Original Article

Technical efficiency analysis of health facilities in Haiti: a stochastic frontier approach

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Background: Health outcomes in Haiti can be characterized as one of the poorest in the Caribbean region. As a result, the country has one of the shortest life expectancies in the region, which is estimated to be 63 years. Haiti's poor health outcome is partly attributed to lower technical efficiency (TE) of health production. The objective of this study was to estimate the TE of health production in all health facilities in the country.

Methods: We used the 2013 Haiti's Service Provision Assessment (SPA) survey data and employed the Stochastic Frontier Analysis (SFA) framework. We specified a health production model with outpatient visits as output and number of health workers and general service readiness index (GSRI) as input indicators. In addition, type of facility, location and management indicators were used as covariates to control for facility heterogeneity. The model was specified with both Cobb-Douglas (CD) and Translog (TL) functional forms. We also considered the half-normal (HN), exponential, and truncated distributions for the TE term.

Results: Number of health workers and the level of service readiness of health facilities have positive and significant association with outpatient visits. Keeping other factors constant, if the number of health workers per health facility increases by 1%, then outpatient visits may increase by 0.65% per month. Similarly, if health service readiness index increases by 1%, outpatient visits can be increased by up to 2.1%. The TE of health facilities is estimated at 51%, which shows the availability of significant room for efficiency gains.

Conclusions: Number of health workers and general service readiness determine facility-based health production. Outpatient visit can be increased by 0.65% and 2.1% respectively if number of health workers and GSRI each increase by 1%. However, there is also a significant waste under the current health production system. Health facilities can serve more outpatient visits which can reach up to 49% from the current figures with the available resource if they implement best practices.

Keywords: Health facilities; technical efficiency (TE); stochastic frontier analysis; Haiti

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Introduction

Health outcomes in Haiti can be characterized as one of the poorest in the Caribbean region. In 2013 infant mortality rate was 55 per 1,000 live births and maternal mortality ratio was 380 per 100,000 live births in the country. These figures were significantly higher than the regional averages (1). The country had also one of the highest numbers of HIV incidence and prevalence. The general HIV related mortality was estimated to be 13% (2). These factors contributed to the country's relatively short life expectancy in the region, which is estimated to be 63 years (3).

Haiti's poor health outcomes are partly attributed to lower technical efficiency (TE) of health production in the

country (3). TE is a health production process performance indicator and it measures the ratio of health outcomes produced to maximum possible health outcomes that can be produced, given health inputs (4). A recent World Bank report indicated that TE in Haiti was 4% in dispensaries, 9% in health centers without bed (HCWOB), and 30% in health centers with bed (HCWB) (3). This implies that dispensaries would have maximized health outcome by 96% given inputs or they would have reduced health inputs by 96% to produce the same health outcome.

In contrast, Moreno-Serra *et al.* (5) characterized Haitian health system as one of the most efficient in Latin America and the Caribbean region. They estimated the TE level of the country at 100% for most of the health outcome indicators used in their study. A precise TE measures can help benchmarking of performance in program planning, monitoring progress, and evaluating achievements (6,7). However, depending on variations in units of analysis, outcome and input indicators, and method of analysis, TE score estimates may differ from study to study (8).

The objective of this study is to estimate TE scores for health facilities in Haiti using a Stochastic Frontier Analysis (SFA) approach (9). Beyond estimating technical inefficiency, SFA allow to consider stochastic errors and facility heterogeneity in health production models (4,10). We present the following article in accordance with the MDAR reporting checklist (available at http://dx.doi.org/10.21037/jhmhp-20-25).

Methods

Theoretical framework

Health facilities (denoted as i = 1, 2, …, N) are considered as production entities which transform health inputs (denoted as X_{ij}) into health output (denoted as Y_i) (11,12). Health workers, medical supplies, and financial resources are among the input indicators (denoted as j = 1,2, …, K). Similarly, inpatient and outpatient visits are health output indicators (13). TE is one of the indicators used to evaluate the health production performance of health facilities (14-16).

