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Comparison of objective measures and patients' perceptions of quality of services in government health facilities in the Democratic Republic of Congo

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Abstract

Objective: Examine the relationship between patients' perceptions of quality and the objective level of quality at government health facilities, and determine whether the pre-existing attitudes and beliefs of patients regarding health services interfere with their ability to accurately assess quality of care.
Design: Cross-sectional, visit-level analysis.
Setting: Three regions (Nord-Ubangi, Kasai/Kasai-Central and Maniema/Tshopo) of the Democratic Republic of Congo.
Participants: Data related to the inpatient and outpatient visits to government health facilities made by all household members who were included in the survey was used for the analysis. Data were collected from patients and the facilities they visited.
Main Outcome Measures: Patients' perceptions of the level of quality related to availability of drugs and equipment; patient-centeredness and safety serve compared with objective measures of quality.
Results: Objective measures and patient perceptions of the drug supply were positively associated ($\beta = 0.16$, 95% CI = 0.03, 0.28) and of safety were negatively associated ($\beta = -0.12$, 95% CI = -0.23, -0.01). Several environmental factors including facility type, region and rural/peri-urban setting were found to be significantly associated with respondents' perceptions of quality across multiple outcomes.
Conclusions: Overall, patients are not particularly accurate in their assessments of quality because their perceptions are impacted by their expectations and prior experience. Future research should examine whether improving patients' knowledge of what they should expect from health services, and the transparency of the facility's quality data can be a strategy for improving the accuracy of patients' assessments of the quality of the health services, particularly in low-resourced settings.

Key words: external quality assurance, surveys, access, patient safety, patient-centered care, developing countries

Introduction

Emphasis on health systems strengthening in low and middle-income countries continues to increase [1]. Strong, integrated health systems are considered critical to achieving the Sustainable Development Goals' aim of guaranteeing the health of the population [2]. In many countries such as the Democratic Republic of Congo (DRC), fragile health systems have contributed to decades of poor healthcare and a high burden of morbidity and mortality. However, local governments and international donors are dedicating substantial resources to health systems strengthening strategies in these settings [3]. A number of these strategies aim to improve the quality of healthcare, including improving pharmaceutical supply chains, modernizing health facilities and training health workers [4].

As clinical conditions improve, it is important for patients to be aware of the improvement. The patient is increasingly viewed as an integral member of the care team whose attitudes, opinions and preferences are critical factors in the success of medical care [5–7]. Patients tend to exhibit higher rates of compliance with medical recommendations when they trust the provider [8, 9]. Further, evidence suggests that patients' decisions as to whether and from whom to seek healthcare depend at least in part to their perception of the quality of available providers [10].

The degree to which patients' assessments of the quality of services align with objective measures of quality of services is not well understood [11] primarily due to a scarcity of research in this area. The majority of research investigating the congruence of patients' assessments quality of services and objective measures of quality of services has occurred in high-income countries. These studies tend to focus on patients with conditions that require a high level of care, such as cancer and spinal injury and conclude that patients' assessments of quality are unrelated to measures of the care that they received [12–14].

The extent to which the results of this research are transferable to the assessments of quality among patients receiving primary healthcare in low and middle-income countries is uncertain. The limited evidence from low and middle-income countries indicates that patient assessments of care may be correlated with objective measures of quality of services, although this correlation is not perfect [15]. The imperfect correlation may be explained by the tendency of people to interpret their environment through the lens of beliefs and prior experiences, [16] limiting their attention to what conforms to their pre-existing beliefs and attitudes [17].

The primary objective of this study is to examine the relationship between patients' perceptions of quality and the objective level of quality at government health facilities in the DRC. It is hypothesized that objective quality is positively correlated with patients' perceptions of facilities' quality. The secondary objective is to determine whether the pre-existing attitudes and beliefs of patients regarding health services in the DRC interfere significantly with their ability to accurately assess clinical conditions within the facility providing their care. Findings from this study may have implications for health policy makers, administrators and researchers working in low resource settings. Whether improvement in the quality of services that a health facility provides can be expected to impact patient attitudes and behavior is an important question as health systems are strengthened with the aim of improving population health.

