



Equity assessment of an eye health programme in rural Malawi

August 2018



Report authors

Shaneez Chatharoo

Ziporah Mugwang'a

Thomas Engels

Stevens Bechange

Effie Kaminyoghe

Elena Schmidt

Contents

Report authors.....	2
List of tables.....	4
List of figures.....	4
Acknowledgements.....	5
Abbreviations and acronyms.....	6
Executive summary.....	7
Background.....	7
Methods.....	7
Results.....	8
Conclusion.....	10
Background.....	11
Purpose of the study.....	13
Research questions.....	13
Methodology.....	14
Study design, setting and population.....	14
Study period.....	15
Sampling method.....	15
Study tools.....	15
Data collection.....	18
Data management and analysis.....	20
Ethical considerations.....	20
Results.....	21
Description of survey participants.....	21
Discussion.....	37
What have we learned?.....	37
Conclusion.....	42
References.....	43
Appendices.....	47
Appendix 1: Simple Poverty Scorecard Malawi (questionnaire and cut-off point tables).....	47
Appendix 2: EquityTool for Malawi (questionnaire).....	49
Appendix 3: Washington Group Short Set of questions.....	50
Appendix 4: Kappa individual question variables camp vs house.....	51

List of tables

Table 1: List of tools and data collected during outreach camps	16
Table 2: Demographic variables	21
Table 3: Probability of poverty using government-defined thresholds	23
Table 4: Poverty likelihood using PBM defined lines	24
Table 5: Description of wealth status by quintile and against national poverty lines	25
Table 6: Household and camp inter-rater reliability	26
Table 7: Poverty likelihood using government and PBM national poverty lines for each national wealth quintile.....	26
Table 8: Prevalence of functional limitations by severity and domains	27
Table 9: WG combined measure of disability	27
Table 10: Number of disabilities reported	28
Table 11: Univariate associations (disability and socio-demographic factors)	29
Table 12: Univariate associations (wealth and socio-demographic factors)	31
Table 13: Multivariate analysis – factors associated with disability.....	33
Table 14: Multivariate analysis – factors associated with wealth	35

List of figures

Figure 1: Location of Malawi in Africa	11
Figure 2: Geomap of health facilities visited	14
Figure 3: Flow diagram of outreach camp process.....	19
Figure 4: Distribution of screened patients by wealth quintiles	25

Acknowledgements

We would like to express our gratitude to the UK Department for International Development for the funding provided to support this study. Many thanks to the Coordinated Approach to Community Health (CATCH) programme team and Sightsavers' Malawi Country Office and field data collectors for their support and contributions to this work.

Abbreviations and acronyms

CATCH	Coordinated Approach to Community Health
CRPD	Convention on the Rights of Persons with Disabilities
CSR	Cataract surgery rate
DFID	Department for International Development
DHS	Demographic and Health Survey
IHS	Integrated Household Survey
LIC	Low income countries
ND	No date
UN	United Nations
UNICEF	United Nations Children's Fund
WG	Washington Group
WHO	World Health Organization

Executive summary

Background

Over recent years, there has been a growing interest in measuring equity of access to health care and health outcomes. In operational terms, pursuing equity in health translates to eliminating health disparities that are systematically associated with underlying social disadvantage or marginalisation. There may be an assumption that programmes targeting rural and remote locations are by virtue equitable, as they aim to reach the poorest and most marginalised individuals and communities. However, without assessing the socio-demographic and -economic profile of programme participants, these are no more than assumptions; even in the most remote locations such programmes may only be reaching and having an impact on individuals who are comparatively advantaged, thereby failing to meet the needs of the most underserved in the population.

The Coordinated Approach to Community Health (CATCH) programme is an international development programme – funded by the UK Department for International Development (DFID) and implemented by Sightsavers in Eastern and Southern Africa – with the aim to increase the coverage of eye health services in trachoma-endemic areas, including diagnosis and treatment of cataract, refractive error, conjunctivitis and other eye conditions. This programme was used to collect data on disability status and socio-economic characteristics of individuals presenting in trachoma/CATCH camps to understand the extent to which the programme reaches individuals at most need, and to provide recommendations to improve equity of access to eye care services.

The purpose of this research was to test various tools and assess the disability status and relative and absolute wealth of programme participants presenting in trachoma/CATCH camps in Kasungu district, central Malawi.

Methods

The study design was a descriptive cross-sectional survey. Participants were recruited from the patients who attended outreach camps, providing they consented and were over the age of 18 years, or under the age of 18 but accompanied by an adult. The study was conducted between April and September 2017. All patients attending outreach camps organised during that period were included in the study until the required minimum sample size was reached. A total of 1,358 individuals were included in the study and interviewed.

Data was collected electronically using smartphones and a KoBoToolbox data collection application (www.kobotoolbox.org/). A structured questionnaire was developed using standardised tools to assess disability status and wealth. Data cleaning and statistical analysis was undertaken using STATA 13 (StataCorp, 2013).

Three tools were used to assess equity in this study. First, the Simple Poverty Scorecard developed by Microfinance Risk Management LLC was used to estimate a particular household's

poverty likelihood – that is, the probability that a household is below a given poverty line. It can also estimate the poverty rate of a group of households at a point in time, which allows the number of households below a poverty line to be estimated accurately. For the purpose of this study we used two groups of poverty thresholds used previously in Malawi. The first group includes four government defined poverty lines: i) food or ultra-poverty line ii) national poverty line (includes food and non-food components) iii) \$1.25 per day line and iv) \$2 per day line. The second group includes four alternative poverty lines calculated for Malawi by Pauw, Beck and Moussa (PBM lines).

Secondly, the EquityTool, developed by the Social Franchising Metrics Group, was used to measure relative wealth. The tool scores households according to their dwelling characteristics and ownership of durable assets. The scores are then compared to national (or urban) wealth index values which determine cut-off points for five wealth quintiles, where quintile 1 represents the poorest segment of the population and quintile 5 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 are the same as the national (or urban) population, each quintile will have 20 per cent of respondents.

Finally, to measure disability, data on functional limitations was collected using the Washington Group Short Set (WGSS) of questions, developed by the Washington Group of the UN Statistics Office. The tool assesses the level of difficulty conducting basic activities in six domains: seeing, hearing, walking/climbing, remembering/concentrating, self-care, and communicating.

Results

Over a five-month period, data was collected from 1,777 individuals attending the TT/CATCH camps in Kasungu. After cleaning the data and removing incomplete or inconsistent records, 1,358 questionnaires were included in the analysis.

Wealth

The results suggest the camp attendees were poor using absolute poverty measures: 18.2% were below the government defined ultra poverty line (12% using PBM line), 35.8% were below the national poverty line (31.2% using PBM line), 62% were below the \$1.25 a day line (51.1% using PBM line), and 83.3% were below the \$2 a day line (76% using PBM line). The finding was not surprising – Malawi is one of the poorest countries in the world and trachoma is predominantly prevalent in rural areas, where the majority of the poor live.

Our relative wealth data, however, suggested that individuals attending the screening camps in Kasungu were wealthier than the national population, with 28% belonging to the second wealthiest quintile and another 23% belonging to the wealthiest quintile. Only 9.2% of study participants belonged to the poorest quintile and, when combined, over half of respondents were in the two wealthiest quintiles; only a quarter belonged to the two poorest quintiles.

One explanation considered by the study team was that people living in Kasungu are relatively wealthier than in other rural parts of the country and the population coming to the camp reflects the

economic status of people living in the district. But this is difficult to either confirm or reject, as data from other national surveys shows different results. For example, the Malawi Integrated Household Survey from 2010-11 did indeed show that the central region where Kasungu is located has lower poverty rates than the northern and southern regions, and that Kasungu is relatively wealthier than other districts in the central region. However, the Demographic and Health Survey (DHS) of 2015-2016 showed that the population in the central region was relatively poorer, particularly compared to the population in the northern region. So it is possible the population coming to camp is relatively wealthier than other rural populations although, in absolute terms, this population is still very poor.

The Simple Poverty Score card and EquityTool use asset-based indexes to measure wealth. They were designed to be used in door-to-door household surveys, where dwelling characteristics and ownership of durable assets could be directly observed.

In this study, camp respondents self-reported this information. The accuracy of this self-reporting was verified by visiting 102 randomly selected households and reassessing their characteristics and assets using direct observation. The level of agreement between camps vs household visit responses was assessed using kappa statistics. Results show a substantial 80% agreement and a kappa statistic of 0.74, suggesting that information on dwelling characteristics and ownership of assets provided by respondents at the camp site is accurate and can be used to assess their wealth.

Disability

Using the recommended definition for disability ('a lot of difficulty' or 'cannot do at all' in at least one domain), 27.5% of study participants were classified as having a disability. As expected, difficulty in seeing was most common, with 18.3% of participants reporting a lot of difficulty and 1.3% not being able to see at all.

When the 'seeing' domain was excluded from the analysis, 14% of respondents were classified as 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.

Among 373 people classified as having a disability, 74% reported disability in one domain; 16.9% had disability in two domains; and 6.4%, 2.1% and 0.5% had disability in three, four or five domains respectively.

Factors associated with disability and wealth

Univariate and multivariate regression analyses were used to test for associations between disability, wealth and other socio-demographic factors. Findings show that both disability and wealth are significantly associated with sex, age, marital status, education and occupation. Such analysis can be used to identify vulnerable groups of the population who are at highest risk of not accessing eye care services.

Conclusion

This is one of a few studies which has collected data on socio-economic characteristics and disability status of patients attending outreach camps with the aim of measuring access to these services by different population groups.

The study showed that the application of both wealth measurement tools and disability questions in eye care camps is feasible and does not create a significant burden on programme activities. The tools have proven to be reliable and effective, and the findings have important programmatic value as they help to better understand the profile of the populations the outreach activities aim to serve. Future outreach programmes should continue collecting disaggregated data to measure equity of service delivery and ensure no one is left behind.

Background

Malawi is a landlocked country in Southeast Africa, bordered by Mozambique, Zambia and Tanzania, with a population of approximately 18 million in 2016 (World Bank, 2017). It is estimated that over half of the population are below the national poverty line (IMF, 2017) and one quarter live in extreme poverty (Malawi IHS, 2012). The poverty levels are particularly high in rural areas, where 90% of the poor reside (World Bank, 2018). The United Nations (UN) Human Development Report of 2016 ranked Malawi at 170 out of 188 countries on the Human Development Index (UN Development Programme, 2017).

There is strong evidence to suggest that poverty and inability to access basic health services are interconnected. Although a number of government and donor supported initiatives have been put in place to address the needs of vulnerable groups, a large proportion of poor Malawians continue to face numerous challenges in accessing health care. Access to services is made more difficult if poor population groups experience other disadvantages, for example gender inequalities or disability.

Over recent years, there has been a growing interest in measuring equity of access to health care and differences in health outcomes. Advancing health equity is one of the core principles underpinning the Roadmap for Action 2014-2019 report launched by the World Health Organization (WHO) to promote monitoring of health inequalities through data disaggregation, protection of human rights, and gender-responsive strategies addressing social determinants of health (WHO, 2015). The report states that “only by disaggregating and analysing data (at minimum by age, sex, place of residence and wealth) can populations in need of health services be identified and included in informed policies and programmes” (WHO, 2015). The WHO defines health inequity as differences in health status or the distribution of health resources between different population groups arising from the social conditions in which people are born, grow, live, work and age; the lower an individual’s socio-economic position, the higher their risk of poor health (WHO, 2017).

