources. Some of
 the structural measures are quite general, related to the provision of any clinical service, such as

general inpatient services. In addition, specific personnel, supplies and drugs must be available at the facility to be able to offer the right type of services at the right time based on the clinical needs of patients. The structural characteristics, although not directly related to maternity care, are the necessary aspects defining the "readiness" of the facility in the provision of effective health care services. Readiness, however, does not necessarily imply actual provision of services. The infrastructural aspects act as the foundation for the provision of services, and relevant health care resources must be combined with the infrastructure to offer services to patients whenever needed. The process variables reflect ability to offer different types of obstetric care services and functions. The process variables for monitoring obstetric care service provision, the signal functions, are well defined and we will use the facility-level signal functions for understanding the readiness of facilities in PNG.¹⁸

12 Study Setting

PNG is remarkably diverse with respect to geography, language, and infrastructure. The country is divided into 22 provinces across four regions (Highlands, Momase and Southern, and the New Guinea Islands). Most of the country's 8 million people live in rural or peri-urban communities and are faced with significant challenges with regard to equitable access to health, education and economic opportunities.

PNG has a government-funded health system throughout much of the country. It is
 supplemented by government-subsidized health services provided by various Christian missions.
 Overall, it is estimated that churches provide 47% of primary health services, particularly in rural
 areas.¹⁹

Health facilities are categorized by the number and cadre of health workers employed and the services they provide and are detailed in the National Health Services Standard (NHSS) of the Government of PNG (GoPNG).²⁰ The levels of health facilities in PNG are numbered 1 through 7, where levels 1 and 2 provide basic primary health care, specifically outpatient services only. Level 3 health facilities, or health centers, provide outpatient and basic inpatient services for deliveries and minor ailments requiring observation. Level 4 health facilities, district and rural hospitals, provide general admissions, limited clinical support services including basic pharmacy and laboratory services, and depending on the employment of a medical officer, may provide surgical intervention services. Levels 5 to 7 health facilities provide secondary and tertiary health services as well as clinical support services, including pharmacy, laboratory, and radiology. The only level 7 health facility, the Port Moresby General Hospital, is the largest and most advanced health care facility of PNG, employs the largest concentration of health care workers and provides comprehensive health care services.

52 35 Survey Design

We conducted a health facility survey of 73 health facilities in PNG in 2015. All operational upper
 level health facilities (levels 5 to 7) were selected for the survey. At the time of data collection,

PNG had 19 upper-level health facilities and all these 19 facilities were surveyed (although one of the facilities was not fully operational). The upper-level health facilities in the survey included the national referral hospital (Port Moresby General Hospital), three regional hospitals, and 15 provincial hospitals. At the national level, since about half of health centers and district/rural hospitals (levels 3 and 4) were Church-run, the survey design intended to sample equal number of publicly-run and Church-run facilities. For selecting facilities at these two levels, between six (New Guinea Islands) and eight (Southern, Highlands, and Momase) districts were randomly selected per region. The largest government- and Church-administered health facilities (one of each type based on outpatient numbers per annum as reported by the National Health Information System) were purposely selected per district. This sampling procedure allowed selection of 30 publicly run and 30 church-run facilities from the selected districts; however, during field visits, not all selected facilities were found to be operational. Where possible, closed health facilities were replaced by functional ones within the same district. In some districts there were no functional level 3 or 4 facilities, resulting in less than 60 facilities surveyed (N=54). Figure 2 shows the location of the health facilities surveyed for this study. The provinces shaded in green indicate where the survey was carried out. The red squares represent level 5 to 7 health facilities, while the blue squares represent levels 3 and 4.

Survey Procedure

The survey comprised of a health facility assessment and costing instrument as well as interviews with healthcare providers, inpatients, and outpatients. Each instrument is detailed in the survey report.²¹ The facility assessment questionnaire can be found in the supplementary file of the article and standard health facility questionnaires were adapted to the PNG context using the NHSS document.²⁰ Briefly, the health facility assessment collected information on various operational aspects of each health facility, while the costing instrument detailed expenditure on human resources, equipment, and consumables utilized for the provision of healthcare services. Both these instruments were completed with health facility managers and administrators. Upper level facilities offered many different types of specialized services and data collection at these levels required interviewing multiple facility personnel. The data collection was done by a team of 5 trained enumerators, who spent three to five days surveying each health facility. In total, 73 health facilities were surveyed.

Informed consents for the survey

For health facility costing and assessment, the survey team requested consent via email from the provincial, district and church health services, depending upon the facility to be surveyed. In addition, consent was requested from the officer in charge of each of the health facilities. The travel plan to the facilities was finalized after the consents were granted. Upon the team's arrival in the facility, the supervisor of the team met the officer in charge to confirm the consent received earlier and to get verbal consent to initiate the interviews.

BMJ Open

For interviews with health care workers and patients, informed consent was requested in writing.

The interviews were conducted only after the consents were granted. As much as possible, visual

and audible privacy was ensured for the interviews. All interview questionnaires were de-

identified by assigning a code number. The code numbers are saved on a secure server at the

11 6 Public Involvement

PNGIMR.

Stakeholder consultations were involved in the design and early dissemination of this research. During the feasibility stage, priority of research questions, choice of outcome measures, and methods were informed by discussions with stakeholders involving representatives from the National Department of Health, UN agencies, academics and other development partners in PNGs. The preliminary findings were also discussed with representatives from the National Department of Health, Provincial Health Authorities, hospitals and development partners in a stakeholder consultation workshop held in Port Moresby, PNG.

222314 Ethics approval

The study was approved by the PNG Institute of Medical Research (IMR) Institutional Review
 Board (IRB) and the PNG Medical Research Advisory Committee (MRAC). The following approval
 numbers were allocated to the study: IRB No. 1414, 7 August 2014; MRAC No 14.26, 10
 November 2014.

30 31 19 Outcome measures

The handbook on monitoring emergency obstetric care¹⁸ identified a set of indicators to measure availability, access and provision of EmOC in a country or a region. Two types of measures were defined -the first type focuses on availability, adequate coverage and utilization of services at national or sub-national levels and the second type measures obstetric care related functions performed by health facilities. The functions identified to define the level of EmOC services offered from a health facility are: (1) Administer parenteral antibiotics, (2) Administer uterotonic drugs, (3) Administer parenteral anticonvulsants, (4) Manually remove the placenta, (5) Remove retained products, (6) Perform assisted vaginal delivery, (7) Perform basic neonatal resuscitation, (8) Perform surgery (e.g., caesarean section), and (9) Perform blood transfusion. When a facility can perform all the functions listed under 1-7, it is considered a Basic EmOC (BEmOC) provider while ability to perform all the nine functions defines the comprehensive EmOC (CEmOC) provider. This study has used these nine measures to categorize health facilities as either a BEmOC or a CEmOC. Note that all these signal functions are defined by the ability to perform specific functions pregnant women need at the time of delivery. Ability to perform the functions does not necessarily imply that the facilities actually provided the services in the recent past.

Since this study is based on facility-level survey data, community or patient related health
 outcome measures are not directly observable. To compensate for this, we have used additional
 measures to understand readiness of health facilities in the provision of general inpatient care.

BMJ Open

Availability of basic medical equipment and supplies and physical condition of the facility

- (infrastructural variables) may affect willingness of clients to utilize services from the facilities.
- Another important intervention that may affect the demand for EmOC is the provision of family planning services. Family planning in PNG is expected to reduce total fertility rate implying that
- need for maternity services should decline with family planning. Therefore, in addition to nine
- EmOC functions listed above, other outcome variables considered in this analysis are: (a)
- readiness of facilities to provide clinical services; (b) availability of family planning items; and (c)
- availability of maternity care related equipment and materials. Availability of drugs and supplies
 - is defined as having the item in stock at the time of the survey.
- For the availability of equipment, instruments and supplies, several indexes were calculated to indicate degree of availability of the items. The index values range from 0 to 100, 100 implying that all the items used for the construction of the index were available in all the facilities surveyed.

Calculating readiness or availability index

The analysis has used facility level data to derive the readiness indicators and ability to perform signal functions for each facility in the survey (Stata version 12 was used). The results are presented as descriptive tables (Tables 1-4) to indicate the proportion of facilities having the instruments or able to perform the specific functions.

An equally weighted index was constructed based on the availability of the items included in each of the categories of service delivery. It reflects the percent of all readiness aspects or variables satisfied by the health facilities in a specific category. For example, if a facility reports having an instrument, a value of 1.0 was assigned for the facility for that equipment. The availability index was constructed to show the percent of listed equipment and items available in each of the facility categories. For example, if the family planning items availability index is 65 for level 3 and 4 facilities, it means that the facilities on the average had 65% of all the family planning equipment and items considered in the analysis.

Results

Facility readiness to provide clinical services

Table 1 reports facility readiness in the provision of services. As shown, 95% (18 out of 19) of level 5 to 7 facilities were connected to the main electric supply grid but only about a third of level 3 and 4 facilities (17 out of 54). However, more than 80% of all facilities connected to the electric supply experienced blackout at least for some time in the week before the survey. All level 5 to 7 facilities had functional backup generators, while the percentage of level 3 and 4 facilities with backup generators was 76% for church-run facilities and 48% for public facilities. Half of the level 3 and 4 facilities with backup generators reported problems in operating the generator in the previous month.

If supply line and water tanks are considered, all level 5 to 7 facilities and 83% of level 3 and level 4 public health facilities and 84% of level 3 and level 4 church health facilities reported having

access to water on the day of the survey. However, less than 10% of level 3 and 4 facilities were

connected with water supply lines. Only 45% of level 3 and 4 public facilities had water connection to the delivery room (and water availability on the day of the survey) compared to 72% at church-run facilities. A significant share of health facilities, 62%, 44% and 38% of level 3 and 4 public, level 3 and 4 church, and level 5 and 6 facilities, respectively, experienced water shortages in 2014. The survey asked facility respondents whether the facility was responsible for maintaining the water supply system and it was observed that about 45% of public level 3-4 facilities were responsible for maintaining the water supply system. The proportions were 64% for church-run level 3 and 4 facilities and 68% for level 5 to 7 facilities. Only 10% public (n=3) and 12% church (n=3) level 3 and 4 health facilities had ability to do direct blood transfusion. Proportion of facilities which could do blood transfusion was much higher, 89% among level 5 and 6 facilities and 100% for level 7. Percentage of health facilities that had operations theatre were much higher. 28% and 36% level of public and church level 3-4 health facilities and all level 5-7 health facilities had at least one operation theatre. Both level 3 and 4 public and church-run health facilities show low readiness score for service delivery (Table 1). Readiness indexes were 40.3 for level 3 and 4 public sector facilities, 48.6 for level 3 and 4 church-run facilities, 84.6 for level 5 and 6 facilities, and 100 for the level 7 facility. Availability of Family Planning Items Table 2 presents the availability of family planning products and supplies in surveyed health facilities. The availability index of family planning items was 81.6 for level 3 and 4 public sector health facilities, 84.0 for level 3 and 4 church-run facilities, and 88.9 for level 5 and 6 facilities. Non-availability of family planning injections in the level 7 facility reduced the overall index of family planning item availability for the facility to 66.7. Since there is only one facility at level 7, non-availability of even a single item significantly reduces the overall index. Availability of supplies and equipment for maternity care A relatively large proportion of health facilities lacked very basic pregnancy and antenatal care related supplies and equipment as shown in table 3. The index values for the availability of antenatal care items were 76.9 and 88.6 for level 3 and 4 public- and Church-run facilities, respectively. The index was 87.3 for level 5 and 6 facilities and 100 for level 7 facility. The index of availability of obstetric and neonatal care items were worse in level 3 and level 4 facilities, 70.6 and 80.5 respectively for public and church facilities. The index was 95.52 for level 5 and 6 facilities. The survey also asked about the availability of vacuum extractors and forceps in the facilities for conducting deliveries. It is interesting that 74% of facilities reported having vacuum extractors and 95% reported having forceps although forceps are not used in PNG for deliveries. Ability to provide emergency obstetric care services

Table 4 indicates the percent of facilities able to perform different obstetric functions. As mentioned earlier, WHO has defined nine functions to understand the level of obstetric services provided from the facilities. The survey questionnaire combined first three signal functions (capacity to administer parenteral antibiotics, uterotonic drugs, parenteral anticonvulsants) into one and asked the respondents to report if the facility was able to perform all the three functions, two of the three or one of the three functions. Most level 3-4 facilities, about 80% (n=42), reported the ability to perform all these three functions. Two facilities at upper levels (levels 5-7) were not able to perform these three basic obstetric functions. One of the upper level facilities in the sample was not fully functional at the time of the survey. Table 4 shows that 38% of Churchrun level 3-4 facilities and 52% of government-run level 3-4 facilities were BEmOC providers. Even among higher level facilities (levels 5, 6 and 7), 11% (n=2) of facilities were not able to perform one or more of the necessary functions required to be considered a BEmOC provider.

If the signal functions for comprehensive emergency obstetric care are considered (all nine signal functions), only about 11% (n=6) of level 3 and 4 health facilities were found to be CEmOC units. About 15% of level 3 and 4 facilities had the capacity to manage a caesarean section or do blood transfusion. Not all level 5 to 7 facilities were CEmOC providers - 21% (n=4) of upper level facilities were not able to perform at least one of the nine signal functions.

18 Discussion

The overall health facility infrastructural condition in PNG is quite poor. Most facilities reported the need for major building repairs and emphasized the lack of adequate toilets, stable electrical supply, and consistent water supply. Many level 3 and 4 health facilities required better connectivity to electricity and clean water supply. One significant concern is the number of health facilities that did not have running water in the facility's delivery room. The quantity and quality of different types of clinical services provided crucially depends on the facility's readiness to offer services in general. Overall, level 3 and 4 facilities, both public and Church-run, scored low on the readiness index, implying that these facilities were not very reliable providers of services and patient-confidence in these facilities are likely to be low. The survey also revealed the need for improving the supply of basic medical items at level 3 and 4 public health facilities. Level 3 and 4 public facilities show lower availability of different medical items compared to those in Church-run facilities.