Methods

Dataset and population

Data for this study comes from the 2014 baseline survey of the 'Accès aux Soins de Santé Primaires' project, which provided support to the health system in parts of three regions: Nord-Ubangi, Maniema and Tshopo and Kasai and Kasai-Central. The survey included modules for households and government health facilities. Questionnaires were pre-tested in rural areas of the DRC to improve their validity in the study setting. Where possible, results were compared with the DRC's 2013/14 Demographic and Health Survey to confirm the survey's reliability [18, 19].

A sample size of 2100 households was sought for measuring changes in health indicators, based on the ability to detect a 10% increase in the percentage of household members using improved sources of drinking water from a baseline of 31%, with 80% statistical power, assuming a 5% probability of committing a type-1 error (1-sided test), a design effect of 2 and a household non-response rate of 10%.

Households were selected using a two-stage sampling strategy. At first stage, the sampling frame consisting of a full list of all villages with population estimates for each health area was obtained from project staff. From each of the three regions, 35 villages were selected using probability proportional to size. The second-stage sampling frames were created by survey teams who mapped village boundaries and enumerated all households in the village. Following enumeration, a constant number of 20 households was systematically selected from each village to meet the desired sample size of 700 households in each region. Data collectors administered the survey face-to-face to the head of the household or another adult in his/her absence. In areas selected for this analysis, 98.8% of sampled households responded to the survey.

During the household module, a representative from each household reported whether members of the household had received inpatient care within the 6 months prior to the survey and if so, provided detailed information regarding the inpatient stay. Household representatives listed the sources from which each member of the household received outpatient care for an illness or injury within the 4 weeks prior to the survey. Similar information regarding each outpatient encounter was also obtained.

The designated outpatient government health facility serving each selected village was selected for the facility module; the questionnaire was administered face-to-face to the nurse in charge of the facility. The health facility module documented the physical environment, equipment and supplies and services provided at government health facilities. Overall, 98.6% of sampled health facilities responded to the survey.

Data related to the inpatient and outpatient visits made by all household members who were included in the survey was used for the analysis. Selection was not limited to visits in which the survey respondent was the patient, as there is evidence suggesting that caregiver perceptions of quality of services align with patients' perceptions of quality when they reside in the same household [20]. The sample was restricted to visits to sampled government health facilities, which consist of reference health centers, health centers and health posts. Overall, 1862 visits were selected for inclusion in the analysis. The patient was the survey respondent for 44.1% of visits.

Key variables

The prevailing framework for measuring quality of healthcare are Donabedian's 'structure, process, outcome' model [21]. The World Health Organization's (WHO) 'basic concepts in quality' is another commonly-used framework [22]. The WHO identifies six dimensions of quality: effectiveness, efficiency, accessibility, patient-centeredness, equitability and safety. In this study, one WHO

dimension of quality corresponding to each of Donabedian's levels of quality are selected for analysis. At the structural level, accessibility of care is examined. Patient-centeredness is selected to represent process quality. Finally, safety is selected as an outcome of care. The independent variables in the analyses are the objective levels of quality related to each of these dimensions as assessed through the facility survey. Respondents' perceptions of the level of quality along each of these dimensions serve as outcome variables.

In order to explore patient perceptions of quality, it is important to understand the factors that influence patient expectations of health services. Sofaer and Firminger [11] identify seven factors that influence patient expectations of quality, which affects patient perceptions of the experience. Three are environmental-level factors (reputation of provider; extent of choice; social/cultural norms) and four are personal (needs of the patient; personal characteristics of the patient; knowledge of what the patient should expect; previous experience). Data related to previous experience with health services were unavailable. Controls for measures of the six remaining factors are included in the analyses. A description of the construction of each variable used in the study can be found in Table 1.

