

Measuring Equity of Access to Health Services in Practice: Example of Eye Health Outreach Camps in Rural Malawi

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Abstract

Introduction

Equity in the access and use of health services is critical if countries are to make progress towards universal health coverage and address the systematic exclusion of the most vulnerable groups. The purpose of this study was to assess if the Co-ordinated Approach To Community Health programme implemented by Sightsavers was successful in reaching the poorest population and people living with disabilities in Kasungu district, Malawi. Outreach camps were organized to provide a range of integrated eye care services.

Methods

Between April and September 2017, data on socio-economic status, household characteristics and functional disability were collected from patients attending at eye camps in Kasungu district, Malawi. Results were compared to Demographic Health Surveys and Integrated Household Surveys data. Using asset-based questions on household characteristics (EquityTool© and Simple Poverty Scorecard©) and the Washington Group Short Set of Questions, individuals were categorized by wealth quintiles, poverty status, and functional disability status.

Results

A total of 1,358 participants participated in the study. The study shows that self-reported data on household characteristics and assets are reliable and can be collected in clinical settings (instead of relying on direct observations). Individuals attending outreach camps were poorer in terms of relative wealth and absolute poverty rates compared to the rest of the population in Kasungu. It was estimated that 9% of the participants belonged to the poorest quintile compared to 4% for the population in Kasungu (DHS 2015–2016). The ultra-poverty rate was also lower among respondents (13%) compared to 15% for Kasungu district (IHS 2017). The functional disability rate was 27.5% for study participants, and statistically higher among women and relatively poorer household dwellers.

Conclusions

Our study shows that existing tools can be reliably used and combined to assess equity of access to health services for vulnerable groups of the population. The findings suggest that the programme was successful in reaching the poorest people of the Kasungu district population as well as those with non-visual disabilities through outreach camps. However, it is essential to use sub-national data (district or regional level) from recent surveys for the purpose of benchmarking in order to produce accurate results.

Introduction

Universal health coverage is central to achieving the 2030 Sustainable Development Goals (SDGs) and ensuring no one is left behind (1). In recent years, there has been good progress in the coverage of some essential interventions, whilst the coverage for others remains low both geographically and in population sub-groups (2). In this context, there has been a growing interest in measuring equity of access to health care and understanding who is being left behind(3, 4). Equity is often described as the absence of avoidable or remediable differences among groups of people, which are defined socially, economically, demographically, or geographically (5). Pursuing equity in health translates to eliminating health disparities that are systematically associated with underlying social disadvantage or marginalisation (6).

Many development programmes make an assumption that targeting rural and remote areas is by virtue equitable, as the poverty levels and marginalisation are particularly high in such locations (7). However, even in remote and rural parts of a country, interventions may only reach and improve health outcomes for individuals who are comparatively advantaged (8). Without assessing the socio-demographic and socio-economic profile of programme participants, resources may not be allocated to those in greatest need leading to an unintentional widening of the health gap.

Eye health is one of the areas where coverage with essential interventions continues to be sub-optimal, particularly in Sub-Saharan Africa (SSA), where over 21 million people live with visual impairments, including 4.3 million, who are blind (9). There are significant variations in coverage between and within SSA countries. A review of 24 population-based Rapid Assessments of Avoidable Blindness (RAABs) in the region estimated the median cataract coverage (i.e. the number of people (or eyes) that have been operated out of those with diagnosed operable cataract) at 29% ranging from 9–55% (10). Coverage with spectacles for distance and near vision is estimated to be even lower, but very few countries in the region have these data (11).

Data on eye health service coverage in different population sub-groups are also rare. RAABs, which are the main source of population-based data on visual impairment, only recently started collecting data on variables other than sex and age (12). Data from the studies available show that women, people from poorer households and those with additional (non-visual) disabilities are disadvantaged in accessing eye care services. There are also context-specific differences which are difficult to review systematically as only a few RAABs have these more comprehensive data.

In this context, routinely collected data from eye health programmes could be a valuable source of information about equity in eye health(13). However, at present eye health services rarely collect data on patient characteristics beyond sex and age and even these basic data are not always used to assess equity of service delivery.

A recent paper by Evans et al reviewed equity in the studies included in the Cochrane Eye and Vision systematic reviews (14). The authors identified 62 unique sources, of which only two reported data by socio-economic status, two by place of residence, three by education and one by occupation. Sex specific

data was reported in the majority (73%) of papers but the sub-group analysis of sex data was included in only two studies. The authors highlighted the urgent need to prioritise equity data in eye health research.

The study presented here was integrated in an eye health programme called the Co-ordinated Approach To Community Health (CATCH). The programme was funded by the UK Department for International Development (DFID) and implemented by the international non-governmental organisation (iNGO) Sightsavers in partnership with other organisations in Eastern (Kenya, Uganda) and Southern Africa (Malawi, Mozambique, and Zambia). The aim of the programme was to increase the coverage of eye health services in trachoma-endemic areas by building on current global initiatives to eliminate blinding trachoma as a public health problem. A range of eye care services including eye examinations and treatment of common eye diseases, such as cataract, refractive error, and conjunctivitis were delivered through outreach camps, where patients with minor morbidities were treated on-site; and those with more complex conditions were taken to a nearby hospital.

The study took place in the Kasungu district in the Central Region of Malawi. The initial objectives of the study were to, firstly, collect data on equity and access to CATCH camps' eye care services. Secondly, test asset-based measurement of wealth tools and the feasibility of collecting related data on patient characteristics and household's assets during the outreach camp. Finally, to collect data on patients' disability status and generate evidence on economic gradient for disability. It was anticipated that the data would be relevant and useful to the programme to guide its community mobilisation and awareness raising campaigns to ensure that those in the greatest need were reached and no one in the target community was left behind.

Methods

Study design and population

The study design was a cross-sectional survey of patients attending eye health outreach camps in the district of Kasungu, central Malawi (Fig. 1).

Study participants were recruited from those who attended the outreach camps, providing they were over the age of 18 years, or accompanied by an adult if below this age and gave consent.

The study was conducted between April and September 2017. During this period eye camps were organised monthly across the district and lasted between two and four days each (Fig. 1).