Comparison of health facility readiness across countries is often tricky because of differences in the level and comprehensiveness of facilities in different countries of the world. A World Bank report²² indicates that 98% of public hospitals in Indonesia had electricity; in Laos, the index of basic amenities was reported as 64%²³ compared to 58% for PNG (weighted mean of the values in table 1).

This study showed that the index of availability of family planning supplies in levels 3 and 4 was about 83%. Family planning supplies should be available in all facilities, especially at the lower levels, to ensure uninterrupted access at all times, which is clearly not the case for PNG. In

BMJ Open

addition, availability of family planning supplies does not necessarily mean utilization of services.

The findings from the most recent PNG DHS survey showed access to family planning services

quite limited. One quarter of currently married women have an unmet need for family planning,

and only 59% of currently married women are satisfied with family planning services. Among

those who have received family planning, about 9 in 10 users obtained their modern family

planning supplies from a public (government) source. Therefore, there is an urgent need to

identify potential gaps in the provision and utilization of family planning services to strengthen

service provision from the government health facilities, especially at lower levels. Better access

and utilization of family planning services can help reduce maternal and child mortality.²⁴⁻²⁶

While 79% of level 5 to 7 facilities were found to be CEmOC providers, the fact that about a fifth were not able to provide comprehensive emergency obstetric care is a major concern, given that these are the higher level referral hospitals in PNG. Consistent with the findings of this study, another study using a much smaller sample of facilities, concluded that the "Capacity for essential surgery and anesthesia services is severely limited in PNG due to shortfalls in physical infrastructure, human resources, and basic equipment and supplies."16

The results from the survey can be used to derive national level estimates of obstetric care availability. Using the proportions of CEmOC facilities at different levels and the total number of facilities in PNG at these levels, the total number of facilities ready to provide comprehensive obstetric care was only 50 at the time of the survey in 2015. Even if we arbitrarily assume balanced geographic distribution of these facilities, an emergency obstetric case will have to travel 53 km each way, on average, to reach a CEmOC facility. The distance to the nearest CEmOC facility is so large that for many emergency cases this is virtually synonymous of not having access to CEmOC. To reduce maternal mortality and morbidity significantly, it is essential to lower the average distance to the nearest CEmOC facility²⁷ implying that PNG will have to upgrade a significant number of levels 3, 4 and 5 facilities. Geographic information systems and geographical modelling tools can help identify the optimal location of CEmOC facilities and existing facilities closest to the optimal locations can be upgraded in the short-run to improve access.28

All facilities at level 3 or above should be able to provide basic EmOC. To improve access to emergency obstetric care, most level 3 and 4 facilities should be considered for immediate upgrading to BEmOC provider or better. The survey of facilities indicated that about 45% of levels 3 and 4 facilities were not ready to provide BEmOC. Despite this low readiness, equipping about 15 to 20% of these facilities to perform signal functions 5 and 6 can improve BEmOC availability from 55% of the facilities to about 80%. Although maternal and child health is a priority area, PNG has not allocated enough resources to achieve improved access to maternity and neonatal services. PNG spends more than 4.3% of its GDP on health (about \$109 per capita in PPP dollars). Total health expenditure is not low compared to other countries with similar level of per capita income.²⁹ However, a significant part of health resources, including human resources, particularly doctors, are concentrated in a few major hospitals. Therefore, the resource allocation at the

lower level health facilities (level 3 and level 4 facilities) are not sufficient. Reallocation of public

sector resources to lower level health facilities are needed to expand access to obstetric care and other preventive services.

To improve availability and access to quality maternity services in PNG, especially in remote rural areas, a program of training and upskilling of Community Health Workers was adopted.³⁰ Although the upskilling has increased utilization of basic maternity services, significant reductions in maternal mortality will require access to hospital-based obstetric care. Government of PNG may consider allocating funds to facilities, both public and church facilities, based on quantities of priority health services delivered rather than on number and mix of human resources and other administrative needs.³¹ While the effectiveness of such performance based financing depend on how the schemes are implemented, evidence in low and middle income countries shows that the performance can be improved through financial incentives.³² From the demand side, past research has found that providing pregnant women with health vouchers to ensure financial protection for accessing medical care has increased utilization of health services.³³ The payments received through the vouchers will also encourage facilities to become more sensitive to the needs of pregnant women and would have incentives to invest to become fully functional EmOC providers. An initiative in two provinces in PNG that provided incentive packages to pregnant women increased facility-based supervised birth rates by 80%³⁴ indicating that enhancing facility readiness combined with incentivizing pregnant women to utilize health facilities will be very effective in improving maternal and neonatal health.

Study Limitations

Several limitations of the study should be mentioned here. First, it is not possible to indicate overall geographic access to primary health care services in PNG using the survey data because the study did not collect information from level 1 and 2 health facilities. However, these facilities do not provide obstetric care services although some basic services like family planning and antenatal care can potentially be organized at these levels. Second, the survey, strictly speaking, is not a representative survey of level 3 and 4 facilities. The survey design selected high-demand fully functional level 3 and 4 facilities in target districts and the definition of fully functional led to the choice of facilities that showed relatively high level of utilization. Therefore, if anything, the results are likely to be significant overestimations of degree of readiness of the facilities in the provision of obstetric care and other related services in PNG. Even with this favorable selection of facilities, the percent of facilities able to perform BEmOC and CEmOC was quite low at levels 3 and 4 implying that the availability of obstetric care services could be significantly worse than what has been reported in this study. Third, the study did not try to connect the service availability and readiness with health outcomes of the population at the subnational level. In PNG, even the national level estimates of mortality and morbidity are considered unreliable and subnational level estimates would suffer from even higher degree of error in estimation. In any case, facility level information clearly indicates that many of the functional facilities are not

- ready to provide obstetric health services and a significant proportion of facilities lack medical
- equipment, instruments and supplies for the provision of quality maternity and neonatal services.

Conclusions

Inability of a health facility, irrespective of whether it is a primary, secondary and tertiary care facility, to provide obstetric care and other related services is an important concern for any health care system. It is especially true for a country like PNG where maternal and infant mortalities are high alongside a high fertility rate. Improved availability and utilization of family planning services can help reduce the demand for EmOC, lower maternal and neonatal mortality/morbidity and improve access to maternity services. Lowering the need for maternity services through interventions like family planning, however, is unlikely to improve access to maternity care significantly in the short-run. Supply-side interventions are necessary to ensure that the services are available in strategically located health facilities. Improving facility infrastructure, equipping the facilities with essential medical equipment and supplies and ensuring the presence of trained personnel in health facilities are needed to make the facilities BEmOC or CEmOC providers. Since the number of facilities in PNG offering EmOC is quite low compared to the needs, all level 3 and 4 facilities should be upgraded to at least the BEmOC level. Survey-based estimates suggest that only 50 facilities in PNG can be considered CEmOC providers and this number is inadequate to ensure equitable access to emergency obstetric cases. Increasing the number of CEmOC providers is urgently needed.

1		
2		
3 4	1	
5	2	Figure caption
6 7	3	
8 9	4	Figure 1. Three components of Dependion enpresses of evoluting quality of ears
10	4	righte 1. Three components of Donabedian approach of evaluating quanty of care
12	5	
13 14	6	Figure 2. Map of PNG with Districts Visited (green) and Location of Surveyed Facilities
15 16	7	
10		
18		
19		
20		
21		
22		
24		
25		
26		
27		
28 20		
30		
31		
32		
33		
34 35		
36		
37		
38		
39		
40 41		
42		
43		
44		
43 46		
47		
48		
49		
50 51		
52		
53		
54		
55 56		
57		
58		17
59		For peer review only http://bmionen.hmi.com/site/about/auidelines.yhtml
60		For peer review only - http://binjopen.binj.com/site/about/guidennes.xhtml

1			
2 3	4	Defe	
4	1	Ketel	rences:
5	2	1.	Islam, M.T., et al., Improvement of coverage and utilization of EmOC services in
6 7	3		southwestern Bangladesh. Int J Gynaecol Obstet, 2005. 91(3): p. 298-305; discussion
8	4		283-4.
9	5	2.	Turab, A., et al., Improved accessibility of emergency obstetrics and newborn care
10	6		(EmONC) services for maternal and newborn health: a community based project. BMC
11 12	7		Pregnancy Childbirth, 2013. 13 : p. 136.
12	8	3.	Chavula, K., et al., Readiness of hospitals to provide Kangaroo Mother Care (KMC) and
14	9		documentation of KMC service delivery: Analysis of Malawi 2014 Emergency Obstetric
15	10		and Newborn Care (EmONC) survey data. J Glob Health, 2017. 7(2): p. 020802.
16 17	11	4.	Ameh, C.A., et al., The effectiveness of training in emergency obstetric care: a systematic
17	12		<i>literature review</i> . Health Policy Plan, 2019. 34 (4): p. 257-270.
19	13	5.	Lee, A.C., et al., Care during labor and birth for the prevention of intrapartum-related
20	14		neonatal deaths: a systematic review and Delphi estimation of mortality effect. BMC
21	15		Public Health, 2011. 11 Suppl 3 (Suppl 3): p. S10.
22	16	6.	Paxton, A., et al., Global patterns in availability of emergency obstetric care. Int J
24	17		Gynaecol Obstet, 2006. 93 (3): p. 300-7.
25	18	7.	Banke-Thomas, A., et al., Assessing emergency obstetric care provision in low- and
26 27	19		middle-income countries: a systematic review of the application of global guidelines.
27 28	20		Glob Health Action, 2016. 9 : p. 31880.
29	21	8.	Government of Papua New Guinea, National Health Plan 2011–2020, Volume 1: Policies
30	22	_	and Strategies. June 2010,.
31	23	9.	Mola, G. and B. Kirby, Discrepancies between national maternal mortality data and
32 33	24		international estimates: The experience of Papua New Guinea. Reproductive health
34	25		matters, 2013. 21: p. 191-202.
35	26	10.	Robbers, G., et al., Maternal and newborn health indicators in Papua New Guinea –
36	27		2008-2018. Sexual and Reproductive Health Matters, 2019. 27 (1): p. 52-68.
37 38	28	11.	PNG National Department of Health, Health Information Systems. 2019.
39	29	12.	WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division.
40	30	10	Irends in Maternal Mortality: 2000 to 2017. Geneva, world Health Organization, 2019.
41	31	13.	National Statistical Office (NSO) [Papua New Guinea] and ICF, Papua New Guinea
42 43	32		Demographic and Health Survey 2016-18. Port Moresby, Papua New Guinea, and Bookwillo, Maguland, USA: NSO and USE 2010
44	33	1.4	ROCKVIIIE, Marylaria, USA: NSO and ICF. 2019.
45	34 25	14.	Noid, G., I Altkell, Maternal mortality in Papua New Guinea 1970-1983. PNG Medical
46	35	15	JUUIIIdi, 1984. 27(2): p. 05-71.
47 49	30	15.	to Safe Surgery and Anosthesia, Anosthesia & Analgosia: January 2018, 126(1): p. 252
40 49	37 20		250 doi: 10 1212/ANE 000000000002550
50	38 20	16	259. doi: 10.1215/ANE.000000000002550 Martin L. Goa Tau, Moona Nathan Chorian, Jonnifer Vergel de Dies, David Mills, Jane
51	29 40	10.	Eitzpatrick William Adu Krow & Daw Chang, Survey of the canacity for accential surgery
52	40 11		and angesthesia services in Panua New Guinea, BMI Open 2015:5: e000841
53 54	41 42		doi:10.1126/bmionon.2015.009841
55	42		doi.10.1130/billjopell-2013-003641.
56			
57			10
50 59			10
60			For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