Study design and methodology

This study is a cross-sectional, visit-level analysis. To begin, the characteristics of visits to government health facilities were summarized using descriptive statistics. Next, the relationship between respondents' perception of quality and the objective level of quality was explored. Simple regression models were estimated to assess correlation.

The relationship between facilities' performance related to each measure of quality and respondents' perceptions of facilities' performance related to each measure of quality (accessibility, patient-centeredness and safety) was then estimated. A probit model was used to estimate the relationship between respondents' perceptions of availability of medications and objective availability of medications for each visit to a health facility. The outcome variable in this model was a binary variable indicating whether the respondent believed the facility's drug supply to be adequate during each visit. The objective availability of medications was represented by the percentage of six medications from the World Health Organization's list of essential drugs [23] that were observed to be available in the facility on the day of the survey.

A separate probit model was also used to explore the relationship between respondents' perceptions of the presence of equipment and the objective presence of basic equipment for each visit to a health facility. The outcome variable in this model was a binary variable indicating whether the respondent believed the facility's equipment to be adequate during each visit. The observed presence of equipment was represented by the percentage of the recommended number of six basic supplies (thermometer, stethoscope, blood pressure cuff, adult scale, pediatric scale and timer) that were observed to be available and in working order in the facility on the day of the survey.

In order to examine the relationship between respondents' perceptions of patient-centeredness and the objective level of patient-centeredness, an ordered probit model was used. The outcome variable was represented by respondents' answers when asked, 'in general, how satisfied are you with how your community involves you in deciding what health services it provides and where it provides them?' The objective level of patient-centeredness at the facility was represented by the degree to which client and community opinions were

reported to be assessed, ranging from a suggestion box to official meetings with community leaders.

An ordered probit model was used to examine the relationship between respondents' perceptions of quality and objective quality for the third dimension: safety. In this model, the outcome variable was a variable comprised of respondents' impressions of the cleanliness of the facility on a five-point scale (very good, good, acceptable, bad and very bad). The objective state of safety at the facility was represented by the percentage of six supplies or practices related to infection control (sterilizer, gloves, sharps box, sanitary toilet or latrine, potable water and safe disposal of bio-hazardous material) that were observed at the facility on the day of the survey.

Probit and ordered probit models were selected based on the form of the independent variables (binary and ordered categorical) and the assumption of non-linear relationships between the independent and dependent variables. Statistical significance was considered at $P < 0.01$ and $P < 0.05$ levels. Data was missing for <5% of observations for respondent reports and objective assessments expect for respondents' report of the availability of drugs (5.58% missing) and equipment (6.61% missing). These missing values did not appear to be systematically related to respondent sex, age or education level. Controls for factors that influence patient expectations (Table 1) were applied to each regression. Probability weights were applied throughout the analysis to account for sampling design; standard errors were clustered at the household level.

Results

A summary of characteristics related to patient visits to health facilities is provided in Table 2. The majority of visits were made to health centers. Most occurred in communities in which the level of satisfaction with the way healthcare runs in the community was mid-high or high. Outpatient visits comprised 72.0% of the total. The patient was unable to perform usual activities for 7 days or less due to the illness or injury associated with 54.1% of visits. Households had to borrow money or sell personal belongings to pay costs associated with 30.8% of visits. Over half of visits were made by patients under age 15 and over and half were made by females. More than one-third of visits were made by a patient from an impoverished household.

Volumes of visits were similar among the three regions. The vast majority (90.5%) occurred in rural areas. Education level was measured as the level of educational attainment of the survey respondent if the patient was less than age 15, and the level of educational attainment of the patient otherwise. Almost 60% of visits were associated with a respondent or patient who had completed primary school. Finally, 36.8% of visits were made by patients who lived in households that owned a radio.