Comprehensive eye health activities were delivered alongside outreach camps targeting trachoma trachomatous (TT) and organised as part of the trachoma elimination programme funded by the Queen Elizabeth Diamond Jubilee Trust (QEDJT) (15).

Sampling

The study population was all individuals who presented at outreach camps who met the inclusion criteria stated above. Study participants were sampled using systematic (interval-based) sampling until the required minimum sample size was reached.

The sample size was calculated based on the formula for proportions' comparison (16). The following assumptions from an earlier pilot and from Demographic and Health Surveys (DHS) 2015/2016 were used: i) an estimated prevalence of non-visual disability of 10%; ii) 8% of those with a disability would belong to the wealthiest quintile; and iii) a power of 80% to detect a 10% difference in the prevalence of disability between attendees belonging to the poorest group (quintile 1) and the wealthiest group (quintile 5) at alpha 0.05, with a ratio of 2. The minimum sample size required was 1,275 participants (17). In this study household and dwelling data were self-reported. Therefore, a number of household visits were organized for randomly selected patients participating in the study in order to verify the validity of these data. The sample size needed for the household visits was calculated to be 102, using a 7.5% margin of error (alpha 0.05).

Study tools

Measuring participants' economic status

Income is commonly used as a measure of economic status. However, it is extremely difficult to measure income in low- and middle-income contexts with large informal sectors and where income does not include in-kind payments and/or fluctuates according to seasonality and migration (18). Household ownership of assets can be used as an alternative to estimate wealth and poverty levels in such contexts (19–21). In this study we used two validated asset-based tools, the EquityTool and the Poverty Scorecard (22, 23).

The Poverty Scorecard, developed by Mark Schreiner of Microfinance Risk Management L.L.C, is a country specific tool, which assesses household characteristics and asset possession. The Malawi tool available at the time of this study was based on the Malawi's 2010/2011 Integrated Household Survey (IHS) and consisted of 10 questions (24). The tool calculates a poverty score for each household which is then used to estimate the poverty rate or the proportion of a group to be below four government defined poverty lines: i) food or ultra-poverty line; ii) national poverty line (includes food and non-food components); iii) \$1.90 per day line; and iv) \$3.10 per day line (Appendix 1) (23, 24).

The EquityTool, developed by Metrics for Management, measures relative wealth based on household characteristics and possession of durable assets. The tool scores households and compares them to the national (or urban) wealth index values derived from DHS (22). These values are used to determine cut-off points for five wealth quintiles, where quintile one represents the poorest segment of the population and quintile five the wealthiest. Individuals within the household are allocated to their corresponding quintile, which allows for comparison of their socio-economic status with the rest of the national (or urban) population. If study or programme participants' level of wealth is the same as the national (or urban) population, each quintile will have 20 percent of respondents. The study used the tool validated for Malawi based on the Malawi DHS 2010 (22, 25). This was the latest version available at the time of the study, which included 17 questions.

Both national surveys (IHS and DHS) allow for disaggregating data at the regional and district level. Therefore, in our analysis for both tools we compared wealth of our programme participants with the national population and the population of Kasungu district. In addition, by the time of the data analysis more recent national surveys (DHS from 2015/16 and IHS 2016/17) had been released (17, 26). We used these more recent datasets in the sensitivity analysis to place our data in the context of these surveys.

Measuring disability

The Washington Group Short Set of Questions on Disability (WGSS) was used to measure self-reported disability. The tool was developed by the United Nations Statistical Commission for use in national censuses and surveys. The tool assesses functional difficulties when conducting basic activities in six domains: seeing, hearing, walking/climbing; remembering/concentrating; self-care and communicating. The answers are given on a four-point scale from 'no difficulty' to 'cannot do at all'. Disability status is defined when participants report having a lot of difficulty or cannot do at all in at least one domain (27). As we expected, a significant number of participants coming to the outreach camps had difficulty in seeing. We also used a measure of "non-visual disability", i.e. a functional difficulty (a lot of difficulty or cannot do at all) in any domain except seeing.

Data collection

Upon arrival at the screening site, all attendees were provided information about the study by the data collection team. Information was provided in local languages and people had an opportunity to ask questions.

All attendees first undertook visual acuity test using a tumbling E chart. Those who failed the test or had other visible eye problems (such as red eye) were examined by the Ophthalmic Clinical Officer, who made a diagnosis and provided a treatment or a referral. Patients selected by the interval random sampling (see above) for a further interview were again informed about the study, its purpose and how the data will be used and were asked to provide their consent. If provided, they were asked questions from the EquityTool, Poverty Scorecard and WGSS questionnaires. A subset of participants was then randomly selected for home visits to verify their household asset scores (Fig. 2).

The data was collected electronically using the mobile phone survey software KOBO ToolBox. Five data collectors with experience of collecting mobile data were recruited and trained ahead of the camp. The questionnaires were administered in local languages, Chichewa and Tumbuka.

Household visits to verify self-reported wealth were attempted on the same day as the camp visit when possible; if not, they were carried out the following day. Community volunteers assisted the data collectors to trace the respondents' homes.

Data analysis

Personal identifiable information collected was separated from the rest of the data before the analysis. Data cleaning and analysis was undertaken using STATA 14 (28).

To compare the level of wealth of camp participants to the rest of the Kasungu district, both DHS 2010 and DHS 2015/2016 data sets were retrieved from the Demographic and Health Surveys programme website and were compared against our study sample. For the analysis using DHS 2015/16 data the EquityTool 2010 questions were used, similar to methods used by Pitchforth et al. and Wilunda et al. (22, 29–31). The choice of applying the EquityTool proxy variables 2010 on the DHS 2015/16 data was justified by the fact that there was an important time gap between DHS 2010 and DHS 2015/16 and that Metrics for Management updated Malawi EquityTool 2017 contained different questions that our survey did not cover (Appendix 2) (32). The same procedure was applied to the Poverty Scorecard results using the IHS 2011 and IHS 2017 at national and district levels as references (24, 26).

STATA complex design-based F-test of independence was used to test our hypothesis that the proportion of study participants belonging to the lowest relative wealth quintile was different from the Kasungu residents, and from the DHS full sample (33).