3	1	17.	Donabedian, A., <i>Evaluating the Quality of Medical Care.</i> The Milbank Quarterly, 2005
4	2		83(4): p. 691-729 (reprint from 44(3): 166-203, 1966).
5 6	3	18.	WHO. UNFPA. UNCEF. & AMDD. Monitoring emergency obstetric care: a handbook.
7	4		2009. Geneva: World Health Organization.
8	5	19	NDOH Christian Health Services Technical Assistance Mission Report 2013 National
9	6	15.	Department of Health: Port Moreshy, Panua New Guinea
10	7	20	Covernment of PNG (CoPNG) National Health Service Standards for Panua New Guinea
11	, 0	20.	2011 2020 Volumos 1 and 2 June 2011
12 13	0	21	2011-2020, Volumes I and 2, June 2011. Khan M. Mahmud Viachui Hau Olga DM Cawari Ibrahim Damir Difat Haidar Shakil
14	9 10	21.	Abread and Justin Dulfard. Carvice Delivery by Health Facilities in Danua New Cuinery
15	10		Anmed and Justin Pulford, Service Delivery by Health Facilities in Papua New Guinea:
16	11		Report based on a countrywide nealth facility survey, wasnington DC: The World Bank
17	12		Group. December 2017.
18	13	22.	World Bank, Universal Maternal Health Coverage? Assessing the Readiness of Public
19	14		Health Facilities to Provide Maternal Health Care in Indonesia. Washington, DC: World
20	15		Bank. 2014.
22	16	23.	World Bank, Maternal Health Out-of-Pocket Expenditure and Service Readiness in Lao
23	17		PDR. Washington, DC: World Bank. 2013.
24	18	24.	Chola L, McGee S, Tugendhaft A, Buchmann E, Hofman K. Scaling Up Family Planning to
25	19		Reduce Maternal and Child Mortality: The Potential Costs and Benefits of Modern
26 27	20		Contraceptive Use in South Africa. PLoS ONE 2015, 10(6): e0130077.
27	21		doi:10.1371/journal.pone.0130077
29	22	25.	Budi Utomo, B. , Purwa Kurnia Sucahya, Nohan Arum Romadlona, Annette Sachs
30	23		Robertson, Riznawaty Imma Arvanty and Robert Joseph Magnani, The impact of family
31	24		planning on maternal mortality in Indonesia: what future contribution can be expected?
32	25		Population Health Metrics (2021) 19:2, https://doi.org/10.1186/s12963-020-00245-w
33 24	26	26	Winikoff B & Maureen Sullivan Assessing the Role of Family Planning in Reducing
35	20	20.	Maternal Mortality Studies in Family Planning, May - Jun, 1987, 18(3), n, 128-143
36	27	27	McKinnon B et al. Distance to emergency obstetric services and early neonatal
37	20	27.	mortality in Ethionia Tron Mod Int Hoalth 2014 10 (7): n 780.90
38	29	20	Ebonor S ot al. Dronosing standardised geographical indicators of physical access to
39	50 21	20.	Eberner, S., et al., Proposing standardised geographical matches of physical access to
40 41	31		Clab Lloolth 2010. 4(Suppl 5): p. 2000778
42	32	20	Glob Health, 2019. 4(Suppl 5): p. e000778.
43	33	29.	World Bank, Health Findncing System Assessment : Papua New Guinea. World Bank,
44	34		Washington, . 2017.
45	35	30.	Mola, G., Upskilling experienced female CHWs currently working in maternity care in
46	36		<i>rural health facilities in maternity care skills,</i> unpublished memeo, December 2020.
47 48	37	31.	Cairns, A. and Xiaohui Hou , Financing the frontline : an analytical review of provincial
49	38		administrations' rural health expenditure 2006-2012 . Health, Nutrition, and Population
50	39		(HNP) discussion paper. Washington, D.C. : World Bank Group. , in 2015:
51	40		https://hubs.worldbank.org/docs/ImageBank/Pages/DocProfile.aspx?nodeid=25991656.
52	41	32.	Paul, E. and D. Renmans, Performance-based financing in the heath sector in low- and
53	42		middle-income countries: Is there anything whereof it may be said, see, this is new? Int J
54 55	43		Health Plann Manage, 2018. 33 (1): p. 51-66.
56			
57			
58			19
59			For peer review only - http://bmionen.hmi.com/site/about/auidelines.yhtml
60			i or peer review only intep.//binjopen.binj.com/site/about/guidelines.kntim

1 2 3 4 5 6 7 8 9 10 11	1 2 3 4 5	33. 34.	CM, B., et al., <i>The impact of vouchers on the use and quality of health care in developing countries: a systematic review</i> . Glob Public Health, 2013. 8 (4): p. 363-88. Mola, G., A pioneering approach to birthing, PNG Attitude, December 2019. https://www.pngattitude.com/2019/12/a-pioneering-approach-to-birthing.html
12 13 14 15 16 17 18 19 20 21 20 21 22 23 24 25 26			
27 28 29 30 31 32 33 34 35 36 37 38 39 40			
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 55 56			
50 57 58 59 60			20 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Table 1. Readiness Index for provision of general clinical services by Facility Level in Papua New Guinea

Readiness indicators		Leve	l 3 and 4		Leve	el 5 and 6	Lev	el 7
	Public	%	Church	%	N	%	N	%
Electricity connected to supply grid	10	34%	7	28%	17	94%	1	100
Backup generator	14	48%	19	76%	18	100%	1	1009
Electricity availability (supply or generator)	20	69%	21	84%	18	100%	1	100
Blackout last week	8	28%	6	24%	15	83%	0	0
Problem last month running generator due to fuel shortage	8	28%	10	40%	3	17%	0	0
Water from main line	2	7%	3	12%	15	83%	1	100
Water shortage last year	18	62%	11	44%	7	39%	0	0
Water available for use by health care providers	24	83%	21	84%	18	100%	1	100
Water available in delivery room	13	45%	18	72%	18	100%	1	100
Facility does direct blood transfusion	3	10%	3	12%	16	89%	1	100
Blood transfusions done last month	3	10%	3	12%	18	100%	1	100
Facility has designated space for clinicians to provide service	20	69%	20	80%	18	100%	1	100
Facility has on-call room or space for health care providers to take rest	3	10%	11	44%	10	56%	1	100
Facility has telephone or shortwave radio	14	48%	14	56%	15	83%	1	100
Facility has ambulance	26	90%	24	96%	17	94%	1	100
Ambulance out of service last year	11	38%	10	40%	6	33%	0	0
Facility has other vehicles	8	28%	5	20%	18	100%	1	100
Facility has operation theatre	8	28%	9	36%	18	100%	1	100
	40).3	48	.5		84.6		100

Family p	planning (FP) items		Level 3 and	d 4 facilitie	S	Leve	el 5 and 6	Level 7	facilities
		# of Public	% of Public	# of	% of Church	# of	% of Level	# of Public	% of
Oral p	ills	26	90%	21	84%	17	94%	1	100%
FP inje	ections	22	76%	22	88%	15	83%	0	0%
Condo	oms	23	79%	20	80%	16	89%	1	100%
Index of	FP items	8	1.6	84	4.0		88.9	6	56.7
ource: 20	ors survey of health jo	icilities in PN	iG (survey (conducted	by this stu	ay)			
				22					
				22					

2 Table 3. Availability of Supplies and Equipment for Maternity Care in PNG by Health Facility Level

Antenatal, pregnancy, obstetric and neonatal care related equipment and supplies	Level 3 and 4 facilities				Level 5 and 6 facilities		Level 7 facility	
	# of Public	% of Public	# of Church	% of Church	# of Public	%	# of Public	%
Foetal stethoscope (or monitor)	27	93%	25	100%	14	78%	1	100%
Stethoscope and blood pressure cuff	22	76%	25	100%	16	89%	1	100%
Tape measure	23	79%	22	88%	16	89%	1	100%
Scale	28	97%	25	100%	16	89%	1	100%
Ultrasound machine (and gel)	28	97%	25	100%	17	94%	1	100%
Stethoscope	10	34%	11	44%	15	83%	1	100%
Pelvic procedure instruments such as speculum	18	62%	22	88%	16	89%	1	100%
Index: availability of antenatal care items	76.85		88.57		87.30		100	
Delivery light	24	83%	24	96%	18	100%	1	100%
Partograph	11	38%	13	52%	14	78%	1	100%
Sterilizer	15	52%	16	64%	13	72%	1	100%
Vacuum extractor	14	48%	21	84%	18	100%	1	100%
Forceps	25	86%	25	100%	18	100%	1	100%
Manual vacuum aspirator/suction bulb	27	93%	25	100%	17	94%	1	100%
Facility has at least two skilled birth attendants covering 24 hours a day	21	72%	19	76%	18	100%	1	100%
Delivery kit (instruments, supplies)	25	86%	25	100%	18	100%	1	100%
Resuscitation bag, newborn	4	14%	4	16%	15	83%	1	100%
Eye drops or ointment for newborn	27	93%	25	100%	18	100%	1	100%
Needles and syringes	28	97%	25	100%	18	100%	1	100%
Sterile C-section instrument kits	28	97%	25	100%	18	100%	1	100%
Cord supplies for newborn: clamps, ties, scissors	2	7%	5	20%	12	67%	1	100%
IV sets, including sterilized needle and tube	27	93%	25	100%	17	94%	1	100%
IV fluids, including normal saline and ringer lactate	29	100%	25	100%	18	100%	1	100%
Index: availability of obstetric and neonatal care items	70	.57	80	.53	92.	52	10	00

Table 4. Percentage of Health Facilities Able to Perform Signal Functions with Categorization of Facilities into Basic Emergency Obstetric Care and Comprehensive Emergency Obstetric Care Providers

Signal functions for obstetric and neonatal care	Ability to perform	Level 3 and 4 public	Level 3 and 4 church	Level 5 to 7	Total
	•	% (n)	% (n)	% (n)	% (n)
Signal functions 1-3: Have capacity to administer parenteral antibiotics, uterotonic drugs, parenteral anticonvulsants?	Yes, all three	76% (22)	80% (20)	89% (17)	81% (59)
	Yes, two of the three	10% (3)	16% (4)	5% (1)	11% (8)
	Yes, one of the three	3% (1)	4% (1)	0% (0)	3% (2)
Signal function 4: Have the ability for manual removal of placenta?	Yes	72% (21)	88% (22)	95% (18)	84% (61
Signal function 5: Have ability to remove retained products?	Yes	59% (17)	80% (20)	95% (18)	75% (55
Signal function 6: Have the capacity to perform assisted vaginal delivery?	Yes	59% (17)	72% (18)	89% (17)	71% (52
Signal function 7: Have ability to Perform basic neonatal resuscitation	Yes	72% (21)	96% (24)	95% (18)	86% (63
Signal function 8: Have ability to perform surgery and manage caesarean section	Yes	14% (4)	16% (4)	95% (18)	36% (26
Signal function 9: Have capacity to do safe blood transfusion	Yes	14% (4)	20% (5)	89% (17)	36% (26
Ability to perform first seven signal functions	Basic EmOC	38% (11)	52% (13)	84% (16)	55% (40
Ability to perform all nine signal functions	Comprehensive EmOC	10% (3)	12% (3)	79% (15)	29% (21

Figure 1. Three components of Donabedian approach of evaluating quality of care


BMJ Open

Figure 2. Map of PNG with Districts Visited (green) and Location of Surveyed Facilities



Note: Red squares represent the level 5 to 7 facilities while the blue squares represent the level 3 to 4 facilities surveyed.

Health Facility Efficiency Study in PNG with a Focus on Secondary Care

Health Facility Assessment 2014

Papua New Guinea Institute of Medical Research, PO Box 60 Goroka, Papua New Guinea; University of South Carolina, Columbia, South Carolina, USA; and Nossal Institute for Global Health, Melbourne, Australia.

		IDENTIFICATION		1	
PROVINCE					
DISTRICT					
LOCAL LEVEL GOVERNMENT AREA	۸				
NAME AND TYPE/ID OF THE FACIL	ITY				
(HC=03, DLH =04, PH =05, RH=06, H	NH=07)				
OWNERSHIP OF THE FACILITY (PUBLIC =01, CHURCH CATHOLIC	=02, CHURCH LUT	THERAN=03, CHURCH S	SDA =04)		
NAME AND DESIGNATION OF THE	RESPONDENT				
Consultant =01, OIC/Head Administr Extension Officer =05, Nurse =06, M worker = 09)	ator = 02, Medical C idwife=07, Commur	Officer =03, Dental Officer hity Health Worker =08, 0	=04, Health Dther Allied Health		L
SEX OF THE RESPONDENT: MAI F	1 FEMALE 2				
Other persons interviewed for infor Name: 1	mation :	Designation (enter c above): 1.	ode in boxes from		
2.		2			
3.		3			
4		4			
5		5			
6		6			
		NTERVIEWER VISITS			
	1	2	3	FINAL	/ISIT (DDMMYYY
DATE					
INTERVIEWER'S NAME & CODE				CODE	
RESULT CODE*				RESUL	T CODE
*RESULT CODES:1: COMPLETED, 2:	REFUSED, 3: PAR	TLY COMPLETED, 8: OTH	IER	(SPECI	FY)
SUPERVISOR	FIE		OFFICE EDIT	OR	KEYED E
NAME	NAME		NAME		NAME
DATE	DATE				DATE

r
Z
3
4
-
5
6
7
/
8
9
10
10
11
12
12
15
14
15
10
10
17
18
10
19
20
21
∠ I
22
23
21
24
25
26
27
27
28
29
20
30
31
32
22
33
34
35
55
36
37
28
50
39
40
<u>،</u>
71
42
43
ΔΛ
45
45
46
47
4/
48
49
50
50
51
52
52
22
54
55
55
30
57
58
50
27

١o	Questions and Filters	Coding categories	Response	Skip
01	Name and position of the person	Interviewee name		
	interviewed for the survey (transfer			
	information from cover page)	Position		
02	Type of health facility (transfer information	HC03		
	from cover page)	DLH04		
		PH05		
		RH06		
		06		
		Other		
03	Ownership of the facility (transfer	Pubic1		
	information from cover page)	Church Catholic2		
		Church Lutheran3		
		Church SDA4		
04	Is there a signboard/sign with the facility	Yes1		
05	name?	NO2		<u> </u>
105	is this facility open 24 hours a day, seven	Yes1		
06	Udys d WEEK ! The services available 24/7 from this facility	A Inpatient hospital services		
00	The services available 24/1 ITOTT THIS Idelilly	B Emergency room services		-
	FOR EACH SERVICE. IF AVAILABLE 24	C. Outpatient clinics for adults		-
	HOURS RECORD "1". OTHERWISE	D Outpatient clinics for children		
	RECORD "2"	E Outpatient clinics for women		
		E Lab and Diagnostic Services		-
		G. Pharmacy Services		
		H. Snake-bite clinic services		-
		I. Other Services (specify)		
07	How many days in a week the outpatient	Days		
	facility is open on weekdays?			
08	Opening time on Weekdays (Mon-Fri)	Hour : Min		
09	Closing time on Weekdays (Mon-Fri)	Hour : Min		
10	Does this facility provide outpatient services	Only Saturdays	<u> · </u> 	
	on Saturdays and Sundays?	Only Sundays2		
		Both Saturdays and Sundays		lf 4
		Not open on weekends4		→11
11	Opening time on Weekends	Hour : Min		
12	Closing time on Weekends	Hour : Min		
13	Is the facility is connected to electric supply	Yes1		lf 2
	grid?	No2		→11
14	Is the electricity available 24 hours a day	Yes1		
	from the grid in a normal week?	No2		-
15	Was electricity available through the grid all	Yes1		
40	the time during the past one week?	NO2		
16	In last one week, now many hours the	Hours		
	electricity was not available through the			
17	Does the facility have a functional back up			+
	Dous the facility have a functional back up	100		