In operational terms, pursuing equity in health translates to eliminating health disparities systematically associated with underlying social disadvantage or marginalisation (Braveman and Gruskin, 2003). There may be an assumption that programmes targeting poor, rural and/or remote locations are by virtue equitable, as they aim to reach the poorest and most marginalised individuals and communities. However, without assessing the socio-demographic and -economic profile of programme participants, these are no more than assumptions – even in the most remote locations such programmes may only be reaching and having an impact on individuals who are comparatively advantaged, thereby failing to meet the needs of the most underserved in the population.



Figure 1: Location of Malawi in Africa

Myriad studies have been conducted using household income and demographic and health surveys (DHS) to observe socio-economic differences and related health outcomes. The 2015 Malawi DHS reported wealth indices of the national population as a proxy measure of long-term standards of living, based on data related to household socio-economic status. The survey reported that only 11% of individuals living in rural areas belonged to the wealthiest quintile, compared to 75% in urban areas. By region, northern Malawi is wealthier than the two others, with 54.6% of the population belonging to the two wealthiest quintiles (quintiles four and five). The central region had 36.1% of the population in the two wealthiest quintiles and 45.1% in the two poorest quintiles (quintiles one and two) (National Statistical Office of Malawi and ICF, 2017).

Globally, the population subgroups facing most difficulty in accessing health services are typically poor, those living in rural areas (UN DESA, 2015), and those who are marginalised for other reasons – for example disability, ethnicity or gender inequalities.

The Sustainable Development Goals, specifically goal three (“ensure healthy lives and promote well-being for all at all ages”), has a strong equity focus and call for data disaggregation with a broad range of stratifiers: income, sex, age, race, ethnicity, migratory status, disability, geographical location, and other characteristics relevant to the national contexts. (WHO Roadmap for Action, 2015).

The World Report on Disability also highlights the need for “comparable and complete data collection on disability especially in developing countries” (WHO–World Bank, 2011).

Malawi ratified the UN Convention on the Rights of Persons with Disabilities (CRPD) in 2009 (The United Nations, 2008). The Disability Act followed in 2012, promoting the rights of people with disability in line with the CRPD. However, some research suggests that the ratification of the UN CRPD did not have a significant impact on the budget for the disability sector and, in practice, the issue remains a low priority (Madans et al, 2011).

There is a profound lack of quality eye health services in low income countries (LICs). Although many eye conditions are preventable and/or treatable with simple and cost-effective interventions (World Health Assembly 56.26, 2003), millions of people in LICs continue to live with blindness and severe visual impairments (Bourne et al, 2017). This in turn leads to economic inactivity and exacerbates poverty (Tafida et al, 2015).

Trachoma is broadly considered a disease of poverty and is the leading infectious cause of blindness globally, with Africa being the most affected among all continents (World Health Organisation trachoma fact sheet, 2017).

Studies from Malawi, Tanzania and Ethiopia showed that children from lower socio-economic households had a higher prevalence of active trachoma, indicating a strong relationship between poverty and trachoma (Tielsch et al 1988; Jansen et al 2007; and Ketema et al 2012). However, quantitative data linking trachoma to household economic status within endemic communities is limited (Habtamu et al, 2015).

Information on the nature and extent of inequalities in eye care is scarce and restricts the ability to plan appropriate strategies to reduce inequality and track progress towards universal eye health

(Ramke, 2016). Without comparable disaggregated eye health data, it will not be possible to accurately monitor development progress and truly ensure no one is left behind (Sightsavers Everybody Counts policy document, 2017). Ramke (2016) recommends that, in addition to population-based surveys, routinely collected health data is used for further exploration of inequalities in eye health. Capturing the prevalence and types of eye conditions in different groups of patients can help to identify which subgroups of the population are less able to access and benefit from eye care services.

The Coordinated Approach to Community Health (CATCH) programme is an international development programme funded by the UK Department for International Development (DFID) and implemented by Sightsavers in Eastern and Southern Africa. The programme aims to increase the coverage of eye health services in trachoma-endemic areas, including diagnosis and treatment of cataract, refractive error and other eye conditions. It uses trachoma community mobilisation and awareness-raising campaigns to encourage community members to attend eye camps for examinations, referrals and treatments.

At the time of this study, the CATCH programme operated in Malawi, Kenya, Mozambique, Uganda and Zambia. In Malawi, the programme worked in two districts: Karonga and Kasungu.

This research was conducted in Kasungu district, Malawi, with the aim of testing different tools to monitor equity of access to eye care services for various population subgroups served by the CATCH programme. Data on disability status and socio-economic characteristics were collected from people presenting in outreach camps.

Purpose of the study

The purpose of the study was to assess the disability status and measure the relative and absolute wealth of programme beneficiaries presenting in CATCH outreach camps in Kasungu district, Malawi.

Research questions

This study aimed to answer the following questions:

- What is the relative and absolute wealth status of patients attending CATCH programme outreach services?
- What is the estimated prevalence of functional difficulties among patients attending CATCH outreach services?
- How reliable and effective are the EquityTool and Poverty Scorecard for collecting routine data on economic status of programme beneficiaries?

Methodology

Study design, setting and population

The study design was a descriptive cross-sectional survey undertaken in outreach camps in the district of Kasungu in the central region of Malawi.

Study participants were recruited from the patients who attended outreach camps, providing they were over the age of 18 years, or under the age of 18 but accompanied by an adult. Patients who did not provide consent or were under the age of 18 years without an accompanying adult were excluded.

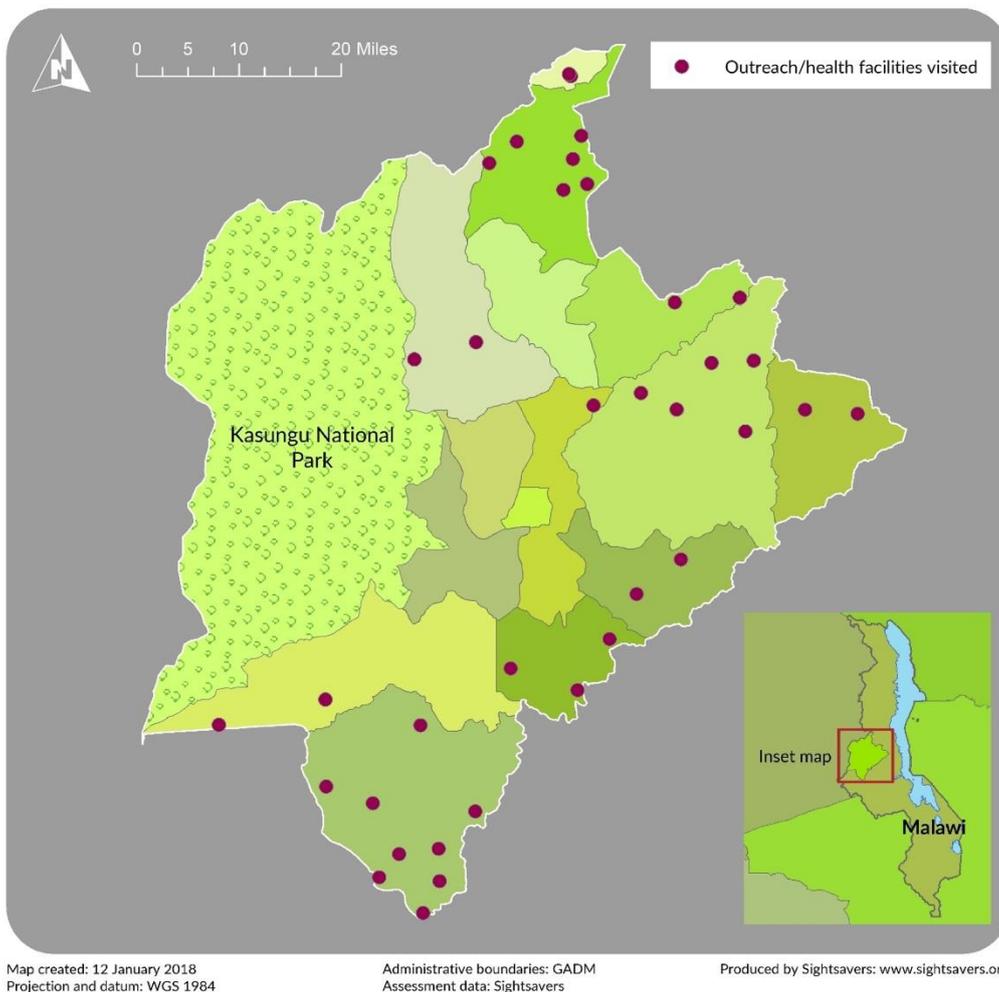


Figure 2: Geomap of health facilities visited

Study period

The study was conducted between April and September 2017. During this period there were monthly eye camps scheduled in Kasungu district lasting between two and four days each, depending on patient demand.

Sampling method

The study population consisted of individuals attending the outreach camp services who met the inclusion criteria. All individuals were included in the study until the required minimum sample size of 1,275 patients was reached.

The minimum sample size was calculated based on the following assumptions: i) an estimated 8% of outreach camp attendees reporting disability would belong to the wealthiest quintile (based on previous pilot data from the programme) and ii) a power of 80% to detect a 10% difference in the prevalence of disability between attendees belonging to the poorest quintile (quintile 1) and the wealthiest quintile (quintile 5) at alpha 0.05, with a ratio of 2.

As the socio-economic status of households was self-reported, the data needed to be verified through household visits. The number of people needed for verification visits was calculated at 102, using a 7.5% margin of error (alpha 0.05). These individuals were randomly selected among participants surveyed at the camp.

Study tools

The study instrument included sections on participant demographics and used existing standardised tools to collect data on wealth and disability as described below and shown in Appendix 1.

The tools were translated into the main local languages – Chichewa and Tumbuka – and translated back into English to ensure consistency and accuracy. The questionnaires were pre-tested in the field and a few revisions were made before data collection started.

Table 1: List of tools and data collected during outreach camps

Data	Assessment method	Case definition
Clinical diagnosis	<p>Visual acuity assessment using tumbling e-chart</p> <p>Ophthalmic examination diagnosing cataract, trachoma, or other.</p>	Not included in the analysis.
Disability	Washington Group Short Set of questions	<p>Functional domains:</p> <ol style="list-style-type: none"> 1. seeing 2. hearing 3. walking (mobility) 4. remembering or concentrating 5. self-care (washing or dressing) 6. communicating (understanding or being understood) <p>Rather than a binary yes/no response, respondents can position themselves on a four-point scale according to the level of difficulty they feel they face. This allows respondents with lower levels of difficulties to be represented.</p> <ol style="list-style-type: none"> a. No, no difficulty b. Yes, some difficulty c. Yes, a lot of difficulty d. Cannot do at all
Wealth	EquityTool	Relative measure of poverty classifying respondents according to population wealth quintiles. Asset-based wealth index comprising 17 questions on dwelling characteristics and ownership of durable assets.
	Poverty Scorecard	Absolute measure of poverty calculating the poverty likelihoods, i.e. probabilities of being above/below selected poverty lines. Scores are calculated based on 10 indicators.

Measuring disability

The Washington Group Short Set (WGSS) was used to measure disability. The WGSS is a six-item questionnaire developed by the UN Statistics Group for use in national censuses and surveys. The questions assess functional limitations 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 is defined as having a lot of difficulty (option C) or complete inability (option D) to perform tasks in at least one domain. The questions were designed to provide comparable data cross-nationally for populations, irrespective of culture or economic resources (Madans et al, 2011). It is particularly relevant for identifying who may have difficulties in accessing services because of a functional impairment.

Measuring wealth status and poverty

Income is commonly used as a measure of economic status, but it is extremely difficult to measure income in low- and middle- income contexts with large informal sectors and where income does not account for in-kind payments and/or fluctuates according to seasonality and migration.