Kappa statistics were used to measure the inter-rater reliability of self-responses at the camp level compared to the household level for questions on dwelling characteristics and ownership of assets, following the methodology described in the literature (34). The guidelines from Landis & Koch (1977) were used to interpret the level of agreement as follows: 0.0–0.20: slight; 0.21–0.40: fair; 0.41–0.60: moderate; 0.61–0.90: substantial; 0.81–1.00: almost perfect (35).

STATA 14 was also used to assess participants' disability status using the recommended cut off (a lot of difficulty or cannot do at all) in at least one domain. Non-visual disability was determined by using the same cut offs but excluding the seeing domain. A logistic regression was used to determine a potential association between reported disability, sex, absolute wealth, and relative wealth quintiles. For this analysis, absolute wealth and relative wealth dichotomous variables have been created. The first and the second relative wealth quintiles (poorest) have been grouped as well as the fourth and the fifth (wealthiest) so as to have two larger and more homogenous groups. For the absolute wealth variable, participants have been separated in two groups, participants with a poverty likelihood, according to poverty scorecard scores, below and above 50%.

Ethical considerations

Ethical approval was obtained from the Malawi National Health Sciences Research Committee (NHSRC) [protocol #16/11/1685]. Informed consent was obtained from all study participants. In the case of minors, their carer provided the consent. Additional verbal consent was requested prior to the household visits; and at the household level, a consent was sought from both the head of the household and the study participant. All information collected was anonymised and kept confidential. All study participants with eye problems were either treated at the camp or referred to the district hospital for further management.

Results

Participants' characteristics

Over a five-month period, 1,358 participants were recruited at the eye camps and participated in the study. Table 1 summarises demographic characteristics of participants.

There were more men than women in the sample (54% vs 46%). Around half of the participants (47.5%) were aged 50 years and above with both the mean and median age of 49 years. Most participants were married (75%). Sixty one percent had attained primary school education only, while about one fifth (21%) had received secondary education; and 16% had no education. Only 34 participants (2.5%) had education beyond secondary.

The majority (74%) reported agriculture as their main occupation followed by professional skilled jobs i.e. technical, administrative, managerial roles (8%). Around 56% said that their occupation was seasonal, while 42% said they worked all year round.

Table 1
Sociodemographic characteristics of study participants (n = 1358)

Socio-demographic characteristics	N (%)
Sex	
Men	733 (53.98)
Women	625 (46.02)
Age group	
< 18	136 (10.01)
20–29	130 (9.57)
30–39	190 (13.99)
40–49	257 (18.92)
50–59	231 (17.01)
+ 60	414 (30.49)
Marital status	
Married/partnership	1025 (75.48)
Divorced/separated	66 (4.86)
Never married	75 (5.52)
Widowed	192 (14.14)
Education level	
No education	211 (15.54)
Primary	823 (60.60)
Secondary	290 (21.35)
Higher than secondary	34 (2.50)
Occupation	
Agriculture	1010 (74.37)
Service worker	16 (1.18)
Sales worker	53 (3.90)
Production worker	38 (2.80)
Professional	115 (8.47)

Socio-demographic characteristics	N (%)
Unemployed/student/other	126 (9.28)
Frequency of work	
All year	515 (41.63)
Seasonal	687 (55.54)
Occasional	35 (2.83)

Participants' socio-economic status

Validity of self-reported data

Table 2 shows that there was a high degree of agreement (80%) between household wealth based on self-reported characteristics and assets and those observed during the household visits with a kappa statistic of 0.74. The finding confirms the accuracy of the self-reported estimates collected during the camps (see appendix 3).

Table 2
Household and camp inter-rater reliability

	Agreement (%)	Expected agreement (%)	Kappa	Standard error
Household versus camp responses	80.1%	24.7%	0.7361	0.0438

Poverty Score card results

Our data shows that 13.2% of the camp attendees were below the ultra-poverty line (also called food line with a threshold of 2,400 calories per day); 35% were below the national poverty line; 65% were below the \$1.90 threshold, and 84% were below the \$3.10 a day threshold (Purchasing Power Parity 2011). When compared to the national and Kasungu populations in 2011, our participants were on average wealthier. For example, the respective poverty rates in Kasungu district were 19.8%, 44.6%, 73.1% and 88.9% in 2011. As indicated in Table 3, absolute poverty rates in Kasungu and at the national level have decreased over the period 2011 and 2017, and poverty rates among camp attendees are similar to poverty rates calculated for Kasungu district in 2017 (IHS 2017).

Table 3
Poverty rates using government. defined thresholds (2011 poverty lines)

Government poverty lines	Camps participant 2017 (n = 1,358) %	IHS 2011 - Kasungu (n = 384)* %	IHS 2011 - National (n = 12,271)* %	IHS 2017 - Kasungu (n = 384)* %	IHS 2017 - National (n = 12,447)* %
Ultra-poverty line	13.2 [12.4–13.9]	19.8 [17.8–21.8]	19.9 [19.5–20.3]	14.2 [12.7–15.6]	11.5 [11.2–11.8]
National poverty line	35.0 [33.6–36.3]	44.6 [41.7–47.5]	44.3 [43.7–44.9]	37.2 [34.6–39.6]	31.6 [31.1–32.1]
\$1.90 dollar per day, PPP 2011	65.2 [63.8–66.5]	73.1 [70.6–75.8]	72.2 [71.6–72.7]	67.3 [65.0–70.0]	60.9 [60.4–61.5]
\$3.10 dollar per day, PPP 2011	84.0 [83.0–85.1]	88.9 [87.1–90.7]	87.8 [87.4–88.2]	85.6 [84.0–87.7]	80.9 [80.5–81.4]
*Weighted poverty rates					

Figure 3 graphically represents the poverty scores of camp attendees compared to the national and Kasungu populations in 2011 and 2017. The statistical tests using Stata survey design adjusted samples t-test also confirmed that the camp attendees were wealthier than the Kasungu and national population in 2011 (respectively $t(1,740) = -6.05, p = 0.000$ and $t(13,598) = -12.12, p = 0.000$). On the other hand, the national sample of the IHS 2017 had a statistically higher mean score $t(13,773) = 5.75, p = 0.000$. Finally, no statistical difference were observed between camps' mean score and Kasungu population of 2017 ($t(1,741) = -1.49, p = 0.137$).