Table 3 summarizes the characteristics of the facilities associated with each visit. Facility survey results indicated that more than half of the six essential drugs assessed were available in the facility associated with 47.8% of visits. Respondents reported that the drug supply was adequate for 32.6% of visits. Facility survey results and respondent reports regarding the drug supply were not significantly correlated.

Facilities fared more poorly in terms of availability of equipment, with more than half of the pieces of equipment assessed during the facility survey available in the facility in 33.5% of visits. However, respondents reported the equipment to be adequate for 53.2% of visits. The association between facility survey results and respondent

Table 1 Construction of variables

Category	Dimension	Survey question	Variable Type	Range/categories
Outcome variable	Accessibility	In your opinion, was the healthcare facility's drug supplies adequate for (NAME'S) treatment?	Binary	Yes; No
		In your opinion, was [the healthcare provider's] equipment adequate for (NAME'S) treatment?	Binary	Yes; No
	Patient-centeredness	In general, how satisfied are you with how your community involves you in deciding what health services it provides and where it provides them?	Categorical (three item scale)	Satisfied; Neither satisfied nor dissatisfied; Dissatisfied
	Safety	What is your general impression about overall cleanliness of the facility, including rooms and toilets?	Categorical (five item scale)	Very good; Good; Neither good nor bad; Bad; Very bad
Independent variable	Accessibility	Is this drug currently in-stock? (Amoxicillin, atenolol, ciproflaxin, cotrimoxazole, diazepam and paracetamol)	Continuous	Percentage of the six drugs that were in-stock
		I will read you a list of equipment and for each piece; please tell me how many the facility has and the number functional (thermometer, stethoscope, blood pressure cuff, adult scale, pediatric scale and timer)	Continuous	Percentage of recommended number of six basic supplies observed to be available and in working order
		Does this facility have any system for determining clients' opinions about the health facility or its services?	Categorical	Suggestion box; Client survey form; Client interview; Official meeting with community leaders; Informal discussion with client or community; No client feedback
	Safety	What is this facility's disposal practice for sharps such as needles, glass, surgical instruments, etc.?	Binary	Sharps box; Other method
		I will read you a list of equipment and for each piece please tell me how many the facility has and the number functional (sterilizer, sterilized gloves)	Binary	Any functional; None functional
		Is there a sanitary toilet or latrine that is available for clients to use, such as those with sewer connections, septic system connections, pour-flush latrines, ventilated improved pit latrines and pit latrines with a slab or covered pit?	Binary	Yes; No
		Is there potable water, that is to say safe drinking water, in the structure?	Binary	Yes; No
		What is this facility's disposal practice for biomedical wastes such as placenta, human body parts, laboratory waste, etc.?	Binary	Other method; Thrown in open pit
Control variable	Facility reputation	In general, how satisfied are you with the way healthcare runs in your community- satisfied, neither satisfied nor dissatisfied or dissatisfied?	Continuous	Constructed variable; index of community satisfaction at the facility level
	Needs of patient	How many days did (NAME) have to stop doing his/her usual activities?	Numeric	0; 99
		Visit type	Categorical (2)	Outpatient; Inpatient
		Did you or another member of your household have to borrow money or sell personal belongings in order to pay for these costs?	Binary	Yes; No
	Extent of choice	Where did (NAME) get care for this problem the last time, without being hospitalized? AND Where was (NAME) hospitalized the last time?	Continuous	Constructed variable: number of types of facilities reportedly visited by patients by health zone
	Personal characteristics of patient	Age in years (of patient)	Categorical (3)	<15; 15–49; 50+
		Sex (of patient)	Categorical (2)	Female; Male
		Poverty (of household)	Binary	Constructed variable: poverty = low or low-middle wealth quintiles
	Social/Cultural norms	Province	Categorical (3)	Nord-Ubangi; Kasai/Kasai-Central; Maniema/Tshopo
		Setting	Categorical (2)	Rural; Peri-urban
	Knowledge of what patient should expect	Level of education completed (of patient or respondent if patient is less than 15 years old)	Categorical (4)	No education; Completed primary
		Does your household have a radio?	Binary	Yes; No