TE of health facilities can be estimated either using Data Envelopment Analysis (DEA) or SFA approach (10,17,18). DEA is a mathematical programming approach which is used to construct efficient production frontiers from input and output combinations of best performing facilities. Any production deviation from the frontier are attributed to technical inefficiency (denoted as u_i) (19). This means that DEA does not account for random noise (denoted as v_i) which may contribute to production deviations from the frontier (18).

SFA is an econometric approach which is used to estimate efficient production frontiers from input and output combinations accounting for both u_i and v_i (10). In addition, SFA allows to account for facility heterogeneity (e.g., facility type, location, and type of management) in the health production model (denoted as z_{ij}) (4,9). Due to these merits we employed the SFA approach.

The health production model within the SFA framework can be specified as (20):

$$y_i = f\left(x_{ij}, \beta\right) e^{(v_i - u_i)} \quad [1]$$

where y_i is the health output of facility i; f (.) is a health production function; x_{ij} is health input j of facility i; β denotes a (K ×1) vector of unknown parameters; e is the base of natural logarithm; v_i is the stochastic error term; and u_i is the non-negative technical inefficiency factor.

From Eq. [1], the TE of facility i (TE_i) can be defined as:

$$TE_i = \frac{f\left(x_{ij}, \beta\right) e^{(v_i - u_i)}}{f\left(x_{ij}, \beta\right) e^{v_i}} = e^{(-u_i)} \quad [2]$$

where 0< TE_i ≤1. TE is close to zero (or 0%) shows poor performance and TE level close to 1 (or 100%) indicates best performance. The parameters in Eq. [1] can be estimated using maximum likelihood estimation method and u_i can be derived using the Jondrow *et al.* method (4).

The SFA model in Eq. [1] needs to specify a functional form and distribution for u_i. We used the Cobb-Douglas (CD) and Translog (TL) functional forms, which are widely used in health care production frontier analysis (17,21). We employed a generalized maximum likelihood-ratio test to select the best functional form as they are nested models (22,23). The commonly assumed u_i distributions include half-normal (HN), exponential-normal (EN) and truncated normal (TN) (9). We used the Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC), which are used to select the most appropriate distribution among non-nested models (24-26) to identify the best distribution of u_i.

Empirical model specification

The CD functional form of the SFA model is defined as:

$$\ln y_i = \beta_0 + \sum_{j=1}^{k} \beta_j \ln x_{ij} + \varnothing_i z_{ij} + v_i - u_i \quad [3]$$

Table 1 Description of variables used in technical efficiency analysis in Haiti, 2013

Variable	Definition	Number
Outcome indicator variable, mean ± SD		
OutPt	Number of outpatient visitors per facility for last completed calendar month during the survey time	555 (±940)
Input indicator variables, mean SD		
LaTot	Number of full-time health workers reported per facility during the survey time	19 (±35)
GSRI	Percentage value of general service readiness index per facility, score/100; 0= lowest & 100= highest	60 (±14)
Covariate variables		
FaXTyp	Type of facility, categorical variable:	
	= 1 if dispensary (reference category)	343 (41%)
	= 2 if health center with bed (HCWB)	274 (33%)
	= 3 if health center without bed (HCWOB)	118 (14%)
	= 4 if hospitals	102 (12%)
FaXLoc	Location of the facility, categorical variable:	
	= 1 if metropolitan area (reference category)	148 (18%)
	= 2 if other urban area	170 (20%)
	= 3 if rural	519 (62%)
FaXMgt	Facility managing authority, categorical variable:	
	= 1 if government or public (reference category)	320 (38%)
	= 2 if private not for profit	153 (18%)
	= 3 if private for profit	194 (23%)
	= 4 if Mission or faith-based	170 (20%)

Source: authors' computation based on data from SPA, 2013. SPA, Service Provision Assessment; GSRI, general service readiness index.