Individuals are also often reluctant to share information about their income, which makes it difficult to measure it during surveys. One alternative has been to measure individual or household consumption instead of income. Economists believe that consumption data – representing the total value of household monetary expenditure and items received as gifts or produced by the household – can be both representative of longer-term wealth and less sensitive to fluctuations in income (Gwatkin et al, 2007; Rutsein and Johnson, 2004).

The tools incorporated in this study to assess the economic status of participants use a proxy to measure consumption in the form of an asset-based wealth index based on household dwelling characteristics and ownership of durable assets.

Poverty scorecard

The Simple Poverty Scorecard (<http://www.simplepovertyscorecard.com/>) was developed by Mark Schreiner of Microfinance Risk Management LLC and has been adapted for different countries. It estimates a particular household's poverty likelihood – that is, the probability that a household is below a given poverty line. The poverty line for an individual is the money they need to achieve the minimum level of welfare to not be deemed 'poor', given their circumstances (Ravallion, 2008).

The scorecard for Malawi uses 10 indicators from Malawi's 2010/11 IHS on dwelling characteristics and ownership of durable assets. When an individual answers the questions, there is a tiered score for each answer to each question; this is then summed to give a total poverty score.

Pre-defined matrices with score bands are used to convert individual total poverty scores to poverty likelihoods (see annexes). The matrix score bands range from zero to 100 (Schreiner, M., 2011) and show the likelihood (probability) that an individual household's expenditure level falls below a

poverty line. Since this is a probability, one cannot say with certainty that an individual household is below a poverty line. Confidence increases the nearer the poverty likelihood is to 100, since this means the odds of a household being below a poverty line are much higher.

Poverty scoring can also estimate the poverty rate of a group of households at a point in time. This estimate is the average of poverty likelihoods among the households in the group, and allows for an accurate estimate of the number of households below a poverty line. However, it cannot tell you which households are actually poor.

There are different poverty lines that can be used for the scoring analysis. In Malawi there are four government defined thresholds: i) food or ultra-poverty line ii) national poverty line (includes food and non-food components) iii) \$1.25 per day line and iv) \$2 per day line.

Alternative thresholds for the four poverty lines in Malawi were calculated by Pauw, Beck and Moussa (known as PBM lines), who used different assumptions and more region-specific data to define poverty likelihoods and rates slightly lower than the government lines (Pauw et al. 2016). For the purpose of this study we used both the government-defined and PBM thresholds, and reported both poverty likelihoods and poverty rates.

Equity tool

The EquityTool (<http://www.equitytool.org/>) is a measure of relative poverty developed by Metrics for Management for routinely monitoring equity in development programmes. The tool has been validated for different countries.

Households are scored according to their infrastructure and the presence of key assets considered to be markers of wealth in that context,. The scores are then compared to national (or urban) wealth index values which determine cut-off points for five wealth quintiles, where quintile 1 represents the poorest segment of the population and quintile 5 the wealthiest. Individuals within the household are then 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 participants or programme participants are the same as the national (or urban) population, each quintile would have 20% of the sample. The EquityTool for Malawi, using data from DHS 2010, consists of 17 questions.

Data collection

Individuals accessing CATCH outreach camp services were informed of the study on arrival during the introductory message. A visual acuity assessment, followed by an eye examination, was conducted at this stage. Once the diagnosis form was completed, the selected patients met the data collectors who re-introduced the study and requested consent verbally (see figure 3 for flow diagram of outreach camp process).

The study was collected electronically using KoBoCollect, a mobile phone survey software. Five data collectors with experience of collecting mobile data were present at each camp. The team was led by an assigned supervisor and all were trained prior to the study.

Routine data collection spot-checks were conducted during each camp (Matul and Kline, 2003) with the supervisor of each team completing a daily form summarising who had been spot-checked, examining any data collection errors, and addressing any specific issues before the next camp.

The poverty scorecard and EquityTool were designed to assess household assets and characteristics while visiting households. In this study, camp respondents self-reported their dwelling characteristics and assets; the accuracy of this self-reporting was verified by visiting randomly selected households, reassessing their characteristics and assets based on observation, and calculating the kappa index.

Household visits to verify self-reported wealth were attempted on the same day as the camp so long as patients were available and arrival would not be too late in the evening. If not, they were carried out the following day. Community volunteers helped data collectors trace the respondents' homes.

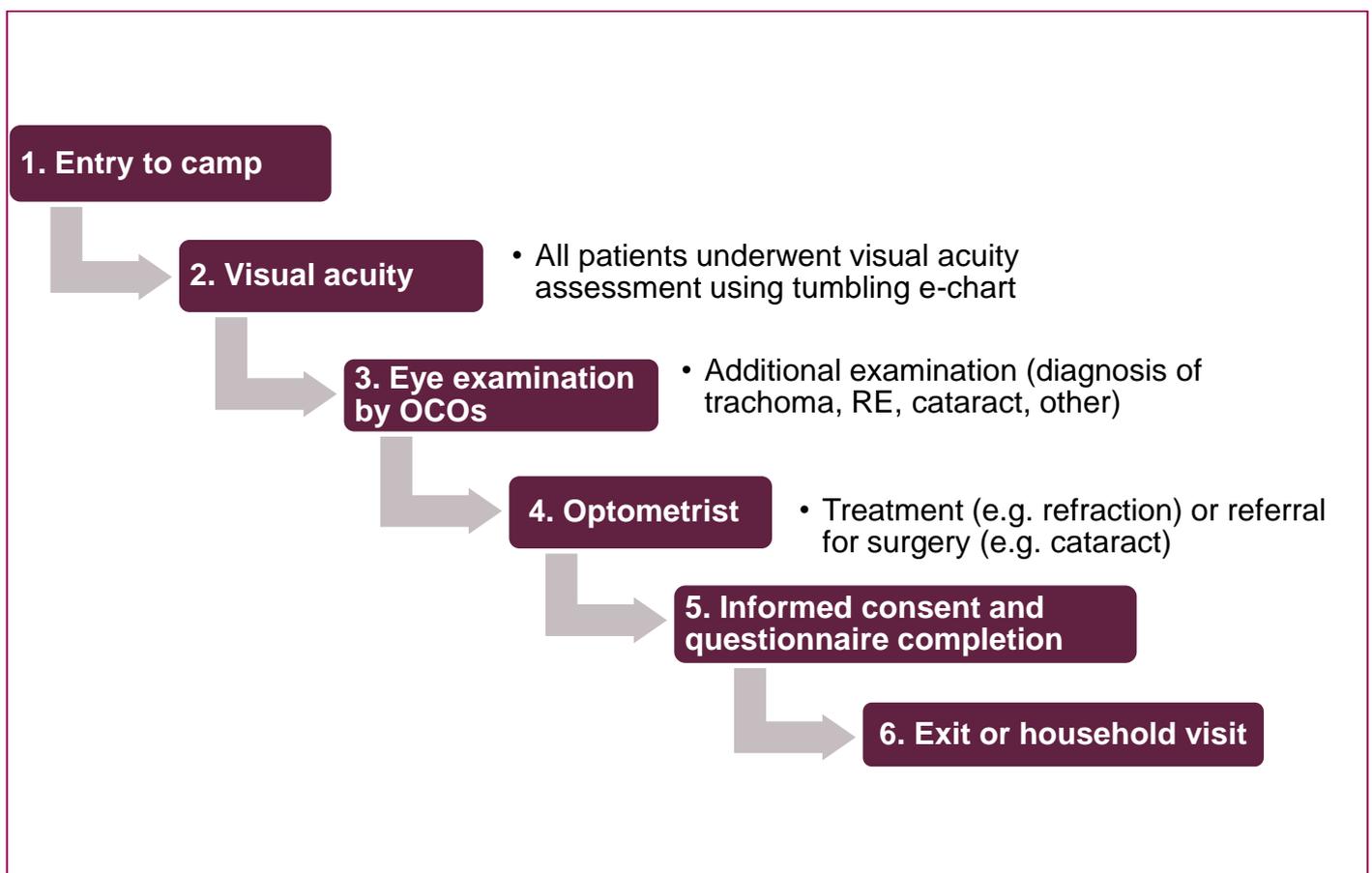


Figure 3: Flow diagram of outreach camp process

Data management and analysis

Personal identifiable information collected was separated from the rest of the data before the analysis. Data cleaning and analysis was undertaken using STATA 13 (StataCorp, 2013).

In addition to descriptive statistics, univariate and multivariate associations between disability and socio-economic characteristics of participants were examined using logistic or ordered logistic models. Kappa statistic was 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 used for measuring wealth status. Kappa statistic is a widely used index for assessing agreement between raters: it measures both the bias and the precision between rater ratings (Banerjee et al, 1999).

Kappa goes from zero (no agreement) to one (perfect agreement). 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

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, the consent was provided by their carer. Additional verbal consent was requested prior to household visits and, at the household level, 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.

Results

Over a five-month period, data was collected from 1,777 patients attending the camps. After checking for informed consent, data cleaning and removing missing or incorrect entries, 1,358 records were included in the analysis. The results of the analysis are presented in tables 2-14.

Description of survey participants

Table 2: Demographic variables

Variable	Value	N (%)
Total		1,358 (100)
Sex	Male	733 (53.98)
	Female	625 (46.02)
Age	<18	128 (9.43)
	20-29	123 (9.06)
	30-39	170 (12.52)
	40-49	273 (20.10)
	50-59	235 (17.30)
	60-69	228 (16.79)
	70-79	136 (10.01)
	80-89	55 (4.05)
	90+	10 (0.74)
Marital status	Divorced/separated	66 (4.86)
	Married	1025 (75.48)
	Never married	75 (5.52)
	Widowed	192 (14.14)
Education	No education	211 (15.54)
	Primary	823 (60.60)
	Secondary	290 (21.35)
	More than secondary	34 (2.50)
Ethnicity/tribe	Chewa	1001 (73.71)
	Tumbuka	237 (17.45)
	Other	120 (8.84)

Variable	Value	N (%)
Occupation	Professional	115 (8.47)
	Service worker	16 (1.18)
	Sales worker	53 (3.90)
	Production worker	38 (2.80)
	Agriculture	1010 (74.37)
	Other/unemployed/student	126 (9.28)
Salary	Cash only	209 (16.90)
	Cash and in-kind	25 (2.02)
	Not paid	1003 (81.08)
Employer	Employed	184 (14.87)
	Self-employed	1053 (85.12)
Frequency of work	All year	515 (41.63)
	Seasonal	687 (55.54)
	Occasional	35 (2.83)

Among 1,358 participants included in the study, 54% were male. Around half of the participants (49%) were aged 50 years and above, with the mean and median age of 49 years. The majority were married (75%). About 60% of participants had attained primary school education only, while one fifth (21%) had received secondary education; 16% had no education at all. Approximately 63% of participants who had no education were above 50 years of age. Only 34 individuals (2.5%) had education beyond secondary. The majority classified their ethnicity as Chewa (74%) followed by Tumbuka (17%).

The majority (74%) reported agriculture as their main occupation, followed by skilled jobs: technical, administrative, managerial roles (8.5%). The majority described themselves as self-employed (85%), while 14% were employed by a non-family member. Around 56% said their occupation was seasonal, while 42% said they worked all year. The majority were not paid for their work (82%). Around 16% were paid in cash and around 2% were paid in cash and in-kind.

Wealth status

Absolute poverty/wealth

Tables 3 and 4 show the likelihood of study participants' households falling below different poverty lines, using the Malawi government and PBM poverty thresholds respectively. Translating the

poverty likelihoods into poverty rates, the results suggest that the camp attendees were poor using absolute poverty measures: 18% were below the government defined ultra-poverty line (12.7% using PBM thresholds for extreme poverty), 42.9% were below the national poverty line (30.9% using PBM line), 61.5% were below the \$1.25 a day threshold (50.7% using PBM line), and 83.2% were below the \$2 a day threshold (75.4% using PBM line).