EquityTool results

Looking at the wealth quintiles in the sample using the DHS 2010 cut off points (Table 4), the results suggest that our participants were relatively wealthier than the rest of the country, as over half of the participants belonged to the two wealthiest quintiles and only 25% to the two poorest quintiles. There is an even greater gap with the Kasungu population in 2010, who were poorer than the national population and where 50% of residents belonged to the two poorest quintiles and only 30% to the two wealthiest quintiles. However, when we compare the 2015-16 DHS data with the 2010 DHS data, we can see that the 2015-16 populations are wealthier, as over 53% in Kasungu and 62% nationally belong to the two wealthiest quintiles using the 2010 thresholds. In fact, camp attendees appear to be poorer than the national and Kasungu populations in 2015-16, as 25% of our sample belonged to the two poorest

quintiles compared to only 12% in the national and Kasungu 2015/16 populations. (Table 4). Our statistical analysis also showed a significant difference ($p < 0.001$)

Table 4
EquityTool 2010 wealth quintiles of CATCH camps participants and DHS survey individuals living in Kasungu district (weighted)

Equity tool 2010 proxies		Camps participant 2017 (n = 1,358)	DHS survey 2015/2016 – Kasungu (n = 1,276)	DHS survey 2015/2016 – National (n = 24,799)	DHS survey 2010 - Kasungu	DHS survey 2010 – National
		N (%)	N (%)*	N (%)*	N (%)*	N (%)*
Relative wealth quintile	Q1 poorest	125 (9.2)	42 (4.24)	549 (2.22)	49 (27.79)	547 (18.76)
	Q2	219 (16.13)	73 (7.41)	981 (3.97)	41 (23.16)	551 (18.87)
	Q3	322 (23.71)	342 (34.94)	7840 (31.71)	33 (18.74)	553 (18.96)
	Q4	380 (27.98)	316 (32.3)	8426 (34.08)	33 (18.64)	596 (20.44)
	Q5 richest	312 (22.97)	206 (21.1)	6924 (28.01)	21 (11.67)	671 (22.98)

*STATA complex sampling design F tests of independence with camps participant ($p < 0.001$)

Disability status

Using the recommended Washington Group definition of disability, 373 persons were classified as disabled (27.5%) (Table 5). Excluding the vision domain, 14.2% (n = 193) were considered having a (non-visual) disability. The most common non-visual disabilities were difficulties in walking (6.6% prevalence) and difficulties in remembering/concentrating (5.8%). Hearing disability was reported by 2% of participants.

The proportion of women reporting a disability was slightly higher (28.8% against 26.3% for men) but not statistically significant. When the seeing domain was excluded, prevalence of non-visual disability was statistically significantly higher among women ($p = 0.018$).

The logistic regression analysis (Table 5) also showed no statistically significant associations between disability (visual or non-visual) and being below the national poverty line. However, persons with disability were more likely to be relatively poor, as their odds of belonging to the two wealthiest quintiles were significantly lower than for people without disabilities (respectively $p = 0.000$ and $p = 0.019$).

Table 5
Association with reported functional disability (with and without visual disability)

Variables (N)	Reported disability		Reported non-visual disability	
	n	Odds ratio (95% confidence interval)	n	Odds ratio (95% confidence interval)
Gender				
Men (N = 733)	193	Ref.	89	Ref.
Women (N = 625)	180	1.13 (0.89–1.44)	104	1.44 (1.06–1.96)*
Poverty scorecard score**				
Above the national poverty line (N = 807)	225	Ref.	117	Ref.
Below the national poverty line (N = 551)	148	0.95 (0.74–1.21)	76	0.94 (0.69–1.29)
EquityTool Wealth quintiles				
Quintile 1 and 2 (N = 344)	121	Ref.	67	Ref.
Quintile 4 and 5 (N = 692)	166	0.58 (0.44–0.77)*	87	0.65 (0.46–0.93)*
Total (N = 1,358)	373	-	193	-
*Significance at $p < 0.05$				
**Above poverty line corresponds to a poverty likelihood inferior to 50%				

Discussion

This study examined the feasibility and utility of collecting data on characteristics of patients attending outreach camps as a way of assessing equity of access to eye care services. Data were collected from a random sample of people presenting at the outreach camps in one of the districts in Central Malawi. We were specifically interested in patients' socio-economic and disability status and used existing standardised international tools to collect these variables. For socio-economic status we measured both absolute poverty rates and relative wealth.

We found that using a set of selected tools to routinely monitor equity in service delivery is feasible; and although data collection did require additional human resources, their work was neither intrusive nor disruptive to the work of the medical personnel. Indeed, CATCH staff who worked alongside the data collection team confirmed that surveying study participants had minimal effect on their usual camp routine. Collecting data from a sample of patients at more convenient time rather than all camp attendees required longer presence of data collectors at the camp but it prevented interference with the flow of patients. Collecting additional data after the initial screening was the most optimum point, as by

that time the patients had received the service they came for they were either on their way home (if they did not have any eye problems) or were waiting at the camp for further examination and treatment.

The study also helped to better understand the use of the tools for measuring patients' socio-economic status in a routine service delivery setting. The EquityTool and the Poverty Scorecard used in this study rely on asset-based wealth indexes which are considered as best practices for household surveys, where dwelling characteristics and ownership of durable assets can be directly observed. There were concerns about the reliability of self-reported data, but this study found a high level of agreement (80%) between the information given by respondents at the point of service delivery and what was observed during the follow-up visits to their homes. This suggests that self-reported data on dwelling characteristics and assets can be a reliable measure of socio-economic wealth and that the tools, such as the EquityTool and the Poverty Scorecard, can be applied to collect data from participants presenting at clinics or outreach camps. Both questionnaires are simple and fast to administer (10 to 15 minutes) causing minimal disruption to health care services.

In terms of absolute wealth measurement, the Poverty Scorecard results showed that camp participants' average poverty rate was significantly higher than the poverty rates of Kasungu and national population of Malawi in 2011 (24). The camp participants' poverty rate was also higher than the national poverty rate measured in 2017 (26). However, the poverty rates were similar to the levels in Kasungu. The findings suggest that the programme reached poor people in a proportion similar to the Kasungu population. The relative wealth measurement and the EquityTool results indicate that camp attendees were relatively wealthier compared to the 2010 population of Kasungu and at the national level (25). However, compared to the DHS 2017, the camp attendees appeared to be relatively poorer than the Kasungu and national populations, which is typical for trachoma endemic areas as trachoma is known to be a disease of poverty affecting the poorest and most marginalised communities (36) .