Table 2 Characteristics related to patient visits to health facilities (*n* = 1862)

		Variable	*n*	%
Environmental factors				
Reputation of provider	Facility type	Health center	1421	76.3
		Reference health center	370	19.9
		Health post	71	3.8
	Index of community satisfaction with the way healthcare runs in the community	High	904	48.5
		Mid-high	699	37.5
		Mid-low	203	10.9
		Low	56	3.0
Extent of choice	Number of types of facility reported to have been visited by respondents, by health zone	1–4 facilities	557	29.9
		5–9 facilities	1305	70.1
Social/Cultural norms	Region	Maniema/Tshopo	683	36.7
		Nord-Ubangi	609	32.7
		Kasai/Kasai-Central	570	30.6
	Setting	Rural	1686	90.5
		Peri-urban	176	9.5
Personal factors				
Needs of patient	Visit type	Outpatient	1341	72.0
		Inpatient	521	28.0
	Number of days that the patient had to stop doing his/her usual activities.	7 days or less	1008	54.1
		8–14 days	237	12.7
		15–21 days	58	3.1
		22–30 days	52	2.8
		>30 days	34	1.8
		Missing	473	25.4
	Household had to borrow money or sell personal belongings in order to pay for costs associated with illness	No	1184	63.6
		Yes	573	30.8
		Missing	105	5.6
Personal characteristics of patient	Age bracket	<15	1001	53.8
		15–49	689	37.0
		50+	172	9.2
	Sex	Female	1020	54.8
		Male	842	45.2
	Impoverished household[a]	Yes	630	33.8
Knowledge of what the patient should expect	Education level[b]	No education	351	18.9
		Some primary	397	21.3
		Completed primary	813	43.7
		Completed secondary	301	16.2
	Household possession of a radio	Yes	686	36.8

Table displays unweighted totals and weighted percentages. [a]Household falls in low or low-middle wealth quintile. [b]Education level of survey respondent is included if patient is under age 15; otherwise, education level of patient is included.

assessments was positive and significant (β = 0.02, 95% CI = 0.01, 0.03).

Overall, at least three of the five infection control practices or supplies were observed in 45.9% of cases, and the patients reported that they were satisfied with the cleanliness of the facility for 52.7% of visits. Respondents' assessments of safety were found to be negatively associated with facility survey data (β = −0.17, 95% CI = −0.25, −0.09).

Lastly, there was a substantial degree of variation among facilities in terms of the degree to which they reported soliciting community or patient opinions. Over 19% reported no methods of solicitation of opinions, while 58.7 reported three methods and 14.0% reported six or more. Respondents reported being largely dissatisfied; in 62.5% of visits the patient was dissatisfied with community involvement in decision-making. No significant association between facility survey results and respondent assessments was detected.

Table 4 displays the results of the probit models. After controlling for environmental and personal factors, facility observations

and respondent perceptions were positively and significantly associated for one of the four quality measures, drug supply, although this was not significant in the bivariate analysis. Facility observations and respondent perceptions related to safety were negatively and significantly associated.

A number of environmental factors were found to be significantly associated with respondents' perceptions of quality. Facility type was significantly correlated with two quality measures: drug supply and equipment. For both measures, respondents who had gone to a health posts were significantly more likely to assess quality positively compared with those at reference health centers (β = 0.81, 95% CI = 0.06, 1.55 and β = 1.35, 95% CI = 0.33, 2.37, respectively). Respondents at health centers were also significantly more likely to assess the drug supply to be adequate compared with patients at reference health centers (β = 0.47, 95% CI = 0.06, 1.55). Community satisfaction with the way heath care runs in the community was positively and significantly associated with perceptions for three quality measures, equipment (β = 0.66, 95% CI = 0.25, 1.07), drug supply (β = 0.66, 95% CI = 0.29, 1.03) and negatively and