Table 3: Probability of poverty using government-defined thresholds

Poverty scorecard results	N (%)	Government-defined poverty likelihood matrix (%)			
		Ultra-poverty	National line (normal poverty)	\$1.25 dollar per day	\$2 dollar per day
0-4	-	100.0	100.0	100.0	100.0
5-9	2 (0.15)	81.6	97.4	100.0	100.0
10-14	8 (0.59)	71.8	95.7	98.7	100.0
15-19	20 (1.47)	70.3	94.4	98.5	100.0
20-24	25 (1.84)	55.7	87.4	95.8	99.3
25-29	79 (5.82)	49.9	80.0	92.9	98.8
30-34	121 (8.91)	36.4	72.0	91.3	98.5
35-39	138 (10.16)	27.6	70.2	88.5	97.5
40-44	158 (11.63)	21.5	57.4	79.8	96.3
45-49	128 (9.43)	16.5	47.9	71.4	93.4
50-54	172 (12.67)	9.4	30.5	52.1	86.2
55-59	164 (12.08)	5.6	24.9	46.2	81.5
60-64	118 (8.69)	4.0	20.0	41.1	72.3
65-69	81 (5.96)	2.2	12.4	30.5	63.3
70-74	60 (4.42)	1.0	6.5	20.8	48.3
75-79	23 (1.69)	0.6	5.3	15.8	39.2
80-84	32 (2.36)	0.4	2.7	9.7	34.0
85-89	26 (1.91)	0.0	1.1	3.7	15.9
90-94	3 (0.22)	0.0	1.1	2.1	11.2
95-100	-	0.0	0.0	0.0	3.2

Table 4: Poverty likelihood using PBM defined lines

Poverty scorecard results	N (%)	PBM-defined poverty likelihood matrix (%)			
		Extreme poverty	National line (normal poverty)	\$1.25 dollar per day	\$2 dollar per day
0-4	-	100.00	100.0	100.0	100.0
5-9	2 (0.15)	68.3	86.9	97.4	100.0
10-14	8 (0.59)	59.7	85.9	95.9	100.0
15-19	20 (1.47)	58.6	85.6	94.6	99.5
20-24	25 (1.84)	46.5	77.6	90.5	97.4
25-29	79 (5.82)	35.8	64.8	83.4	95.0
30-34	121 (8.91)	25.7	55.1	77.6	95.0
35-39	138 (10.16)	20.0	47.1	73.8	93.7
40-44	158 (11.63)	14.7	39.6	65.5	88.9
45-49	128 (9.43)	10.5	32.5	58.0	83.8
50-54	172 (12.67)	5.6	20.7	41.6	72.3
55-59	164 (12.08)	3.6	16.7	35.2	68.6
60-64	118 (8.69)	2.1	12.8	30.9	64.8
65-69	81 (5.96)	0.9	7.2	24.4	54.3
70-74	60 (4.42)	0.6	4.2	13.3	41.6
75-79	23 (1.69)	0.6	3.5	10.3	30.2
80-84	32 (2.36)	0.4	1.5	6.4	27.9
85-89	26 (1.91)	0.0	0.8	2.4	18.1
90-94	3 (0.22)	0.0	0.8	1.3	11.2
95-100	-	0.0	0	0.0	7.8

Relative wealth

When looking at the relative levels of poverty/wealth using the EquityTool, the study findings suggest that although the individuals attending the screening camps in Kasungu were poor in absolute terms, they were wealthier than the national population, with 28% belonging to the second wealthiest quintile (n=380) and another 23% belonging to the wealthiest quintile (n=312). Only 9.2% of study participants belonged to the poorest quintile (n=125).

When combined, over half of respondents were in the two wealthiest quintiles (n=692 or 51%), while only a quarter belonged to the two poorest quintiles (n=344 or 25.3%).

There was correlation between the levels of education and occupation and relative wealth. All participants who had studied further than secondary level, and three quarters of those who attended secondary school, fell into the two wealthiest quintiles (4 and 5). Approximately half of the participants with no education fell into the poorest or second poorest quintile (48%). Among those in professional skill roles, 88% fell in the wealthiest quintile, and almost all (96%) fell into the two wealthier quintiles.

Table 5: Description of wealth status by quintile and against national poverty lines

Variable	Value	N (%)
Wealth quintiles (national)	Quintile 1 (poorest)	125 (9.20)
	Quintile 2	219 (16.13)
	Quintile 3	322 (23.71)
	Quintile 4	380 (27.98)
	Quintile 5 (wealthiest)	312 (22.97)

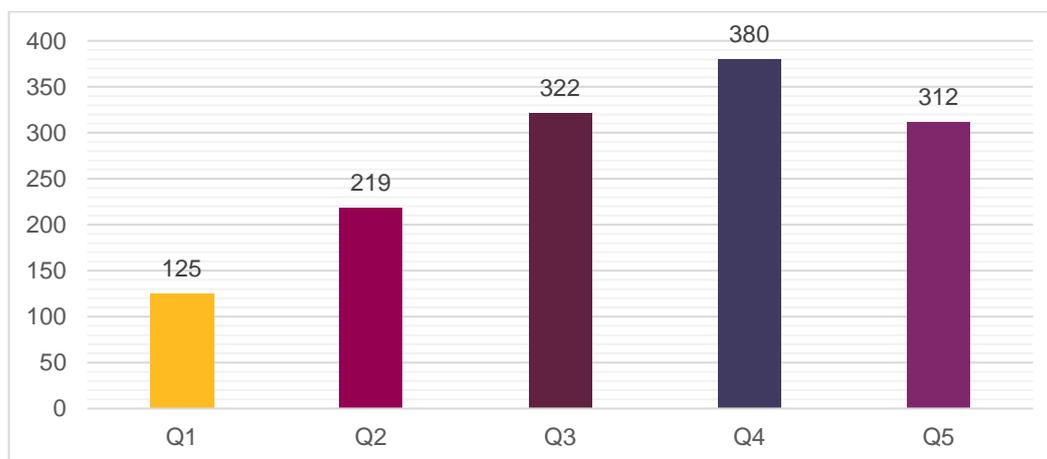


Figure 4: Distribution of screened patients by wealth quintiles

Comparison of camp responses with household observation

Table 6: Household and camp inter-rater reliability

Wealth quintiles	Agreement (%)	Expected agreement (%)	Kappa	Standard error
Household versus camp responses	80.13%	24.69%	0.7361	0.0438

The result of the kappa statistic in this study was 80% agreement and kappa 0.74, equivalent to a substantial agreement between responses obtained at the camp (self-reported) and during household follow-up home visits (observed). The high level of agreement confirms the accuracy of the self-reported estimates collected during the camps (see Appendix 4 for kappa agreement disaggregation per question).

Table 7: Poverty likelihood using government and PBM national poverty lines for each national wealth quintile

Wealth quintiles	Government	PBM
	100% national line (food+ non-food)	100% national line (food + non-food)
Q1	43%	57%
Q2	36%	49%
Q3	39%	53%
Q4	30%	42%
Q5	16%	23%

When comparing the results of the EquityTool and poverty scorecard, data shows that the likelihood of being under the national poverty line is decreasing for respondents in the wealthier quintiles.

For example, those in the poorest quintile (quintile 1) had on average 43% chance of being below the national poverty line using government defined thresholds, and 57% chance using the PBM threshold. Those in the wealthiest quintile (quintile 5) had only 16% chance of being below the poverty line using the government line, and 23% chance using the PBM line.

The data however confirms that, irrespective of the participants' relative wealth, the majority of the camp attendees are poor, with nearly one out of five respondents in quintile 5 (richest) still below the government-defined national poverty line – and one in six below the PBM poverty line.

Disability status

Table 8 shows how participants responded to the questions on limitations in six functional domains of the WGSS.

Table 8: Prevalence of functional limitations by severity and domains

N (%)	No difficulties (A)	Some (B)	A lot (C)	Cannot do at all (D)
See	118 (8.69)	975 (71.80)	248 (18.26)	17 (1.25)
Hear	1076 (79.23)	254 (18.70)	28 (2.06)	-
Walk	878 (64.65)	390 (28.72)	85 (6.26)	5 (0.37)
Remember	860 (63.33)	419 (30.85)	75 (5.52)	4 (0.29)
Self-care	1256 (92.49)	55 (4.05)	10 (0.74)	37 (2.72)
Communicate	1300 (95.73)	51 (3.76)	5 (0.37)	2 (0.15)

Using the recommended Washington Group definition for disability, 27.5% of study participants were classified as having a disability. Not surprisingly, difficulty in seeing was the most common disability with 18.3% (n=248) of participants reporting a lot of difficulty and 1.3% (n=17) not being able to see at all. When the 'seeing' domain was excluded from the analysis, 14% of respondents were classified as having a (non-visual) disability. The most common non-visual disabilities were difficulties in walking (prevalence 6.6%) and difficulty in remembering/concentrating (5.8%). Hearing disability ('a lot of difficulty' only) was reported by 2% of participants (Table 9). Less than 5% of individuals reported complete inability in at least one functional domain.

Table 9 WG combined measure of disability

		N (%)	N (%) *Excl. seeing
WGQ Some difficulties	6 domains, at least one C or D or two Bs	855 (62.91)	456 (33.55)
WGQ Severe difficulties (WG recommended definition)	6 domains, at least one C or D	373 (27.45)	193 (14.20)

NB. A = no difficulties B = some difficulty C = a lot of difficulties D = cannot do at all

Table 10 shows that among 373 persons classified as having a disability, 276 individuals (74%) reported disability in one domain; 63 individuals (16.9%) had disability in two domains; and 24 (6.4%), 8 (2.1%) and 2 (0.5%) had disability in three, four or five domains respectively.

Table 10: Number of disabilities reported

Number of Washington Group domain difficulties	(D) level Cannot do at all		(C) or (D) level A lot of difficulty or cannot do*		(B), (C) or (D) level Some difficulty, a lot of difficulty or cannot do	
	N	%	N	%	N	%
0	1305	96.1	985	72.5	67	4.9
1	45	3.3	276	20.3	517	38.1
2	6	0.45	63	4.65	383	28.2
3	-	-	24	1.8	236	17.4
4	2	0.15	8	0.6	114	8.4
5	-	-	2	0.15	33	2.4
6	-	-	-	-	8	0.6

* recommended definition

Factors associated with disability and wealth: univariate and multivariate analyses

Tables 11 and 12 show results of the univariate analysis of the associations between disability or wealth and socio-demographic characteristics of participants.

