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The Effect of Health Service Quality on Health Facility Choice and Health Outcomes in Malawi

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Abstract

We study the impact of health care service quality on health facility choice and health outcomes in Malawi. We use Malawi Demographic and Health Survey (MDHS) 2015 and Malawi Service Provision Assessment (MSPA) 2013-2014 to examine the effect. MSPA provides many useful health care service quality information that has not been examined much in the previous studies. We create health care service quality measures to represent infrastructure quality, medical supplies quality and health facility management quality. We examine the impact of these quality measures on the demand for health services and health outcomes. We find that people who live closer to quality health facilities are more likely to utilize health services such as facility delivery. However, we do not find strong and significant evidences that healthcare quality is associated with positive health outcomes due to the insufficient data and the weak identification strategies.

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1. Introduction

The aim of Millennium Development Goal (MDG) 2 was to achieve universal primary education by 2015 and it was mainly focused on increasing the primary school net enrollment in the developing countries. Although MDG 2 has been achieved in many parts of the developing world, expanding education quantity is not enough because what generates real returns to education is learning and acquiring skills. Unfortunately, learning or quality education is not happening in many countries and this is why Sustainable Development Goal (SDG) 4 emphasizes the quality aspect of education throughout its targets and indicators.

Likewise, the traditional focus of much of the global health interventions has been on expanding formal healthcare access for reducing child mortality, improving maternal health and combating infectious diseases to name a few. It is shown that formal healthcare access in low income countries can be significantly improved by deploying community health workers (Singh and Sachs, 2013) or by providing financial incentives (Obare et al., 2014). However, accessing to formal healthcare services in some circumstances may not guarantee that it translates into the desired health outcomes. For example, one of the world's largest cash incentive programs for maternity services in India (Powell-Jackson et al., 2015) and a ban on informal health providers in Malawi (Godlonton and Okeke, 2016) increased the uptake and utilization of the formal healthcare services but there was no strong evidence that their key outcomes such as neonatal and infant mortality rates were reduced.

One of the key determinants that connects healthcare access to desired health outcomes is healthcare quality. When it comes to healthcare quality, there are mainly three issues to be discussed: 1) how to measure healthcare quality, 2) whether there exists demand for quality health services, and 3) whether quality healthcare services bring positive outcomes of interest. We first use Malawi Service Provision Assessment (SPA) 2013-2014 data to measure healthcare quality on all the health facilities in Malawi. Next, we combine Malawi SPA 2013-2014 data with Malawi Demographic and Health Survey (MDHS) 2015 where global positioning system (GPS) information for households' residence and their utilization of health services are available. With these two dataset, we try to answer whether people respond to healthcare quality in the context of Malawi. Finally, we analyze the impact of healthcare quality on health outcomes of interest.

We present evidence that people who live closer to quality health facilities are more likely to utilize health services such as facility delivery. However, we do not find strong and significant evidences that healthcare quality is associated with the reduction of neonatal and infant mortality rates due to the weak IV issue as well as the endogeneity problem.

The remainder of the paper is organized as follows. Section 2 describes the data and background and Section 3 explains our empirical strategies. After presenting the results in Section 4 and we discuss the implications of our results and conclude in Section 5.

2. Data and background

To examine the association between the quality of health facility and the demand for health, we used two sets of data: 1) Malawi Demographic and Health Survey (MDHS) 2015 and 2) Malawi Service Provision Assessment (MSPA) 2013/4.

MDHS 2015 is a representative national level survey of females and adults. Female respondents are aged between 15 and 49. It contains individual and household level information such as basic socioeconomic status information and family background information, health center use, health outcomes, the place of birth and birth information.

MSPA 2013/4 collected information of health facilities. The survey was conducted between July 2013 and February 2014, the first large scale systematic and detailed survey of health facilities in Malawi. It provides national and sub-national information on the availability and quality of services from all functioning health facilities. It also contains information about the quality of health facilities in Malawi with its exact location information. The total number of health facilities collected from MSPA is 973, including general hospitals, health clinic, private clinic, dispensary, and health post. The location information includes latitude and longitude coordinates. Figure 1 shows the distribution of health facility location in Malawi.