The TL functional form of the SFA model is defined as:

$$\ln y_i = \beta_0 + \sum_{j=1}^{k} \beta_j \ln x_{ij} + \frac{1}{2} \sum_{j=1}^{k} \sum_{m=1}^{n} \beta_{jm} \ln x_j \ln x_m + \varnothing_i z_{ij} + v_i - u_i \quad [4]$$

where y_i refers to health output, x_{ij} health input, and z_{ij} covariates.

Variable definition

The output, input and covariate variables are presented in *Table 1*. The selection of output, input, and covariate variables was guided by the purpose of the study, literature, and data availability (16).

- Outpatient visit (OutPt) was used as output measure (y_i). It refers to number of outpatient visitors in the last completed calendar month during the survey time.
- Health workforce (LaTot) was used as input measure (x_{ij}). It refers to number of full-time health workers reported per facility during the survey time. It is the summation of generalist, surgical and specialist medical doctors, nurses, midwife, pharmacist, laboratory technologies, radiologists, dentists, and community health workers.
- General service readiness index (GSRI) was used as the other input measure (x_{ij}. The GSRI measures the overall capacity of health facilities to provide general health services (27,28). Following WHO's guideline (27) facility capacity was assed based on five domains: availability of basic amenities, basic equipment, standard precautions for infection prevention, diagnostic capacity and essential medicines. A score

is generated per domain based on the number of domain elements present, then the GSRI was computed based on the mean of the five domains (28).

- Type of facility (FaxTyp), management (FaxMgt), and location (FaxLoc) were used as covariates to control for facility heterogeneity.

Data source

We used Haiti's Service Provision Assessment (SPA) survey data, which were collected between March 2013 and July 2013 by the Institut Haitien de l'Enfance (IHE) (29). The SPA survey data included, among others, types of available health services including outpatient services at health facility level. In addition, it accounted the number of patients who got each service for last completed calendar month during the survey time and the number of health professionals working in the facilities. Furthermore, the survey covered indicators which help to compute facility level general service provision readiness scores (27,28). The data were part of the facility inventory dataset and accessed with permission from the DHS program website (29).

Unit of analysis

The SPA survey covered 905 health facilities including 358 dispensaries, 297 HCWOB, 129 HCWB, and 121 hospitals which include university, regional, community referral, and other hospitals. However, only the 837 facilities including 343 dispensaries, 274 HCWOB, 118 HCWB, and 102 hospitals had complete data and considered as our unit of analysis. The remaining 68 facilities were dropped from our analysis due to missing data. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Our study did not involve human experiments and it is health facility analysis based on secondary data. Therefore, we do not think that the ethical approval applies to our study.

Data analysis

Both descriptive statistics and econometric analysis techniques were employed. The descriptive statistics analysis technique was used to summarize the output, input and control variables. In addition, this technique was used to summarize TE scores and general service readiness scores.

Following the theoretical and empirical frameworks presented in the preceded sub-sections, the SFA, an econometric analysis technique was employed to predict TE scores of health facilities. It has to be noted that the natural log of the number of outpatient visits and health workers were used in the empirical model. As the GSRI was already expressed in percentages, it was used as it is in the empirical model. We used Stata 15 for data analysis and its sfcross command for the SFA (23,30).

Results

Descriptive statistics of outpatient visits, health workers and service readiness

Table 2 presents the descriptive statistics of outpatient visits, health workers and GSRI by health facility characteristics. Dispensaries have the lowest outpatient visits and health workers. The service readiness index also shows that dispensaries have, on average, a little higher than half of the capacity required to provide general health services. As expected, hospitals have the highest number of outpatient visits and health professionals. Furthermore, hospitals have the highest GSRI compared with other health facility types (for detailed summary statistics of GSRI please refer Table S1).