Table 11: Univariate associations (disability and socio-demographic factors)

Variable	Values	Disability ^(a)			Disability, excl. vision		
		N (%)	Odds ratio	P-value ^(b)	N (%)	Odds ratio	P-value ^(b)
Sex	Male	193 (26.3)	-	-	89 (12.1)	-	-
	Female	180 (28.8)	1.13	0.310	104 (16.6)	1.44	0.018**
Age (binary)	<50	125 (18.0)	-	-	71 (10.2)	-	-
	50+	247 (37.2)	2.74	0.000***	121 (18.2)	1.99	0.000***
Age groups	<18	27 (21.1)	-	-	19 (14.8)	-	-
	20-29	14 (11.4)	0.48	0.040**	9 (7.3)	0.45	0.063*
	30-39	29 (17.1)	0.77	0.378	16 (9.4)	0.60	0.152
	40-49	55 (20.2)	0.94	0.826	27 (9.9)	0.63	0.149
	50-59	68 (28.9)	1.52	0.106	34 (14.5)	0.97	0.923
	60-69	77 (33.8)	1.91	0.012**	34 (14.9)	1.01	0.986
	70-79	68 (50.0)	3.74	0.000***	37 (27.2)	2.14	0.015**
	80-89	26 (47.3)	3.35	0.000***	13 (23.6)	1.78	0.154
	90+	9 (90.0)	33.7	0.001***	4 (40.0)	3.82	0.052*
Marital status	Married	253 (24.7)	-	-	126 (12.3)	-	-
	Divorced	16 (24.2)	0.97	0.936	10 (15.1)	1.27	0.497
	Never married	15 (20.0)	0.76	0.363	12 (16.0)	1.36	0.351
	Widowed	89 (46.3)	2.64	0.000***	45 (23.4)	2.18	0.000***
Quintiles (national)	Q1	44 (35.2)	-	-	25 (20.0)	-	-
	Q2	77 (35.2)	1.13	0.612	37 (16.9)	0.98	0.951
	Q3	86 (26.7)	0.79	0.334	44 (13.7)	0.82	0.515
	Q4	103 (27.1)	0.78	0.272	58 (15.3)	0.93	0.806
	Q5	63 (20.2)	0.54	0.013**	29 (9.3)	0.52	0.044**
National poverty line ^(c)	above	225 (27.9)	-	-	117 (14.5)	-	-
	below	148 (26.8)	0.95	0.679	76 (13.8)	0.94	0.715

Variable	Values	Disability ^(a)			Disability, excl. vision		
		N (%)	Odds ratio	P-value ^(b)	N (%)	Odds ratio	P-value ^(b)
Education	None	88 (41.2)	-	-	57 (27.0)	-	-
	Primary	232 (28.2)	0.55	0.000***	111 (13.5)	0.42	0.000***
	Secondary	46 (15.9)	0.26	0.000***	22 (7.6)	0.22	0.000***
	Higher	7 (20.6)	0.36	0.023**	3 (8.8)	0.26	0.030***
Occupation	Agriculture	278 (27.5)	-	-	138 (13.7)	-	-
	Services	8 (50.0)	2.63	0.055*	4 (25.0)	2.11	0.203
	Sales	10 (18.9)	0.61	0.171	5 (9.4)	0.66	0.382
	Production	6 (15.8)	0.49	0.117	4 (10.5)	0.74	0.580
	Professional	14 (12.2)	0.36	0.001***	7 (6.1)	0.41	0.026**
	Unemployed	51 (54.3)	3.12	0.000***	31 (33.0)	3.11	0.000***
	Student	3 (11.1)	0.34	0.071*	3 (11.1)	0.79	0.703
	Others	3 (60.0)	3.95	0.134	1 (20.0)	1.58	0.684

(a) defined as having severe difficulty (C or D) in at least one of the six domains

(b) p-value; significance levels: p<0.01 (***), p<0.05 (**), and p<0.10 (*)

(c) used government defined national poverty line and 50% likelihood threshold to determine if respondents are below or above poverty line (e.g. if poverty likelihood >50%, respondent is considered to be below poverty line.)

Table 12: Univariate associations (wealth and socio-demographic factors)

Variable	Values	Wealth quintiles			Absolute poverty ^(c) (below national poverty line)		
		N (%)	Odds ratio	P-value ^(b)	N (%)	Odds ratio	P-value ^(b)
Sex	Male	733 (54.0)	-	-	304 (41.5)	-	-
	Female	180 (46.0)	0.68	0.000***	247 (39.5)	0.92	0.465
Age (binary)	<50	694 (51.1)	-	-	298 (42.9)	-	-
	50+	664 (48.9)	0.56	0.000***	253 (38.1)	0.82	0.070*
Age groups	<18	128 (9.4)	-	-	47 (36.7)	-	-
	20-29	123 (9.1)	0.78	0.270	62 (50.4)	1.75	0.029**
	30-39	170 (12.5)	1.26	0.268	72 (42.3)	1.27	0.326
	40-49	273 (20.1)	0.91	0.604	117 (42.9)	1.29	0.244
	50-59	235 (17.3)	0.52	0.001***	102 (43.4)	1.32	0.217
	60-69	228 (16.8)	0.49	0.000***	91 (39.9)	1.14	0.553
	70-79	136 (10.0)	0.70	0.110	40 (29.4)	0.72	0.208
	80-89	55 (4.1)	0.65	0.127	17 (30.9)	0.77	0.450
	90+	10 (0.7)	0.17	0.002***	3 (30.0)	0.74	0.671
Marital status	Married	1025 (75.5)	-	-	424 (41.37)	-	-
	Divorced	66 (4.9)	0.49	0.001***	27 (40.9)	0.98	0.942
	Never married	75 (5.5)	1.01	0.980	38 (50.7)	1.46	0.117
	Widowed	192 (14.1)	0.44	0.000***	62 (32.3)	0.68	0.019**
Disability ^(a)	No	985 (72.5)	-	-	403 (40.9)	-	-
	Yes	373 (27.5)	0.65	0.000***	148 (39.7)	0.95	0.679
Education	None	211 (15.5)	-	-	112 (53.1)	-	-
	Primary	823 (60.6)	2.32	0.000***	370 (45.0)	0.72	0.035**
	Secondary	290 (21.4)	11.56	0.000***	67 (23.1)	0.26	0.000***
	Higher	34 (2.5)	74.53	0.000***	2 (5.9)	0.06	0.000***

Variable	Values	Wealth quintiles			Absolute poverty ^(c) (below national poverty line)		
		N (%)	Odds ratio	P-value ^(b)	N (%)	Odds ratio	P-value ^(b)
Occupation	Agriculture	1010 (74.4)	-	-	443 (43.9)	-	-
	Services	16 (1.2)	1.09	0.842	9 (56.2)	1.65	0.327
	Sales	53 (3.9)	3.66	0.000***	13 (24.5)	0.42	0.007***
	Production	38 (2.8)	0.66	0.170	18 (47.4)	1.15	0.669
	Professional	115 (8.5)	37.0	0.000***	9 (7.8)	0.11	0.000***
	Unemployed	94 (6.9)	0.64	0.030**	42 (44.7)	1.03	0.878
	Students	27 (2.0)	2.51	0.010***	14 (51.8)	1.38	0.411
	Others	5 (0.4)	1.15	0.859	3 (60.0)	1.92	0.476

(a) defined as having severe difficulty (C or D) in at least one of the six domains

(b) p-value; significance levels: p<0.01 (***), p<0.05 (**), and p<0.10 (*)

(c) used government defined national poverty line and 50% likelihood threshold to determine if respondents are below or above poverty line (e.g. if poverty likelihood >50%, respondent is considered to be below poverty line)

In the univariate analysis, disability (including all domains) was associated with age, marital status, education, occupation and wealth quintiles. Older participants (50+ years) were 2.7 times more likely to report disability than those aged less than 50 years (OR 2.74, p=0.000). Those who were widowed were 2.6 times more likely to report disability than those who were married (p= 0.0000).

People with primary, secondary, and higher education were less likely to report disability than those with no education. Participants who were unemployed were significantly more likely to report disability compared to those working in the agriculture sector (OR 3.12, p=0.000), while individuals working in skilled roles were significantly less likely to do so (OR 0.36, p=0.001).

Finally, people in the richest quintile were 46% less likely to report disability than those in the poorest quintile (OR 0.54, p=0.013). There was no significant association between disability and probability of being above or below the national poverty line (p=0.679). Findings were similar when the 'seeing' domain of disability was excluded, except when that disability was associated with sex – with women being 44% more likely to report non-visual disability than men (OR= 1.44; p=0.018).

For wealth, univariate analysis shows that higher socio-economic status was associated with sex, age, marital status, education, occupation, and disability. Women (OR 0.68, p=0.000), participants above 50 years (OR 0.56, p=0.000), those who were either divorced or widowed (OR 0.49, p=0.001; OR 0.44, p=0.000), and those with a disability (OR 0.65, p=0.000) were less likely to be in the wealthiest quintile.

In contrast, participants with primary, secondary and higher education (p=0.000), as well as students (OR 2.5, p=0.01) and respondents working in skilled roles (OR 37.0, p=0.000) or in the sales sector (OR 3.7, p=0.000) were more likely to be in the wealthiest quintile.

When using the measure of absolute poverty, respondents with primary (OR 0.7, p=0.03), secondary OR 0.26, p=0.000) or higher (OR 0.06, p=0.000) education were less likely to be under the national poverty line compared to those with no education. The odds of being under the poverty line were also significantly lower for those in skilled jobs (OR 0.1, p=0.000) or in the sales sector (OR 0.42, p=0.007), compared to workers in the agricultural sector.

Table 13: Multivariate analysis – factors associated with disability

Variable	Values	Disability ^(a)			Disability, excl. vision		
		N (%)	Odds ratio ^(d)	P-val. ^(b)	N (%)	Odds ratio ^(d)	P-val. ^(b)
Sex	Male	193 (26.3)	-	-	89 (12.1)	-	-
	Female	180 (28.8)	1.26	0.110	104 (16.6)	1.62	0.008***
Age groups	<18	27 (21.1)	-	-	19 (14.8)	-	-
	20-29	14 (11.4)	0.46	0.039**	9 (7.3)	0.49	0.112
	30-39	29 (17.1)	0.72	0.302	16 (9.4)	0.66	0.299
	40-49	55 (20.2)	0.92	0.767	27 (9.9)	0.77	0.465
	50-59	68 (28.9)	1.39	0.269	34 (14.5)	1.13	0.728
	60-69	77 (33.8)	1.65	0.090*	34 (14.9)	1.13	0.739
	70-79	68 (50.0)	3.38	0.000***	37 (27.2)	2.57	0.010***
	80-89	26 (47.3)	3.04	0.003***	13 (23.6)	2.12	0.086*
	90+	9 (90.0)	32.3	0.001***	4 (40.0)	5.23	0.023**
Marital status	Married	253 (24.7)	-	-	126 (12.3)	-	-
	Divorced	16 (24.2)	0.94	0.840	10 (15.1)	1.15	0.693
	Never married	15 (20.0)	0.94	0.850	12 (16.0)	1.46	0.330
	Widowed	89 (46.3)	1.70	0.005***	45 (23.4)	1.35	0.184

Variable	Values	Disability ^(a)			Disability, excl. vision		
		N (%)	Odds ratio ^(d)	P-val. ^(b)	N (%)	Odds ratio ^(d)	P-val. ^(b)
Quintiles (national)	Q1	44 (35.2)	-	-	25 (20.0)	-	-
	Q2	77 (35.2)	1.07	0.773	37 (16.9)	0.82	0.513
	Q3	86 (26.7)	0.79	0.321	44 (13.7)	0.72	0.239
	Q4	103 (27.1)	0.84	0.445	58 (15.3)	0.84	0.522
	Q5	63 (20.2)	0.62	0.054*	29 (9.3)	0.51	0.027**
National poverty line ^(c)	above	225 (27.9)	-	-	117 (14.5)	-	-
	below	148 (26.8)	1.11	0.419	76 (13.8)	1.07	0.680
Education	None	88 (41.2)	-	-	57 (27.0)	-	-
	Primary	232 (28.2)	0.64	0.010***	111 (13.5)	0.49	0.000***
	Secondary	46 (15.9)	0.42	0.000***	22 (7.6)	0.31	0.000***
	Higher	7 (20.6)	0.50	0.152	3 (8.8)	0.34	0.092*
Occupation	Agriculture	278 (27.5)	-	-	138 (13.7)	-	-
	Services	8 (50.0)	3.93	0.010***	4 (25.0)	2.80	0.088*
	Sales	10 (18.9)	0.72	0.383	5 (9.4)	0.68	0.434
	Production	6 (15.8)	0.56	0.209	4 (10.5)	0.83	0.738
	Professional	14 (12.2)	0.54	0.040**	7 (6.1)	0.56	0.161
	Unemployed	51 (54.3)	2.35	0.000***	31 (33.0)	2.27	0.001***
	Student	3 (11.1)	0.47	0.288	3 (11.1)	0.66	0.574
	Others	3 (60.0)	4.64	0.113	1 (20.0)	1.26	0.842

(a) defined as having severe difficulty (C or D) in at least one of the six domains

(b) p-value; significance levels: p<0.01 (***), p<0.05 (**), and p<0.10 (*)

(c) used government defined national poverty line and 50% likelihood threshold to determine absolute poverty (e.g. if poverty likelihood >50%, respondent is considered to be below poverty line)

(d) Adjusted odds ratios; multivariate model included sex, age, marital status and either relative wealth, absolute wealth, education or occupation. Wealth, education and occupation were introduced separately in the model since these variables are strongly correlated.