No	Questions and Filters	Coding categories	Response	Skip
118	Does the facility face problems with	Yes1		
	operating the backup system/generator due	No2		
	to lack of fuel in last one month?			
119	What is the health facility's main source of	Piped1		
	water now?	Water tank (Water stored from supply)2		
		Tube well		
		Bore hole4		
		Others (Specify)		
		Others (Specify)		
120	If water comes from supply line, how many	Hours		
120	hours the water is normally available in a			
	dav?		11	
121	In 2014, has water been available from this	Yes1		
	source all year?	No2		
122	Are health workers able to use this water	Voc 1		
122	Source today when treating patients?	No 2		
400	source today when treating patients:			
123	Is the water supply connected to the	Yes1		
404	delivery room and working today?	NOZ		
124	(fixtures and lines), who is responsible for	District 2		
	fixing it?	Church agency 3		
		This facility 4		
		Referral health facility		
125	How are expenses for fixing problems with	Request province1		
	the water supply met?	Request district		
		Own budget3		
		Referral health facility4		
126	Do you think that the facility has adequate	Adequate1		
	number of toilets?	Need few additional2		
407	la thora a privata pharmaay within walking	Not adequate at all		
121	distance from this facility?	No 2		
128	How many buildings are used to provide	Number of buildings		
120	services in the facility?			
129	Total land area of the facility	Land area in decimals		1
-				l
130	Construction materials used in the	Cement/brick1	Roof	
	construction of the main building of the	Tin/other metals/tile2		
	facility	Wood3	Wall	
		Leaves/other low-cost materials4		
404		Utners	⊢loor ∟	
131	Condition of the infrastructure	iviost buildings/ building need major repairs1		
		Does not require much repairs 2		
132	Is the land area around the health facility	Υρς 1		
1JZ	clean?	No 2		
133	Is the main building raised?	Yes		lf 2
.00		No		→135
134	How many meters the building is raised?	Meters (MM.M)		
135	Are there living guarters on campus?	Yes1		lf 2
		No2		→137
·	•	•		•

No	Questions and Filters	Coding categories	Response	Skip
136	How many families can live on campus (No.	If more than 98 families, enter 98.		
	of separate quarters)	Not known= 99		
137	Does the facility have a blood bank?	Yes1		
		No2		
138	Does the health unit have blood transfusion	Yes1		lf 2
	facility?	No2		→14
139	Were there any blood transfusions done in	Yes1		
	the last one month?	No2		
		Not applicable		
140	Does this facility have designated spaces	Yes1		
	for each of the doctors/key service providers	No		
	to provide services after initial	Not applicable 3		
	triage/examination?			
141	Is there an on-call room/space where health	Yes 1		
	care professionals can rest during their on	No 2		
	call?	Not applicable 3		
1/2	Does this facility have working telephone or	Voc 1		
142	boes this facility have working telephone of			
4.40	shortwave radio to call outside?	N0		16.0
143	Does this facility have ambulances?	Yes1		
		No2		→14
144	How many ambulances does the facility	Number		
	have?	\sim		
145	Was there any time this year when the	Yes1		
	ambulance was not in service?	No2		
146	If yes, how many ambulances remained out	A. How many were out of service even		
-	of service and for how long on average over	temporarily?		
	the last one year?	B. Average weeks of out-of-service		
		g		
147	Does the facility have any other vehicles like	Yes 1		lf 2
	cars, motorcycles etc.?	No		→201
148	How many vehicles does the facility have?	Car		2
140				
		Motorcycles		
140	Principal use of vehicles and embulances in	Transporting patients to facility	Ambulance	
149	nast sovon dave	Transporting patients to facility		
	pasi seven uays	facility		
		For upo by boolth facility administrators	Coro	
		For use by realth facility administrators		
		For conducting outreach		
			Matan	
		I ransporting healthcare providers to the	wotorcycles	
		facility5		
			Boats	
			1 1 1 1	1
150	Who meets the costs for maintenance /	Province		
150	Who meets the costs for maintenance / servicing of the vehicles?	Province		
150	Who meets the costs for maintenance / servicing of the vehicles?	Province District		

2
2
5
4
5
6
7
/
8
9
10
10
11
12
12
13
14
15
16
10
17
18
10
19
20
21
22
~~
23
24
25
20
26
27
28
20
29
30
31
22
52
33
34
25
55
36
37
38
20
39
40
41
 د ۸
42
43
44
45
46
47
48
40
49
50
51
50
52
53
54
55
22
56
57
58
50
L ()

Section 2.1: Information on each	of the buildings
----------------------------------	------------------

No	Questions/ Items	Responses and codes	Building/ Structure #1	Building/ Structure #2
201	Name of the structure/ building			
202	Principal activities normally performed in the building/ structure	Inpatient services		
203	Total floor space of the building	Floor space in sq meters		
204	Number of rooms in the structure (not including toilets, closets, hallways)	Number Don't know: 998		
205	Do windows and doors of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
206	Do interior walls and roof of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
207	Does electric supply system of the facility need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed		
208	Does water supply system of the facility need repair works?	No repairs needed1 Few repairs needed2 Many repairs needed		
209	Does toilet (latrine) for clients' use of the facility need repair works?	No repairs needed		
210	Number of toilets	Number Don't know: 98		
211	Are most of the toilets functional?	Yes1 No2		
212	Are the toilets clean?	Yes, all the toilets are clean	2	
213	How many rooms or areas in the building have water connection?	Number Don't know: 98		
214	Are the water outlets are functional in toilet?	Yes1 No2		
215	Floor space of waiting rooms/space for clients	Floor space in sq meters		
216	How many seating spaces are there in waiting rooms/spaces?	Number Don't know: 98		
217	Are the waiting areas/rooms clean?	Yes1 No2		
218	Floor space of outpatient consultation (not including consultant's offices)	Floor space in sq meters		

No	Questions/ Items	Responses and codes	Building/ Structure #1	Building/ Structure #2
219	Is there at least one site in the outpatient clinic area where both auditory and visual privacy can be maintained for client services?	Yes1 No2		
220	Is the building is accessible to persons with disabilities (e.g., wheel chair ramps, elevators if more than one floor, hand rails etc.)	Yes1 No2		
221	Floor space in the emergency department including waiting space	Floor space in sq meters		
222	Floor space for blood bank, blood donation space, etc.	Floor space in sq meters		
223	Number of observation beds in the building/ Structure (not including inpatient beds)	Number Don't know: 998		
224	Number of inpatient wards in the	Number Don't know: 998		
225	Floor space of general adult wards	Floor space in sq meters		
226	Number of inpatient beds in general adult wards (according to National Medical Standards)	Number Don't know: 998		
227	How many patients are in the general ward today?	Number // Number		
228	Floor space of pediatric wards	Floor space in sq meters		
229	Number of inpatient beds in pediatric wards	Number Don't know: 998		
230	Number of beds in pediatric wards (according to National Medical Standards)	Number Don't know: 998		
231	How many patients are in the pediatric ward today?	Number Don't know: 998		
232	Floor space of surgery wards	Floor space in sq meters		
233	Number of inpatient beds in surgery wards (according to National Medical Standards)	Number Don't know: 998		
234	How many patients are in the surgery ward today?	Number 🛛 🔪 🛶		
235	Other wards (specify) ward	Floor space in sq meters		
236	Number of inpatient beds in ward	Number Don't know: 998		
237	How many patients are in the ward today?	Number Don't know: 998		
238	Other wards (specify) ward	Floor space in sq meters		
239	Number of inpatient beds in ward	Number Don't know: 998		
240	How many patients are in the	Number		

3 4	No	Questions/ Items	Responses and codes	Building/ Structure #1		Building/ Structure #2			#2			
5	241	Condition of the mattresses on the	Good1									
6 7		beds?	Not so good/not so bad2 Bad3									
8	242	Are there patients on floors in any of	Yes1								1	
9		the wards or any other areas?	No2									
10 11	243	Are the inpatient areas clean?	Yes1 No]	
12 13	244	Area of laboratory and diagnostic services including waiting areas	Floor space in sq meters	1			1			1	<u> </u>	
14	245	Are the lab/diagnostic services areas	Yes1					ŀ				
15		clean?	No2									
16	246	Area used for drug, supply and medical	Floor space in sq meters									
17		instrument storage										
18 19	247	Floor space in sq meters used for drug dispensing (if separate from storage)	Floor space in sq meters									
20	248	Floor space in sq meters of delivery	Floor space in sq meters									
21	249	How many delivery rooms are there in	Number						l			
22		this building?	Don't know: 998		Ι		I			I	I	
23	250	Are the delivery rooms equipped with	Yes1			_ <u> </u> _						
25		delivery beds, lights, etc.?	No									
26	251	Did the facility deliver babies in last	Yes1			٦						
27		seven days?	No2									
28	252	Are the delivery rooms clean?	Yes1									
29			No2									
30	253	Floor space in sq meters of operation theaters	Floor space in sq meters									
32	254	How many operation theaters are there in the building?	Number Don't know: 998	1	1	1						
33	255	Are the operation theaters functional	Yes1			<u>ו_</u>						
34		and used regularly?	No									
35 36	256	Floor space in sq meters used by administrative personnel	Floor space in sq meters		1	I	1			1		
37 38	257	Floor space in sq meters used by laundry services	Floor space in sq meters						 	 		
39	258	Floor space in sq meters used by food	Floor space in sq meters					ŀ				
40		services and kitchen									1	
41	259	Floor space in sq meters of cafeteria for	Floor space in sq meters									
42		employees and clients		E								
43 44	260	Meeting and other common areas for	Floor space in sq meters			-						
44 45		the use of facility personnel										
45 46	261	Floor space used by research projects/	Floor space in sq meters					. .		,		
47	262	INGUS and other external entities	(EXOLUDE DIRECT PATIENT CARE AREAS)					ĽЩ.			<u> </u>	
48	202	Floor space in sq meters used by	FIOUR SPACE IN SQ METERS	1	ı	I	I			I	ı	I
49	262	Floor space in so meters used by	Floor space in so meters									<u> </u>
50	205	mortuary			Ι	Ι	I		I	I	I	I
51	264	How many private rooms are there for	Number of rooms						l	-		<u></u> L
52	-• ·	inpatient stays?	Don't know: 98									
53	265	How many beds are there in the private	Number									
54		rooms?	Don't know: 998									
55	266	Floor space in sq meters used by										
56		private rooms	Floor space in sq meters		_							
57												

3	
4	
5	
6	
7	
/	
8	
9	
10	
11	
12	
13	
14	
15	
15	
16	
17	
18	
19	
20	
21	
22	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
21	
32	
33	
34	
35	
36	
37	
38	
30	
10	
40	
41	
42	
43	
44	
45	
46	
47	
48	
<u>4</u> 0	
50	
50	
51	
52	
53	
54	
55	
56	
57	
50	
20	
59	
60	

Section 2: Information on each of the buildings (USE ADDITIONAL FORMS IF NEEDED)

No	Questions/ Items	Responses and codes	Building/ Structure #I	Building/ Structure #I
201	Name of the structure/ building			
202	Principal activities normally performed in the building/ structure	Inpatient services		
203	Total floor space of the building	Floor space in sq meters		
204	Number of rooms in the structure (not including toilets, closets, hallways)	Number Don't know: 998		
205	Do windows and doors of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
206	Do interior walls and roof of the building need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
207	Does electric supply system of the facility need repairs?	No repairs needed1 Few repairs needed2 Many repairs needed3		
208	Does water supply system of the facility need repair works?	No repairs needed1 Few repairs needed2 Many repairs needed3		
209	Does toilet (latrine) for clients' use of the facility need repair works?	No repairs needed		
210	Number of toilets	Number Don't know: 98		
211	Are most of the toilets functional?	Yes1 No2		
212	Are the toilets clean?	Yes, all the toilets are clean1 Yes, most of the toilets are clean2 No, most are not clean3 No, all are unclean4		
213	How many rooms or areas in the building have water connection?	Number Don't know: 98		
214	Are the water outlets are functional in toilet?	Yes1 No2		
215	Floor space of waiting rooms/space for clients	Floor space in sq meters		
216	How many seating spaces are there in waiting rooms/spaces?	Number Don't know: 98		
217	Are the waiting areas/rooms clean?	Yes1 No2		
218	Floor space of outpatient consultation (not including consultant's offices)	Floor space in sq meters		

No	Questions/ Items	Responses and codes	Building/ Structure #	Building/ Structure #
219	Is there at least one site in the outpatient clinic area where both auditory and visual privacy can be maintained for client services?	Yes1 No2		
220	Is the building is accessible to persons with disabilities (e.g., wheel chair ramps, elevators if more than one floor, hand rails etc.)	Yes1 No2		
221	Floor space in the emergency department including waiting space	Floor space in sq meters		
222	Floor space for blood bank, blood donation space, etc.	Floor space in sq meters		
223	Number of observation beds in the building/ Structure (not including inpatient beds)	Number Don't know: 998		
224	Number of inpatient wards in the	Number Don't know: 998		
225	Floor space of general adult wards	Floor space in sq meters		
226	Number of inpatient beds in general adult wards (according to National Medical Standards)	Number Don't know: 998		
227	How many patients are in the general ward today?	Number 🔨 Don't know: 998 🦴		
228	Floor space of pediatric wards	Floor space in sq meters		
229	Number of inpatient beds in pediatric wards	Number Don't know: 998		
230	Number of beds in pediatric wards (according to National Medical Standards)	Number Don't know: 998		
231	How many patients are in the pediatric ward today?	Number Don't know: 998		
232	Floor space of surgery wards	Floor space in sq meters		
233	Number of inpatient beds in surgery wards (according to National Medical Standards)	Number Don't know: 998		
234	How many patients are in the surgery ward today?	Number 🛁 🛁 Number 🛁 🛁 Number 🛀 🛀 Number Num		
235	Other wards (specify) ward	Floor space in sq meters		
236	Number of inpatient beds inward	Number Don't know: 998		
237	How many patients are in theward today?	Number Don't know: 998		
238	Other wards (specify)	Floor space in sq meters		
239	Number of inpatient beds inward	Number Don't know: 998		
240	How many patients are in the ward today?	Number Don't know: 998		