Health facilities located in urban centers outside the metropolitan area of Port-au-Prince have the highest number of outpatient visitors. They also have the highest number of health workers and are at better capacity to serve general health services compared to the facilities in the other locations. The same trend is observed in health facilities managed by private not for profits. They have the highest number of outpatient visitors and health workers.

SFA results

The first step that we carried out in the SFA was testing whether there is technical inefficiency component in the health production model. Our test statistics show that the null hypothesis of no inefficiency component is rejected ($z=-6.59$, $P<0.000$). Accordingly, we proceeded with the use of stochastic frontier model instead of using ordinary least square model.

The second step of our SFA involved in testing whether the CD or TL functional form best fit the health production model assuming u_i has TN distribution. Following the one-sided generalized LR test, we fail to reject the null hypothesis which stated the CD model is nested in the TL model {LR chi2 [1] =0.08; $P<0.774$}. In addition, the CD

Table 2 Descriptive statistics for variables by health facility characteristics in Haiti, 2013

Facility characteristics	N	Outpatient visits		Health Workers		GSRI	
		Mean	SD	Mean	SD	Mean	SD
Facility type							
Dispensary	343	229	463	7	6	52	11
Health center with bed	274	517	718	13	19	61	14
Health center without bed	118	596	745	21	19	68	13
Hospitals	102	1,708	1,687	75	70	73	12
Total	837	555	940	19	35	60	14
Facility location							
Metropolitan	148	831	1,345	30	55	64	15
Other urban	170	904	1,134	31	38	66	13
Rural	519	362	628	12	23	57	14
Total	837	555	940	19	35	60	14
Facility managing authority							
Government or public	320	585	1,034	22	40	57	14
Private not for profit	153	693	929	24	46	62	16
Private for profit	194	475	971	15	26	62	15
Mission or faith-based	170	467	683	13	16	60	12
Total	837	555	940	19	35	60	14

Source: authors' computation based on data from SPA, 2013. SPA, Service Provision Assessment; GSRI, general service readiness index.

model's AIC (i.e., 2,651) and BIC (i.e., 2,718) values are relatively smaller than the TL model's AIC (i.e., 2,653) and BIC (i.e., 2,724). However, both functional forms resulted similar estimates to the model parameters and TE scores. Consequently, we presented the CD model results to avoid redundancy.

Finally, we computed the information criteria for the models with HN (AIC =2,655 & BIC =2,716), EN (AIC =2,649 & BIC =2,711), and TN (AIC =2,651 & BIC =2,718) to determine which distribution of the technical inefficiency component to use. The results indicated that the EN distribution has the lowest AIC and BIC values, hence selected for analysis. However, we presented the parameter estimates (*Table 3*) and TE scores (*Table 4*) from the three distributions for comparison purpose. We would like also to note that the differences in both AIC and BIC values are relatively marginal (<10) across the three distributions, which makes it hard to choose among the distributions. Furthermore, the CD model with EN and TN distributions resulted similar TE scores. Contrarily, the HN model resulted lower TE scores.

Association of outpatient visits with health workers and facility service readiness

Table 3 presents the parameter estimates of the SFA model with the CD functional form. The number of health workers and the level of service readiness of health facilities have positive and significant association with outpatient visits. If the number of health workers per health facility increases by 1%, then outpatient visits may increase by 0.65% per month, keeping other factors constant. Similarly, if health facilities increase service readiness, on average, by one percentage point outpatient visits can be increased by up to 2.1%. The results are similar across the three distributions.