Table 14: Multivariate analysis – factors associated with wealth

Variable	Values	Wealth quintiles			Absolute poverty ^(c) (below national poverty line)		
		N (%)	Odds ratio ^(d)	P-value ^(b)	N (%)	Odds ratio ^(d)	P-value ^(b)
Sex	Male	733 (54.0)	-	-	304 (41.5)	-	-
	Female	180 (46.0)	0.71	0.001***	247 (39.5)	0.95	0.665
Age groups	<18	128 (9.4)	-	-	47 (36.7)	-	-
	20-29	123 (9.1)	0.73	0.184	62 (50.4)	2.20	0.005***
	30-39	170 (12.5)	1.17	0.510	72 (42.3)	1.69	0.053*
	40-49	273 (20.1)	0.79	0.271	117 (42.9)	1.72	0.035**
	50-59	235 (17.3)	0.47	0.001***	102 (43.4)	1.81	0.023**
	60-69	228 (16.8)	0.47	0.001***	91 (39.9)	1.61	0.074*
	70-79	136 (10.0)	0.65	0.083*	40 (29.4)	0.99	0.989
	80-89	55 (4.1)	0.60	0.094*	17 (30.9)	1.05	0.889
	90+	10 (0.7)	0.14	0.001***	3 (30.0)	1.03	0.963
Marital status	Married	1025 (75.5)	-	-	424 (41.37)	-	-
	Divorced	66 (4.9)	0.53	0.006***	27 (40.9)	1.02	0.947
	Never married	75 (5.5)	0.76	0.269	38 (50.7)	1.94	0.019**
	Widowed	192 (14.1)	0.62	0.003***	62 (32.3)	0.74	0.111
Disability ^(a)	No	985 (72.5)	-	-	403 (40.9)	-	-
	Yes	373 (27.5)	0.76	0.018**	148 (39.7)	1.11	0.424
Education	None	211 (15.5)	-	-	112 (53.1)	-	-
	Primary	823 (60.6)	2.07	0.000***	370 (45.0)	0.59	0.002***
	Secondary	290 (21.4)	10.17	0.000***	67 (23.1)	0.16	0.000***
	Higher	34 (2.5)	63.91	0.000***	2 (5.9)	0.03	0.000***

Variable	Values	Wealth quintiles			Absolute poverty ^(c) (below national poverty line)		
		N (%)	Odds ratio ^(d)	P-value ^(b)	N (%)	Odds ratio ^(d)	P-value ^(b)
Occupation	Agriculture	1010 (74.4)	-	-	443 (43.9)	-	-
	Services	16 (1.2)	0.95	0.906	9 (56.2)	1.45	0.475
	Sales	53 (3.9)	3.49	0.000***	13 (24.5)	0.39	0.005***
	Production	38 (2.8)	0.62	0.119	18 (47.4)	1.11	0.763
	Professional	115 (8.5)	33.9	0.000***	9 (7.8)	0.09	0.000***
	Unemployed	94 (6.9)	0.80	0.308	42 (44.7)	1.25	0.338
	Students	27 (2.0)	3.03	0.013**	14 (51.8)	1.00	0.996
	Others	5 (0.4)	1.24	0.792	3 (60.0)	2.18	0.417

(a) defined as having severe difficulty (C or D) in at least one of the six domains

(b) p-value; significance levels: p<0.01 (***), p<0.05 (**), and p<0.10 (*)

(c) used government defined national poverty line and 50% likelihood threshold to determine absolute poverty (e.g. if poverty likelihood >50%, respondent is considered to be below poverty line)

(d) Adjusted odds ratios; multivariate model included sex, age, marital status and either relative wealth, absolute wealth, education or occupation. Wealth, education and occupation were introduced separately in the model since these variables are strongly correlated.

Results of the multivariate analysis are shown in tables 13 and 14. After the adjustment for confounding factors, disability (all domains) remained significantly associated with sex, age, marital status, education, occupation and wealth.

When excluding the vision domain, marital status was no longer associated with disability, but women were 62% more likely to report non-visual disability than men (OR=1.62, p=0.008).

For wealth, results of the multivariate analysis do not differ from the univariate analysis and sex, age, marital status, education, occupation and disability status continued to be significantly associated with wealth quintiles. The results are the same as in the univariate analysis when using the measure of absolute poverty.

Discussion

Access to health care is often mediated by various socio-demographic factors: age, sex, education, disability and wealth. Without careful consideration of groups at high risk of exclusion when planning and implementing health services, equity is difficult to attain.

This study aimed to test the feasibility of using different tools to monitor equity of access to eye care services provided through outreach camps organised as part of the CATCH programme in Kasungu district, Malawi. The study used standardised tools to collect data on economic and disability status of programme beneficiaries. The EquityTool and the Simple Poverty Scorecard were used to measure wealth, while the Washington Group Short Set of questions was used to measure disability.

What have we learned?

The research showed that the EquityTool and Poverty Scorecard can be used in a complementary way to collect data on the economic status of programme beneficiaries in the context of outreach camps. The tools provide useful information of who the programme does and does not reach.

The study also assessed validity of self-reporting wealth, and found a high level of agreement between the information given by respondents at the camp site and what was observed during follow-up visits at their homes. This suggests that self-reported data on dwelling characteristics and assets is reliable and that the EquityTool and Poverty Scorecard can also be applied to collect data from patients presenting in clinics or outreach camps.

Data collection process

The design of the questionnaire was simple and effective in surveying patients presenting at the camps. The design of the camp process was set up in such a way that the questionnaire administration was best received on exit; it took approximately 10 to 15 minutes to interview one patient, and when the questionnaire had been completed the data collector would wait for the next patient. This meant the flow of patients was constant and there were no queues, which could be the reason why there were no refusals to be surveyed.

CATCH staff who worked alongside the data collection team also confirmed that surveying the patients had minimal effect on their routine compared with camps that did not survey patients. Where patient numbers were higher than expected, the data collection team split into two groups and the survey was also conducted at the entry point.

Mobile data collection allowed for uploading and downloading data on the same day to monitor the progress and quality of the study in real time. The KoBo software was simple and easy to use, although when amending the forms there were occasions where the changes did not save due to connectivity issues. Spot checking of data collectors' forms allowed for the lead study coordinator to identify individual discrepancies and areas for retraining, if necessary. In addition, the subsample

of patients that was selected for household visits allowed for further quality control of the wealth data collected at the camp.

Based on the lessons learned from a few previous studies, the questionnaire was translated and back-translated to two local languages, Chichewa and Tumbuka. The questionnaire was piloted during the data collectors' training, which allowed for corrections and further validation of the tool and the data collection process.

Wealth measurement

We made a number of observations when collecting and interpreting data on the wealth of the patients attending the CATCH camps. First, our data shows that a high proportion of programme participants are poor in absolute terms: over 40% were below the government national poverty line, about one in six were ultra poor, and over three quarters were below the \$2 a day threshold. The finding is not surprising, as Malawi is one of the poorest countries in the world – global estimates suggest that at least 14 out of 18 million Malawians live on less than \$2 a day, and one in four live in extreme poverty (World Bank, 2016; World Bank, 2018).

Interestingly, when we place our findings in the context of Malawi as a whole, results based on the EquityTool data suggest that people attending outreach camps in Kasungu were relatively wealthier. Half of the camp attendees belonged to the two wealthiest quintiles and only a quarter were in the two poorest quintiles when compared to the national population.

We considered a number of explanations for this finding. First, it is possible that the finding is true, and people coming to the camp are poor in absolute terms but relatively wealthier than other people in the area. People in the relatively wealthier economic quintiles tend to be better educated, more mobile, have better access to information and stronger links with the community. They are therefore more likely to be aware of and come to the camps. However, based on the evidence collected in this study, we cannot definitively either confirm or disprove this.

Another possible explanation is that people living in Kasungu are relatively wealthier than in other rural parts of the country, and the population coming to the camp reflects the economic status of people living in that district. In fact, the Malawi Integrated Household Survey from 2010-11 suggests that the central region, where Kasungu is located, had lower poverty rates estimated at the time of the survey – 49% compared to 60% in the northern region, and 63% in the southern region.

Furthermore, the breakdown of the IHS data by district suggests that Kasungu is relatively wealthier than other districts in the central region, with poverty rates estimated at 33.6% at the time of the survey. Our evidence may therefore suggest that people coming to the camps were relatively wealthier than the general population of Malawi, but not necessarily of the Kasungu district.

However, a more recent DHS survey of 2015-2016 showed that the population in the central region was relatively poorer, particularly compared to the population in the northern region. We do not have the district level information from this survey and cannot compare it with the characteristics of the patients coming to the CATCH camp. More detailed district level data would be useful to make more definitive conclusions on the relative wealth of the camp attendees.

Our findings show that when using the EquityTool it is important to compare the wealth status of programme beneficiaries with people living in the region or district, rather than nationally. Local data helps to make more accurate estimates of the relative wealth of programme participants than crude national comparisons.

It is also important to remember that people coming to eye care outreach camps may not be representative of the district population. People in need of eye care services tend to be older, and their economic status may be different to the general population. To make more accurate conclusions, one needs to have information on socio-economic characteristics of people with visual impairments in the district. At present, district level surveys of visual impairment do not routinely collect this data.

Disability measurement

The estimated prevalence of functional limitations among programme participants attending the outreach camps was 27.5%, and 14.2% excluding the sight domain, when using the Washington group definition of disability ('a lot of difficulty' or 'cannot do at all' in at least one domain).

The data is difficult to place in the national context, as the census conducted in Malawi in 2008 estimated prevalence of disability at less than 4% using the Washington Group questions. Even if we take into account the overall population is much younger than those who come to outreach camps, 4% prevalence is likely to be an underestimate which may be due to the way the disability section of the census was introduced. Evidence from other settings shows that if fieldworkers accidentally use the word "disability", or its local language equivalent, the prevalence estimates decrease significantly due to stigma associated with disability (Mont, 2007).

Data from studies which applied Washington Group questions in other African contexts varies. For example, population-based surveys among people aged 15+ years in Ethiopia, Malawi, Tanzania and Uganda also reported low prevalence of disability at 3.46%, 1.39%, 3.88% and 3.76% respectively (Mitra, 2017). Studies in Maldives and Zambia showed higher estimates of 9.6% (age 5+) (Loeb, 2016), and 8.5% (all ages) respectively (Eide and Loeb, 2006).

Prevalence of disability estimated in the population-based surveys is difficult to compare with data collected in outreach eye camps, as people coming to eye camps tend to be older and have visual impairments. It is therefore not surprising that over 27% of CATCH camp attendees had a disability and 71% of them had sight-related disabilities.