We found the use of both tools necessary and complementary, as the Poverty Scorecard shows how poor your target population is in absolute terms, while the EquityTool assesses programme populations in comparison with the national population or the urban population of a country. However, it is important to note that the comparison of our camp attendees with the population of Kasungu rather than the national population produced more relevant results to measure equitable access of a local health programme. The finding suggests the importance of using regional and district level subsets of national survey data as benchmarks for comparison.

It is also important to note that the latest versions of the tools available to us at the time of the study (in 2017) were based on relatively old surveys (DHS 2010 and IHS 2010/2011) [6, 9]; the tools have since been updated based on more recent surveys (DHS 2015-16 and IHS 2017). This is likely to explain the fact that our participants were generally wealthier when compared to the national and Kasungu district populations in 2010-11 (as compared to more recent surveys). The results confirm an earlier observation made by Wilunda et al. that tools based on the ownership of assets tend to lose their reliability over time (30). It is particularly true for the ownership of assets such as radios, televisions or mobile phones, which

can rapidly change over a short period of time. Therefore, to determine the economic status more accurately it is essential to use the most recent household survey benchmarks and tools (37). This finding is important to consider when integrating equity measurement in a development project cycle. For example, in the contexts where only a relatively old (five years or more) tool for measuring wealth is available, it may be better to wait for the release of an updated tool, as the conclusions based on the data from the old tool are likely to be inaccurate and misleading.

The estimated prevalence of functional limitations among programme participants attending the outreach camps was 27.5%, including all domains, and 14.2%, excluding the sight domain when using the Washington Group definition of disability. Disability data collected at the facility level is difficult to interpret, as people coming to the facilities are not necessarily representative of the general population. In addition, people coming to eye care services, are usually older and have visual impairments but population-based data on the prevalence of additional disabilities in people with visual impairments is limited, as very few RAABs integrate disability measurement in their design. However, we could compare our data with a recent survey of living conditions of people with disabilities in Malawi published in 2018 (38). The survey used the same WGSS tool and collected disability data in a large sample of over 30,000 people aged 2 + years. Prevalence of disability among adults was 9%. Prevalence of disability among people 50 + years was 20.2%, which shows that our results are broadly comparable to the population-based data in Malawi suggesting that the camps were accessible for people with disabilities.

Intersectionality between disability and poverty has been of great interest to academic literature (39–42). Indeed poverty can increase the risk of disability and, conversely, disability can trap people in poverty because of the barriers disabled people face in taking part in education, employment, social activities and other aspects of life (43–45), Therefore, our study had the objective of examining and adding empirical evidence of the association between disability and poverty. Results showed that the odds of belonging to the wealthiest quintiles while reporting a disability (visual or non-visual) were statistically lower (respectively $p = 0.000$ and $p = 0.019$). However, there were no relationship between disability and poverty in absolute terms. This is likely to be because a very large proportion of our participants were below the poverty line and a large proportion had a disability. Even though the absolute measure of wealth did not show statistical links, the relative wealth analysis indicates differences and suggests that programmes should systematically include inclusive services and disaggregate monitoring data to ensure no one is left behind.

Another aspect of equity that may require further attention is gender equity. Outreach camps in the CATCH programme targeted primarily people with cataract and trachomatis trichiasis. For both conditions, women are at higher risk than men. Yet, 54% of our study participants were male. Gender inequities in accessing eye health services have been well documented (9, 46–50). In most low-income settings in Sub-Saharan Africa, women have lower coverage with cataract services and are more likely to be blind and severely visually impaired than men. The reasons for this are multiple and complex, ranging from cultural norms that value males over females to women's inability to pay or travel outside their community (49–51). Our study suggests that women are not only less likely to accept and access

treatment, but that they are less likely to attend the first point of contact with a healthcare provider, which is outreach camps. Further studies are needed to explore the drivers of women's health seeking behaviour and to better understand whether women do not have access to information about outreach camps or they do not come due to household, childcare or other duties.

There are several challenges and limitations that need to be considered when interpreting these results or when planning similar studies in other locations. First, our conclusions are limited to one location, Kasungu, and cannot be generalised to other settings doing similar programmes in Malawi or elsewhere. Studies in other parts of Malawi and other countries would be beneficial to review equity in accessing eye health services in a more systematic way and whether there are any cross-country generalisations. Second, in this study we did not have access to clinical data. The data collected here was only on the attendance of outreach camps. We do not know whether there were differences in the severity of visual impairment presented at the camp or the uptake of referrals by gender, socio-economic status, or disability.

Finally, although the residence of programme participants (village and traditional authority area) was recorded in this study, it could not be classified into urban or rural as per the DHS. We did not map patients' residence in relation to the location of the camps and did not assess whether there were any specific locations that could not be reached due to distance. Future outreach camps need to collect more accurate data on attendees' residence and distance travelled, possibly using GIS maps. This will help to better understand the intersectionality of wealth, rural residence, gender, and disability.

Conclusions

Despite some limitations the study provides valuable information on the tools that could be used in programme settings to assess the equity of access to eye care services. It shows that it is feasible to use the Poverty Scorecard, the EquityTool and the Washington Group Short Set of Questions on Disability in an outreach camp without major disruptions to the services provided. The findings show that the outreach camps managed to reach a poor section of the district population as well those with non-visual disabilities. However, women and possibly people with mobility limitations may find it more difficult to access the camps and need to be given a particular attention in the community mobilisation campaigns. The study also shows that self-reported data on household characteristics and assets are reliable and can be collected in clinical settings without a need for onsite observations. However, to produce accurate results on the household wealth the most recent surveys and regional datasets should be used for the purpose of benchmarking. The study further emphasises the need for monitoring equity in eye care programmes with additional data on patient residence, clinical diagnoses, and the uptake of referrals.