Table 3 Facility quality measures based on facility survey data and respondent assessments with comparison using simple regression (n = 1862)

Facility survey				Household survey (patient assessment)					Simple regression
		n	%				n	%	Beta-coefficients [CI]
Accessibility				Accessibility					
Number of tracer drugs in-stock on the day of the survey	0	52	2.8	Drug supply was adequate	No		990	62.6	0.07 [−0.05; 0.18]
	1	79	4.2		Yes		763	32.6	
	2	380	20.4		Missing		109	4.9	
	3	461	24.8						
	4	552	29.7						
	5	330	17.7						
	6	8	0.4						
Equipment availability	1	255	13.7	Equipment supply was adequate	No		527	42.6	<0.001** [0.01; 0.03]
	2	274	14.7		Yes		1212	53.2	
	3	409	22.0		Missing		123	4.2	
	4	342	18.4						
	5	233	12.5						
	6	48	2.6						
	missing	301	16.2						
Safety				Safety					
Infection control practices and supplies	0	97	5.2	Cleanliness of the facility	Negative		663	45.1	−0.17** [−0.25; −0.09]
	1	418	22.5		Positive		1146	52.7	
	2	472	25.4		Missing		53	2.2	
	3	615	33.0						
	4	209	11.2						
	5	32	1.7						
	missing	19	1.0						
Patient-centeredness				Patient-centeredness					
Solicitation of community/ patient opinions	0	366	19.7	Satisfaction with community involvement in health services decision-making	Dissatisfied		1106	62.5	−0.05 [−0.10; 0.00]
	1	48	2.6		Satisfied		754	37.2	
	2	23	1.2		Missing		2	0.2	
	3	1092	58.7						
	4	23	1.2						
	5	50	2.7						
	6+	260	14.0						

Table displays unweighted totals, weighted percentages, beta-coefficients and 95% confidence intervals. Statistical significance is indicated using *'s next to the beta coefficients. Significance is considered at *$P < 0.05$ and **$P < 0.01$.

significantly associated for solicitation of opinion (β = −1.10, 95% CI = −0.70, −0.07).

The extent of choice of facilities in the area was significantly associated with respondent assessment of the drug supply (β = −1.10, 95% CI = −0.20, −0.01) and equipment (β = −0.20, 95% CI = −0.33, −0.06) during their visit to a government health facility. In both cases, those in areas with a higher degree of choice were significantly less likely to assess the drug supply and equipment at the facility to be adequate.

Region was significantly associated with three quality measures: equipment, drug supply and safety. Respondents in Kasai/Kasai-Central and Maniema/Tshopo were significantly less likely to assess the drug supply (β = −1.16, 95% CI = −1.54, −0.78), and equipment (β = −0.46, 95% CI = −0.91, <0.00), to be adequate compared with patients in Nord-Ubangi. However, respondents in Kasai/Kasai-Central (β = 0.67, 95% CI = 0.29, 1.05) and Maniema/Tshopo (β = 0.31, 95% CI = 0.02, 0.59) were significantly more likely to assess the facility's safety to be satisfactory compared with those in Nord-Ubangi.

Finally, setting was significantly associated with two quality measures, equipment and safety. Respondents in peri-urban areas were significantly more likely to assess equipment as adequate (β = 1.42, 95% CI = 0.60, 2.23), and significantly less likely to assess safety to be satisfactory (β = −0.56, 95% CI = −0.96, −0.16), compared with patients in rural areas.