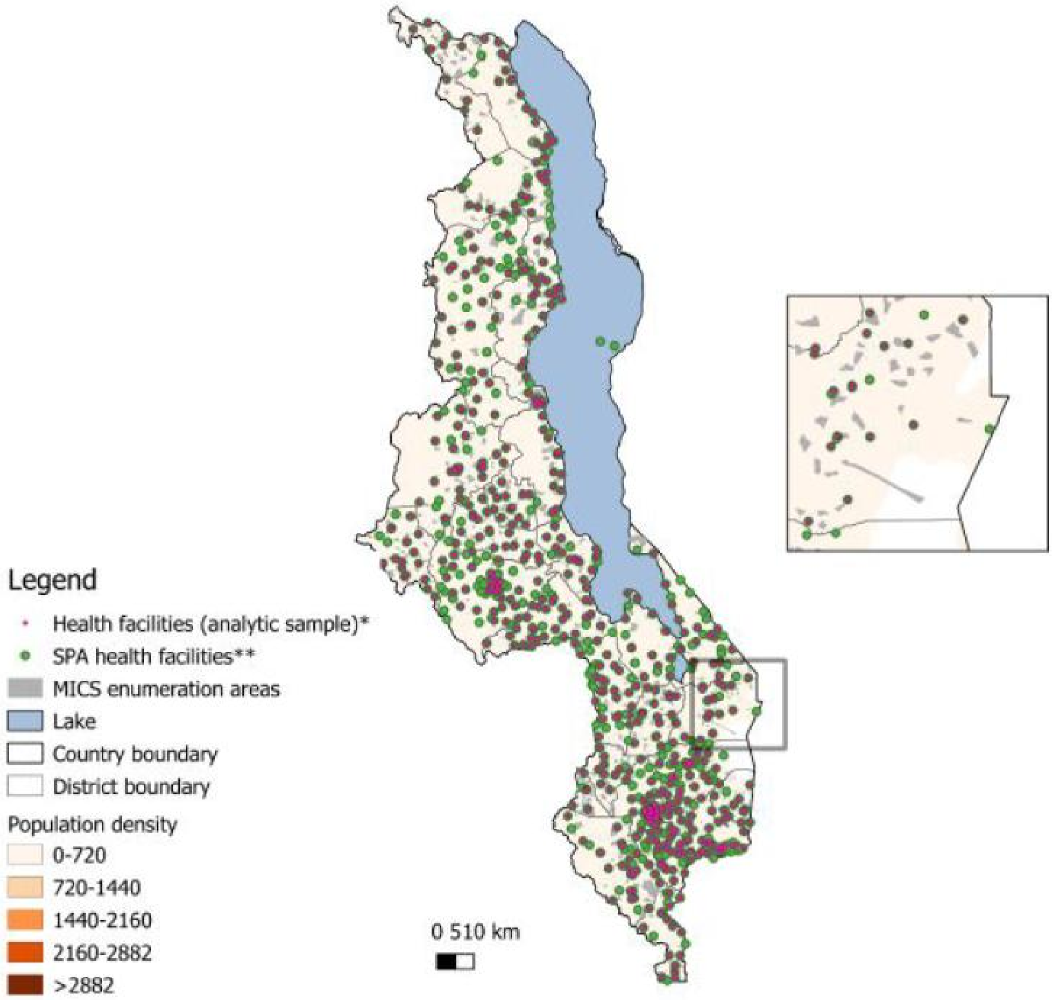


Figure 1. Health Facility Distribution in Malawi (source: Liu et al. 2019)

Along with location information, it collects an audit of health facility resources, clinical practice information, and medical personnel information. More specifically, the rich set of quality measure includes quality of medical personnel (education level, medical training experiences and so on), the quantity of medical supplies, user fees, payment system, the type of health facility, managing authority (whether the health facility is run by government, Christian health association of Malawi, NGOs, private and faith-based organizations) and so on. The biggest strength of MSPA is that the survey contains GPS information of health facilities. Identifying the exact location of health facilities makes it possible to calculate the distance from MDHS respondent’s home to the nearest health facilities.

First, we match MSPA 2013/4 with MDHS 2015 in order to examine whether the quality of health facilities does matter for the choice of health facilities. The information about the choice of health facilities is included in the MDHS 2015 while the quality of health facilities is included in the MSPA 2013/4. As mentioned above, MSPA 2013/4 includes GPS information of health facilities. MDHS 2015 provides survey respondents' village information that includes GPS information of each village. We use the GPS information of health facilities and villages to identify the nearest health facilities from each survey respondent's home. MDHS 2015 also contains information whether the survey respondent visits health facility to get treatment, which enables identifying the choice of quality health facilities.

One weakness of our data set is that no exact information about the health facilities in which individual respondents visit is available. Instead, we assume that the nearest health facility is the one frequently used by individual respondent. With this assumption, we hypothesize that if the nearest health facility is a quality health facility, it increases the number of health facility visit when the health service is needed.

Table 1 shows the descriptive statistics of several health facility quality measures collected from MSPA survey. Among 973 health facilities, 83% provides child vaccination and 86% provides family planning service such as providing condoms and education sessions. Almost all health facilities (about 96%) provides basic curative care service for children under age 5. Due to high malaria prevalence rate in Malawi, almost all health facilities (about 98%) provide malaria treatment service. With regard to birth delivery at health facilities, 70% of health facilities provide normal birth delivery service while less than 10% of health facilities have the capability of performing a cesarean delivery.