TE levels of health facilities in Haiti

Table 4 presents the estimated TE levels disaggregated by

Table 3 Estimated stochastic production frontier models

Description	Variable	HN, Coef. (SE)	EN, Coef. (SE)	TN, Coef. (SE)
Production function	lnLaTot	0.654 (0.051)*	0.650 (0.051)*	0.650 (0.051)*
	GSRI	0.020 (0.004)*	0.021 (0.004)*	0.021 (0.004)*
	Facility location (metropolitan area is the reference category)			
	Other urban	0.030 (0.135)	0.039 (0.135)	0.039 (0.135)
	Rural	–0.137 (0.122)	–0.114 (0.122)	–0.114 (0.122)
	Facility type (dispensary is the reference category)			
	HCWOB	0.219 (0.108)**	0.224 (0.108)**	0.224 (0.108)**
	HCWB	–0.025 (0.141)	–0.030 (0.139)	–0.030 (0.139)
	Hospital	0.174 (0.177)	0.248 (0.179)	0.248 (0.179)
	Facility management (government or public facility is the reference category)			
	Not for profit	0.217 (0.117)***	0.209 (0.116)***	0.209 (0.116)***
	Privet for profit	–0.201 (0.111)***	–0.196 (0.110)***	–0.196 (0.110)***
	Faith-based	0.065 (0.111)	0.050 (0.111)	0.050 (0.111)
	Constant	3.800 (0.245)*	3.307 (0.238)*	3.309 (0.238)*
Distribution of u and v	σ_u	1.489 (0.104)*	0.768 (0.075)*	28.821 (0.075)
	σ_v	0.771 (0.058)*	0.902 (0.047)*	0.902 (0.047)*
	$\lambda=\frac{\sigma_u}{\sigma_v}$	1.932 (0.153)*	0.851 (0.113)*	31.947 (51.549)
Log likelihood		–1,314.456	–1,311.698	–1,311.700

Source: authors' computation based on data from SPA, 2013. *, **, *** indicate statistical significance at 99%, 95% and 90% level, respectively. SPA, Service Provision Assessment; GSRI, general service readiness index.

basic characteristics of the health facilities. Considering all health facility types, the average TE of health production was estimated at 51% with CD functional form specification and EN distribution. TE with this specification ranges from 0.2% to 81%. However, the average TE falls down to 37%, which range from 0.2% to 78% with CD functional form and HN distribution.

There was little disparity in TE scores when we disaggregate results by various health facility characteristics. The TE of Dispensaries and HCWOB was estimated at 51% whereas that of HCWB and hospitals was 52%. Similarly, health facilities located in non-metropolitan urban centers had relatively higher average TE scores, which was estimated at 52%. Health facilities in rural areas had the second largest average TE score, which was also estimated at 51%. Health facilities in the metropolitan areas had the least TE scores, which was estimated at 50%.

There is also limited variation in TE scores by types of managing authorities of health facilities. Government or public health facilities had relatively higher average TE estimated at 52% followed by private not-for profits and faith-based organizations with average TE estimated at 51%. Private for profits had the lowest TE scores estimated at 50%.

Discussion

In Haiti, outpatient visits are responsive to the number of health workers available per health facility. Our SFA result showed that the elasticity of outpatient visits to health workers is estimated at 0.65%. This means that if the number of health workers per health facility increases by 1%, then outpatient visits may increase by 0.65% per month, keeping other factors constant. A similar study in Ghana (16) reported 0.38% to 0.40% elasticity of outpatient visit with respect to health workers. The positive association between outpatient visits and health workforce in Haiti can be attributed to the gap between health services needs and