BMJ Open

241 242 243 244 245 245 246 247	Condition of the mattresses on the beds? Are there patients on floors in any of the wards or any other areas? Are the inpatient areas clean? Area of laboratory and diagnostic services including waiting areas Are the lab/diagnostic services areas clean? Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	Good. 1 Not so good/not so bad. 2 Bad. 3 Yes. 1 No 2 Yes. 1 No 2 Floor space in sq meters 2 Floor space in sq meters 1 No 2 Floor space in sq meters 2 Floor space in sq meters 1 No 2 Floor space in sq meters 2	
242 243 244 245 246 247	Are there patients on floors in any of the wards or any other areas? Are the inpatient areas clean? Area of laboratory and diagnostic services including waiting areas Are the lab/diagnostic services areas clean? Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	Yes. 1 No 2 Yes. 1 No 2 Floor space in sq meters 2 Yes. 1 No 2 Floor space in sq meters 2 Floor space in sq meters 1 No 2 Floor space in sq meters 1	
243 244 245 246 247	Are the inpatient areas clean? Area of laboratory and diagnostic services including waiting areas Are the lab/diagnostic services areas clean? Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	No	
244 245 246 247	Area of laboratory and diagnostic services including waiting areas Are the lab/diagnostic services areas clean? Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	No	
244 245 246 247	Area of laboratory and diagnostic services including waiting areas Are the lab/diagnostic services areas clean? Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	Floor space in sq meters Yes1 No2 Floor space in sq meters	
245 246 247	Are the lab/diagnostic services areas clean? Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	Yes1 No2 Floor space in sq meters	
246 247	Area used for drug, supply and medical instrument storage Floor space in sq meters used for drug dispensing (if separate from storage)	Floor space in sq meters	
247	Floor space in sq meters used for drug dispensing (if separate from storage)		
		Floor space in sq meters	
248	Floor space in sq meters of delivery rooms	Floor space in sq meters	
249	How many delivery rooms are there in this building?	Number Don't know: 998	
250	Are the delivery rooms equipped with delivery beds lights etc?	Yes1 No 2	
251	Did the facility deliver babies in last	Yes	
252	Are the delivery rooms clean?	Yes	
253	Floor space in sq meters of operation theaters	Floor space in sq meters	
254	How many operation theaters are there in the building?	Number Don't know: 998	
255	Are the operation theaters functional and used regularly?	Yes1	
256	Floor space in sq meters used by administrative personnel	Floor space in sq meters	
257	Floor space in sq meters used by laundry services	Floor space in sq meters	
258	Floor space in sq meters used by food services and kitchen	Floor space in sq meters	
259	Floor space in sq meters of cafeteria for employees and clients	Floor space in sq meters	
260	Meeting and other common areas for the use of facility personnel	Floor space in sq meters	
261	Floor space used by research projects/	Floor space in sq meters	
262	Floor space in sq meters used by security personnel	Floor space in sq meters	
263	Floor space in sq meters used by	Floor space in sq meters	
264	How many private rooms are there for	Number of rooms	
265	How many beds are there in the	Number	
266	Floor space in sq meters used by		

NO	Questions and Filters	Loging categories	Response	SKIP
301	How far is the closest referral facility from this facility?	Kilometers Don't know		
302	What type of facility is that (the referral facility)?	NH		
303	On the average, how many patients are referred to other facilities in a month from this facility?	Number of patients referred Don't know998		
304	How long does it take to transfer sick patients to the referral hospital if transported by ambulance (hours and days)	Hours and/or days	hours days	
305	What is the average cost per trip for the patients, please specify	A. Travel person:PNG kina B. Accommodation per person:PNG kina C. Per diem per personPNG kina		
306	Do you budget specifically for patient transfers?	Yes1 No2		
307	Were the referred patients treated at the referral facility?	Yes		
308	Did the referral facilities refer some of the referred patients to another facility?	Yes1 No2 Don't know8		
309	What is the mode of communication between this facility and the usual referral center?	No formal communication system		
310	What is the most common form of transport when referring patients?	Using the facility's ambulance/vehicle1 Using commercially available cars2 Using vans		
311	Does a health worker travel with a sick patient to the referral hospital?	Yes		
312	Does the referral hospital have to verbally confirm they will accept the patient before they can be transferred?	Yes		

Section 3: Communications between this health facility and a referral facility

No	Questions and Filters	Coding categories	Response	Skip
401	Who should be responsible for ensuring	Province1		
	infrastructure maintenance is carried out	? District		
		Church agency		
		This facility		
		Referral health facility		
402	Is it desirable for other maintenance (i.e.	Yes1		lf 2
	anything other than really simple tasks)	No2		→404
	being managed at a higher level?			
403	If yes, by who?	Province1		
		District2		
		Church agency3		
		This facility4		
		Referral health facility		
404	Who should be responsible for ensuring	Province1		
	basic utilities are maintained at the health	District2		
	facility?	Church agency		
405		Referral health facility		
405	Comments on repair needs or types of re	pair problems of the facility:		
	Medical weeks two through Marily and the			
	wedical waste treatment verify use if in			
406	Is there any incinerator (high	Available and used 1		
	temperature) available in the facility?	Available but not used 2		
		Not available3		
407	Is there any incinerator (1 chamber	Available and used 1		
	drum/brick) available in the facility?	Available but not used2		
		Not available3		
408	Is there any burial pit for waste	Available and used 1		
	available in the facility?	Available but not used 2		
		Not available3		
409	Is there any system of segregating	Available and used 1		
	medical wastes into three colored	Available but not used 2		
	waste baskets available in the facility?	Not available		
410	Disposal practice of sharps (needles,	Incinerator		
	glass, surgical instruments, etc.)	Burn and bury2		
		Bury but do not burn		
		Burn but do not bury4		
		Put in a covered pit (could be latrine)		
		Put in an open pit		
		Store, collect and move offsite		
		Just throw out in the open		
		Ulilei		
/11	Disposal practice of biomedical wastes	Incinerator 1		+
	(nlacenta, human body parts	Burn and hurv 2		
	laboratory waste etc.)	Bury but do not burn 3		
		Burn but do not bury		
		Put in a covered nit (could be latrine) 5		
		Put in an open pit		
		Store collect and move offsite 7		
		Just throw out in the open 8		
		Other a		
			1	1

Section 5: Food Services and Kitchen Area

NO	Questions and Filters	Coding categories	Response	Sk
501	Do you provide food service to inpatients?	Yes1 No2		lf 2 ➔
502	Do you charge inpatients any money for food?	Yes1 No2		
503	How much do you charge for food per person per day?	PGKina. (000 if patients are not charged)		
504	What is the cost of food per person per day?	PGKina		
505	Number of patients who were served with food yesterday?	Number of patients#		
506	Is there a protocol for feeding hospitalized infants (<1 year)?	Yes1 No2		
507	How many meals are typically provided for infants in 24 hours?	Two to three times. 1 Four to five times. 2 Six times or more. 3		
508	Is the budget allocated for food service enough for buying groceries and other needs for all patients in the facility?	Yes1 No2		
509	Does the facility contract out food services?	Yes, only grocery procurement contracted out1 Yes, cooking +other food services contracted out2 No3		
510	Is the food prepared on-site or prepared outside the facility?	Prepared in the facility1 Not prepared in the facility2		-
511	Is there a chimney or working exhaust fan in cooking area?	Yes		
512	Is soap/detergent present in cooking area for washing hands?	Yes1 No2		
513	Is soap/detergent present for washing pots, pans, plates, utensils	Yes1 No2		
514	Is the kitchen floor clean (no garbage on floor)?	Yes1 No2		
515	Is the wiping cloth used in the kitchen is clean, not smelly?	Yes		
516	Are there signs of cockroach/mice infestation in the kitchen area?	Yes		
517	Do cooking personnel tie hair back and/or wear caps?	Yes		
518	Do cooks wear gloves while handling food?	Yes		
519	Are prepared foods covered?	Yes		

	Questions and Filters	Coding categories	Response	Skip
601	Are Antenatal services provided at this facility?	Yes1 No2		lf 2 → 604
602	How many days in a week the facility provide ANC?	#Days in a week		
603	Number of antenatal outreach clinics held in the last 3 months?	Number of outreach clinics held Don't know998		
Antenation	atal clinic equipment and supplies: check	to see whether the following items are present and fu	inctional in or near	
604	Fetal stethoscope (or foetal monitor)	A Number		
		B. Number Working C. Number regularly used		
605	Stethoscope and blood pressure cuff	A. Number B. Number Working		
		C. Number regularly used		
606	Tape measure	A. Number B. Number Working		
607	Scale	A. Number B. Number Working		
		C. Number regularly used		
608	Ultrasound Machine (and gel)	A. Number B. Number Working		
MATE		C. Number regularly used		
MATE Ask the	RNAL AND NEONATAL CARE: Deliveries	C. Number regularly used		
MATE Ask the	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with	C. Number regularly used	 	lf 2 → 611
MATE Ask the 609	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community?	C. Number regularly used S. No		lf 2 → 611
MATE Ask the 609 610	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with	C. Number regularly used s. nis section. Yes No		lf 2 → 611
MATE Ask the 609 610	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and	C. Number regularly used s. nis section. Yes No		lf 2 → 611
MATE Ask the 609 610	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community?	C. Number regularly used i. is section. Yes Only in facility Only in community Both in facility and community		lf 2 → 611
MATE Ask the 609 610 611	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, ovytocics, and	C. Number regularly used i. is section. Yes		If 2 → 611
MATE Ask the 609 610 611	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies?	C. Number regularly used is section. Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3		lf 2 → 611
MATE Ask the 609 610 611	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies?	C. Number regularly used is section. Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4		lf 2 → 611
MATE Ask the 609 610 611 612	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the	C. Number regularly used is section. Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4		lf 2 → 611
MATE Ask the 609 610 611 612	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 2		If 2 -≯ 611
MATE Ask the 609 610 611 612	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3		If 2 → 611
MATE Ask the 609 610 611 612 613	RNAL AND NEONATAL CARE: Deliveries e in charge to assist you with questions in the Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to	C. Number regularly used is section. Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1		If 2 → 611
MATE Ask the 609 610 611 612 613	 RNAL AND NEONATAL CARE: Deliveries <i>e</i> in charge to assist you with questions in th Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2		If 2 → 611
MATE Ask the 609 610 611 612 613	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the capacity to remove retained products following miscarriage or abortion? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3		lf 2 → 611
MATEI Ask the 609 610 611 612 613 614	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to remove the facility have the capacity to remove the facility have the capacity to remove retained products following miscarriage or abortion? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3		If 2- ≫ 611
MATE Ask the 609 610 611 612 613 614	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 2 Does not have the capacity 3 Yes, can do now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 2		If 2 → 611
MATE Ask the 609 610 611 612 613 614 614	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? 	C. Number regularly used <i>nis section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3		If 2 → 611
MATE Ask the 609 610 611 612 613 614 615	 RNAL AND NEONATAL CARE: Deliveries <i>e</i> in charge to assist you with questions in th Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 <		If 2 → 611
MATE Ask the 609 610 611 612 613 614 615	 RNAL AND NEONATAL CARE: Deliveries <i>e</i> in charge to assist you with questions in the deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do two of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 <		lf 2- > 611
MATE Ask the 609 610 611 612 613 614 615 616	 RNAL AND NEONATAL CARE: Deliveries <i>e in charge to assist you with questions in th</i> Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to administer antibiotic? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does the facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 <		If 2- ≫ 611
MATE Ask the 609 610 611 612 613 614 615 616	 RNAL AND NEONATAL CARE: Deliveries <i>e</i> in charge to assist you with questions in th Does the facility staff assist with deliveries, either in the facility or in the community? Does the facility staff assist with deliveries only in the facility, only in the community, or in both facility and community? Does this facility have the capacity to administer antibiotics, oxytocics, and anticonvulsants for delivery of babies? Does this facility have the ability/capacity for manual removal of the placenta? Does this facility have the capacity to remove retained products following miscarriage or abortion? Does this facility have the capacity to do assisted vaginal delivery, preferably with vacuum extractor? Does the facility have the capacity to provide newborn care? 	C. Number regularly used <i>is section.</i> Yes 1 No 2 Only in facility 1 Only in community 2 Both in facility and community 3 Yes, can do all of the three 1 Can do two of the three 2 Can do one of the three 2 Can do one of the three 3 No 4 Yes, can do now 1 Usually, but nit now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 Does not have the capacity 3 Yes, can do now 1 Usually, but not now 2 <		If 2- ≫ 611

Section 6: Services and other supplies Section 6.1: Maternal and neonatal care: Antenatal care