Table 1. Descriptive statistics of health facility quality measures

	(1)	(2)
VARIABLES (N=973)	Mean	SD
Child vaccination	0.828	0.378
Growth monitoring service	0.848	0.359
Curative Care service for children under age 5	0.964	0.185

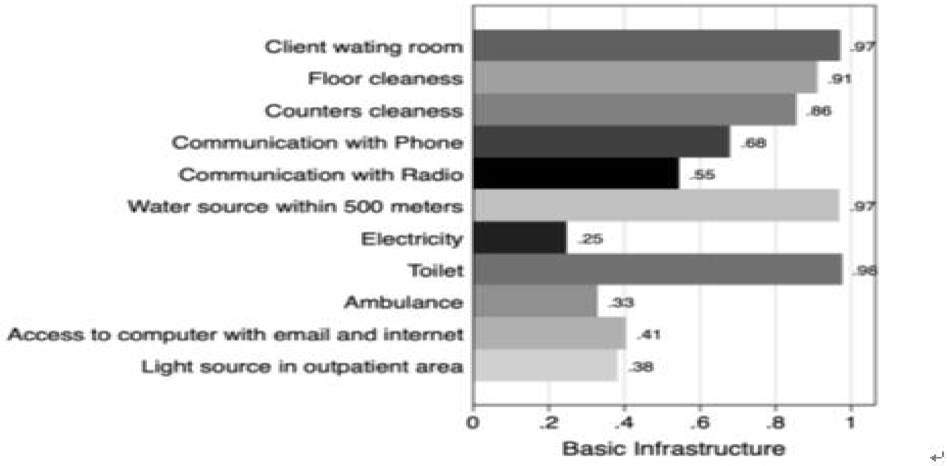
Family planning service	0.859	0.348
Antenatal care service	0.771	0.420
PMTCT	0.734	0.442
Normal delivery	0.699	0.459
Malaria treatment	0.975	0.157
STIs treatment	0.960	0.196
TB treatment	0.605	0.489
HIV testing and counselling	0.880	0.325
HIV/AIDS antiretroviral prescription	0.767	0.423
HIV/AIDS care and support services	0.729	0.444
Non-communicable diseases treatment	0.901	0.298
Minor surgical services	0.921	0.270
Cesarean section	0.0941	0.292
Laboratory diagnostic services	0.870	0.336
Blood typing services	0.127	0.333
Blood transfusion service	0.111	0.314

Notes: All the variables in Table 1 are dummy variables which equal to 1 when its service is available.

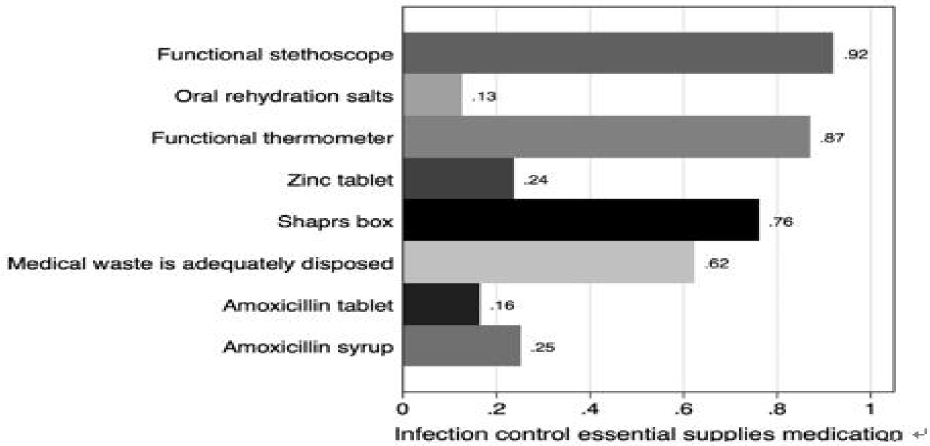
Among various health quality measures, we select several quality indicators that represent well the general quality level of health facilities. Since health facility quality is difficult to observe and to define, the measurement of health facility quality is still debatable. World Health Organization (WHO) defines six measurements to assess health quality improvement: 1) service delivery, 2) health workforce, 3) information, 4) medicines, 5) financing and 6) governance. Although WHO provides a broad guideline for measuring health facility quality to create objective measurement system, only few studies have discussed the health quality measurement.

We follow Liu et al. (2019) to create health quality measures. An index of structural quality based on the facility audit is consistent with the guidelines provided by WHO Service Availability and Readiness Assessment (SARA). MSPA provided several structural quality measures creating three broad sets of quality measure: 1) basic infrastructure quality, 2) infection control, essential supplies medication, and 3) staffing and management. In this paper, we use several quality measures to construct three broad sets of quality measure. First, basic infrastructure quality consists of eleven measures: client waiting room, floor cleanness, counters cleanness, communication with phone, communication with radio, water source within 500 meters, electricity, toilet, ambulance, access to computer with email and internet, light source in outpatient area. Second, an index of measures related to infection control and essential supplies medication includes functional stethoscope, oral rehydration salts, functional thermometer, zinc tablet, sharps box, whether medical waste is adequately disposed, amoxicillin tablet, amoxicillin syrup. Third, staffing and management measure includes last supervisory visit within 6 months, health facility data-based decision process, checklist for quality of services data, feedback provision, routine quality assurance activities, reporting client opinion in place, 24 hours staff, management team meeting every 6 months.

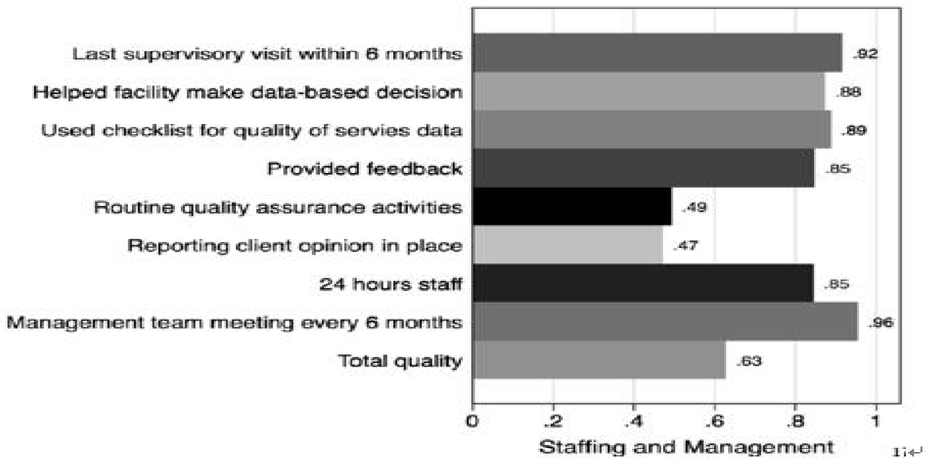
Figure 2 shows the summary of each quality measure. Figure 2 (a) shows the distribution of functioning health facilities with regard to basic infrastructure. For example, 97% of health facilities in Malawi have functioning client waiting room, only 33% of health facilities have ambulance and only 41% have an access to computer with email and internet. Figure 2 (b) shows the distribution of health facilities with infection control and essential medicine supplies. 92% of health facilities have functioning stethoscope and 76% of health facilities have sharp boxes. On the contrary, only 13% of health facilities have oral rehydration salts while only 16% of health facilities have amoxicillin tablet. Figure 2 (c) shows the distribution of health facilities with quality staff and management system. 92% of health facilities have the system of supervisory visits within 6 months, 85% of health facilities provide feedback. However, only 47% of health facilities place reporting client opinion in the health facilities and 49% of health facilities have system of routine quality assurance activities.



(a) Basic Infrastructure



(b) Infection control and essential medicine supplies



(c) Staffing and Management

Figure 2. Health Facility Quality Measures

Using these three broad categories of health quality index, we could identify each health facility's quality level by averaging the total quality measures (Liu et al., 2019). For robustness check, we use different indicators (whether health facilities provide cesarean section delivery, whether health facilities have essential surgical care guideline, whether health facilities provide HIV test kit) to proxy the health facility quality. Although the health quality measures that we use in this paper include various indicators, the simple average of those measures may not provide accurate information of health facility quality. Factor analysis of indicators to provide the alternative total quality index is conducive to constructing the total quality measure, which is left for the future work. Despite the limitations, the health facility quality index used in this paper provides comprehensive information of health facilities. Finally, we also utilize rainfall information from National Oceanic and Atmospheric Administration (NOAA). Since our identification strategy uses rainfall data at the time of birth delivery to generate exogenous variation in travel costs to the health facilities, we identify rainfall information for each individual's place of birth, month and year of birth. Rainfall data from NOAA provides monthly level precipitation from 1979 and 2017 based on 2.5 by 2.5 grid calculation, which varies at the monthly level and village level. Based on the information of birth location and timing from MDHS, we could match precipitation data with each individual in our sample.

3. Empirical Strategies

Before we discuss our empirical strategies, we briefly discuss our conceptual framework. The basic model that our study follows is Gertler et al. (1987) and Sahn et al. (2003). Individual's choice over several options of health care services depends on several factors. An individual maximizes his utility by choosing the option that gives the highest return. The utility function is dependent on several factors such as income/wealth level, socioeconomic status, preference for health care service, knowledge about the health care quality, and risk/time preference. As Sahn et al. (2013) suggested, individual's utility from his choice on health care service (for example, whether he chooses treatment from hospital or he never chooses to get treatment from health facility) is determined by the equation (1).

$$V_j = f(y - p_j) + Q(X, Z_j) + e_j \quad (1)$$

where V_j is the utility he obtains from his choice of health care service j, y - p_j is net income after paying for health care option j. Q(X, Z_j) indicates the health facility quality function that is dependent on two set of vectors X and Z_j. X is a set of control variables at the individual or household level such as income, wealth, traveling costs to health facility. Z_j is a set of health center-choice specific variables representing the quality of medical care service of j. In sum, the quality function Q(X, Z_j) depends on observables (X) and the quality measure of health care services (Z_j). The key component of this model is that the quality function is explicitly included in the individual's utility function, which means that an individual responds to the quality of health facilities.

Many previous studies have examined the determinants of demand for health facilities by studying the effect of the supply of health facilities. In developing countries, it is well understood that the traveling cost to the health facilities is one of the important factors for the low demand for health facilities. In order to reduce mortality/morbidity rate in developing countries, the policy makers have tried to increase the number of health infrastructures. Although the increasing accessibility to health facilities contributes to the improvement of health outcomes in developing countries, it is obvious that the improvement of health outcomes in the developing countries is insufficient without adequate quality improvement of health facilities in developing countries (Leslie et al., 2017).

Based on the conceptual framework introduced by Sahn et al. (2003), our empirical strategies explicitly control for health facility quality using MSPA data set. We estimate the effect of health facility quality on health facility choice controlling for traveling cost to health facilities that is also important factor for health facility choice. Our empirical strategy equations are of the general form:

$$H_{ijmt} = \alpha_0 + \alpha_1 Quality_{ijmt} + \alpha_2 Distance_{ijmt} + \alpha_3 Rainfall_{ijmt} + \alpha_4 Quality_{ijmt} * Distance_{ijmt} + \alpha_5 Quality_{ijmt} * Rainfall_{ijmt} + \alpha_6 Distance_{ijmt} * Rainfall_{ijmt} + \alpha_7 Quality_{ijmt} * Distance_{ijmt} * Rainfall_{ijmt} + X_{ijmt} + \delta_j + \theta_t + \pi_m + \varepsilon_{ijmt} \quad (2)$$

where H_{ijmt} is the health facility choice outcome variable by a female individual i in the residence village j when she gives a birth in the month m in the year t. In this paper, we mostly focus on an indicator whether the individual gives a birth at a health facility for health facility choice outcome. Thus, if an individual delivers a baby at health facility, H_{ijmt} is equal to 1 and 0 otherwise. $Quality_{ijmt}$ is the measure of health facility quality that is explained in the previous section while $Distance_{ijmt}$, $Rainfall_{ijmt}$ both represents the traveling cost to the health facility. For the easier interpretation of our coefficients, we define inverse quality measure. That is, if the health facility quality is good, the quality measure, $Quality_{ijmt}$ is becoming lower.

Accordingly, the theoretical prediction of α_1 is negative and α_2 and α_3 are also negative given the assumption that an individual responds to good quality health facility positively and the longer distance to health facility or the more rainfall an individual experiences prevents an individual from visiting health facility for giving a birth. X_{ijmt} is an individual control set of vector such as income, wealth level, female respondent's education level, age at the time of giving a birth, the total number of babies, the pregnancy duration, gender of baby, the birth order of baby, historical mean of rainfall level. δ_j controls for village fixed effect, θ_t controls for year of birth fixed effect for newborn births, π_m controls for month of birth fixed effect for newborn births. We also control for all the interaction terms of the three main regressors ($Quality_{ijmt}$, $Distance_{ijmt}$, and $Rainfall_{ijmt}$) to run a fully saturated model. The interaction term captures the heterogeneity effect of each regressors.

For example, α_4 is the heterogeneous effect health facility quality by distance to health facilities. As addressed in the coefficient of α_2, the farther distance to health facilities costs more for traveling leading to low demand for health facility. In addition, if the health facility quality is worse than other health facilities, α_4 should be less than 0. Similarly, α_5 captures the heterogeneous effect if traveling cost varied exogenously by rainfall level at the time of giving a birth by health facility quality. If α_5 is negative, traveling cost incurred by rainfall to health facilities deters health facility visits and this aggravates the health facility choice when the health facility quality is bad. α_7 is the coefficient of our main interest and represents the heterogeneous effect of traveling cost to health facilities by health facility quality. We cluster the standard error at the village level (sampling unit) to account for any correlations across individuals within same villages.

One potential concern in our estimation strategy is the endogeneity of our regressors. Rainfall at the time of giving a birth is considered exogenous so the regressor of rainfall is relatively free from endogeneity concern. However, both health facility quality and distance to health facility are potential concerns. Unobservable variables could be correlated with regressors of interest and outcome variables. For example, if an individual who has a strong preference for seeing a doctor, he prefers staying close to health facilities or good quality health facilities. This residential sorting could confound the true effect of both regressors on health facility choice. We do recognize this potential concern but this concern is relatively small in the context of Malawi. Residential sorting based on the information of health facility location and quality is limited and the people in Malawi do not migrate often from villages to villages. However, for the conservative interpretation of our estimates, we do not emphasize much on causal effect of our regressors on the outcome variable, instead we interpret the estimates as correlation.

4. Empirical Results

Before we examine the regression analyses, we would like to present the simple correlation between distance to the nearest health facility and demand for health service. Figure 3 shows the association between traveling cost to health facilities and the use of health facility. The proxy of traveling cost to health facilities is distance to the nearest health facility. The longer distance to the nearest health facility has a negative correlation with giving a birth at health facility. The demand for health facility is highly likely to be dependent on the distance to the nearest health facility. The low demand for health facilities due to higher traveling cost may affect the health outcomes as well.

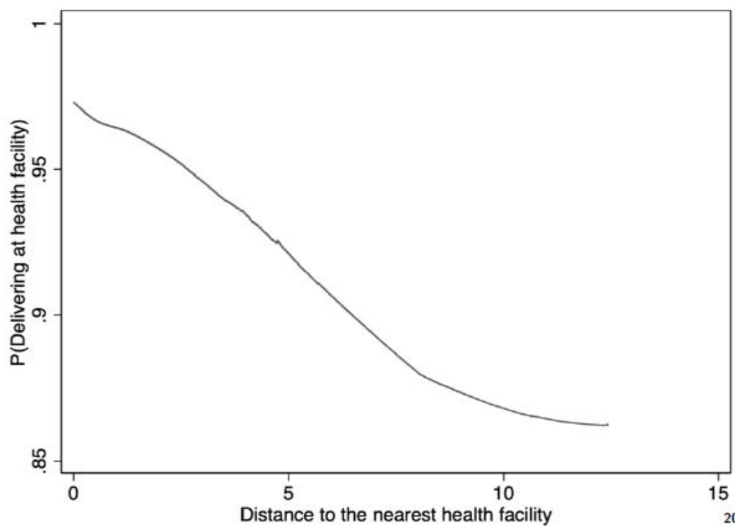
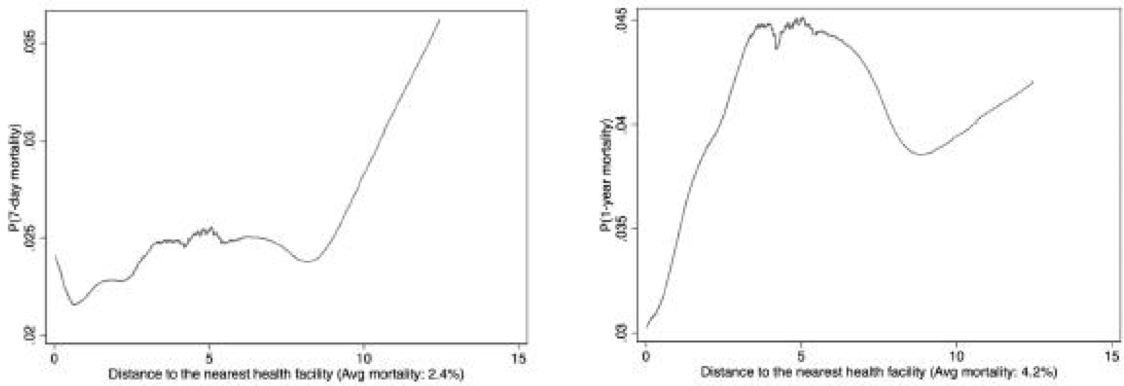


Figure 3. Distance to the health facility and health facility visit

Figure 4 shows the correlation between distance to the nearest health facilities and infant mortality rate. As the distance to the nearest health facilities is farther, the higher mortality rate is observed. The correlation between the distance to nearest health facilities and infant mortality is likely to be affected by the correlation between the nearest health facility and low demand for health facility. That is, the low demand for health due to traveling cost caused by longer distance to the nearest health facility may affect higher infant mortality rate.



(a) 7-day mortality (b) 1-year mortality

Figure 4. Distance to the health facility and infant mortality rates

Now, we examine the impact of health facility quality and distance on the demand for health facility at the time of giving a birth in Table 2. All specifications control village fixed effect, month and year of birth fixed effect. Column (3) and (4) estimates the impact of distance only on the health facility use. Distance negatively affects health facility use very significantly. Column (1) is the regression estimates without control variables to examine the effect of distance and health facility quality on health facility use separately. Although the endogeneity is a concern in the regression, the distance significantly affects the health facility use. The result indicates that the longer distance to the nearest health facilities is negatively correlated with the health facility use, which coincides with theoretical prediction. Similarly, if the health facility quality is bad, it negatively affects the health facility use. This empirical results confirm the theoretical prediction that traveling cost to the health facilities is the one of key factors determining health facility use. This result is consistent even after we include many control variables as seen in the column (2).

Column (5) and (6) are the main empirical results in our specification. We control for all the interaction terms of regressors to run a fully saturated regression model. A fully saturated model presents the heterogeneous effects of traveling cost to the health facilities by health facility quality. For example, the interaction of distance by rainfall is statistically significant in column (8), suggesting that if the distance to health facility is far and there is more rainfall at the timing of giving a birth, it reduces a chance of going to health facilities for giving a birth. Our main interest is the triple interaction term of distance, rainfall and health facility quality. It is also statistically significant with a negative sign, suggesting that the more traveling cost by the longer distance and more rainfall reduces the demand for health facility more when the health facility quality is worse. This is also consistent with our theoretical prediction. The results indicate that there is a significant heterogeneous effect of traveling cost on demand for health by the quality of health facility. When determining the health facility choice, we find that individuals consider health facility quality as previous studies have found the similar results in the context of developed countries.

Table 2. The determinants of health facility use

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance	-0.011***	-0.008***	-0.011***	-0.009***	-0.010***	-0.007***	-0.012	-0.012
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.010)	(0.009)
Distance*Rainfall					-0.136	-0.144	-1.363**	-1.390**
					(0.156)	(0.148)	(0.595)	(0.556)
Distance*Rainfall*Bad Quality							-1.983**	-2.011**
							(0.882)	(0.835)
Distance*Bad Quality							-0.003	-0.009
							(0.015)	(0.014)
Rainfall*Bad Quality							0.061*	0.064*
							(0.035)	(0.035)
Bad Quality	-0.065*	-0.051					-0.046	-0.010
	(0.038)	(0.036)					(0.055)	(0.052)
Rainfall					-0.003	-0.002	0.035	0.038
					(0.005)	(0.008)	(0.023)	(0.023)
Controls	X	O	X	O	X	O	X	O
Observations	16,888	16,888	16,888	16,888	16,852	16,852	16,852	16,852
R-squared	0.014	0.032	0.014	0.032	0.014	0.032	0.016	0.034

Notes: Control variables are income, wealth level, female respondent's education level, age at the time of giving a birth, the total number of babies, the pregnancy duration, gender of baby, the birth order of baby, historical mean of rainfall level. Standard errors are clustered at the village level. * significance at 10% level. ** significance at 5% level. *** significance at 1% level.

To test for robustness check, we add to the specification an alternative health facility quality measure. We present these estimates in Table 3 with three different quality measures: whether a health facility provides caesarean section delivery, whether a health facility has essential surgical care guideline, whether a health facility provides HIV test kit. Applying the same specifications used in the Table 2, we find that the interaction term of distance, rainfall and health facility quality is negative and statistically significant. Although the magnitude of the coefficients and the statistical significance level is decreased, the implication of the estimates are not different from the results in Table 2.

Table 3. The determinants of health facility use with different quality measures

	(1)	(2)	(3)	(4)	(5)	(6)
Quality measure	c-section		essential surgical care guideline		HIV Test kit	
Distance	-0.011	-0.006	-0.006*	-0.002	-0.010***	-0.008***
	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)	(0.003)
Distance*Rainfall	0.628	0.643	0.386	0.371	-0.120	-0.116
	(0.471)	(0.468)	(0.272)	(0.273)	(0.180)	(0.172)
Distance*Rainfall* Bad Quality	-0.798*	-0.825*	-0.585*	-0.573*	-0.866*	-0.868*
	(0.475)	(0.471)	(0.333)	(0.331)	(0.521)	(0.521)
Distance*Bad Quality	0.001	-0.001	-0.005	-0.006*	0.000	0.000
	(0.008)	(0.007)	(0.004)	(0.003)	(0.008)	(0.007)
Rainfall*Bad Quality	0.019	0.021	0.010	0.012	0.023	0.024
	(0.016)	(0.016)	(0.013)	(0.013)	(0.015)	(0.014)
Bad Quality	0.005	0.021	0.011	0.018	-0.008	-0.008
	(0.018)	(0.016)	(0.011)	(0.011)	(0.021)	(0.021)
Rainfall	-0.021	-0.020	-0.012	-0.014	-0.002	0.003
	(0.015)	(0.016)	(0.011)	(0.012)	(0.006)	(0.010)
Controls	X	O	X	O	X	O
Observations	16,852	16,852	15,498	15,498	11,227	11,227
R-squared	0.015	0.033	0.016	0.034	0.020	0.037

Notes: Control variables are income, wealth level, female respondent's education level, age at the time of giving a birth, the total number of babies, the pregnancy duration, gender of baby, the birth order of baby, historical mean of rainfall level. Standard errors are clustered at the village level. * significance at 10% level. ** significance at 5% level. *** significance at 1% level.

We also check another robustness by using different outcome variable that is proxy for the demand for health facility. In Table 2 and Table 3, we use health facility birth delivery as a proxy for the demand for health. Table 4 presents the impact of distance and health facility quality on the demand for health facility using child vaccination information. The outcome variable indicates that if an individual visits health facility for child vaccination, the outcome variable is 1 and 0 otherwise. We find that the interaction term of distance, rainfall and health facility quality is negative and statistically significant although the significance is weak. The longer distance and the more rainfall prevents individuals from going to health facility for child vaccination further if health facility quality is bad. When we include control variables in Column (6), the coefficient on the triple interaction is not significant. However, the implication of the triple interaction term is similar to what we discussed in Table 2 and Table 3.

Table 4. The determinants of health facility use (child vaccination)

	(1)	(2)	(3)	(4)	(5)	(6)
Distance	-0.002	0.001	0.002	0.004	0.048	0.039
	(0.004)	(0.004)	(0.006)	(0.007)	(0.029)	(0.031)
Distance*Rainfall			-0.452	-0.452	-3.307*	-2.767
			(0.339)	(0.393)	(1.770)	(1.925)
Distance*Rainfall*Bad Quality					-4.624*	-3.781
					(2.548)	(2.852)
Distance*Bad Quality					0.075	0.057
					(0.045)	(0.051)
Rainfall*Bad Quality					0.079	0.038
					(0.131)	(0.146)
Bad Quality					-0.220	-0.112
					(0.228)	(0.258)
Rainfall			0.036**	0.060	0.086	0.083
			(0.014)	(0.043)	(0.090)	(0.103)
Controls	X	O	X	O	X	O
Observations	820	820	818	818	818	818
R-squared	0.000	0.065	0.006	0.068	0.009	0.070

Notes: Control variables are income, wealth level, female respondent's education level, age at the time of giving a birth, the total number of babies, the pregnancy duration, gender of baby, the birth order of baby, historical mean of rainfall level. Standard errors are clustered at the village level. * significance at 10% level. **

significance at 5% level. *** significance at 1% level.

Finally, we examine the effect of going to health facility for a baby birth on health outcomes. We investigate the effect of various factors on the demand for health in Table 2 and Table 3. Using this result as a first stage result in the context of instrument variable approach, we extend our analysis to the investigation of the impact of health facility use on health outcomes. Table 5 presents the second stage result of the impact of health facility use on newborn mortality and infant mortality outcomes. The regressors, distance, rainfall, bad quality and its all interactions shown in Table 2, are used as a set of instrument variables for giving a birth at health facility. The predicted value of giving a birth at health facility from the regression in Table 2 is used as a regressor in the second stage regression in Table 5.

In table 5, we use two different main outcome variables: 7-days newborn mortality and 1-year infant mortality.[3] IV 1 specification uses the distance only as an instrument variable, IV 2 specification uses the distance, distance*rainfall, rainfall as instrument variables, and IV 3 specification uses distance, rainfall, bad quality, and all interactions as instrument variables. There are no statistically significant changes in newborn and infant mortality and the sign of the coefficient is different across different instrument variables. In this paper, the second stage results are not clear because instrument variables are not strong enough in the first stage and may not satisfy the exclusion restriction to draw a clear conclusion.

Table 5. The impact of giving a birth at health facility on newborn and infant mortality

	7-days newborn mortality			Infant Mortality		
	IV 1	IV 2	IV 3	IV 1	IV 2	IV 3
Facility delivery	-0.071	0.141	0.138	-0.091	0.621	0.454
	(0.072)	(0.420)	(0.211)	(0.084)	(0.970)	(0.399)
First stage F	88.66	1.683	4.477	88.66	1.683	4.477
Observations	16,888	16,888	16,852	16,852	16,852	16,852

Notes: Control variables are income, wealth level, female respondent's education level, age at the time of giving

[3] Newborn (Infant) mortality is the death of an infant before his or her first seven days (birthday). The newborn (infant) mortality rate is the number of newborn (infant) deaths for every 1,000 live births.

a birth, the total number of babies, the pregnancy duration, gender of baby, the birth order of baby, historical mean of rainfall level. Standard errors are clustered at the village level. * significance at 10% level. ** significance at 5% level. *** significance at 1% level.

5. Discussion and Conclusion

In developing countries, it has been an important task to increase the accessibility to health care service to reduce mortality rate and disease prevalence rate. Due to much effort by governments and international aid agencies, the accessibility to health service has been rapidly increased. That is, most interventions have focused only on the provision of infrastructure and medical resources. However, the quality of medical care is also very important factor for improving health outcomes in developing countries. Some studies have examined the role of health facility quality in terms of medical personnel and the management system in health facilities. Recently, Bloom et al. (2014) have examined the importance of management system of hospitals in developed countries. They found that better health facility quality increases the demand for health and produces better clinical health outcomes such as increased survival rates of heart attack. There are also some studies with regard to health quality in developing countries (Mwabu et al. (1993); Lavy et al. (1996); Sahn et al. (2003)). However, due to lack of information about health quality in developing countries, only few studies have looked at this topic.

We empirically test the choice of health facility related to health facility quality. Overall, we find that there are statistically significant heterogeneous effect of traveling cost to health facility by health facility quality. Health facility quality is also very important factor in determining the demand for health facility in Malawi. We find consistent heterogeneous effects of across several specifications and different health facility quality measures. We also estimate the impact of giving a birth at health facility on newborn and infant mortality using an instrument variable approach. We find no significant results across different instrument variable specifications.

This study contributes to the existing literature in the following sense. First, we empirically test the determinants of health facility choice by including health facility quality measures. The previous studies only focus on theoretical part and few empirical papers have examined the impact of health facility quality on health facility choice.

Second, we utilize the various kinds of health facility quality. Previous studies defined the health facility quality by using number of medical doctors/nurses and number of available medicines. MSPA includes richer information such as number of medical services, storage of medicines, communication, source of water, power, supervision and so on. We aggregate similar quality measures and examine the heterogeneous effects of health facility quality on health facility choice.

As addressed in the previous section, this paper also has limitations. The health facility quality used in this paper can be constructed using different methods, which could support empirical results. We also address a concern about the endogeneity of our regressors although the concern is minimized in the context of Malawi. Given that the health facility quality issue is becoming more important in developing countries, these concerns should be addressed more in detail in the future work.

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