Abbreviations

CATCH

Co-ordinated Approach To Community Health

DHS

Demographic and Health Surveys

DFID

Department for International Development

IHS

Integrated Household Survey

INGO

international Non-Governmental Organisation

NHSRC

National Health Sciences Research Committee

PPP

Purchasing Power Parity

QEDJT

Queen Elizabeth Diamond Jubilee Trust

RAAB

Rapid Assessments of Avoidable Blindness

SDGs

Sustainable Development Goals

SSA

Sub-Saharan Africa

TT

Trachoma Trachomatous

WGSS

Washington Group Short Set

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Malawi National Health Sciences Research Committee (NHSRC) [protocol #16/11/1685]. Informed consent was obtained from all study participants. In the case of minors, their carer provided the consent. Additional verbal consent was requested prior to household visits; and at the household level, a consent was sought from both the head of the household and the study participant. All information collected was anonymised and kept confidential. All study participants with eye problems were either treated at the camp or referred to nearby surgical services.

Consent for publication

Availability of data and materials

All data used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SSA, ZM, TE, EK, SB and ES conceptualised the study. SSA, ZM, TE and EK were responsible of the study design, data collection, and initial data analysis. GT, working closely with IJ, led the manuscript writing and extended data analysis (including DHS and IHS datasets). All authors have reviewed, edited and approved the final manuscript.

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References

1. Sidibé M. Universal health coverage: political courage to leave no one behind. *The Lancet Global Health*. 2016;4(6):e355-e6.
2. World Health Organization. *Primary Health Care on the Road to Universal Health Coverage, 2019 Monitoring Report*. Geneva: World Health Organization; 2019.
3. Mujica OJ, Moreno CM. From words to action: measuring health inequalities to "leave no one behind". *Pan American Journal of Public Health*; 2019.
4. Rodney AM, Hill PS. Achieving equity within universal health coverage: a narrative review of progress and resources for measuring success. *International Journal for Equity in Health*. 2014;13(1):72.
5. Whitehead M. The concepts and principles of equity and health. *International journal of health services: planning administration evaluation*. 1992;22(3):429–45.
6. Braveman P, Gruskin S. Defining equity in health. *J Epidemiol Community Health*. 2003;57(4):254–8.
7. World Bank Group. *Poverty & Equity Brief, Sub-Saharan Africa Malawi*. 2018.

8. International Labour Organization
Scheil-Adlung X. International Labour Organization. Global evidence on inequities in rural health protection - New data on rural deficits in health coverage for 174 countries. International Labour Office, Social Protection Department; 2015. Contract No.: ESS Document No. 47.
9. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *The Lancet Global Health*. 2017;5(9):e888-e97.
10. Lewallen S, Schmidt E, Jolley E, Lindfield R, Dean WH, Cook C, et al. Factors affecting cataract surgical coverage and outcomes: a retrospective cross-sectional study of eye health systems in sub-Saharan Africa. *BMC Ophthalmol*. 2015;15:67.
11. World Health Organisation. World report on vision. Geneva; 2019.
12. Jolley E, Buttan S, Engels T, Gillani M, Jadoon MZ, Kabona G, et al. Prevalence of Visual Impairment and Coverage of Cataract Surgical Services: Associations with Sex, Disability, and Economic Status in Five Diverse Sites. *Ophthalmic epidemiology*. 2020:1–9.
13. Ramke J. Measuring inequality in eye care: the first step towards change. *Community eye health*. 2016;29(93):6–7.
14. Evans J, Mwangi N, Burn H, Ramke J. Equity was rarely considered in Cochrane Eyes and Vision systematic reviews and primary studies on cataract. *Journal of Clinical Epidemiology*. 2020.
15. Tropical Health. Trachoma Elimination in Africa - Lessons from two multi-country initiatives. 2019.
16. Wang HC, Shein-Chung. Sample Size Calculation for Comparing Proportions. *Wiley Encyclopedia of Clinical Trials* 2007.
17. National Statistical Office Malawi, Icf. Malawi Demographic and Health Survey 2015-16 [Dataset]. Multiple Datasets. Zomba: National Statistical Office and ICF; 2017.
18. Howe LD, Galobardes B, Matijasevich A, Gordon D, Johnston D, Onwujekwe O, et al. Measuring socio-economic position for epidemiological studies in low- and middle-income countries: a methods of measurement in epidemiology paper. *Int J Epidemiol*. 2012;41(3):871–86.
19. Chakraborty NM, Fry K, Behl R, Longfield K. Simplified Asset Indices to Measure Wealth and Equity in Health Programs: A Reliability and Validity Analysis Using Survey Data From 16 Countries. *Global health. science practice*. 2016;4(1):141–54.
20. Rutstein SO, Johnson K. The DHS wealth index. Maryland: ORC Macro; Calverton; 2004.
21. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. *Demography*. 2001;38(1):115–32.
22. Metrics for Management. Malawi EquityTool. 2015.
23. Schreiner M. Simple Poverty Scorecard® Poverty-Assessment Tool Malawi 2015.
24. National Statistical Office. Third Integrated Household Survey 2010–2011 [Dataset]. Multiple Datasets. Zomba, Malawi: The Commissioner of Statistics.
25. National S Office; 2012.