617	Does the facility have the capacity to	Yes, can do now1		
	do safe blood transfusion?	Usually, but not now		
		Does not have the capacity		
618	Does the facility have the capacity to	Yes, can do now1		
	administer anesthesia?	Usually, but not now		
		Does not have the capacity 3		
619	Does the facility have the capacity to	Yes can do now 1		
010	care for sick and low-birth weight	Lisually, but not now 2		
	newborns including resuscitation?	Does not have the canacity 3		
620	Deep the facility have at least two			
020	Does the facility have at least two			
	skilled allendarits covering 24 hours a	NOZ		
	day and seven days a week, assisted			
	by trained support staff?			
MATE	RNAL AND NEONATAL CARE: Delivery	room equipment and supplies		
Check	to see whether the following items are pre-	sent and functional in or near the delivery room.	1	
621	Delivery kit (instruments, supplies)	Present and complete1		
		Present but not complete2		
		Not present3		
check t	o see whether the following items are pres	ent and functional in or near the area where antenatal	services are	
provide	d			
622	Stethoscope	A. Number		
		B. Number Working		
		C. Number regularly used		
623	Partograph	A Number		
		B Number Working		
		C. Number regularly used		
624	Pelvic procedure instrumente like			
UZ4		D. Number Working		
	speculum	D. Number regularly used		
005	Delivery light	Number regularly used		
025		A. Number		
		C. Number regularly used		
626	Sterilizer	A. Number		
		B. Number Working		
		C. Number regularly used		
627	Vacuum extractor	A. Number		
		B. Number Working		
		C. Number regularly used		
628	Forceps	A. Number		
-		B. Number Working		
		C. Number regularly used		
629	Manual vacuum aspirator/suction	A Number		
JLJ		B Number Working		
		C Number regularly used		
620	Dequesitation has reachers			
030	Resuscitation bag , newborn	A. Number D. Number Warking		
		B. Number vvorking		
		U. Number regularly used		
631	Eye drops or ointment for newborn	A. Number		
		B. Number Working		
		C. Number regularly used		
632	Needles and syringes (10-20 cc)	A. Number		-
		B. Number Working		
		C. Number regularly used		

633	Sterile C-section in	nstrument	kits	A. Number B. Number Working C. Number regularly used	
634	Cord supplies for ties, scissors	new born:	clamps,	A. Number B. Number Working C. Number regularly used	
635	IV sets, including and tube	sterilized r	needle	A. Number B. Number Working C. Number regularly used	
636	IV fluids, including ringer lactate	normal sa	aline and	A. Number B. Number Working C. Number regularly used	
MATER	RNAL AND NEONAT	AL CARE	: Postpartu	um Care	
637	Are postpartum care services offered routinely?	Yes, in t Yes, in t NO, not NO, not	the facility a the facility a as part of r offered at t	s part of routine services only1 s part of routine services and in special clinics2 outine services but only in special clinics	lf 4 →645
Are the	e following services	provided	?		
638	Maternal examina treatment	tion &	Yes No	1 2	
639	Breast feeding cou	unseling	Yes No		
640	Newborn examina treatment	ition &	Yes No	1	
641	Growth Monitoring promotion	j &	Yes No	1	
642	Vaccination couns	seling	Yes No		
643	Family planning counseling		Yes No		
	Treatment of any	vro	Yes		

Section 6.2: Protocols, Guidelines and Templates

No	Questions and Filters	Coding categories	Response	Skip
645	IMCI chart book or wall chart	Present1 Not Present		
646	ARI (NOT PART OF IMCI)	Present		
647	Diagnosis and treatment of diarrhea (NOT PART OF IMCI)	Present		
648	Graphs for growth monitoring	Present		
649	Treatment of severe malnutrition	Present		
650	Tuberculosis diagnosis and treatment	Present		
651	NHIS guidelines	Present		

652	Malaria Protocol	Present	
653	Immunization schedule	Present	
654	Family planning	Present	
655	Are patient education materials displayed?	Present	

Section 6.3: Laboratory tests

No	Ouestions and Eilters	Coding categories	Response	Skin
NU 656	Questions and Fillers	Able to do this test today	Response	экір
000		Able to do this test in past 6 months but not today		
		Able to do this test in past o months but not today2		
657	Dese this facility perform			16.0
007	Does this facility perform			
	aboratory tests other than	NO		70/0
650		Able to do this test to day.		
000	Anemia testing	Able to do this test in past 6 months but not today.		
		Able to do this test in past o months but not today2		
650	Liripo for D/M/E	Able to do this test today		
009		Able to do this test in past 6 months but not today.		
		Able to do this test in past o months but not today2		
660	Diand Chusses	Able to do this test today		
000	Blood Glucose	Able to do this test in past 6 months but not today.		
		Able to do this test in past o months but not today2		
664		Cannot do this test today.		
001	Stool for RE	Able to do this test today		
		Able to do this test in past 6 months but not today2		
<u></u>		Cannot do this test		-
662	HIV lesting	Able to do this test today		
		Able to do this test in past 6 months but not today2		
	TD One one	Cannot do this test		-
663	IB Smears	Able to do this test today		
		Able to do this test in past 6 months but not today2		
<u></u>	Orana Otaina	Cannot do this test		-
664	Gram Stains	Able to do this test today		
		Able to do this test in past 6 months but not today2		
005	Disad Turkan and anona	Cannot do this test		
663	Blood Typing and cross	Able to do this test today		
	matching	Able to do this test in past 6 months but not today2		
	Ourshilling to office as	Cannot do this test		
000	Syphilis testing	Able to do this test today		
		Able to do this test in past 6 months but not today2		
007	Liver for sting to sting	Cannot do this test		
667	Liver function testing	Able to do this test today		
		Able to do this test in past 6 months but not today2		
		Cannot do this test		
668	Pregnancy testing	Able to do this test today		
		Able to do this test in past 6 months but not today2		
	11			
669	Hepatitis	Able to do this test today		
		Able to do this test in past 6 months but not today2		
		Cannot do this test	1	

No	Questions and Filters	Coding categories	Response	Skip
670	Is there a separate room/space for	Yes1		lf 2
	drug storage?	No2		→749
671	Are doors and windows secured in	Yes1		
	the drug storage area?	No2		
672	Drug storage area has ventilation?	Yes1		
		No2		
673	Are there enough shelves for storing	Yes1		
	drugs/other supplies (nothing on the floor)?	No2		
674	Are the stored items protected from	Yes1		
	sun?	No2		
675	Are the stored items protected from	Yes 1		
010	rain?	No 2		
676				
0/0	Is/are there functioning reingerator/s			
	Ior storing drugs?	NOZ		
677	How many boxes of drugs did you	Number of Boxes		
	receive in the last six months (Push			
	system)?			_
678	When do you think you might get	Less than 2 weeks1		
	next batch of boxes (Push system)?	2 weeks to 1 month2		
		1 to 2 months		
		More than 2 months4		
6/9	Currently, do you or your staff order	Yes1		
	medicines for the health facility?	No2		
680	If yes, from where do you order	Referral health facility / Hospital		
	most of the drugs used in the	Provincial / district health office2		
	facility?	Area Medical store		
		Provincial Medical Store		
		NDoH5		
681	When did you order drugs last time?	Less than a month ago1		
		1 month to less than 2 months2		
		2 months to less than 3 months3		
		3 months to less than 4 months4		
		4 months to less than 6 months5		
		6 months to less than 9 months6		
		9 months to less than 1 year7		
		More than 1 year ago		
682	Where did you order for the drug	Referral health facility / Hospital1		
	last time?	Provincial / district health office2		
		Area Medical store		
<u></u>	The next includes the second s	NDOH		-
683	I ne previous order you received	Less than 2 weeks		
	(not the last order), now long it took	2 weeks to 1 months		
	for the drugs to arrive after the	A More than 2 months		
<u> </u>	placement of order?	More than 2 months4		14.0
004	bo you always get the drugs you	1 TES		
		INU		
685	On average, what percentage of	Percent of drugs ordered received		
	I drugs ordered are reasived?	1		1

Section 6.4: Pharmacy room, drug storage area and supply system

686 Who normally makes the collection from the facility? Community health worker					
687 How is the drug delivered to the facility? Facility gets the drug from medical store/NDoH1 Medical store/NDoH1 Medical store/NDoH delivers to the facility	686	Who normally makes the collection from the facility?	Community health worker1 1 Volunteer2 2 Nurse3 3 Brought to the facility by suppliers4		
688 How do you pay the expenses for collecting drugs ordered? Province	687	How is the drug delivered to the facility?	Facility gets the drug from medical store/NDoH1 Medical store/NDoH delivers to the facility2 Others deliver to the facility3		
689 How much does it cost (all expenses) on one average pick up? PNG Kina 690 Where did you go last time to collect medical supplies? Please specify 691 What month and year did you receive your last round of medical supply kits? Please specify 692 Were the medical supply kits Month	688	How do you pay the expenses for collecting drugs ordered?	Province		
690 Where did you go last time to collect medical supplies? Please specify 691 What month and year did you receive your last round of medical supply kits? Month 692 Were the medical supply kits delivered directly or did the facility pick up the kits? Month 693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A 694 List three drugs that you think are not enough based on needs in the facility? A 695 Have you purchased additional medicines or medical supplies this year? Yes 695 Have you purchased additional medicines or medical supplies this year? Yes 696 If yes, how did you pay for this purchase? Request province 1 No 697 How much did you spend on additional drugs in 2014? PNG Kina 1 No 1 No 698 Are you pulanning on purchasing additional drugs in 2015? Yes 1 No 1 No 1 No	689	How much does it cost (all expenses) on one average pick up?	PNG Kina Don't Know: 99999		
Medical Supply Kits (Push System) Month 691 What month and year did you receive your last round of medical supply kits? Month supply kits? Vear 692 Were the medical supply kits Delivered delivered directly or did the facility pick up the kits? Delivered 693 List three drugs that you think are more than enough based on needs here in the facility A	690	Where did you go last time to collect medical supplies?	Please specify		
691 What month and year did you receive your last round of medical supply kits? Month	Medica	al Supply Kits (Push System)	·		
supply kits? Year I	691	What month and year did you receive your last round of medical	Month		
692 Were the medical supply kits delivered directly or did the facility pick up the kits? Delivered 1 693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A		supply kits?	Year		
693 List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST A	692	Were the medical supply kits delivered directly or did the facility pick up the kits?	Delivered1 Picked up2		
694 List three drugs that you think are not enough based on needs in the facility? A	693	List three drugs that you think are more than enough based on needs here in the facility WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST	A B C		
Purchased Drugs 695 Have you purchased additional medicines or medical supplies this year? Yes 1 696 If yes, how did you pay for this purchase? Request province 2 697 How much did you spend on additional drugs in 2014? PNG Kina 698 Are you planning on purchasing additional drugs in 2015? Yes 1	694	List three drugs that you think are not enough based on needs in the facility? WRITE NAME AND CODE OF THE DRUGS FROM THE SUPPLY KITS DRUG LIST	A B C		
695 Have you purchased additional medicines or medical supplies this year? Yes 1 696 If yes, how did you pay for this purchase? Request province 1 697 How much did you spend on additional drugs in 2014? PNG Kina	Purcha	ased Drugs		,	
696 If yes, how did you pay for this purchase? Request province1 Own budget	695	Have you purchased additional medicines or medical supplies this year?	Yes1 No2		
697 How much did you spend on additional drugs in 2014? PNG Kina	696	If yes, how did you pay for this purchase?	Request province1 Own budget		
698 Are you planning on purchasing additional drugs in 2015? Yes	697	How much did you spend on additional drugs in 2014?	PNG Kina		
	698	Are you planning on purchasing additional drugs in 2015?	Yes1 No2		

3
4
5
6
7
8
0
9
10
11
12
13
14
15
16
17
10
10
19
20
21
22
23
24
25
26
20
27
28
29
30
31
32
33
34
25
22
36
37
38
39
40
41
42
<u>4</u> 2
75 77
44 45
45
46
47
48
49
50
51
51
52
53
54
55
56
57
58
50
55

1 2

Section 7.1: Availability of Essential Drugs or supplies

SL#	Drug	Question	Response	Question	Response
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	В
701	Panadol/ Paracetamol tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
702	Paracetamol liquid	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
703	Diclofenac (pain/inflammation) capsule or tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
704	Pethidine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
705	Chloroquine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
706	Quinine Injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
707	Primaquine	Yes1 No2	DZ_	Yes1 No2 No expiratory date3 Drug is not present4	
708	Amodiaquine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
709	Artemisinin combination	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
710	Fansidar	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
711	Sulfadoxine tab.	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
712	Pyrimethamine tab.	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

SL #	Drug	Question	Response	Question	Response
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	В
713	Rifampicin	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
714	Isoniazid	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
715	Ethambutol	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
716	Pyrazinamide	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
717	Streptomycin	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
718	TB blister packs	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
719	Oxytocin	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
720	Ergometrine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
721	Lignocaine	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
722	Depo-provera	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
723	Ferrous sulphate	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
724	Liniment	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

SL #	Drug	Question	Response	Question	Response
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	В
725	Flagyl/ Metronidazole	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
726	Amoxicillin capsule or tablets	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
727	Co-trimoxazole oral susp or tablet	Yes1 No2		Yes2 No2 No expiratory date3 Drug is not present4	
728	Diazepam capsule or tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
729	Amitriptyline 25 mg, capsule or tablet (depression medicine)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
730	Paraldehyde	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
731	Albendazole tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
732	Tinidazole tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
733	Ciprofloxacin capsule or tablet (usually 500 mg)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
734	Crystalline penicillin injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
735	Ceftriaxone 1g/vial injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
736	Chloramphenicol injection	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

SL #	Drug	Question	Response	Question	Resp
		Drugs continuously available last 30 days without any stock-outs?	A	Are expired drug present?	B
737	Mala wan (1)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present 4	
738	Captopril, 25 mg, capsule or tab	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
739	Atenolol 50 mg, capsule or tablet (Cardiovascular disease drug)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
740	Simvastatin 20 mg, capsule or tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
741	Glibenclamide 5mg, capsule or tablet (for diabetes)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
742	Salbutamol tab 4 mg	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
743	CMP(Chlorpheniramine maleate) tablet	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present 4	
744	Omeprazole (capsule or tablet)	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	
745	ART for HIV/AIDS	Yes1 No2		Yes1 No2 No expiratory date3 Drug is not present4	