Data from the Rapid Assessment of Avoidable Blindness (RAAB) conducted by Sightsavers in rural Tanzania in 2017 may be more comparable with the results of this study, as RAAB surveys target similar age groups (50+ years). The prevalence of disability among people aged 50+ years in Tanzania was 21.2% for all disabilities and 10.6%, excluding sight. Similar to our findings, the most common disabilities in Tanzania were seeing (13.4% prevalence) and walking (10.6%). Prevalence of sight-related disabilities in our Malawi camps was higher than in the Tanzania RAAB (19.5%), which is not surprising given that the camp targeted people with visual impairments. Prevalence of hearing disabilities was similar, around 2%. Prevalence of difficulties in remembering/concentrating was higher (5.8% vs 2.2%) but prevalence of walking-related disabilities was lower (6.6% vs

10.6%). This may suggest a certain proportion of people with mobility problems could not be reached by the camps as they simply found it difficult to walk to the location.

One aspect that needs to be taken into account when interpreting our results is that the CATCH programme was integrated within the trachoma elimination programme, where well-resourced community mobilisation campaigns were organised to proactively search and identify as many TT patients as possible, often using house-to-house search strategies. A typical outreach programme focusing on cataract is unlikely to have similar types of resources, and it is possible that more standard eye camps miss more people with mobility, hearing or other disabilities. Further studies disaggregating data by disability in more typical eye care camps will be useful to test this hypothesis.

Overall, the disaggregation of data by disability suggests the CATCH camps did reach a significant proportion of people with disabilities, including those with non-visual disabilities. People with mobility problems may need to be given particular attention as they may find it difficult to get to the camp. Given that mobility disabilities are very common among older people targeted by eye care programmes, a significant proportion of those who could benefit from eye care outreach camps may be at risk of being missed.

Factors associated with disability and wealth

Disability and poverty are intricately interlinked. Poverty can increase the risk of disability through malnutrition, poor access to health services and sanitation, and unsafe living and working conditions. Conversely, the presence of a disability can trap people in poverty because of the barriers disabled people face to take part in education, employment, social activities and other aspects of life (Mont, 2007).

Our data shows that wealth quintiles and disability are associated, with respondents in the richest quintile being significantly less likely to report a disability compared to those in the poorest quintile (OR 0.65, $p=0.000$). This association remains significant when adjusting for other socio-demographic factors (OR 0.76, $p=0.018$).

Univariate and multivariate regression analyses also show that disability and wealth are significantly associated with demographic factors such as sex, age, marital status, education and occupation. Such analysis can help to identify factors increasing vulnerability and population subgroups that are at highest risk of not accessing eye care services in project areas. For example, disability and poverty among camp attendees was found to be strongly associated with older age, lower education status, being widowed or unemployed. It is therefore important to consider these factors at the project design stage and put specific interventions in place to ensure outreach camps and eye care services are accessible to these difficult-to-reach population subgroups.

Challenges

There are a number of challenges and limitations that need to be considered when interpreting the results of this study and/or planning similar studies in other locations. First, due to the rainy season, it was not possible to travel to Karonga district in the northern region, where additional CATCH

camps were held. Our conclusions are therefore limited to one location and cannot be representative of other CATCH settings. Studies in other regions of Malawi and other countries would be beneficial to draw more generalised conclusions and explore cross-country variations.

Secondly, this study could not collect accurate data on clinical diagnoses, as this would have led to disruption of the medical examination process. Linking clinical records with disability and poverty variables was not possible either due to the problems with coding and assigning patient IDs. Data on the distribution of eye health outcomes by socio-economic gradient and disability is limited, as RAAB surveys do not collect such data currently and the sample size is often insufficient to draw meaningful conclusions. Routinely collected data from health clinics and outreach camps can be invaluable in filling these knowledge gaps – it is important for future programmes to find a way to link clinical data with socio-economic variables such as poverty and 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. 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 whether the place of residence and distance to the camp play a role in the uptake of outreach services by different population sub-groups.

Conclusion

This is one of a few studies which collected data on socio-economic characteristics of patients attending outreach eye camps with the aim to better understand equity in accessing eye care services in Malawi.

The study showed that the use of both wealth measurement tools and disability questions for routine data collection in eye care camps is feasible and does not create a significant burden on outreach activities. The tools have proven to be reliable and effective, and the findings have important programmatic value as they help to better understand the profile of the populations the outreach activities aim to serve.

The study generated valuable evidence on the associations between disability, wealth and other socio-demographic factors that can help to identify vulnerable sub-groups that are at risk of being excluded from accessing services. Given the dearth of data on disability in LMICs, this is a significant added value of this study. Future surveys and eye health programmes should continue collecting disaggregated data to measure equity of service delivery and ensure that no one is left behind.

References

- Banerjee, M., Capozzoli, M., McSweeney, L., & Sinha, D. (1999). Beyond kappa: A review of interrater agreement measures. *Canadian journal of statistics*, 27(1), 3-23.
- Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. (2017) Vision Loss Expert Group. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *Lancet Glob Health*. Sep;5(9):e888–97.
- Braveman P, Gruskin S. Defining equity in health. *Journal of Epidemiology and Community Health* 2003;57:254-8.
- Chakraborty NM, Wanderi J, Oduor C, and Montagu, D. (2017). *Assessing Provision and Equity in Low and Middle Income Country Health Markets: A Study from Kenya*. Oakland, CA: Metrics for Management.
- Cohen J. A coefficient of agreement for nominal scales. *Educ Psychol Meas*. 1960;20(1): 37–46.
- Eide, A. H., & Loeb, M. E. (2006). Reflections on disability data and statistics in developing countries. In B. Albert (Ed.), *In or out of the mainstream? Lessons from research on disability and development cooperation*. Leeds: University of Leeds, The Disability Press.
- Fifty-sixth world health assembly, WHA 56.26. (2003). The Resolution of the World Health Assembly on the Elimination of Avoidable Blindness. *Community Eye Health*, 16(46), 17.
- Gwatkin, D. R., Rutstein, S., Johnson, K., Suliman, E., Wagstaff, A., & Amouzou, A. (2007). *Socio-economic differences in health, nutrition, and population within developing countries* (pp. 1784-1790). Washington, DC, World Bank.
- Habtmu E, Wondie T, Aweke S, Tadesse Z, Zerihun M, Zewdie Z, et al. (2015) Trachoma and Relative Poverty: A Case-Control Study. *PLoS Negl Trop Dis* 9(11): e0004228. doi:10.1371/journal.pntd.0004228.
- Harvard Humanitarian Initiative. KoBo Toolbox 2.0. web (ND). Available at <http://www.kobotoolbox.org> [Accessed October 2017].
- Hosseinpoor, A. R., Stewart Williams, J. A., Gautam, J., Posarac, A., Ofcer, A., Verdes, E., et al. (2013). Socioeconomic inequality in disability among adults: A multicountry study using the World Health Survey. *American Journal of Public Health*, 103(7), 1278–1286.
- International Monetary Fund. (2017). Malawi Economic Development Document. IMF Country Report No. 17/184.
- Jansen E, Baltussen RM, van Doorslaer E, Ngirwamungu E, Nguyen MP, et al. (2007) An Eye for Inequality: How Trachoma Relates to Poverty in Tanzania and Vietnam. *Ophthalmic Epidemiology* 14: 278–287. PMID: [17994437](https://pubmed.ncbi.nlm.nih.gov/17994437/)

Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population Development, The DHS Program II. Kenya Demographic and Health Survey 2014. Nairobi: Kenya National Bureau of Statistics.

Ketema K, Tiruneh M, Woldeyohannes D, Muluye D (2012) Active trachoma and associated risk factors among children in Baso Liben District of East Gojjam, Ethiopia. BMC public health 12: 1105. doi: [10.1186/1471-2458-12-1105](https://doi.org/10.1186/1471-2458-12-1105) PMID: [23259854](https://pubmed.ncbi.nlm.nih.gov/23259854/)

Loeb, M., & Eide, A. (2004). *Living conditions among people with activity limitations in Malawi*. Oslo: SINTEF Health Research.

Loeb, M., Eide, A. & Mont, D. (2008). Approaching the measurement of disability prevalence: The case of Zambia. ALTER-European Journal of Disability Research/Revue Européenne de Recherche sur le Handicap, 2(1), 32-43.

Madans, J.H., M.E. Loeb, and B.M. (2011). Altman, *Measuring disability and monitoring the UN Convention on the Rights of Persons with Disabilities: the work of the Washington Group on Disability Statistics*. BMC public health. 11(Suppl 4): p. S4.

Malawi EquityTool [Released December 2015], equitytool.org, maintained by Metrics for Management.

Malawi ministry of health (no date). Health sector strategic plan II (2017-22). Available at www.health.gov.mw/index.php/policies-strategies?download=47:hssp-ii-final [Accessed January 2018].

Matul, M., & Kline, S. (2003). Scoring Change: Prizma's Approach to Assessing Poverty, Spotlight Note No. 4, Warsaw: Microfinance Centre for Central and Eastern Europe and the New Independent States, Available at http://www.mfc.org.pl/doc/Research/ImpAct/SN/MFC_SN04_eng.pdf [Accessed January 2018].

Mitra, S. (2017). *Disability, Health and Human Development*, Palgrave Studies in Disability and International Development, Chapter 4: Prevalence of functional difficulties DOI 10.1057/978-1-137-53638-9_4

Mont, D. (2007). Measuring disability prevalence, SP Discussion Paper, No. 0706, World Bank.

National Malaria Control Programme (NMCP) [Malawi] and ICF International. (2012). Malawi Malaria Indicator Survey (MIS) 2012. Lilongwe, Malawi, and Calverton, Maryland, USA: NMCP and ICF International.

National Statistical Office (NSO) [Malawi] and ICF. (2017). Malawi Demographic and Health Survey 2015-16. Zomba, Malawi, and Rockville, Maryland, USA. NSO and ICF.

National Statistical Office (NSO) [Malawi] *Population and housing census (2008). Preliminary report Lilongwe, Government of Malawi, National Statistical Office, 2008.*

National Statistical Office of Malawi. (2008). *Malawi population and housing census*. Main Report. ^[1]_[SEP]

National Statistical Office of Malawi (2012). Malawi Third Integrated Household Survey (IHS3) 2010-11.

Pauw, K., U. Beck, and R. Mussa (2016). 'Did Rapid Smallholder-Led Agricultural Growth Fail to Reduce Rural Poverty?'. In C. Arndt, A. McKay, and F. Tarp (eds), *Growth and Poverty in sub-Saharan Africa*. Oxford: Oxford University Press.

Ravallion, M. (1998). Poverty lines in theory and practice. Living Standards Measurement Study Working Paper No. 133. Washington, DC: World Bank.

Ravallion, M. (2008). Poverty lines. *The New Palgrave Dictionary of Economics*, 2.

Ramke, J. (2016). Measuring inequality in eye care: the first step towards change. *Community Eye Health*, 29(93), 6–7.

Rutstein S, Johnson K (2004). The DHS wealth index. DHS Comparative Reports No. 6. Calverton (MD): ORC Macro. Available from: <http://www.dhsprogram.com/publications/publication-cr6-comparative-reports.cfm>

Schreiner, M. (2011). A Simple Poverty Scorecard for Malawi. *Microfinance Risk Management, Kansas City, KS*. www.microfinance.com

Sightsavers CATCH online (no date). Available at <https://www.sightsavers.org/programmes/catch/> [Accessed December 2017].

Sightsavers Everybody Counts policy document (2017). Sightsavers' disability data disaggregation project. Available at https://www.sightsavers.org/wp-content/uploads/2017/09/PolicyDoc_EverybodyCount_Web.pdf [Accessed December 2017].

StataCorp. 2013. Stata: Release 13. Statistical Software. College Station, TX: StataCorp LP.

Tafida, A., Kyari, F., Abdull, M. M., Sivasubramaniam, S., Murthy, G. V. S., Kana, I., et al & Nigeria National Survey of Blindness and Visual Impairment Study Group. (2015). Poverty and blindness in Nigeria: results from the national survey of blindness and visual impairment. *Ophthalmic epidemiology*, 22(5), 333-341.