Table 4 Technical efficiency levels of health facilities in Haiti, 2013

Facility characteristics	Subtype	Distribution	Obs.	Mean	Std. Dev.	Min	Max
Facility type	Dispensaries	Half normal	343	36	19	0.9	77
		Exponential	343	51	18	1.2	80
		Truncated	343	51	18	1.2	80
	HCWOB	Half normal	274	37	19	1.3	78
		Exponential	274	51	18	1.8	81
		Truncated	274	51	18	1.8	81
	HCWB	Half normal	118	37	17	3.3	74
		Exponential	118	52	15	5.8	78
		Truncated	118	52	15	5.8	78
	Hospital	Half normal	102	38	17	0.2	72
		Exponential	102	52	18	0.2	76
		Truncated	102	52	18	0.2	76
Facility location	Metropolitan	Half normal	148	36	20	1.3	78
		Exponential	148	50	19	1.8	81
		Truncated	148	50	19	1.8	81
	Other urban	Half normal	170	37	17	2.0	77
		Exponential	170	52	16	3.2	80
		Truncated	170	52	16	3.2	80
	Rural	Half normal	519	37	18	0.2	76
		Exponential	519	51	17	0.2	79
		Truncated	519	51	17	0.2	79
Facility management	Government/ public	Half normal	320	37	17	0.9	78
		Exponential	320	52	16	1.2	81
		Truncated	320	52	16	1.2	81
	Private not for profit	Half normal	153	37	19	2.3	76
		Exponential	153	51	18	3.4	79
		Truncated	153	51	18	3.4	79
	Private for profit	Half normal	194	37	19	0.2	74
		Exponential	194	50	19	0.2	78
		Truncated	194	50	19	0.2	78
	Mission/faith-based	Half normal	170	36	19	2.0	76
		Exponential	170	51	17	3.2	79
		Truncated	170	51	17	3.2	79
Total		Half normal	837	37	18	0.2	78
		Exponential	837	51	17	0.2	81
		Truncated	837	51	17	0.2	81

Source: authors' computation based on data from SPA, 2013. SPA, Service Provision Assessment.

health workforce shortages. For instance, though WHO recommends 4.45 doctors nurses, and midwives per 1,000 people, Haiti stood at 0.65 only (31). This has to do with problems related to recruitment and allocation of human resource for health (3,32). However, the problem is not only health workforce shortage but also low health workforce productivity. Absenteeism and moonlighting are among the factors for the low productivity (3). This implies that there are unmet health service needs which can be addressed through increasing the availability and productivity of health workforce (33). It is a well-documented fact that availability of health workforce is one of the determinant factors of patients' healthcare seeking behavior (34). Beyond resolving staff shortages through recruiting new staff, reallocation, and task shifting whenever necessary, promoting results-based financing can help enhance health workforce productivity (3).

General service readiness of health facilities also determines the number of outpatient visits per month in the country. Based on our SFA result, if service readiness is increased by 1%, outpatient visits can be increased by up to 2.1%. This result shows that outpatient visits to health facilities is positively responsive to enhancing health facilities' capacity to serve general health services in Haiti. As indicated in *Table 2*, service readiness is the lowest in dispensaries (57%). These are also the facility types which were reported to be with extremely low patient volumes (3). This implies that though readiness does not guarantee quality service provision, it can be said a pre-requisite to deliver basic health services to patients (35,36). However, health facilities in Haiti have, on average, only 60% of the resources required for general health services. For instance, the average diagnostic capacity is 39% and availability of essential medicine is 63%. To get better health outcomes like outpatient visits, the country must increase the readiness of health facilities. A recent study in Haiti (37) found out strong association between readiness and facility-based birth. Therefore, health system reform measures in Haiti must give due emphasis to health facility readiness through enhancing the diagnosis capacity of and availing essential medicine in health facilities.

The key finding of our analysis is the significance potential for TE gains in all types of health facilities in Haiti. Based on the current number of health workers and level of general service readiness, our empirical results indicate that the overall mean TE is estimated at 51%. This indicates that health facilities are serving only a little higher than half of outpatient visits that they would have served. Given the current human resources for health and the general health service capacity, the health facilities can increase outpatient visits by up to 49% if they implement best practices. A similar study in Ghana also reported a TE score of 51% for primary health care facilities (16). However, a previous study in Haiti using DEA technique reported a 92% overall mean TE score (3), which is higher than our finding. This implies that differences in estimation approaches (DEA *vs.* SFA), and variations in output and input types used leads to TE variations. Therefore, there is a need to carefully consider the appropriate approach which lets to capture statistical noises and consider covariates (38).