Discussion

This study examines the relationship between patients' (and their family members') perceptions of quality and the objective level of quality at government health facilities. Findings indicate that the hypothesis that objective quality is positively associated with patients' perceptions of quality is upheld for one of the four dimensions of quality examined, drug supply. One dimension, safety, was found to be significantly and negatively associated with objective levels of quality. The analyses support the secondary hypothesis that the pre-existing attitudes and beliefs of patients regarding health services interfere with their ability to accurately assess clinical conditions within the facility providing their care. However, results show that environmental-level factors (reputation of provider; extent of choice; social/cultural norms) have more of an impact on patient perceptions than do personal factors (needs of the patient; personal characteristics of the patient; knowledge of what the patient should expect). Across all four models, environmental factors are more frequently significant and on average have stronger effect sizes than do personal factors.

Improving the quality of health services has intrinsic value. However, it is not clear that patients' perceptions of quality match more objective measures. Quality improvement alone may be limited in its use as a means toward improving patient's trust in the health

Table 4 Probit and ordered probit models of the relationship between observed measures of facility quality and respondents' assessments of quality, according to patient and facility characteristics

	Access				Safety		Patient-centeredness	
Model type Outcome variable	Probit Drug supply (*n* = 1230)		Probit Equipment (*n* = 1228)		Ordered probit Safety practices (*n* = 1253)		Ordered probit Community opinion (*n* = 1292)	
	Beta-coefficient	[CI]	Beta-coefficient	[CI]	Beta-coefficient	[CI]	Beta-coefficient	[CI]
Facility quality variable	**0.16***	[0.03; 0.28]	0.84	[−0.25; 1.94]	**−0.12***	[−0.23; −0.01]	−0.03	[−0.08; −0.01]
Facility type								
Reference health center	Reference category		Reference category		Reference category		Reference category	
Health center	**0.47***	[>0.00; 0.93]	0.05	[−0.33; 0.43]	−0.22	[−0.49; 0.05]	−0.09	[−0.49; 0.05]
Health post	**0.81***	[0.06; 1.55]	**1.35***	[0.33; 2.37]	−0.10	[−0.59; 0.39]	−0.31	[−0.59; 0.39]
Index of community satisfaction with the way healthcare runs in the community	**0.66****	[0.25; 1.07]	**0.66****	[0.29; 1.03]	−0.31	[−0.70; 0.07]	**−1.10****	[−0.70; 0.07]
Visit type (outpatient)	−0.20	[−0.51; 0.10]	−0.22	[−0.55; 0.11]	0.05	[−0.18; 0.29]	−0.02	[−0.18; 0.29]
Number of days that the patient had to stop doing his/her usual activities	**0.01***	[>0.00; 0.01]	<0.01	[<0.00; 0.01]	<0.01	[−0.01; <0.00]	−0.01	[−0.01; <0.00]
Household had to borrow money or sell personal belongings in order to pay for costs associated with illness	−0.34	[−0.70; 0.02]	−0.32	[−0.68; 0.04]	−0.10	[−0.37; 0.16]	0.16	[−0.37; 0.16]
Extent of choice	**−0.10***	[−0.20; −0.01]	**−0.20****	[−0.33; −0.06]	0.04	[−0.05; 0.12]	0.03	[−0.05; 0.012]
Age								
<15	Reference category		Reference category		Reference category		Reference category	
15–49	−0.09	[−0.42; 0.23]	0.13	[−0.20; 0.45]	−0.04	[−0.29; 0.22]	−0.02	[−0.29; 0.22]
50+	−0.21	[−0.71; 0.20]	−0.41	[−0.94; 0.13]	0.19	[−0.19; 0.56]	−0.24	[−0.19; 0.56]
Sex (male)	−0.15	[−0.42; 0.13]	−0.05	[−0.34; 0.24]	0.11	[−0.12; 0.35]	−0.04	[−0.12; 0.35]
Impoverished household	−0.25	[−0.70; 0.20]	−0.43	[−0.91; 0.05]	0.11	[−0.13; 0.35]	0.20	[−0.13; 0.35]
Region								
Nord-Ubangi	Reference category		Reference category		Reference category		Reference category	
Kasai/Kasai-Central	**−1.16****	[−1.54; −0.78]	**−0.46***	[−0.91; <0.00]	**0.67****	[0.29; 1.05]	0.27	[0.29; 1.05]
Maniema/Tshopo	**−2.00****	[−2.34; −1.66]	**−0.43***	[−0.80; −0.05]	**0.31***	[0.02; 0.59]	0.22	[0.02; 0.59]
Setting (peri-urban)	0.37	[−0.29; 1.04]	**1.42****	[0.60; 2.23]	**−0.56***	[−0.96; −0.16]	0.06	[−0.096; −0.16]
Education Level								
No education	Reference category		Reference category		Reference category		Reference category	
Some primary	0.23	[−0.18; 0.63]	−0.15	[−0.68; 0.38]	−0.17	[−0.55; 0.20]	−0.04	[−0.55; 0.20]
Completed primary	0.17	[−0.25;0.59]	−0.02	[−0.51; 0.47]	−0.22	[−0.58; 0.14]	−0.24	[−0.58; 0.14]
Completed secondary	0.44	[−0.12; 1.01]	−0.18	[−0.83; 0.46]	−0.26	[−0.72; 0.20]	−0.42	[−0.72; 0.20]
Household possession of a radio	−0.07	[−0.46; 0.32]	−0.09	[−0.49; 0.30]	**−0.30***	[−0.55; −0.04]	−0.05	[−0.55; −0.04]