The United Nations (2008). Convention of the Rights of Persons with Disabilities and Optional Protocol.

Tielsch JM, West KP, Katz J, Keyvan-Larijani E, Tizazu T, et al. (1988) The Epidemiology of Trachoma in Southern Malawi. *The American Journal of Tropical Medicine and Hygiene* 38: 393–399. PMID: [3354773](https://pubmed.ncbi.nlm.nih.gov/3354773/)

United Nations, Department of Economic and Social Affairs, Population Division. (2015). "World Urbanization Prospects: The 2014 Revision". (ST/ESA/SER.A/366). Retrieved 3 June 2016 from: <https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf>

United Nations Development Programme (2016). Human Development Report 2016. Human Development for Everyone. UNDP.

WHO Roadmap For Action (2015) Roadmap for action 2014-19. Integrating equity, sex, human rights, and social determinants into the work of WHO. Available at <http://www.who.int/sex-equity-rights/knowledge/web-roadmap.pdf?ua=1> Retrieved 21/03/18.

WHO–World Bank. (2011). *World report on disability*. Geneva: World Health Organization.

World Bank (2018). Poverty & Equity Brief, Sub-Saharan Africa Malawi. April 2018.

World Bank (2005) “Note on Construction of Expenditure Aggregate and Poverty Lines for IHS2”, Washington, D.C., siteresources.worldbank.org/INTLSMS/Resources/3358986-1181743055198/3877319-1181928149600/ihs2agg.pdf, retrieved 4 August 2015.

World Bank (2016). Republic of Malawi poverty assessment. Poverty and equity global practice Africa region.

World Bank (2018). Poverty & Equity Brief, Sub-Saharan Africa Malawi. April 2018.

World Bank Malawi at a glance overview [online] (2017). Available at <http://www.worldbank.org/en/country/malawi/overview> [Accessed December 2017].

The World Bank. 2015. “FAQs: Global Poverty Line Updates.” Available at <http://www.worldbank.org/en/topic/poverty/brief/global-poverty-line-faq> [Accessed April 2018].

World Health Organization (2013) *Universal eye health: a global action plan 2014-2019*. ISBN 978 92 4 150656 4

World Health Organization (2015) Roadmap for action, 2014-2019. WHO/FWC/GER/15.2

World Health Organization equity online (no date). Health systems topics: Equity. Available at <http://www.who.int/healthsystems/topics/equity/en/> [Accessed December 2017].

World Health Organization health inequities fact file (2017). 10 facts on health inequities and their causes. Available at http://www.who.int/features/factfiles/health_inequities/en/ [Accessed December 2017].

World Health Organization trachoma fact sheet (2017). Trachoma fact sheet n382. Available at <http://www.who.int/mediacentre/factsheets/fs382/en/> [Accessed December 2017].

World Health Organization (2010). First WHO report on neglected tropical diseases: working to overcome the global impact of neglected tropical diseases. ISBN 978 92 4 1564090. <http://www.vargfakta.se/wp-content/uploads/2011/09/WHO-neglected-tropical-diseases-2010.pdf> [Accessed January 2018]

World Health Organization. (2001). *International Classification of Functioning, Disability and Health: ICF*. World Health Organization.

Appendices

Appendix 1: Simple Poverty Scorecard Malawi (questionnaire and cut-off point tables)

Simple Poverty Scorecard™

Interview ID: _____	<u>Name</u>	<u>Identifier</u>
Interview date: _____	Participant: _____	_____
Country: <u>MWI</u>	Field agent: _____	_____
Scorecard: <u>002</u>	Service point: _____	_____
Sampling wgt.: _____	Number of household members: _____	

Indicator	Response	Points	Score
1. How many members does the household have?	A. Seven or more	0	
	B. Six	4	
	C. Five	10	
	D. Four	15	
	E. One, two, or three	31	
2. Is the (oldest) female head/spouse able to read and write in Chichewa or English?	A. No	0	
	B. Yes, only Chichewa	4	
	C. Yes, English (regardless of Chichewa)	8	
	D. No female head/spouse	13	
3. The floor of the main dwelling is predominantly made of what material?	A. Smoothed mud, or sand	0	
	B. Smooth cement, wood, tile, or other	8	
4. The outer walls of the main dwelling of the household are predominantly made of what material?	A. Mud (<i>yomata</i>), or grass	0	
	B. Mud brick (unfired)	5	
	C. Compacted earth (<i>yamdindo</i>), burnt bricks, concrete, wood, iron sheets, or other	8	
5. The roof of the main dwelling is predominantly made of what material?	A. Grass, plastic sheeting, or other	0	
	B. Iron sheets, clay tiles, or concrete	3	
6. What kind of toilet facility does the household use?	A. None, traditional latrine without roof shared with other households, or other	0	
	B. Traditional latrine without roof only for household members	4	
	C. Traditional latrine with roof shared with other households	4	
	D. Traditional latrine with roof only for household members, VIP latrine, or flush toilet	6	
7. What is the household's main source of lighting fuel?	A. Collected firewood, purchased firewood, grass, or gas	0	
	B. Paraffin, or other	8	
	C. Battery/dry cell (torch), candles, or electricity	13	
8. Do any members of the household sleep under a bed net to protect against mosquitos at some time during the year?	A. No	0	
	B. Yes	5	
9. Does the household own any tables?	A. No	0	
	B. Yes	9	
10. Does the household own any beds?	A. No	0	
	B. Yes	4	

microfinance.com Score: _____

Cut-off points

		Targeting segment	
		<u>Targeted</u>	<u>Non-targeted</u>
<u>True poverty status</u>	<u>Below poverty line</u>	<u>Inclusion</u> Below poverty line correctly targeted	<u>Undercoverage</u> Below poverty line mistakenly non-targeted
	<u>Above poverty line</u>	<u>Leakage</u> Above poverty line mistakenly targeted	<u>Exclusion</u> Above poverty line correctly non-targeted

Score	<u>Inclusion:</u> < poverty line correctly targeted	<u>Undercoverage:</u> < poverty line mistakenly non-targeted	<u>Leakage:</u> ≥ poverty line mistakenly targeted	<u>Exclusion:</u> ≥ poverty line correctly non-targeted
≤4	0.1	43.3	0.0	56.6
≤9	0.3	43.1	0.0	56.6
≤14	1.3	42.1	0.0	56.6
≤19	2.9	40.4	0.2	56.4
≤24	6.4	37.0	0.8	55.8
≤29	11.9	31.5	2.2	54.4
≤34	18.2	25.2	4.4	52.2
≤39	24.4	19.0	7.6	49.0
≤44	29.9	13.5	12.5	44.1
≤49	34.0	9.4	18.2	38.4
≤54	37.3	6.0	24.2	32.4
≤59	40.3	3.1	31.3	25.3
≤64	42.1	1.3	38.2	18.4
≤69	42.7	0.7	43.9	12.7
≤74	43.1	0.3	48.5	8.1
≤79	43.3	0.0	51.4	5.2
≤84	43.4	0.0	53.3	3.3
≤89	43.4	0.0	54.6	2.0
≤94	43.4	0.0	55.6	1.1
≤100	43.4	0.0	56.6	0.0

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Appendix 2: EquityTool for Malawi (questionnaire)

	Question	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Q1	Does your household have ... a mobile telephone?	Yes	No						
Q2	...a television?	Yes	No						
Q3	... electricity?	Yes	No						
Q4	...a radio?	Yes	No						
Q5	... a telephone (landline)?	Yes	No						
Q6	... a refrigerator?	Yes	No						
Q7	Does any member of your household own... a bicycle?	Yes	No						
Q8	... a motorcycle or motor scooter?	Yes	No						
Q9	... a car or truck?	Yes	No						
Q10	Does any member of this household have a bank account?	Yes	No						
Q11	What is the main source of drinking water for members of your household?	Piped into dwelling	Piped into yard/plot	Public tap / standpipe	Tube well or borehole	Unprotected dug well	Unprotected Spring	Surface water-river, lake, dam, pond	Other
Q12	What kind of toilet facility do members of your household usually use?	Flush or pour flush toilet	Ventilated Pit Latrine (VIP) latrine	Pit latrine without slab / open pit	Pit latrine with slab	No facility/bus h/field	Other		
Q13	Do you share this toilet facility with other households?	Yes	No						
Q14	What type of fuel does your household mainly use for cooking?	Electricity	Wood	Charcoal	Other				
Q15	What is the main material of the floor in your household?	Cement	Ceramic tile	Earth, sand, dung	Other				
Q16	What is the main material of the exterior walls in your household?	Stone walls with lime/cement	Unburnt bricks	Cane/palm/trunks/dirt	Bamboo/tree trunks with mud	Cement	Burnt bricks	Other	
Q17	What is the main material of the roof in your household?	Thatch/palm leaf	Palm / bamboo /	Iron sheet	Other				

Appendix 3: Washington Group Short Set of questions

Census Questions on Disability Endorsed by the Washington Group

Introductory phrase:

The next questions ask about difficulties you may have doing certain activities because of a HEALTH PROBLEM.

1. Do you have difficulty seeing, even if wearing glasses?
 - a. No - no difficulty
 - b. Yes – some difficulty
 - c. Yes – a lot of difficulty
 - d. Cannot do at all

 2. Do you have difficulty hearing, even if using a hearing aid?
 - a. No- no difficulty
 - b. Yes – some difficulty
 - c. Yes – a lot of difficulty
 - d. Cannot do at all

 3. Do you have difficulty walking or climbing steps?
 - a. No- no difficulty
 - b. Yes – some difficulty
 - c. Yes – a lot of difficulty
 - d. Cannot do at all

 4. Do you have difficulty remembering or concentrating?
 - a. No – no difficulty
 - b. Yes – some difficulty
 - c. Yes – a lot of difficulty
 - d. Cannot do at all

 5. Do you have difficulty (with self-care such as) washing all over or dressing?
 - a. No – no difficulty
 - b. Yes – some difficulty
 - c. Yes – a lot of difficulty
 - d. Cannot do at all

 6. Using your usual (customary) language, do you have difficulty communicating, for example understanding or being understood?
 - a. No – no difficulty
 - b. Yes – some difficulty
 - c. Yes – a lot of difficulty
 - d. Cannot do at all
-

Appendix 4: Kappa individual question variables camp vs house

Question	Agreement	Expected agreement	Kappa
Q1	94.23%	54.49	0.8732
Q2	94.23%	67.01	0.8251
Q3	98.08%	85.26	0.8696
Q4	92.95%	50.00	0.8590
Q5	99.36%	99.36	0.0000
Q6	97.44%	92.60	0.6537
Q7	87.82%	51.73	0.7477
Q8	98.08%	85.26	0.8696
Q9	96.79%	90.83	0.6505
Q10	94.87%	53.62	0.8894
Q11	91.67%	60.81	0.7874
Q12	89.74%	55.97	0.7671
Q13	86.54%	71.79	0.5227
Q14	96.79%	86.25	0.7668
Q15	94.23%	53.21	0.8767
Q16	92.31%	62.39	0.7955
Q17	96.79%	50.35	0.9355

We work with partners in low and middle income countries to eliminate avoidable blindness and promote equal opportunities for people with disabilities

www.sightsavers.org

Visit our research centre:

www.research.sightsavers.org

 Share [SightsaversUK](#)

 Follow [@Sightsavers](#) [@Sightsavers_Pol](#)

 Watch [SightsaversTV](#)

Bumpers Way
Bumpers Farm
Chippenham
SN14 6NG
UK

+44 (0)1444 446 600

info@sightsavers.org

 **Sightsavers**

Registered charity numbers 207544 and SC038110