SL#		Available for use today (Yes=1 No=2)	Continuously available in the last 30 days without any stock-outs? (Yes=1 No=2)
Family	Planning items	(1 2 5-1, 110-2)	
7/0	Family planning: Oral pills		
749	Family planning. Oral plits		
750			
Vacain			
750			
752			
753			
754			
755			
756		5	
/5/	Measles		
758	letanus loxoid		
759	Iron tablet or folic acid		
Availab	pility of Kits for Malaria, TB and HIV/AIDS I	S	
760	HIV/AIDS Test Kit		
761	RDT Test kit for Malaria		
762	TB Category 1 kit		
762	TB Category 2 kit		
Other in	tems		
763	ORS for diarrhea		
764	HS Darrows		
765	Oxygen		0.
766	Baby/scale book		
767	Mother's health book		
768	Quarterly TB report book		
769	Monthly report forms		
770	Health center record books		
771	Daily summary book		

Table 7.2: Availability and Stock-out information of other supplies

No	Questions and Filters	Coding categories	Response	Ski
772	Does this facility provide EPI services?	Yes		lf →8
773	Does this facility provide opportunistic immunizations (i.e., immunization provided when an unimmunized child shows up)?	Yes1 No2		
774	Are child immunizations regularly given to children at this facility or in outreach EPI activities?	Yes, at facility only1 Yes, at outreach only2 Yes, both facilities & outreach3		lf 1 ➔
775	How many EPI outreach activities were conducted in the past 3 months?	Number EPI outreach activities		
776	How many children were vaccinated during past three months and what proportion of total children was vaccinated through outreach activities?	A. Total immunized B. % immunize through outreach		
777	How is the main vaccine refrigerator powered?	None 1 Fuel 2 Electric 3 Solar 4 Gas 5 Other 6		lf 1 →
778	Is the main vaccine refrigerator working?	Yes		
779	Is the main vaccine thermometer present and working?	Yes		
780	Is a temperature log kept	At least twice a day for past 30 days		lf 1 ➔
781	# of days in the past month in which refrigerator temp over 8°C or under 0°C	Number of days Don't know98		
782	Are most of the cold boxes/vaccine carriers functional /working?	Almost all working1 Most not working2 Do not have		
783	Are ice packs present and in good condition?	Present, good condition1 Present, not good condition2 Not present3		
784	Are adequate immunization cards present for at least 30 days? (Based on estimation by in-charge)	Yes		

Section 8.1 Health Outreach Patrols

SL No	Questions and Filters	Coding categories	Response	Skip
801	Does this facility conduct outreach patrols in the community?	Yes1 No2		lf 2 →822
802	How many health outreach patrols to villages were planned in 2014?	Number of days Don't know		
803	How many health outreach patrols to villages were conducted in 2014?	Number of days Don't know998		
804	How many for each of the following types conducted in 2014?	A. Maternal and child health (MCH) B. Immunization C. Joint outreach clinics		
805	If the number conducted is less than the number planned, what are the reasons?	Lack of funds		
806	How many villages/patrol sites are reached on a typical patrol?	Number Don't know		
807	What is the typical average time taken to conduct one patrol? i.e., how long are health workers normally away from the facility at a time.	Half day		
808	Do health workers receive an allowance to go out on patrol?	Yes		
809	If yes, how much per typical patrol?	PNG Kina Don't know998		
810	Are porters / volunteers / casual health staff used to help this facility carry out patrols?	Yes1 No2		
811	Is the health information gathered from conducting a patrol incorporated into monthly reporting for this health facility?	Yes2		
812	What proportion of total catchment population is served either through the facility or the outreach patrols in a quarter?	Almost all served 1 Majority served 2 More than quarter served 3 Less than quarter served 4 None served 5		
813	What proportion of total catchment population do you think live in "remote areas" (at least a day's walk from an operational road)?	% of population		
814	What proportion of the "remote areas" population covered?	% of population		
815	Do you receive support and involvement from 'higher levels' (i.e. hospitals, district health office) such as doctors, specialists accompanying you on patrols?	Yes2		

	Questions and Filters	Coding categories	Response	Skip
040			•	
816	If yes, please specify the	A. Doctor		
		B. Specialist		
	ACCOMPANIED AND 2 IF NOT	D Other health personnel		
	ACCOMPANIED	E. Security personnel		
		F. Other		
		Specify		
817	In your opinion, has the system of	Better1		
	conducting regular outreach	Stagnated2		
	patrols to rural and remote	Worse		
	gotten better worse or stagnated?			
818	The reasons for this change over	A. Availability of funds	1	
	the last five years	B. Availability of transportation		
	RECORD 1 IF THE REASON IS	C. Availability of staff		
	MENTIONED AND 2 IF NOT	D. Weather		
	MENTIONED	E. Unrest		
		F. Other		
040		Spechy		
819	If a health patrol finds very sick	Ask community for help1		
	action is normally taken?	Report back to health facility 3		
		Other, specify		
820	Do you have the means to	Yes		lf 2
	respond immediately to the health emergency?	No 2		→822
821	How do you respond to health	A. Call ambulance or vehicle to transport patient		
		B. Call specialist from the local hospital		
	MENTIONED AND 2 IF NOT	D. Other		
	MENTIONED	D. Other		

SL No	Questions and Filters	Coding categories	Response	Skip
822	How many health care providers arrived at the facility on time	Number of days Don't know		
823	How many HEOs, nurses, midwives, and CHWs arrived on	Number of days Don't know		
824	How many doctors are present now? RECORD "98" FOR THE	A. Time now: Hour and Minute		
825	Are there enough official registers, stationery and other supplies?	Yes		
826	Are there enough forms for the admission and discharge?	Yes		
827	How many meetings of the facility staff were held in past three months?	Number Don't know		
828	Is there a Hospital/facility community advisory committee/Village Health Committees in this area?	Yes1 No2		lf 2 ➔831
829	How many meetings of the Hospital/facility community advisory committee were held in past three months?	Number held in past year Don't know		
830	Does the facility have written records of activities carried out by the Hospital/facility community advisory committee?	Yes		
831	Is there an asset registry (equipment and furniture inventory)? Ask to see the inventory; if health staff report having list but do not show it to you, circle 4.	Yes1 Present, not complete2 Not present3 Staff report having inventory but do not show it to surveyor4		
832	When was the last time inventory updated?	Within last one month1 1 With last three months2 2 Within last six months3 3 More than six months ago4		
833	Did the health facility have to close for any reason this year?	Yes1 No2		lf 2 →835
834	If yes, how long and the reason for disruption in operations.	A. Days remaining closed last year: B. Reason (please specify):		

Section	8.2: /	Adminis	tration a	and ı	management
					~ ~



SL SL	Questions and Filters	Coding categories	Response	5
No				_
835	Is there at least one officially assigned external supervisor for this health facility?	Yes1		
836	What are the designations of the supervisors	A. Doctor		+
	who visited the health facility in the last one	B. PHO		
	year and how many times did they visit?	C. DHA		_
	FACH KIND OF SUPERVISOR IN	D. PDCO		_
	RESPONSE COLUMN AND RECORD 00 IF	E. Maternal and Child Health		-
	NO SUPERVISION DONE BY THAT TYPE	G. Other		-
	OF PERSONNEL	Specify		
837	What were the purpose/ reasons for latest	A. Overall activities in the facility		_
	SUPERVISOR'S VISIT?	B. Drug Storage and Distribution		-
	AND 2 IF NOT MENTIONED	D Maternal/Child health Services		-
		E. Immunization program		-
		F. Other		
000	Deep a destance of this health facility 2	Specify		_
838	Does a doctor work at this health facility?	Yes1 No 2		
839	If no, how many times has a doctor visited this	Number		+
000	health facility in 2014?	Don't know		
840	Does a Health Extension Officer work at this	Yes1		+
	health facility?	No2		-
841	If no, how many times did a Health Extension	Number		+
• • •	Officer (HEO) visit this health facility in 2014?	Don't know		
842	Does this health facility supervise aid posts /	Yes1		T
	sub-health centers?	No2		•
843	If yes, how many?	Number		
044		Don't know		_
844	How many supervisory visits were made to these clinics in 20142	Number Don't know 998		
845	How are the costs for supervisory visits paid	Bequest province		+
040	for at the health facility?	Request district		
		Own budget3		
0.4.0	And some other tables a seried suction and investigation	Referral health facility4		_
040	with conducting supervisory visits?	A. Consultation to patients		-
	RECORD 1 IF THE TASK MENTIONED AND	C. Care in Well baby Clinic		-
	2 IF NOT MENTIONED	D. Immunization services]
		E. Other		
		оресну		
847	Were recommendations written in a	Book present, recommendations written1		╋
	supervision book from last supervision?	Book present, No recommendations2		
		No book3		

2
2
ر ۸
4
5
6
7
8
9
10
10
11
12
13
14
15
16
17
10
10
19
20
21
22
23
24
25
25
20
27
28
29
30
31
32
22
22
34
35
36
37
38
39
40
-70 //1
41
42
43
44
45
46
47
48
10
79
50
51
52
53
54
55
56
50
5/
58
59
60

Section 8.4: Autonomy [Respondent: Health Facility Manager only]

SL No	Questions and Filters	Coding categories	Response	Skip
848	What authority do you have to	A. Total amount to be spent	-	
	make decision on expenditure	B. Reallocation of money within same category		
	of funds provided to your	C. Reallocation between exp categories		
	facility?	D. Months in which expenditures can be made		
	RECORD 1 IF THE	E. Can sign cheques to pay suppliers and other		-
	2 IF NOT MENTIONED	vendors		
349	Do you need preapprovals for exercising the authorities you have related to fund allocation?	Yes		
850	What authority do you have in	A. Disciplinary action/reporting for poor performance		
	decisions related to facility	B. Identify needs for additional / new staff		
	personnel?	C. Hiring of new staff		
		D. Determine level of payment for staff		
	RECORD 1 IF THE	E. Allocating tasks/duties to existing staff		
	DECISION MENTIONED AND	F. Commending staff for good performance		
	2 IF NOT MENTIONED	G. Promoting staff to higher position		
		H. Dismissal of staff		
		I. Other		
		Specify		
851	Do you need preapprovals for exercising the authorities you have related to fund	Yes1 No2		
852	Mbat authority do you have in	A Planning the schedule of services		
002	decisions on the	B Changing the content of services delivered		
	type/organizations of service	C. Quality of services	-	
	provision?	D. Operating procedures	-	
	p	E. Procedures for accessing services	-	
	RECORD 1 IF THE	E. Charges for services	-	
	DECISION MENTIONED AND	G. Addition of new services	-	
	2 IF NOT MENTIONED	H Other	-	
		Specify		
853	For each area of authority: are	Yes1		
	you satisfied with the level of authority you have?	No2		
854	If not what type of authority	A. Authority to generate revenue for facility		
	vou think vou need for	B. Authority to allocate budget		
	improving performance of the	C Authority to hire and fire staff		-
	health facility?	D. Authority to give reward/ounishment		-
		E. Authority to plan		1
	RECORD 1 IF THE	F. Authority of guality assurance		-
	AUTHROITY MENTIONED	G. Other		1
				1



Section 9 E.	Derriere	to mononing	facility
Section 8.5:	Barriers	to managing	facility

0000	on olo. Durners to managing facility		
856	What are the three main constraints you face in managing this facility effectively?	1.	
		2.	
		3.	
		No problem9	
857	Please identify three ways in which the government or your organization could	1.	
	help you do your job better.	2.	
		3.	
	0	No problem9	
858	Suggest three ways of better involving the community with the health facility	1.	
	activities.	2.	
		3.	
		No problem9	

Section 8.6: Facility health information systems

		Record	d the appropriat	e number in the	e "Response" colu	ımn	Response
Revi	ew records for the last completed month.	1. Do not provide the service, no register	2. Register Present, fully completed	3. Register Present, not fully completed	4. Report having but did not show it to surveyor	5. Not present	
859	ANC register	1	2	3	4	5	
860	Delivery/maternity register	1	2	3	4	5	
861	OT register	1	2	3	4	5	
862	Blood bank register	1	2	3	4	5	
863	HIV Register	1	2	3	4	5	
864	TB Register	1	2	3	4	5	
865	Hospital activity report	1	2	3	4	5	
866	EPI report	1	2	3	4	5	
867	Family Planning report	1	2	3	4	5	
868	Leprosy report	1	2	3	4	5	
869	Lab register	1	2	3	4	5	
870	Morbidity/ Mortality report	1	2	3	4	5	
871	Malaria, Kala-azar report	1	2	3	4	5	
872	Notifiable Disease report	1	2	3	4	5	
873	IMCI report	1	2	3	4	5	
874	Equipment status report	1	2	3	4	5	
875	Other	1	2	3	4	5	
876	Other	1	2	3	4	5	
877	Other	1	2	3	4	5	
878	Other	1	2	3	4	5	
879	Other	1	2	3	4	5	

Section 9: Number of cases by disease or medical conditions for the latest month (based on the latest Health Center Monthly Summary Report available)

SL#	Question or items	Response instructions	Record Response	Skip
901	Does the facility have monthly reports available for review (either from facility or elsewhere)?	Yes1 No2		lf 2 ➔904
902	The month and year of latest monthly report available in the facility or obtained from upper administrative level	Month (MM) and Year (YY)		
903	Is the latest monthly report complete?	All fields are recorded/completed1 Most of the fields completed2 Most of the fields not completed3 Only very few items are recorded4		

Table 9.1: Outpatients (from monthly report)