Table presents beta-coefficients and 95% confidence intervals. Statistical significance is shown using *'s next to the beta coefficients. Significance is considered at *P < 0.05 and **P < 0.01.

provider, compliance with medical advice and their likelihood of selecting the provider who delivers the highest-quality services. This study supports the conclusions of research in both higher and lower income settings that overall, patients are not particularly accurate in their assessments of quality because their perceptions are impacted by their expectations and prior experience [13, 15, 24, 25].

Additional steps should be taken to mitigate the impact of patients' prior experiences and expectations. This study found that patients assess the availability of drugs most accurately; this may be due to the fact that in the DRC patients are given a prescription to purchase needed medicines from private pharmacies during a stock-out at the government facility. Patients are made aware that they needed a particular medicine and that the facility cannot provide it. Evidence suggests that patients who understand the types of drugs and equipment that are needed, the infection control practices that should be in place, and their right to have their opinions heard may

assess quality more accurately than those who do not [26, 27]. Those who have data on the facility's performance, particularly on measures that they cannot easily observe such as infection control practices, may be more accurate still [28]. Future research should examine whether improving health knowledge and transparency of the facility's quality data can be a strategy for improving the accuracy of patients' assessments of the quality of the health services, particularly in low-resourced settings.

This study has several limitations. Data related to the outcomes of visits and patients' prior experience with health services were unavailable, though these may be important factors in patients' subsequent perceptions of quality. The data were restricted to those who had visited a health provider for an illness or injury and did not include those who sought preventive care. This may understate the degree to which patients are able to assess quality, as patients who are not sick or injured may be more attuned to conditions in

the facility. The survey item used to assess patient-centeredness, 'in general, how satisfied are you with how your community involves you in deciding what health services it provides and where it provides them?' is a double-barreled question which may, therefore, understate the degree to which respondents felt involved overall. Finally, conditions at the health facility were not observed at the precise time of the patients' visits.

Conclusion

Patients' perceptions of the quality of health services can influence the effectiveness of their care; therefore, the accuracy of their assessments of quality is important. Findings from this research indicate that patients' pre-existing attitudes and beliefs may result in perceptions of quality that differ from objective measures. This may contribute to patients being less likely to avoid poor-quality providers and less likely to comply with medical advice. Efforts to improve the accuracy of patient perceptions could focus on increasing patients' knowledge of what they should expect and the transparency of quality data.

Funding

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