26. National Statistical Office NSOM. Macro ICF. Malawi Demographic and Health Survey 2010 [Dataset]. Multiple datasets. Zomba: NSO/Malawi and ICF Macro; 2011.
27. National Statistica Office
Fourth Integrated Household Survey 2016–2017 [Dataset]
National Statistica Office. Fourth Integrated Household Survey 2016–2017 [Dataset]. Multiple datasets. Zomba, Malawi: The Commissioner of Statistics.
28. National S Office; 2017.
29. Centers for Disease Control and Prevention. Short Set of Questions on Disability: cdc.gov; 2010 [Available from: https://www.cdc.gov/nchs/washington_group/wg_questions.htm].
30. StataCorp. Stata Statistical Software: Release 14. College Station. TX: StataCorp LP; 2015.
31. Malawi Demographic and Health Survey. In. Office NS, editor 2015–2016.
32. Wilunda C, Putoto G, Manenti F, Castiglioni M, Azzimonti G, Edessa W, et al. Measuring equity in utilization of emergency obstetric care at Wolisso Hospital in Oromiya, Ethiopia: a cross sectional study. *International Journal for Equity in Health*. 2013;12(1):27.
33. Pitchforth E, van Teijlingen E, Graham W, Fitzmaurice A. Development of a proxy wealth index for women utilizing emergency obstetric care in Bangladesh. *Health policy planning*. 2007;22(5):311–9.
34. Metrics for Management. Malawi 2017 [Available from: <https://www.equitytool.org/malawi/>].
35. StataCorp. Stata Survey Data Reference Manual: Release 2016. College Station: StataCorp LLC; 2019.
36. Banerjee M, Capozzoli M, McSweeney L, Sinha D. Beyond Kappa: A Review of Interrater Agreement Measures. *The Canadian Journal of Statistics / La Revue Canadienne de Statistique*. 1999;27(1):3–23.
37. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33(1):159–74.
38. Habtamu E, Wondie T, Aweke S, Tadesse Z, Zerihun M, Zewdie Z, et al. Trachoma and Relative Poverty: A Case-Control Study. *PLoS Negl Trop Dis*. 2015;9(11):e0004228-e.
39. Mathiassen AW, Bjorn K. Challenges in predicting poverty trends using survey to survey imputation: Experiences from Malawi. Oslo: Statistics Norway, Research Department; 2019.
40. Eide AHM, Alister. Living conditions among persons with disabilities in Malawi. SINTEF; 2017.
41. Peters DH, Garg A, Bloom G, Walker DG, Brieger WR, Rahman MH. Poverty and access to health care in developing countries. *Ann N Y Acad Sci*. 2008;1136:161–71.
42. Batana YM. Multidimensional Measurement of Poverty Among Women in Sub-Saharan Africa. *Soc Indic Res*. 2013;112(2):337–62.
43. Kett M. Global issues in disability and inclusivity in developing countries/ International health: Opportunities for challenge-led innovation. Horizon 2020 Expert Paper; 2012.
44. World Health Organisation. Bank TW. World Report on Disability. Geneva: World Health Organisation; 2011.

45. Pinilla-Roncancio M. Disability and poverty: two related conditions. A review of the literature. *Revista de la Facultad de Medicina*. 2015;63:113–23.
46. Mont D. *Measuring Disability Prevalence*. World Bank Group; 2007.
47. Stapleton DC, O'Day BL, Livermore GA, Imperato AJ. Dismantling the poverty trap: disability policy for the twenty-first century. *Milbank Q*. 2006;84(4):701–32.
48. Flaxman SR, Bourne RRA, Resnikoff S, Ackland P, Braithwaite T, Cicinelli MV, et al. Global causes of blindness and distance vision impairment 1990–2020: a systematic review and meta-analysis. *The Lancet Global health*. 2017;5(12):e1221-e34.
49. Lewallen S, Mousa A, Bassett K, Courtright P. Cataract surgical coverage remains lower in women. *Br J Ophthalmol*. 2009;93(3):295–8.
50. Gilbert CE, Lepvrier-Chomette N. Gender Inequalities in Surgery for Bilateral Cataract among Children in Low-Income Countries: A Systematic Review. *Ophthalmology*. 2016;123(6):1245–51.
51. Mercer GD, Lyons P, Bassett K. Interventions to improve gender equity in eye care in low-middle income countries: A systematic review. *Ophthalmic Epidemiol*. 2019;26(3):189–99.
52. Aboobaker S, Courtright P. Barriers to Cataract Surgery in Africa: A Systematic Review. *Middle East African journal of ophthalmology*. 2016;23(1):145–9.
53. Adhishesha Reddy P, Kishiki EA, Thapa HB, Demers L, Geneau R, Bassett K. Interventions to improve utilization of cataract surgical services by girls: Case studies from Asia and Africa. *Ophthalmic Epidemiol*. 2018;25(3):199–206.