SL No	Diseases	Male (Number of cases)	Female (Number of cases)
		A	В
904	Measles (suspected)		
905	Pertussis		
906	Simple cough		
907	Pneumonia (<1 year)		
908	Pneumonia (1-4 yrs)		
909	Pneumonia (5 yrs+)		
910	Chronic Obstructive Pulmonary Diseases		
911	Asthma		
912	Other upper respiratory tract infections		
913	Diarrhea (<1 year)		
914	Diarrhea (1-4 yrs)		
915	Diarrhea (5 yrs+)		
916	Malaria (<1 year)		
917	Malaria (1-4 yrs)		
918	Malaria (5 yrs+)		
919	Malaria (Pregnant women)		
920	Pyrexia (Fever) of unknown cause (PUO)		
921	Anaemia		
922	Malnutrition (<1 yr)		
923	Malnutrition (1-4 yrs)		
924	Accident /injuries		
925	Genital ulcers		
926	Urethral discharge		
927	Vaginal discharge		
928	Pelvic Inflammatory Disease		
929	Genital warts		
930	Latent syphilis (blood test)		
931	Other STI		

SL No	Diseases or medical conditions	Male (Number of cases) A	Female (Number of cases B
932	Pulmonary TB suspect		
933	Pulmonary TB confirmed by sputum test		
934	Leprosy		
935	Yaws		
936	Other skin diseases		
937	Ear infections (including both middle and outer ear infections)		
938	Eye infections		<u> _ _ _ </u>
939	All other new cases		
Table 9.2	: Inpatients (Number of discharges from monthly re	eport)	- . <i></i>
SL No	Diseases or medical conditions	Male (discharges)	Female (discharges)
040	Diphthoria	A	
940	Negenetal Totanua		
941	Aguta Elagoid Darahaja		
942	Acute Flaccid Paralysis		
943	Dertuccio		
944	Negrotal consis		
945			
940	Pneumonia (<1 year)		
947	Pneumonia (1-4 yrs)		
940	Pheumonia (5 yrs+)		
949	Chronic Obstructive Pulmonary Diseases		
950	Asthma		
951	Other respiratory		
952	Diarrhea (<1 year)		
953	Diarrhea (1-4 yrs)		
954	Diarrhea (5 yrs+)		
955	Malaria (Clinical diagnosis) (0-4 years)		
956	Malaria (Clinical diagnosis) (5-14 years)		
957	Malaria (Clinical diagnosis) (15 yrs+)		
958	Malaria (Clinical diagnosis) (Pregnant)		
959	Malaria (Slide or RDT diagnosis) (0-4 years)		
960	Malaria (Slide or RDT diagnosis) (5-14 years)		
961	Malaria (Slide or RDT diagnosis) (15 yrs +)		
962	Malaria (Slide or RDT diagnosis) (Pregnant)		
963	Anemia		
964	Malnutrition (<1 yr)		
965	Malnutrition (1-4 yrs)		
966	All accidents/injuries		

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

SL No	o Disc	eases or medical condition	ons	Male (discl	narges)	Female (discharges)						
967	Typhoid											
968	TB				<u> </u>							
969	Leprosy											
970	Meningitis (<	(1 year)										
971	Meningitis (1	-4 years)										
972	Meningitis (5 years+)										
973	Snakebite											
974	Skin disease	9S										
975	HIV/AIDS (<	5 years)										
976	HIV/AIDS (5	-14 years)										
977	HIV/AIDS (1	5-24 years)										
978	HIV/AIDS (2	5 years+)										
979	TB-HIV Patie	ents										
980	Ischemic hea	art diseases										
981	Cancer		0									
982	Hypertension	n										
983	Diabetes											
984	Other discha	arges not included above			<u> </u>							
Table 0) 2. Eamily Dlanni											
SI	FP Methods	New attendance in	Re-atten	dance in N	ew attendanc	e in Re-attendance in						
SL No	FP Methods and services	New attendance in facility	Re-atten faci	dance in N lity	ew attendanc Aidpost	e in Re-attendance in Aidpost						
SL No	FP Methods and services	New attendance in facility A	Re-atten faci	dance in N lity 3	ew attendanc Aidpost C	e in Re-attendance in Aidpost						
SL No 985	FP Methods and services Breast feeding	New attendance in facility A	Re-atten faci	dance in N lity 	ew attendanc Aidpost C	e in Re-attendance in Aidpost D						
SL No 985 986	FP Methods and services Breast feeding Com. Pill (OCP)	New attendance in facility A	Re-atten faci	dance in N lity 3 	ew attendanc Aidpost C 	e in Re-attendance in Aidpost D						
SL No 985 986 987 987	FP Methods and services Breast feeding Com. Pill (OCP) Injection	New attendance in facility A	Re-atten faci	dance in N lity 3 	ew attendanc Aidpost C 	e in Re-attendance in Aidpost D						
SL No 985 986 987 988	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation	A Image: A strength of the strengt of the strenge strength of the strengt of the strenge strength o	Re-atten faci E	dance in N lity - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc Aidpost C 	e in Re-attendance in Aidpost D						
SL No 985 986 987 988 989 2000	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom	A I I	Re-atten faci E	dance in N lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc <u>Aidpost</u> C <u> </u>	e in Re-attendance in Aidpost D						
SL No 985 986 987 988 989 990	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD	A I	Re-atten faci 	dance in N lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc Aidpost C	e in Re-attendance in Aidpost D U U U U U U U U U U U U U U U U U U						
SL No 985 986 987 988 989 990 991 2225	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation	A I	Re-atten faci -	dance in N lity - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ew attendanc Aidpost C I I I I I I I I	e in Re-attendance in Aidpost D						
SL No 985 986 987 988 989 990 991 992	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy	New attendance in facility A I	Re-atten faci	dance in N lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D						
SL No 985 986 987 988 989 990 991 992 993 993	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities	New attendance in facility A I	Re-atten faci I I I I I I I I I I	dance in N lity - - -	ew attendanc <u>Aidpost</u> C _	e in Re-attendance in Aidpost D I						
SL No 985 986 987 988 989 990 991 992 993 Table 9	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities 0.4: Maternal, Nec	A I I	Re-atten faci E I <td< td=""><td>dance in N lity - - -</td><td>ew attendanc <u>Aidpost</u> C </td><td>e in Re-attendance in Aidpost D D Image: Second sec</td></td<>	dance in N lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D Image: Second sec						
Pable 9 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities O.4: Maternal, Neo Antenatal car	A A <td< td=""><td>Re-atten faci E</td><td>dance in N lity - - -</td><td>ew attendanc <u>Aidpost</u> C </td><td>e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D</td></td<>	Re-atten faci E	dance in N lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D						
SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities D.4: Maternal, Neo Antenatal car First visit	New attendance in facility A A A A A A A A A A A A A A A A A A A	Re-atten faci E I	dance in N lity - - -	ew attendanc <u>Aidpost</u> C _	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D						
Table 9 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995 2000	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities O.4: Maternal, Neo Antenatal car First visit Fourth visit	New attendance in facility A A A A A A A A A A A A A A A A A A A	Re-atten faci E I	dance in N lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D						
Table 9 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995 996 007	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities Other facilities Other First visit Fourth visit Other	New attendance in facility A A A A A A A A A A A A A A A A A A A	Re-atten faci E I I	dance in N lity - - -	ew attendanc <u>Aidpost</u> C _	e in Re-attendance in Aidpost D D U U U U U U U U U U U U U U U U U						
Table 9 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995 996 997 2000	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities O.4: Maternal, Neo Antenatal car First visit Fourth visit Other First dose TT	New attendance in facility A A A A A A A A A A A A A A A A A A A	Re-atten faci E I	dance in N lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D						
Table 9 SL No 985 986 987 988 989 990 991 992 993 Table 9 SL No 994 995 996 997 998 2000	FP Methods and services Breast feeding Com. Pill (OCP) Injection Ovulation Condom Loops/IUD T/ligation Vasectomy Referred out to other facilities Other facilities Antenatal car First visit Fourth visit Other First dose TT Second dose T	Image: services Provided New attendance in facility A Image: services Provided Image: services Provided Image: services Provided Image: services Provided Image: services Provided Pr	Re-atten faci I	dance in N lity - - -	ew attendanc <u>Aidpost</u> C 	e in Re-attendance in Aidpost D D D D D D D D D D D D D D D D D D D						
	Deliveries					Number						
--	---	--------	------------------------	------	-------	-----------	---------	---	---------------------	---------------	---------------	---
1000	Uncomplicated deliveries in health facility											
1001	Deliveries with complications in health facility											
1002	Transferred to hospital for pregnancy and delivery of	compli	ations									
1003	Birth weight <2500 grams											
1004	Still births											
1005	Born before arrival											
1006	Village births attended (total)											
Table 9	.5 Well Baby Clinic											
SL	Type of service			Ne	w att	end			Re-attend			
Number					A						В	
1007	Clinic Attendances (<1 year)			_	_					_		.
1008	Clinic Attendances (1-4 years)			_						_		
Table 9.0	3: Immunizations administered											
Serial	Vaccine type administered	Adr	Administered in clinic			ic or	; or in		Administered by Aid			
NO			outreach					B				
1009	BCG (Within 24 hours of birth)										-	
1010	BCG (<1 week but not within 24 hours of birth)		I			I				 	 	
1011	BCG (> 1 week)									i	 	
			I	I		I				 	 	
1012	Hepatitis B (Within 24 hours of birth)											
1012 1013	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours)			 		I						
1012 1013 1014	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)				 	 			_ _	_ 	!_ 	
1012 1013 1014 1015	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year) DTP/Hib (Hep B) (Second dose < 1 year)					 			_ _ 	_ _ _	_ _ _	
1012 1013 1014 1015 1016	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)					 			_ _ 	_ _ _	_ _ _	
1012 1013 1014 1015 1016 1017	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018	Hepatitis B (Within 24 hours of birth)Hepatitis B (> 24 hours)DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019	Hepatitis B (Within 24 hours of birth)Hepatitis B (> 24 hours)DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020	Hepatitis B (Within 24 hours of birth)Hepatitis B (> 24 hours)DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020 1021	Hepatitis B (Within 24 hours of birth)Hepatitis B (> 24 hours)DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025	Hepatitis B (Within 24 hours of birth) Hepatitis B (> 24 hours) DTP/Hib (Hep B) (First dose < 1 year)											
1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026	Hepatitis B (Within 24 hours of birth)Hepatitis B (> 24 hours)DTP/Hib (Hep B) (First dose < 1 year)											

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

1	
2	
۲ ۲	
1	
-+ _	
د د	
6	
/	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
10	
20	
20 ⊇1	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
25	
26	
30	
3/	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	

STROBE Statement-	-Checklist of item	s that should be i	included in re	ports of <i>cross-se</i>	ctional studies
	0110011100 01 100111				••••••••••••••••••••••

	Item No	Recommendation	Page #
Title and	1	(a) Indicate the study's design with a commonly used term in the title or the	1, 2
abstract		abstract: DONE	
		(b) Provide in the abstract an informative and balanced summary of what was	4
		done and what was found	
Introduction			
Background/	2	Explain the scientific background and rationale for the investigation being	6 and
rationale		reported: SEE INTRODUCTION SECTION	7
Objectives	3	State specific objectives, including any prespecified hypotheses:	7
Methods		0	
Study design	4	Present key elements of study design early in the paper:	7-11
Setting	5	Describe the setting, locations, and relevant dates, including periods of	8-9
		recruitment, exposure, follow-up, and data collection	
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of	8,9
		participants	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and	10-11
		effect modifiers. Give diagnostic criteria, if applicable. SEE THE SECTION ON	
		"OUTCOME MEASURES"	
Data sources/	8*	For each variable of interest, give sources of data and details of methods of	10-11
measurement		assessment (measurement). Describe comparability of assessment methods if	
		there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	10
Study size	10	Explain how the study size was arrived at: SEE SURVEY DESIGN	8-9
Quantitative	11	Explain how quantitative variables were handled in the analyses. If applicable,	10-11
variables		describe which groupings were chosen and why	
Statistical	12	(a) Describe all statistical methods, including those used to control for	10-11
methods		confounding	
		(b) Describe any methods used to examine subgroups and interactions.	10-11
		(c) Explain how missing data were addressed. NOT APPLICABLE	NA
		(<i>d</i>) If applicable, describe analytical methods taking account of sampling strategy.	
		NOT APPLICABLE	
		(e) Describe any sensitivity analyses. NOT APPLICABLE	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially	8-9
		eligible, examined for eligibility, confirmed eligible, included in the study,	
		completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage: NO PARTICIPATION	NA
		ISSUE. THE FACILITIES VISITED WERE SURVEYED.	
		(c) Consider use of a flow diagram: NOT APPLICABLE FOR THE STUDY	NA

	BMJ Open					
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	NA			
		(b) Indicate number of participants with missing data for each variable of interest: FACILITY LEVEL DATA HAD NO MISSING VALUES.	NA			
Outcome data	15*	Report numbers of outcome events or summary measures: SEE THE TABLES TO PRESENT THE RESULTS	21-2			
Main results	16	(<i>a</i>) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included: SEE TABLES. AVERAGES ARE USED FOR COMPARATIVE PURPOSES.	21-2			
		(b) Report category boundaries when continuous variables were categorized. NOT RELEVANT	NA			
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period. NOT RELEVANT	NA			
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses. NOT RELEVANT	NA			
Discussion						
Key results	18	Summarise key results with reference to study objectives. LAST PARAGRAPH OF PAGE 13 AND FIRST 2 PARAGRAPHS OF PAGE 14	13-1			
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias SEE STUDY LIMITATIONS SECTION, PAGE 15.	15			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence CONCLUSIONS SECTION, PAGE 16	16			
Generalisability	21	Discuss the generalisability (external validity) of the study results FIRST PART OF DISCUSSION SECTION.	13			
Other information	on					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	3			
		2				
	For pee	er review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml				