Social Science & Medicine 283 (2021) 114127

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Using locational data in a novel mixed-methods sequence design: Identifying critical health care barriers for people with disabilities in Malawi

Thomas Halvorsen[a,b,*], Alister Munthali[c], Stine Hellum Braathen[b], Jan Ketil Rød[a], Arne Henning Eide[b]

[a] Department of Geography, Faculty of Social and Educational Sciences, Norwegian University of Science and Technology, N-7491, Trondheim, Norway
[b] SINTEF Health Research, N-7465, Trondheim, Norway
[c] Centre for Social Research, University of Malawi, Zomba, Malawi

ARTICLE INFO

Keywords:
Malawi
Healthcare access
Disability
Mixed-methods
GIS
Field-study

ABSTRACT

The primary aim of this study was to determine which health care barriers were most important for people with disabilities in Malawi. To accomplish this, we devised a sequential mixed-methods research design that integrated locational survey data and qualitative data from field studies. Our secondary aim was to evaluate this research design not only as a design-solution to our particular research objective, but as a tool with more general applicability within social sciences. Malawi has one of the most underserved health service populations in the world with chronic resource shortages and long travel distances where people with disabilities are at a particular disadvantage. Nevertheless, our results show that even in a resource scarce society such as Malawi it is the interpersonal relationships between patients and health service providers that has the largest impact on the perception of access among patients. Our results also suggest that the sequential mixed-methods design is effective in guiding researchers towards models with strong specifications.

1. Introduction

The Alma-Ata Declaration of 1978 emphasizes the need for primary health care to be introduced in developing countries in order to achieve the goal of health for all (Declaration of Alma-Ata, 2017; O The World Health Re, 2008). Later, the 2030 Sustainable Development Agenda (SDA) set forth universal health coverage and access to quality health care for all as one of its main developmental goals, making "leave no one behind" its ethos. The right to health and health care for persons with disabilities is a key target of the United Nations Convention on the Rights of Persons with Disabilities (CRPD) (United Nations, 2006). These are formidable challenges, because while the populations of developing countries in general have the poorest health and the highest health care needs, they also face the greatest barriers to accessing health care (World Health Organization, 2018; Peters et al., 2008). This relationship is so pervasive and persistent that it has been coined the *inverse care law*, and at a particular disadvantage are people with disabilities in low-income countries (Gwatkin et al., 2004)' (Badu et al., 2018a)' (Badu et al., 2018b)' (Trani et al., 2011)' (Dassah et al., 2018)' (Eide et al., 2015).

Poverty creates conditions that produce and maintain high rates of disability. On the other hand, disability creates poverty (Eide and Ingstad, 2011). The World Report on Disability (2011) estimates that 15 per cent of the world's population has a disability, and that a disproportionate share of these lives in the global South (O World report on dis, 2011). A high rate of disability is a poverty trap because disability contributes to poverty through lost earnings, un- or under-employment, and additional costs of living. Hence, there is a poverty–disability–poverty cycle, which is one of the self-reinforcing mechanisms that maintains poverty, keeping poor countries poor. Strengthening access to health care for people with disabilities is one of the necessary keys to unlock this unfortunate cycle.

The definition of access to health care has evolved over time. Early contributions frequently conceptualized *access* as either the supply of health services (International Conference, 1978) or the actual use of health care services in contrast to the mere presence of health care

* Corresponding author. Department of Geography, Faculty of Social and Educational Sciences, Norwegian University of Science and Technology, N-7491, Trondheim, Norway.
E-mail address: thomas.halvorsen@ntnu.no (T. Halvorsen).

https://doi.org/10.1016/j.socscimed.2021.114127
Received 28 August 2020; Received in revised form 20 January 2021; Accepted 8 June 2021
Available online 15 June 2021

facilities (Donabedian, 1973). Later definitions broadened the concept to account for further dimensions and more explicit recognition of both population characteristics and health system characteristics. For instance, Penchansky and Thomas (1981) proposed that access to health care involves the interactions of the health services and the populations along the dimensions of *accessibility*, *availability*, *affordability*, *accommodation*, and *acceptability* (Penchansky and Thomas, 1981). How well the health service characteristics and population characteristics match, or in the words of Penchansky & Thomas, the "degree of "fit" between the clients and the system", determines health care access (Penchansky and Thomas, 1981).

Geography, or the spatial distribution of people, services, and natural or man-made features of the landscape, influence the degree of "fit" between the system and the population. Access to healthcare varies over space because neither populations nor health services are uniformly distributed. Variations in terrain, road-networks, lakes and waterways will likely have an effect as well. Strictly spatial characteristics such as distance to services will influence their accessibility, but so too will the spatial distribution of health/disease, demographics, socioeconomic indicators, languages and cultures. Similarly, the quantity and quality of health services may also vary substantially from site to site.

Malawi has a three-tier health system consisting of primary, secondary and tertiary services linked together through a referral system. There are two main providers of health services in Malawi, The Ministry of Health and the private organization Christian Health Association of Malawi (CHAM). Together they provide approximately 97% of health services in the country, with CHAM accounting for about 29% and operating mainly in rural areas (Munthali et al., 2019; Government of the Republi, 2017). CHAM is a major partner to the Ministry of Health and is responsible for the training of the majority of health care providers (AboutChristian Hea, 2019). Another side of this partnership is that Malawi is divided into non-overlapping catchment areas where the provider responsibility in rural catchment areas is mainly CHAM's, while the Ministry of Health covers mainly urban areas (Munthali et al., 2019).

Malawi's Health Sector Strategic Plan (2017–2022) summarizes a number of the country's most pressing challenges: severe shortage of health care workers with a 45% vacancy rate; regular shortages of essential medical products; unsustainable and unpredictable financing of services; socioeconomic, gender and geographical inequalities in health care access and health outcomes; and weak monitoring, evaluation and governance structures (Government of the Republi, 2017). People with disabilities share many of the same barriers as the rest of the population, but their disability tends to amplify them both in terms of the practical challenges and the stigma/discrimination they are met with within the services (Munthali et al., 2019). Studies from four sub-Saharan countries, including Malawi, have shown that the probability of accessing health care is inversely related to level of disability, and that persons with disabilities have less access to health care compared to those without disabilities, even though persons with disabilities have more health problems and thus are in need of more care (Eide et al., 2015). For example, most patients in Malawi will walk to the clinic since few own bikes or motorized vehicles, most cannot afford to pay for transport, and there is no paramedic response unit system in the country (Loeb and Eide, 2004). Depending on the disability, this may significantly reduce the *accessibility* for patients with disabilities compared to patients without disability.

Pointing out obvious characteristics of the health care system that impede access in a developing country such as Malawi is not where the real challenge lies. The demanding part is determining which barriers are most important, or, in other words, identifying the barriers that would yield the largest benefits to the most disadvantaged populations if they were reduced. In settings characterized by endemic poverty, such as Malawi, it is of particular importance to ensure that priority is given to those barriers that people with disabilities and other vulnerable populations themselves perceive as most important. One of the main obstacles in establishing a hierarchy in the relative importance of spatial barriers as opposed to other population and system characteristics has been the lack of integrative research. Within the limited literature, the tendency has been to analyze spatial access, based on measures developed through the use of geographic information systems (GIS), separately from other quantitative and qualitative access determinants (Tang et al., 2017). Little is therefore known about the level of agreement between these lines of research. Therefore, there is a need for studies that combine GIS-based measures of access and measures based on peoples own perceptions and experiences in addressing this question.

The primary aim of this study was to determine which health care barriers are most important for people with disabilities in Malawi. To achieve this, we devised a sequential research design which combines GIS-based measures, survey data, and qualitative field work data. Our secondary aim was to evaluate this research design not only as a design-solution to our particular research objective, but as a tool with more general applicability within social sciences.

The study is set up to answer three research questions: First, what is the level of agreement between patients' perception of health care access and spatial access? Second, what factors can explain observed deviances between perceived and spatial access? And third, how much do these factors contribute to explaining the variation of perceived access relative to a measure of spatial access? In answering these questions, we seek to identify the most important barriers to health care access in Malawi for people with disabilities.

2. Research design

The empirical starting point for our study is an earlier large-scale household survey carried out in the 2009–2012 time period within the project *EquitAble* (Enabling universal and equitable access to healthcare for vulnerable people in resource poor settings in Africa, funded by EU FP7). This project was carried out in four African countries by an international research consortium. In two of the countries, Malawi and Namibia, the data from each household was supplemented with their GPS (Global Positioning System) coordinates. While these locational data were not taken advantage of in the *EquitAble* project, they are essential in the research design of the current project, *GeoHealthAccess* (funded by the The Research Council of Norway).

The central idea of this design is to develop an initial statistical model that forms a point of departure for a second stage, where GIS is used to focus in on locations where observations deviate substantially from the predicted values of our initial model. After having identified sites with large deviances, the third stage of the study design consists of selecting sites to collect qualitative field data in order to gain insights into the causes of the identified deviations. In the fourth and final stage, we modify our statistical model based on the findings from the field work (see Fig. 1). A new iteration of stages 2–4 could be initiated at this point. If so, one could do another residual analysis and select sites that deviated from the predictions of the revised model, and so on. These iterations could go on until the model can no longer be improved or until the relevant data to revise the model is not at hand. In the latter case, one can, if resources allow it, do a follow-up of the survey to collect additional data.

2.1. Seeking answers in the deviances

In the first sequence of our design, we formulate a simple linear regression model of perceived access as a function of spatial access, self-reported functional limitations and their age. The score on functional limitations measure the level of disability. Age is added due to its association with frailty. We control for these traits because they will likely influence people's perception of access. The model can be formulated as:

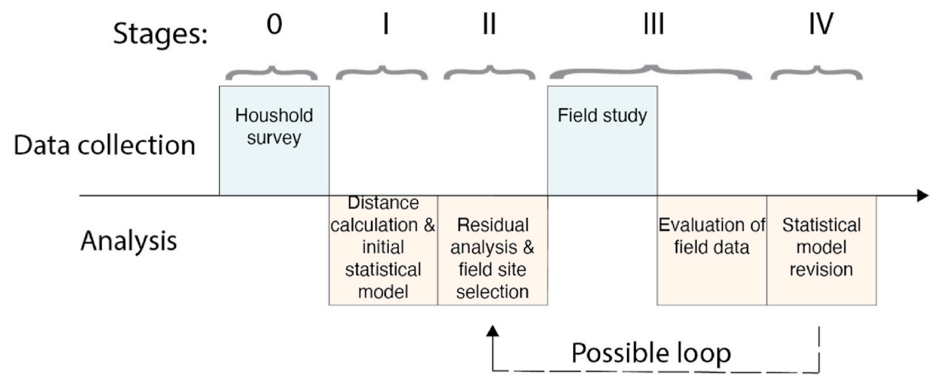

Fig. 1. Sequential design.

$$Perceived\ access_i = \beta_{i1}*Spatial\ access + \beta_{i2}*Self\ reported\ health + \beta_{i3}*Age + e_i$$

This model will answer our first research question: what is the level of agreement between perceived access and spatial access? A high level of agreement will result in a strong effect of spatial access (β_{i1}) and a model that can explain much of the variation in perceived access (high R^2).

The model estimation also serves another purpose. We estimate each respondent's deviation from the linear estimate (the error, e_i, for each individual), the essential point being that all variation in perceived access not explained by the independent variables in the model is picked up by the error term (the difference between the observed and predicted value). An important principle of regression models is to reduce the amount of residual variation to a minimum through model specification (without overfitting). Following a hypothetic-deductive logic, model specification is generally done by including variables that are found to be theoretically relevant. This is, in general, a sound approach, but in situations where a multitude of theoretical expectations can be deduced, or in other situations with weak theoretical guidance, the hypothetic-deductive logic has its limits. In the case of Malawi, there are so many readily identifiable shortcomings in the health sector that it becomes difficult to theoretically single out the most relevant hypothetical relationships. Hence, we need a procedure that can aid in limiting the scope of model specification other than testing a multitude of theoretically derived variables or outright data mining. While such approaches are feasible, they go against the principle of parsimony (i.e. Occam's razor) and will typically introduce confounding and other data dredging issues (Smith and Ebrahim, 2002).

An alternative procedure to such approaches is what our research design offers. We have so far specified a very basic model of perceived access as the function of spatial access, controlling for respondents' functional limitations and age. The residuals from this model reflect the level of agreement between the estimate and each respondent's observed score on perceived access. Deviances are normally viewed as nuisances to be minimized by including theoretically relevant predictors, but in contrast to relying heavily on existing literature and theoretical reasoning, we propose an alternative approach where residuals are given explicit attention in an analysis of their *spatial* distribution. If the spatial distribution of residuals is not characterized by randomness, but instead display spatial clustering of either positive or negative residuals, it implies that there are underlying non-random factors creating these patterns. Especially interesting are clusters of residuals with high absolute values because it is those observations that have the lowest level of agreement with our initial model, and therefore do most harm to the model's explanatory power. So, stage two of our research design involves identifying clusters with either negative or positive residuals using GIS and selecting sites for field work based on this analysis. Stage three involves carrying out the fieldwork in order to provide insights into the underlying clustering factors. If the fieldwork directs our attention towards factors where relevant quantitative data are available, we then revise our model specification accordingly in stage four. Although we stop after one iteration of this inductive-deductive loop, it could, as previously mentioned, be repeated a number of times to identify the second most important set of determinants, the third most important set, and so on.

If this sequential research design works according to our assumptions, it will (1) identify the most important barriers for perceived health care access for people with disabilities in Malawi, and (2) yield a model with significantly more explanatory power than the initial model specification.

2.2. The survey and perceived access

The *EquitAble* household survey was aimed at including populations with different characteristics in order to highlight particular contextual mechanisms for accessing health care. In Malawi, it aimed at capturing a sample characterized by chronic poverty and high illness burden. The study areas in Malawi were selected by the University of Malawi. Within each area, a total screening of households was carried out using the Washington Group's six screening questions to identify households with and without members with disabilities (United Nations, 2020). A random sampling was subsequently carried out, ensuring representation of both household types. Data collection was carried out between November 2011 and February 2012. In the follow-up project, *Geo-HealthAccess*, additional GPS coordinates were collected for health facilities in the study area.

Our measure of access to health care is based on a broad definition. The study combines survey-items from a number of dimensions. Table 1 lists all the survey items that were combined into our dependent variable, *perceived access*. All items were scored similarly following a scale from 1 – *no problem* to 5 – *insurmountable problem* (see Table 1). By simply adding the item-scores together for each individual we gave all items equal weight in the composite measure.

Our second composite measure constructed from the survey is *functional limitations*. Table 2 lists the survey items that were combined into this measure. This is the Washington Group six questions with the addition of one item on mental limitations (7) and one item on limitations beyond age expectancies (8). The items are scored on a scale from 1 (no problem) to 4 (unable) on questions about the difficulties in doing certain activities because of a health problem or impairment. The different items were again combined into one measure by adding the item-scores together.

2.3. Calculation of spatial access

Both the survey respondents' households and the health care facilities they use were geocoded. This enabled us to use a geographic

Table 1
Items in composite measure of perceived access.

Considering your own experience, tell me whether the following make it difficult for you to get health care: Scores: 1 - no problem, 2 - small problem, 3 - moderate problem, 4 - serious problem, 5 - insurmountable problem	
1	Lack of transport from home to health facility
2	No services available
3	Physical access to health facility
4	Because of faith/belief
5	Negative attitudes among health workers
6	There is no accommodation at the health facility
7	Communication with health workers
8	Standard of the health facility
9	The journey to the health facility is dangerous
10	You did not know where to go
11	Could not afford the cost of the visit
12	Don't have the necessary document (health card/passport)
13	You thought you were not sick enough
14	You tried but were denied health care
15	The health care provider's drugs or equipment were inadequate
16	Could not take time off work or had other commitments
17	You were previously badly treated
18	Could not afford the cost of transport

Table 2
Items in composite measure of functional limitations.

The next questions ask about difficulties you may have doing certain activities because of a health problem or impairment: scores: 1 - no, 2 - some, 3 - a lot, 4 - unable	
1	Do you have difficulty seeing, even if wearing glasses?
2	Do you have difficulty hearing, even if fusing a hearing aid?
3	Do you have difficulty walking or climbing steps?
4	Do you have difficulty remembering or concentrating?
5	Do you have difficulty with self-care such as washing all over or dressing?
6	Using your usual (customary) language, do you have difficulty communicating for example understanding or being understood?
7	Do you have a problem with nervousness, sadness or depression?
8	Do you have a problem performing tasks that are expected of people of your age?

information system (GIS) to measure the time needed to walk from each household to the health facility and back. We used a raster-based approach to model both horizontal and vertical impedance. For horizontal impedance, we integrated streets from OpenStreetMap with the global land cover dataset for 2010 at 30 m resolution (Globeland30) produced by the National Geomatics Center of China (Chen et al., 2015; Geofabrik Download Server, 2020). Similar to Rogers et al. (2015), we reclassified the land cover classes to cost values in order to take into account that movement is easier (and thus faster) along paths and roads, than along other land use categories (Rogers et al., 2015).

We also needed to take into account the vertical impedance due to the fact that movements downhill is easier than uphill. As input representing the vertical impedance, we used a digital elevation model (DEM) with 30 m by 30 m resolution from ALOS World 3D – 30m (AW3D30) made available by the Japan Aerospace Exploration Agency in 2015 (Tadono et al., 2014; Global Digital Surfa, 2020). The elevation raster holds the z-values (vertical) for each cell location and are used to calculate slope values for each cell. These slope values are used to calculate vertical impedance incurred when moving from one cell to another. In order to simulate walking cost, we multiplied the slope values with a factor to make the representations of movements uphill, downhill and on flat surface more realistic. We used Tobler's hiking function (1993) that predicts human walking speed based on slope (Tobler and Tobler, 1993).

The horizontal and vertical impedance are entered into the standard path distance function of our GIS package (Path Distance (Spatial An, 2020). We performed the path analysis twice: one to model travel time from the household locations to the health facilities, and one that models the travel time back. The results are two raster layers. We extracted cell values from these two raster layers at the point locations for the households and recorded the values in two fields in the attribute table for the point features representing households. Using these two fields, we calculated the sum and stored it in a new variable called *Walking time*.

3. Results

3.1. Stage 1 – initial model

The results from the initial model show that there is a significant, but weak association between measured distance/walking time and perceived access (see Table 4 model (1)). After controlling for age and functional limitations (which behave as expected), an increase of 1 h of walking time increases the perceived access score with only 0.057 points on the scale (min. score 18, max. score 73).

The explained variance $({}^{2}_{R})$ of the model is another indication of the low level of agreement between spatial access (*Walking time*) and peoples' perception of access. The current model explains only 3.7 percent of the variation in perceived access, so one can assume that important determinants of perceived access are so far unaccounted for. Although a model with a higher level of explained variance is always preferable, it is not critical at this stage because this is the starting point from which the next stages in the design should guide us towards a model with a stronger specification (see Fig. 1).

3.2. Stage 2 – mapping residuals for field site selection

As each household in the survey is geocoded, we can map the spatial distribution of model residuals. As an example, Fig. 2 shows a map over Chimembe Health Center and nearby survey locations. Several of the households near to the Chimembe Health Center form two significant hot spots. The high positive residuals of these households imply that they are more dissatisfied with the health accessibility than the model predicts (relatively near to the health center). Several other households in the upper right corner of the map form a significant cold spot. These are households with large negative residuals, implying more satisfaction with accessibility than predicted (despite a location relatively far removed from the health center). Mapping residuals across the surveyed areas, we were able to identify several candidates for the ensuing field work.

3.3. Stage 3 – fieldwork and qualitative assessment

Two fieldwork sites were identified as particularly promising due to patterns of clustering of either negative or positive residuals. These sites were located within:

1. Blantyre District (negative clustering)
2. Phalombe District (positive clustering)

The fieldwork at these sites were undertaken in October and November 2017. We utilized qualitative explorative research methods to uncover the underlying causes of why these sites contained clusters of high or low residuals. In each of the two study sites, *key informant interviews* (KII), *focus group discussions (*FGD) *and individual in-depth interviews* (IDI) were conducted (see Table 3 for an overview of the interviewed groups):

Using elements of participatory GIS, existing maps and the creation of new maps were used as a starting point for the focus group discussions on access to health care with health service users and providers (See Eide et al. (2018) for further details on the methodological approach (Eide et al., 2018)).

Overall, the results from the field studies showed that in Blantyre the clustering of negative residuals (perceived access were good despite being far from the health facility) could be explained by three primary causes. Foremost, patients preferred to go to this clinic because the staff

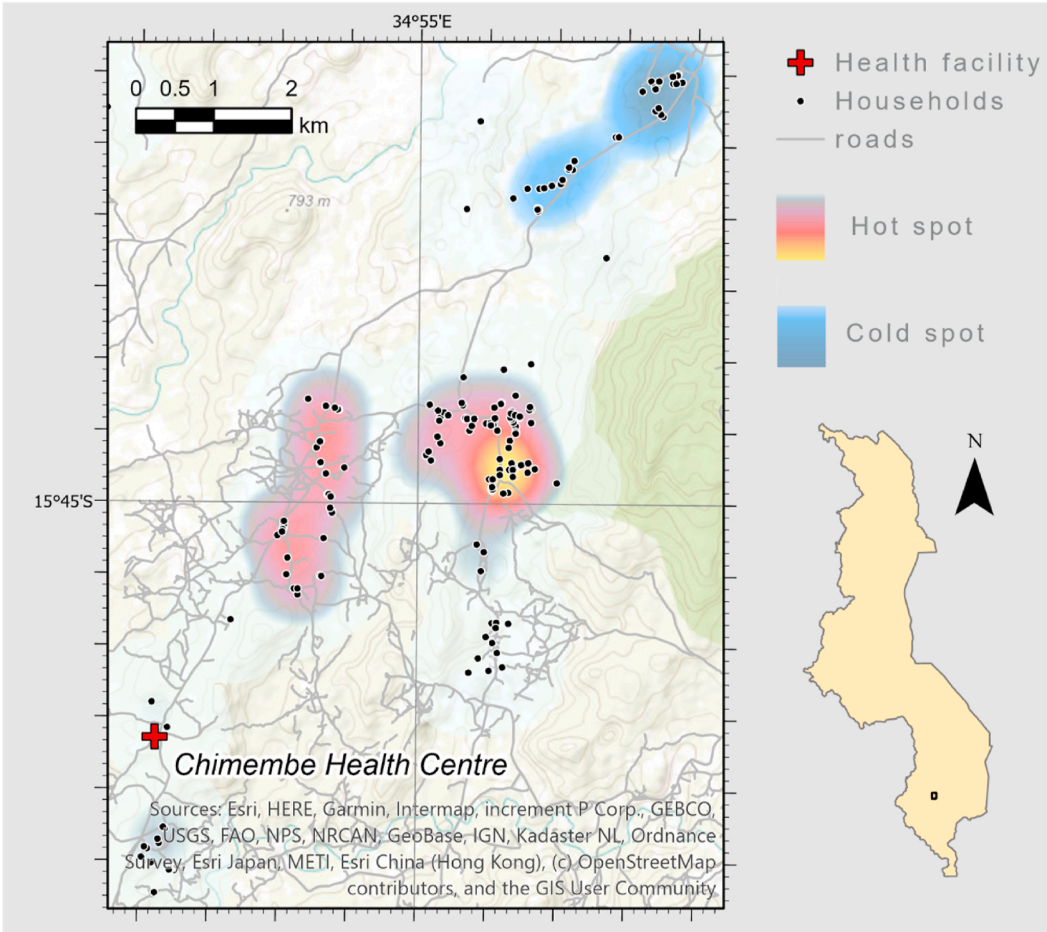

Fig. 2. Chimembe catchment area, heatmap of residual clustering.

were seen as friendly and welcoming. Second, patients at this health facility experienced that they were given medication and treatment that were appropriate and effective. Third, many found that they were turned away from other facilities closer to their community if they happened to live within a different catchment area.

At the other field site, in Phalombe, were there was a cluster of positive residuals (perceived access was bad despite being located close to the clinic), this seemed to be mainly related to negative experiences of care at the facility. In particular the attitudes and conduct of the health workers, as illustrated by the following statement:

> *"Our facility [is] [name of health facility in Phalombe]. We fought so hard to get it, the problem is the workers are people who have different personalities and most of them are not goodhearted. They are more short-tempered, angry and full of insults."*
>
> *Elderly man*

Some also related their negative experiences to inappropriate and lacking health care. For example, there were many who thought that they got wrong medication and often not enough to recover properly. There was frequently a lack of medication at the clinic, and a widespread belief was that this was caused by medications being sold on the black market by nurses from the health facility. Moreover, some informants suspected that registers of patients and medications were manipulated in order to enable the illegal trade of these goods. Finally, some patients experienced that the health facility's staff would not attend to patients who got acutely sick late in the day.

In summary, distance and geographical measures of access seemed less relevant compared to both positive and negative experiences patients have at the health facilities. Locally based and geographically accessible health services are viewed as less important, while quality of care explanations such as patient-provider relations and the attitudes and conduct of the service providers seem to outweigh spatial access in patients' assessment.

3.4. Stage 4 – model revision

At this stage of the research design, we seek to revise our statistical model based on the findings from the field work. The previous stage of the research design highlighted qualitative features of the health services as important determinants of access, especially the professional conduct and attitudes of the health service providers. Hence, the patient-provider relationship seemed to be important. Two items in our composite dependent variable contain relevant information, namely item 5 "Negative attitudes among health workers" and item 17 "You were previously badly treated" (ref. Table 1).

If we were to include these items as independent variables and keep our dependent variable unaltered it would introduce a level of endogeneity into our model. On the other hand, if we draw these items out of the dependent variable, we are left with a composite measure that do not reflect these dimensions directly, and by construction have a weaker association to these determinants. Nonetheless, erring on the side of caution we go for the latter option and create a new dependent variable that is constructed in a similar fashion as the original, but without items 5 and 17.

Table 4 display the results from the initial regression model estimation (1) together with the revised regression models (2 & 3) where we have drawn items 5 and 17 out of our dependent variable and now

Table 3
Interviews made during field study.

Interview type	Blantyre District			Phalombe District		
	Total informants	Male	Female	Total informants	Male	Female
KII village headman	1	1				
KII traditional healer and spiritual healer	2	1	1			
KII medical assistant at health center	2	2		1	1	
KII nurse at health center				1	1	
KII midwife at health center	2		2	1		1
IDI female headed household	1		1	1		1
FGD female headed household	6		6	6		6
FGD male elderly (65+ years)	9	9		7	7	
FGD female elderly (65+ years)	5		5	6		6
FGD people with disabilities	6	3	3	6	1	5
FGD health surveillance assistants at health center	6	6		7	5	2
Total	40	22	18	36	15	21

Abbreviations: KII – key informant interviews, IDI - individual in-depth interview, FGD – focus group discussions.

include them as explanatory variables.

What we can see from our revised model (2) is that both the newly added variables have a significant and positive effect on perceived access. In other words, they both increase the composite score in perceived access, where increasing scores are associated with relatively large increases in access barriers. For example, moving up one category in the *Badly treated* variable, from say, (1) "no problem" to (2) "small problem", will increase the estimate of perceived access with nearly four (3.816). More importantly, we can now observe that the explained variance (R^2) has jumped up from 3.8 percent to 47.5 percent. Hence, the revised model is nearly 13 times better at explaining the perception of access than our initial model.

Another thing to note when comparing model 1 and 2 is that the residual standard error has been reduced from 9.2 to 5.8. This reduction is illustrated in Fig. 3. A sizable reduction in residual standard error is expected given the large increase in explained variance, but it is, nonetheless, another indication of the success of the sequential design in steering us towards a model with a superior specification.

In the third model specification (3) we expand our model further, although we now revert back to the traditional hypothetical-deductive logic, adding four variables based on assumptions of relevance derived from previous research. Being married, having a low education and being female are socio-economic predictors previously shown to be of relevance to health care access in many contexts (Peters et al., 2008; Trani et al., 2011; Eide et al., 2015; Dixon-Woods et al., 2006). Since traditional medicine still has a large following in Malawi (Simwaka et al., 2007), we also add the variable *Traditional healer* to account for respondent's predilection towards alternative health services. Respondents are asked to evaluate the following statement: "The traditional healers have appropriate competence to help with your health problems". The scores range from 1 "Strongly disagree" to 4 "Strongly agree". None of the newly added variables except for *Traditional healer* in model three (3) have a significant contribution. Moreover, there is only a slight increase in explained variance (R^2) from model two (2). There is, in other words, little explanatory power gained by expanding the model further through a hypothetical-deductive logic.

Table 4
Initial (1) and revised models (2, 3) of perceived access.

	Dependent variable:		
	Perceived access		
	(1)	(2[a])	(3[a])
Age	0.038***	0.024***	0.020***
	(0.009)	(0.005)	(0.007)
Functional limitations	0.785***	0.478***	0.521***
	(0.119)	(0.076)	(0.080)
Walking time	0.057***	0.035***	0.037***
	(0.007)	(0.005)	(0.005)
Negative attitudes		2.163***	2.123***
		(0.089)	(0.092)
Badly treated		3.816***	3.873***
		(0.112)	(0.115)
Married			0.256
			(0.245)
Low education			−0.086
			(0.243)
Female			0.060
			(0.207)
Traditional healer			−0.122***
			(0.032)
Constant	20.663***	10.653***	11.234***
	(0.847)	(0.556)	(0.686)
Observations	3379	3379	3214
R^2	**0.038**	**0.475**	**0.480**
Adjusted R^2	0.037	0.474	0.479
Residual Std. Error	9.172 (df = 3375)	5.825 (df = 3373)	5.845 (df = 3204)
F Statistic	44.525*** (df = 3; 3375)	610.062*** (df = 5; 3373)	328.824*** (df = 9; 3204)

Notes: Ordinary least squares regression (OLS), a = revised dependent variables without items 5 (Negative attitudes among health workers) & 17 (You were previously badly treated), *p < 0.1; **p < 0.05; ***p < 0.01.

An alternative approach at this point, with the potential of yielding stronger improvements according to our rationale, would be to initiate another iteration of our inductive-deductive loop; mapping the residuals of model two (2) and identifying new sites for a new round of field work that would eventually guide another round of model revision. We are, however, satisfied with the current progress in explanatory power of our model and therefore decide against doing another loop.

4. Discussion

Reflecting the general level of societal development, the health care system in Malawi has a number of fundamental challenges. There are severe shortages of personnel and medication. Paramedic response services or other public patient transport services are non-existent, so most patients walk to clinics because they lack or cannot afford alternative modes of transport. In considering impoverished societies such as Malawi, one could be misled to believe that quantitative and spatial barriers such as these must be the most critical, especially for people with disabilities that may have additional mobility restrictions. Nevertheless, results from this study do not support such conclusions. This study demonstrates a weak relationship between spatial access to health services and patients' perception of access. Other quantitative limitations seem to be of secondary importance too. Instead, our results

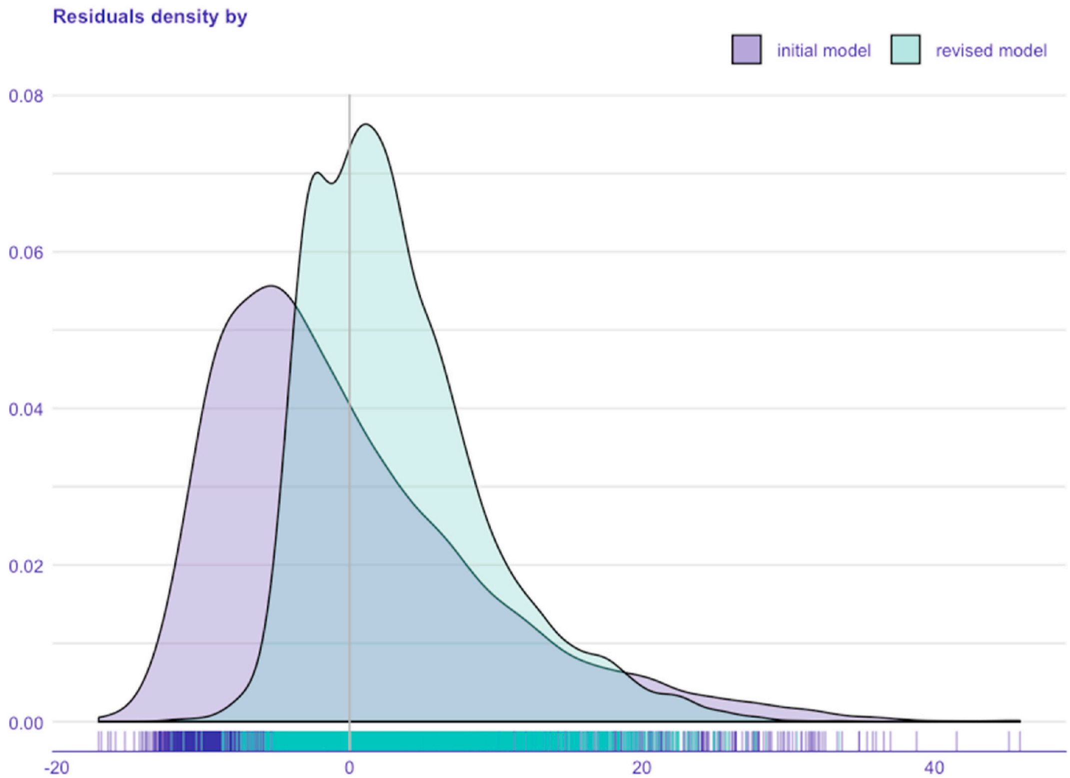

Fig. 3. Density plot of residuals in initial (1) and revised model (2).

suggest that qualitative features of the health services are more important determinants of the perception of access.

Following a sequential mixed-methods design that utilizes locational data and GIS to identify sites with clusters of non-conforming observations, followed by fieldwork at a selection of those sites, we were able to identify critical health care access barriers for people with disabilities in Malawi. The most decisive factors were the attitudes and conduct of health care workers towards their patients.

4.1. Perception of access

This study has chosen to explain the perception of access rather than accounting directly for the material, spatial or qualitative dimensions of access. A possible critique of this choice could be that it obfuscates and under-communicates the reality of the situation for people with disabilities in Malawi, which is that they are one of the most underserved health care populations in the world. So why focus on the perception of access? Why does it matter? The perception of access is important not only because public health care institutions depend on it to retain legitimacy, but more importantly it has been found that the *perception of access* is important in converting potential access into realized access, and that it affects where, when and even whether people seek or receive health care at all (Fone et al., 2006). For instance, studies from other developing countries have documented that patients' *perceptions* of quality can be more important in determining the *utilization* of health services than costs or other dimensions of access (Duong et al., 2004; Fotso and Mukiira, 2012; Peters et al., 2008; Rao et al., 2006; Baltussen et al., 2002; Andaleeb, 2001).

Returning to Penchansky and Thomas' (1981) definition of health care access, one of its central dimensions is *acceptability* (Penchansky and Thomas, 1981). Acceptability in their definition refers to the personal opinions and feelings of both patients and providers towards each other:

> *Acceptability, the relationship of clients' attitudes about personal and practice characteristics of providers to the actual characteristics of existing providers, as well as to provider attitudes about acceptable personal characteristics of clients.*
>
> *Penchansky and Thomas, 1981, p. 129*

Our findings show that patients' perception of access clearly depend on how they experience the attitudes of health workers towards them. Moreover, the results show that negative consultation or treatment experiences in the past also strongly influence their perception of access. The importance of the patient-provider relationship has been confirmed across many studies in different settings. Most of the research has focused on patient satisfaction. In a systematic review of 109 different studies, Batbaatar et al. (2017) found that the strongest determinant of patient satisfaction was the interpersonal skills of the health professionals (Batbaatar et al., 2017). Another strand of this literature has established an association between patient-provider communication and health outcomes (Griffin et al., 2004). What is less understood are the pathways through which this association is established (Street et al., 2009). Our results shed some light on one of the causal pathways in this relationship. It goes through the *perception of access*, and although we do not directly measure communication, this would be the primary way through which a patient-provider relationship is established. In our study, the patient-provider relationship was clearly the strongest determinant of how accessible health care was viewed, and by implication it plays an important part in determining where, when or whether individuals with disabilities in Malawi seek or receive needed health care.

A number of earlier studies describe communication and attitude problems in the Malawi health sector (Munthali et al., 2019; Crabb et al., 2012; Fay et al., 2011). Two policy implications should be mentioned in relation to this finding. First, it is the educational system that should ensure that students reach the desired level of professionalism, including how they engage with their patients. However, most studies and policy documents relating to the educational system in Malawi focus on the difficult resource situation (Anders, Chirwa)' (Udedi, 2016)' (Mandeville et al., 2017). In resource scarce environments it is especially important that available resources are used efficiently. Findings from this study suggest that available health sector resources will be more effectively utilized if effective patient communication and patient relations are developed through the training curriculum of health service workers. Second, unprofessional attitudes and conduct by public servants are also a governance problem. Development agencies such as the IMF and the World bank have, since the pro-market emphasis of the 1980s, increasingly viewed governance as a key to development (Lateef, 2016). While efficient governance can be difficult to implement even in high-income countries, this is at least a challenge that is largely recognized in Malawi's strategic plan for the health sector (Government of the Republi, 2017).

Another governance related issue that came up during the field work, but that we were unable to control for in our statistical model due to lacking data, was the misappropriation of health facilities' medical supplies. This is not the first time this problem has been identified in Malawi (Muula and Maseko, 2006; Chaulagai et al., 2005). Corruption not only lowers public trust in government officials, it also erodes the legitimacy of the institution as a whole (Neshkova and Kalesnikaite, 2019). While most of this research has been conducted on the level of national democratic institutions, less is known about its effect on the public's trust in lower levels of government or at the level of public service production (Neshkova and Kalesnikaite, 2019). What is known, however, is that the health sector is especially vulnerable to corruption because it involves a high degree of imbalance of information, high levels of individual discretion, and insulation from competition and external accountability due to the decentralized and individualized character of the service provision (Vian, 2008).

Our results indicate that perceived access to health services is lower if patients have a favorable perception of traditional medicine. A feature of health services in high-income countries is the relatively inelastic demand for services (Vian, 2008). In many African societies, however, traditional medicine will be seen and used as a substitute for modern biomedical medicine and remains a large source of healthcare for the populations (World Health Organization, 2013). Traditional medicine has deep historical roots in Malawi, and still has a strong position today (Lampiao et al., 2019). Hence, it is likely that there is a more elastic demand for modern health services in Malawi and that there will be large substitution effects between traditional healers and modern services. For instance, it has been found that many patients will prefer to consult traditional practitioners even in severe cases because they provide client-centered and personalized healthcare with a perspective that is sensitive to the cultural and spiritual needs and expectations of the patients (Simwaka et al., 2007; King and Homsy, 1997). Another consideration patients make in the choice between a traditional service and the health clinic is the travel distance. As traditional healers are widespread throughout the country, they will be more accessible. This is especially relevant for patients with mobility restrictions, since traditional medicine will be on offer in many local communities, while health facilities, especially in rural districts, often involve substantial travel distances.

Although walking time to health facilities is significant in our statistical models, it did not by itself explain much of the variation in perceived access. The straightforward interpretation of this is that spatial access is of less importance than other considerations in the assessment of access. Akin and Hutchinson (1999) used the term *bypassing* to describe the behavior of patients who choose to travel past local clinics in favor of more distant and often more expensive service locations (Akin and Hutchinson, 1999). This is a widespread phenomenon throughout the developing world and usually indicates significant problems with the quality of care at the bypassed clinic or a considerably better service quality at the alternative facility (Akin and Hutchinson, 1999). This behavior creates some ground for discussion on how to best operationalize distance to account for *bypassing*. Our measurements of distance measure the distance to the clinic patients state that they use and not the distance to their designated "home" clinic. Information from the interviews indicate that *bypassing* is in fact happening to a large extent, but we were unable to account for this in our analysis. In any case, when patients opt to seek out more distant service locations it lends support to our finding that distance is secondary to qualitative considerations in the perception of access.

4.2. The spatial mixed-methods sequence design

Our study supports the general notion that mixed-methods research designs can provide mutual validation of data and findings and produce more coherent and complete pictures of the investigated topics than monomethod designs (Kelle, 2006). Moreover, our spatial sequence design introduces some novelties to the field of social science methodology. First, it introduces a screening procedure to help pick the most promising locations for social science field work. While this type of screening procedure is uncommon in most social sciences, it is not within archeology, where two types of site screening procedures can be identified. *Sampling* is used when an area is too large to be investigated in its entirety and *prospecting* is used to identify particular sites of interest. *Sampling* is comparable with social science sampling procedures where a pre-determined rule-based sampling procedure is employed to pick units of observation. *Prospecting*, on the other hand, involves the use of predictive statistical models and GIS to identify interesting sites based on comparison of previous differences between areas with and without archeological value (Espa et al., 2006). Similarly, our GIS-based mapping of residuals from the initial statistical model is a systematic comparison of differences in observations across our area of study based on the premise that field work locations with clusters of high-value residuals in absolute terms have the largest potential in providing insights that could steer researchers towards stronger model specifications.

The second novelty of our research design is that it introduces a strong empirical and analytical integration between the quantitative data and the qualitative data. Our design is an *explorative-confirmatory design*. The screening procedure is used to locate high-potential field-sites for the qualitative data collection, and the findings from the qualitative part of the study are then fed back into the quantitative model in its revision in the final stage. The improvement in the statistical model in this final stage gives the researcher feedback on how successful the previous stages in the design have been in identifying the most relevant determinants. Moreover, this sets the stage for another loop of screening and qualitative data collection if there is a need to further refine the model specification. If resources allow it, the loop could even be extended to a new round of quantitative data collection (see Fig. 1).

There are some limitations to this design that deserve mentioning. This type of screening is most effective with geocoded data that provide precise locations for the observations. Most surveys or registry-based data, especially containing medical information, will be anonymized. While they may not provide precise locations of observations, they will often contain information about the administrative unit to which they belong (e.g. counties, municipalities, districts, catchment areas, etc.). The screening could then be applied to pick out the administrative units with residual distributions that deviate from the rest, and one could then perform field-studies in those areas. Another limitation is that this design is best suited to explorative data analysis, where there is an open-ended question as to what the relevant determinants might be, and where the aim is to arrive at the strongest possible model specification. It is in such cases that the R-squared or other goodness-of-fit measures are most useful (Hagquist and Stenbeck, 1998). Researchers whose main objective is to evaluate one or a limited set of hypotheses/relationships will be less concerned about the 'other' determinants and about the model's overall goodness of fit and would therefore probably choose another research design.

5. Conclusion

The contribution of this study is twofold. First, the study contributes to the theoretical discussion on what determines health care access by showing how important the interpersonal relationship between health care providers and patients is relative to other determinants such as travel distances and material and economic resources. It is a tendency to equate 'better' care with 'more' care, especially in countries with chronic resource shortages, but while 'more' would surely help, this study points to a strong interconnection between the qualitative elements of patient care and the effective utilization of available resources. To achieve better use of available resources priority should therefore be given to policies that seek to strengthen patient relations in the training curriculum and the governance of the health sector in Malawi.

A secondary goal of this study has been to evaluate the research design we have employed. The design is an addition to the growing range of mixed-methods designs. Using locational quantitative data in a stage design that screens for promising field-study locations has been very effective at guiding us toward better model specifications and hence to a better understanding of what the most influential determinants are and how they exert their influence. Future studies employing such designs should be carried out to further determine the design's general applicability and usefulness.

Credit author statement

Thomas Halvorsen: Conceptualization, Methodology, Formal analysis, Data Curation, Writing - Original Draft, Visualization. Alister Munthali: Investigation, Writing - Review & Editing. Stine Hellum Braathen: Investigation, Writing - Original Draft. Jan Ketil Rød: Methodology, Formal analysis, Data Curation, Writing - Original Draft, Visualization Arne Henning Eide: Supervision, Project administration, Funding acquisition, Writing - Review & Editing.

References

About CHAM Christian health association of Malawi. http://www.cham.org.mw/about-cham.html–. (Accessed 5 December 2019).

Akin, J.S., Hutchinson, P., 1999. Health-care facility choice and the phenomenon of bypassing. Health Pol. Plann. 14 (2), 135–151. https://doi.org/10.1093/heapol/14.2.135.

Andaleeb, S.S., 2001. Service quality perceptions and patient satisfaction: a study of hospitals in a developing country. Soc. Sci. Med. 52 (9), 1359–1370. https://doi.org/10.1016/S0277-9536(00)00235-5.

Anders G, Chirwa WC. The Importance of Practical Norms in Government Health and Education Services in Malawi. :42.

Badu, E., O'Brien, A.P., Mitchell, R., 2018a. An integrative review of potential enablers and barriers to accessing mental health services in Ghana. Health Res. Pol. Syst. 16 (1), 110. https://doi.org/10.1186/s12961-018-0382-1.

Badu, E., Gyamfi, N., Opoku, M.P., Mprah, W.K., Edusei, A.K., 2018b. Enablers and barriers in accessing sexual and reproductive health services among visually impaired women in the Ashanti and Brong Ahafo Regions of Ghana. Reprod. Health Matters 26 (54), 51–60. https://doi.org/10.1080/09688080.2018.1538849.

Baltussen, R., Yé, Y., Haddad, S., Sauerborn, R.S., 2002. Perceived quality of care of primary health care services in Burkina Faso. Health Pol. Plann. 17 (1), 42–48. https://doi.org/10.1093/heapol/17.1.42.

Batbaatar, E., Dorjdagva, J., Luvsannyam, A., Savino, M.M., Amenta, P., 2017. Determinants of patient satisfaction: a systematic review. Perspect Public Health 137 (2), 89–101. https://doi.org/10.1177/1757913916634136.

Chaulagai, C.N., Moyo, C.M., Koot, J., et al., 2005. Design and implementation of a health management information system in Malawi: issues, innovations and results. Health Pol. Plann. 20 (6), 375–384. https://doi.org/10.1093/heapol/czi044.

Chen, J., Chen, J., Liao, A., et al., 2015. Global land cover mapping at 30m resolution: a POK-based operational approach. ISPRS J. Photogrammetry Remote Sens. 103, 7–27. https://doi.org/10.1016/j.isprsjprs.2014.09.002.

Crabb, J., Stewart, R.C., Kokota, D., Masson, N., Chabunya, S., Krishnadas, R., 2012. Attitudes towards mental illness in Malawi: a cross-sectional survey. BMC Publ. Health 12 (1), 541. https://doi.org/10.1186/1471-2458-12-541.

Dassah, E., Aldersey, H.M., McColl, M.A., Davison, C., 2018. 'When I don't have money to buy the drugs, I just manage.'—exploring the lived experience of persons with physical disabilities in accessing primary health care services in rural Ghana. Soc. Sci. Med. 214, 83–90. https://doi.org/10.1016/j.socscimed.2018.08.023.

December 4, 2019 Declaration of Alma-Ata, 2017, 1978. Published March 18. http://www.euro.who.int/en/publications/policy-documents/declaration-of-alma-ata,-1978.

Dixon-Woods, M., Cavers, D., Agarwal, S., et al., 2006. Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. BMC Med. Res. Methodol. 6 (1), 35. https://doi.org/10.1186/1471-2288-6-35.

Donabedian, A., 1973. Aspects of Medical Care Administration: Specifying Requirements for Health Care. Harvard University Press.

Duong, D.V., Binns, C.W., Lee, A.H., 2004. Utilization of delivery services at the primary health care level in rural Vietnam. Soc. Sci. Med. 59 (12), 2585–2595. https://doi.org/10.1016/j.socscimed.2004.04.007.

Eide, Arne Henning, Benedicte, Ingstad, 2011. Disability and Poverty: A Global Challenge. Policy Press.

Eide, A.H., Mannan, H., Khogali, M., et al., 2015. Perceived barriers for accessing health services among individuals with disability in four african countries. PloS One 10 (5), e0125915. https://doi.org/10.1371/journal.pone.0125915.

Eide, A.H., et al., 2018. Combining survey data, GIS and qualitative interviews in the analysis of health service access for persons with disabilities. BMC Int. Health Hum. Right 18, 26.

Espa, G., Benedetti, R., De Meo, A., Ricci, U., Espa, S., 2006. GIS based models and estimation methods for the probability of archaeological site location. J. Cult. Herit. 7 (3), 147–155. https://doi.org/10.1016/j.culher.2006.06.001.

Fay, H., Baral, S.D., Trapence, G., et al., 2011. Stigma, health care access, and HIV knowledge among men who have sex with men in Malawi, Namibia, and Botswana. AIDS Behav. 15 (6), 1088–1097. https://doi.org/10.1007/s10461-010-9861-2.

Fone, D.L., Christie, S., Lester, N., 2006. Comparison of perceived and modelled geographical access to accident and emergency departments: a cross-sectional analysis from the Caerphilly Health and Social Needs Study. Int. J. Health Geogr. 5 (1), 16. https://doi.org/10.1186/1476-072X-5-16.

Fotso, J.C., Mukiira, C., 2012. Perceived quality of and access to care among poor urban women in Kenya and their utilization of delivery care: harnessing the potential of private clinics? Health Pol. Plann. 27 (6), 505–515. https://doi.org/10.1093/heapol/czr074.

Geofabrik Download Server. http://download.geofabrik.de/africa/malawi.html. (Accessed 27 August 2020).

ALOS global digital surface model "ALOS world 3D - 30m" (AW3D30). https://www.eorc.jaxa.jp/ALOS/en/aw3d30/. (Accessed 27 August 2020).

Government of the republic of Malawi. Health Sector Strategic Plan II, 2017 122 (2017-2022).

Griffin, S.J., Kinmonth, A.-L., Veltman, M.W.M., Gillard, S., Grant, J., Stewart, M., 2004. Effect on health-related outcomes of interventions to alter the interaction between patients and practitioners: a systematic review of trials. Ann. Fam. Med. 2 (6), 595–608. https://doi.org/10.1370/afm.142.

Gwatkin, D.R., Bhuiya, A., Victora, C.G., 2004. Making health systems more equitable. Lancet 364 (9441), 1273–1280. https://doi.org/10.1016/S0140-6736(04)17145-6.

Hagquist, C., Stenbeck, M., 1998. Goodness of fit in regression analysis – R2 and G2 reconsidered. Qual. Quantity 32, 18.

International Conference on Primary Health Care (1978: Alma-Ata U, World Health Organization, United Nations Children's Fund (UNICEF). Primary Health Care: Report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978/Jointly Sponsored by the World Health Organization and the United Nations Children's Fund. Soins Santé Prim Rapp Conférence Int Sur Soins Santé Prim Alma-Ata URSS 6-12 Sept 1978, 1978. Published online. https://apps.who.int/iris/handle/10665/39228.

Kelle, U., 2006. Combining qualitative and quantitative methods in research practice: purposes and advantages. Qual. Res. Psychol. 3 (4), 293–311. https://doi.org/10.1177/1478088706070839.

King, R., Homsy, J., 1997. Involving traditional healers in AIDS education and councelling in sub-Saharan Africa: a review. AIDS 11 (Suppl. A). https://www.researchgate.net/profile/Rachel_King8/publication/13778719_Involving_Traditional_Healers_in_AIDS_education_and_counselling_in_Sub-Saharan_Africa_A_review/links/570cfec608ae3199889b464e.pdf. (Accessed 12 June 2020).

Lampiao, F., Chisaka, J., Clements, C., 2019. Communication between traditional medical practitioners and western medical professionals. Front Sociol 4. https://doi.org/10.3389/fsoc.2019.00037.

Lateef, K.S., 2016. Evolution of the World Bank's Thinking on Governance, p. 44. Published online.

Mitchell, Loeb, Eide, Arne Henning, 2004. Living Conditions Among People with Activity Limitations in Malawi. A National Representative Study. SINTEF. https://www.sintef.no/en/publications/publication/?pubid=CRIStin+1268755. (Accessed 27 August 2020).

Mandeville, K.L., Hanson, K., Muula, A.S., Dzowela, T., Ulaya, G., Lagarde, M., 2017. Specialty training for the retention of Malawian doctors: a cost-effectiveness analysis. Soc. Sci. Med. 194, 87–95. https://doi.org/10.1016/j.socscimed.2017.10.012.

Munthali, A.C., Swartz, L., Mannan, H., MacLachlan, M., Chilimampunga, C., Makupe, C., 2019. "This one will delay us": barriers to accessing health care services among persons with disabilities in Malawi. Disabil. Rehabil. 41 (6), 683–690. https://doi.org/10.1080/09638288.2017.1404148.

Muula, A.S., Maseko, F.C., 2006. How are health professionals earning their living in Malawi? BMC Health Serv. Res. 6 (1), 97. https://doi.org/10.1186/1472-6963-6-97.

Neshkova, M.I., Kalesnikaite, V., 2019. Corruption and citizen participation in local government: evidence from Latin America. Governance 32 (4), 677–693. https://doi.org/10.1111/gove.12401.

WHO, 2008. The World Health Report 2008 - Primary Health Care (Now More than Ever). WHO. Published. https://www.who.int/whr/2008/en/. (Accessed 4 December 2019).

WHO, 2011. World Report on Disability. WHO. Published. http://www.who.int/disabilities/world_report/2011/report/en/. (Accessed 5 December 2019).

Path distance (spatial analyst)—ArcMap | documentation. https://desktop.arcgis.com/en/arcmap/latest/tools/spatial-analyst-toolbox/path-distance.htm. (Accessed 27 August 2020).

Penchansky, R., Thomas, J.W., 1981. The concept of access: definition and relationship to consumer satisfaction. Med. Care 19 (2), 127–140. https://doi.org/10.1097/00005650-198102000-00001.

Peters, D., Garg, A., Bloom, G., Walker, D.G., Brieger, W.R., Rahman, M.H., 2008. Poverty and access to health care in developing countries. Ann. N. Y. Acad. Sci. 1136, 161–171. https://doi.org/10.1196/annals.1425.011.

Rao, K.D., Peters, D.H., Bandeen-Roche, K., 2006. Towards patient-centered health services in India—a scale to measure patient perceptions of quality. Int. J. Qual. Health Care 18 (6), 414–421. https://doi.org/10.1093/intqhc/mzl049.

Rogers, S.R., Lugon, R., Collet, C., 2015. Least Cost Path Analysis for Predicting Glacial Archaeological Site Potential in Central Europe. Across Space and Time: Papers from the 41st Conference in Computer Applications and Quantitative Methods in Archaeology (CAA) 2013. Published. https://hesso.tind.io/record/997. (Accessed 27 August 2020).

Simwaka, A., Peltzer, K., Maluwa-Banda, D., 2007. Indigenous healing practices in Malawi. J. Psychol. Afr. 17 (1–2), 155–161. https://doi.org/10.1080/14330237.2007.10820162.

Smith, G.D., Ebrahim, S., 2002. Data dredging, bias, or confounding: they can all get you into the BMJ and the Friday papers. BMJ 325 (7378), 1437–1438. https://doi.org/10.1136/bmj.325.7378.1437.

Street, R.L., Makoul, G., Arora, N.K., Epstein, R.M., 2009. How does communication heal? Pathways linking clinician–patient communication to health outcomes. Patient Educ. Counsel. 74 (3), 295–301. https://doi.org/10.1016/j.pec.2008.11.015.

Tadono, T., Ishida, H., Oda, F., Naito, S., Minakawa, K., Iwamoto, H., 2014. Precise global DEM generation by ALOS PRISM. In: ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences, vols. II-4. Copernicus GmbH, pp. 71–76. https://doi.org/10.5194/isprsannals-II-4-71-2014.

Tang, J.-H., Chiu, Y.-H., Chiang, P.-H., Su, M.-D., Chan, T.-C., 2017. A flow-based statistical model integrating spatial and nonspatial dimensions to measure healthcare access. Health Place 47, 126–138. https://doi.org/10.1016/j.healthplace.2017.08.006.

Tobler, W., Tobler, W., 1993. Non-Isotropic Geographic Modeling.

Trani, J.-F., Browne, J., Kett, M., et al., 2011. Access to health care, reproductive health and disability: a large scale survey in Sierra Leone. Soc. Sci. Med. 73 (10), 1477–1489. https://doi.org/10.1016/j.socscimed.2011.08.040.

Udedi, M., 2016. Improving Access to Mental Health Services in Malawi. Ministry of Healht, Malawi. https://doi.org/10.13140/RG.2.1.3996.9524. (Accessed 5 June 2020).

United Nations, 2006. Convention on the Rights of Persons with Disabilities (CRPD). United Nations Enable. Published. https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html. (Accessed 10 January 2020).

United Nations, 2020. About • Washington Group on disability statistics. Published. http://www.washingtongroup-disability.com/about/. (Accessed 17 February 2020).

Vian, T., 2008. Review of corruption in the health sector: theory, methods and interventions. Health Pol. Plann. 23 (2), 83–94. https://doi.org/10.1093/heapol/czm048.

World Health Organization (Ed.), 2013. WHO Traditional Medicine Strategy. 2014-2023. World Health Organization.

World Health Organization, 2018. World Health Statistics 2018: Monitoring Health for the SDGs. http://apps.who.int/iris/bitstream/handle/10665/272596/9789241565585-eng.pdf?ua=1. (Accessed 5 December 2019).