Figures

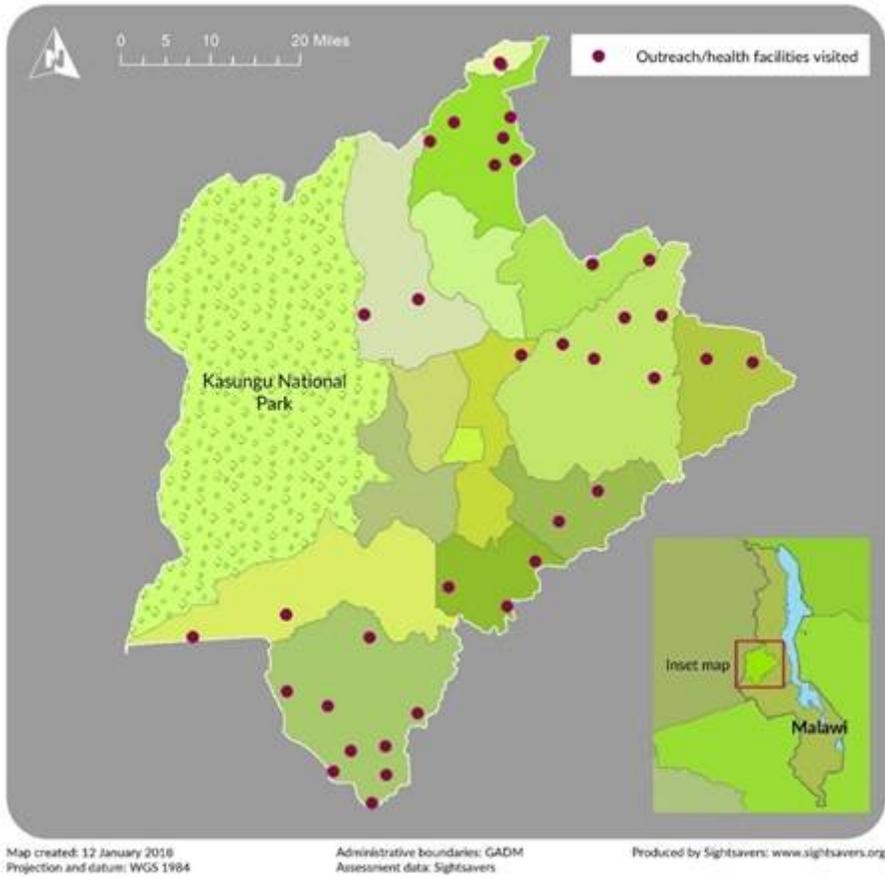


Figure 1

Figure 1

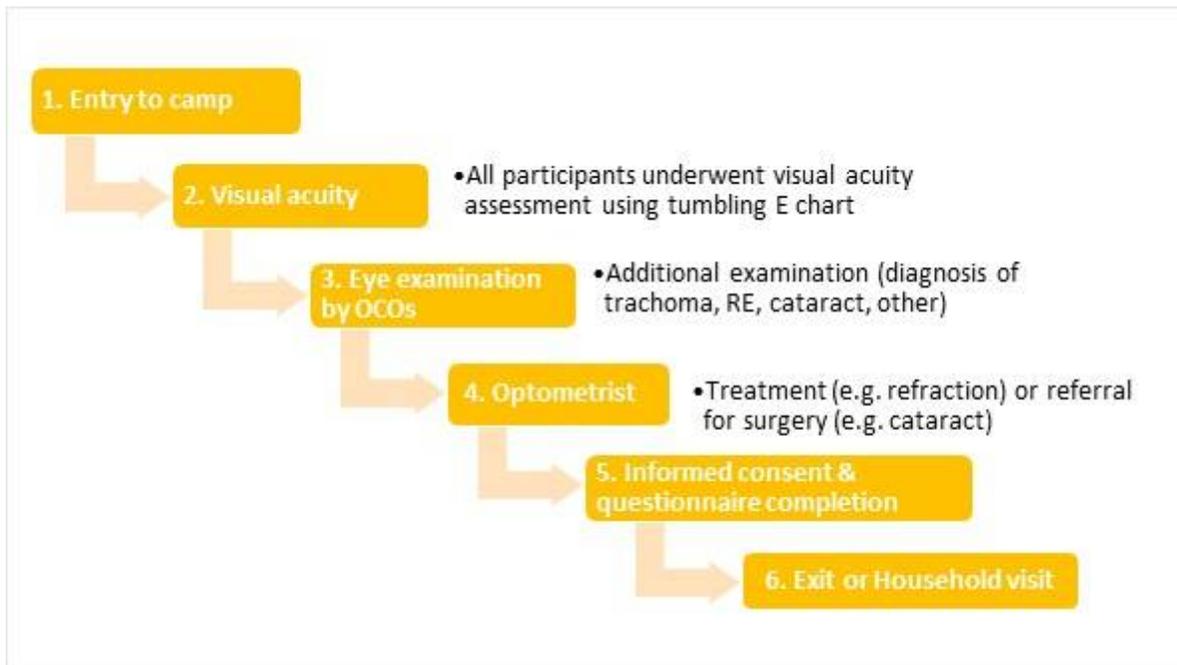
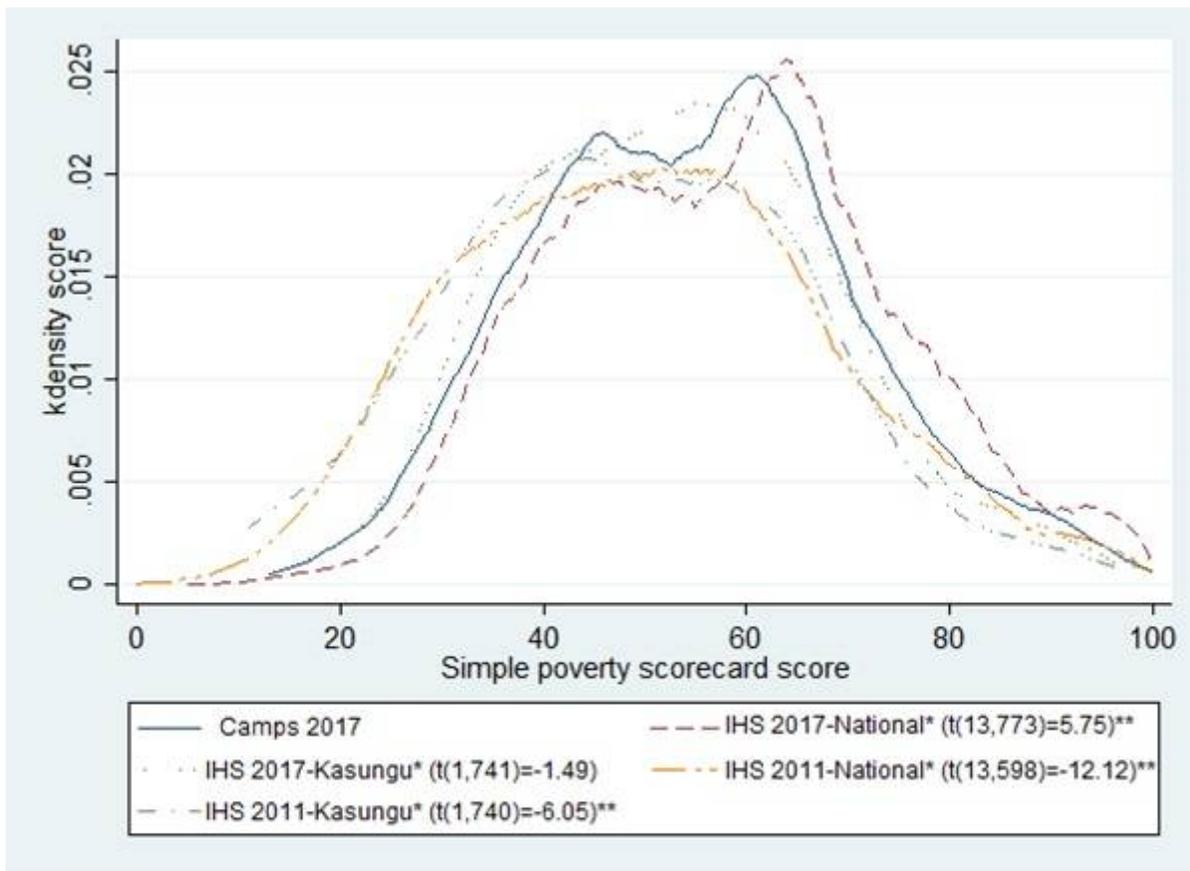


Figure 2

Figure 2



*Weighted using IHS household sampling weights

**STATA survey design adjusted samples t-testsof independence with camp participants, significant at alpha = 0.001 (two tails)

Figure 3

Figure 3

Supplementary Files

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