However, this study has also a couple of limitations. First, the data we used is for 2013 and the findings may not show the current status of TE of health facilities in Haiti. Second, this analysis is also based on a cross-sectional data and does not show the TE dynamics in the country over time. In addition, the outcome measure is limited to outpatient visits and this can be complemented with other outcome measures. Though the current analysis results give valuable insights they can be improved if latest and panel data can be used for analysis. Furthermore, better insights can also be extracted if service specific readiness with a corresponding outcome measure is used instead of the general service readiness.

Conclusions

The facility-based health production in Haiti is determined by the number of health workers and general service readiness of facilities. Outpatient visit are positively responsive to changes in these inputs, showing the gap in human resources for health and facilities service readiness. The TE of health production was also estimated at 51%, indicating that the health facilities can serve more outpatient visits by up to 49% with the current inputs if they implement best practices. The policy implication of our finding is that countries with limited resources like Haiti can benefit from enhancing the TE of health facilities beyond mobilizing additional resources to improve the health outcomes of their people.

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Supplementary

Table S1 General service readiness score in Haiti, 2013

Domain	Tracer items	Mean	Std. Dev.
Basic amenities	OPD area has running water	55	50
	OPD has private room, visual & auditory	73	45
	Facility has functioning latrine for clients	93	26
	The facility has functioning communication system	70	46
	The facility has functioning computer	70	46
	The facility has functional ambulance/other vehicle	41	49
	Facility connected to central supply electricity grid	37	48
	Average basic amenities domain score	61	21
Basic equipment	Adult weighing scale	93	25
	Child weighing scale	60	49
	Infant weighing scale	59	49
	Functioning thermometer	94	23
	Functioning stethoscope	98	15
	Functioning digital/manual blood pressure apparatus	97	18
	Light source like flashlight in the OPD area	37	48
	Average basic equipment domain score	77	17
Standard precautions for infection prevention	Sharps waste disposal	68	47
	Sharps waste storage	68	47
	Medical waste disposal	62	49
	Medical waste storage	9	28
	Disinfectant in the general OPD area	60	49
	Autodestruct syringes with needles or single-use disposable syringes	64	48
	Soap/running water/alcohol-based hand rub	87	34
	Clean/sterile latex gloves in the OPD area	82	38
	Guidelines for standard precautions in the OPD area	22	42
	Average standard precautions for infection prevention	58	20
Diagnostic capacity	Hemoglobin test	32	47
	Blood glucose test	34	47
	Malaria test (lab or RDT)	41	49
	Urine dipsticks for protein	39	49
	Urine dipsticks for glucose	37	48
	HIV test (internal or external)	39	49
	Syphilis test (lab or RDT)	38	49
	Urine pregnancy lab test	57	50
	Average diagnostic capacity domain score	39	35
Essential medicines	Amitriptyline for depression	14	34
	Amlodipine tablets for hypertension	44	50
	Amoxicillin tablet/clavulanate (augmentin)/syrup(suspension)	97	18
	Ampicillin injection	71	45
	Beclomethasone inhaler	19	39
	Ceftriaxone injection	65	48
	Enalapril capsule (a.c.e inhibitor)	80	40
	Gentamycin injection	66	47
	Glibenclamide (type 2 diabetes)	46	50
	Diclofenac (strong pain medicine ~ ibuprofen)	91	29
	Insulin injections (Lente) (diabetes)	28	45
	Metformin tablets (diabetes)	61	49
	Omeprazole	85	36
	Oral rehydration solution (ORS)	95	23
	Paracetamol tablets	97	18
	Salbutamol inhaler	72	45
	Simvastatin (high cholesterol)	25	43
	zinc tablets)	83	38
	Average essential medicines domain score	63	22
General service readiness score		60	14

Source: data from SPA, 2013. OPD, outpatient department; RDT, rapid diagnostic test.

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