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# BMJ Open

## The prevalence, care-seeking practices, and impact of perceived vision impairment in Southwest Cameroon: A community-based study

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## BMJ Open

**Title:** The prevalence, care-seeking practices, and impact of perceived vision impairment in Southwest Cameroon: A community-based study

**Authors and Affiliations:**

Susana N. Mbeboh MD<sup>1</sup>, S. Ariane Christie MD<sup>2</sup>, Melissa M. Carvalho MPH<sup>3</sup>, Drusia Dickson MD<sup>2</sup>, Theophile Nana MD<sup>4</sup>, Frida Embolo MD<sup>1</sup>, Rochelle Dicker MD<sup>3</sup>, Catherine Juillard MD MPH<sup>3</sup>, Alain Chichom Mefire MD<sup>1</sup>

<sup>1</sup> Faculty of Health Sciences, University of Buea, Buea, Cameroon.

<sup>2</sup> Center for Global Surgical Studies, Department of Surgery, University of California, San Francisco, CA

<sup>3</sup>Department of Surgery, University of California Los Angeles, CA

<sup>4</sup>Department of Surgery, Limbe Regional Hospital, Limbe, Cameroon

**Corresponding Author:** Catherine Juillard MD MPH

Postal Address:

UCLA Center for Health Sciences

10833 LeConte Ave, 72-215

Los Angeles, CA 90095

Email: [cjuillard@mednet.ucla.edu](mailto:cjuillard@mednet.ucla.edu)

Telephone: 310-825-9425

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## **Abstract**

**Objectives:** To establish the prevalence of perceived vision impairment (VI) in Southwest Cameroon, and describe associated care seeking practices, functional limitations, and economic hardships.

**Design:** A cross-sectional community-based study

**Setting:** The Southwest region of Cameroon

**Participants:** 8,046 individuals of all ages residing in the Southwest region of Cameroon

**Primary and secondary outcome measures:** Prevalence of perceived VI, patterns of vision loss, care-seeking practices, diagnosis and treatment, functional limitations, economic hardships on household, beliefs about surgical treatability of blindness, and barriers to surgical care.

**Results:** The estimated prevalence of perceived VI in Southwest Cameroon was 0.87% (95% CI: 0.62 -1.21). Among subjects aged  $\geq 40$  years, the prevalence increased to 2.61% (95% CI: 1.74 – 3.90). Less than a quarter of affected subjects reported difficulty working (20.5%) or trouble going to school (12.0%) as a result of their VI. Yet over half (52% (n=43) of affected households experienced significant economic hardships due to the VI. Residing in an urban setting (aOR: 1.16) and belonging to a higher socio-economic status (aOR: 1.13) were factors associated with the belief that certain types of blindness were surgically reversible. Formal care was not sought by 16.3% (n=8) of affected subjects. Cataracts was the leading diagnosis among subjects who did seek formal care (43.2%, n=16), though 93.8% of these cases were not surgically treated, primarily due to a lack of perceived need.

**Conclusion:** The prevalence of individuals able to perceive vision loss in Southwest Cameroon is considerably lower than prior published estimates based on visual physical examinations. Routine community-level screening and cost financing schemes could improve detection of pre-clinical eye disease and the utilization of surgical care. It could also pre-empt disability and economic hardships associated with advanced VI in the region.

## **Article Summary**

Strengths and limitations of this study:

- This was a community-based household survey of the Southwest region of Cameroon that employed a three-stage cluster sampling framework
- Demographic, socio-economic, and behavioral data of over 8000 study participants were collected.
- A designated family representative provided information on behalf of all household members in each sampled household.
- This may have led to an under-reporting of cases and their associated care-seeking behaviors and functional impairments.

## **Introduction**

Vision impairment (VI) is the functional limitation of the visual system as a result of a disease or disorder, which interferes with an individual's ability to perform daily activities.<sup>1</sup> Globally, an estimated 253 million people are visually impaired, amongst which 36 million are blind and 217 million have moderate to severe vision loss.<sup>2</sup> The loss of vision presents significant consequences to an individual, as it not only increases a person's risk of death, but adversely affects their quality of life, and considerably impedes on their economic and educational opportunities.<sup>3</sup> VI is thus recognized as a major global public health issue, particularly in low- and middle-income countries (LMICs) where a majority of the world's vision impaired are found.<sup>4</sup>

Although chronic eye conditions pose a growing threat to a rapidly aging world population, the World Health Organization (WHO) estimates that 80% of VI is curable or preventable.<sup>1,5</sup> Surgically reversible causes of vision loss, such as cataracts, are particularly prevalent in LMICs and contribute to significant disability. Cataracts accounts for 48% of all VI worldwide and is the leading cause of blindness in LMICs.<sup>6</sup> Cataract surgery can be feasibly provided in LMICs, as it is the second most cost-effective health intervention after vaccinations. Several studies in LMIC settings have also highlighted its positive impact on improving patients' autonomy and productivity.<sup>7-10</sup>

Despite its treatability, many people in developing countries still live with cataracts as well as other surgically reversible conditions. Health system strengthening and sustainable healthcare financing measures are needed to address low surgical coverage and poor utilization of eye care services among populations.<sup>11-13</sup> There is also a critical knowledge gap regarding how best to expand treatment of surgically reversible VI, particularly in Sub-Saharan Africa (SSA) where the lowest cataract surgical rates are reported.<sup>11</sup>

To eradicate surgically reversible VI, it is imperative to gain an understanding of the care-seeking patterns of persons experiencing vision loss in the community, as well as to describe commonly held beliefs about surgical treatment of blindness. Most community based studies of surgically reversible blindness in SSA have focused on establishing the prevalence of VI via direct physical examinations, but have largely overlooked perceived impairment and functional disability criteria.<sup>14-17</sup> Investigating these factors, however, would provide key information on barriers to care and could effectively guide policy to promote the utilization of surgical services. To our knowledge, no surveys investigating care-seeking behaviors among persons who are able to recognize their VI had thus far been carried out in the Central African country of Cameroon. Hence, this study aimed to establish the prevalence and patterns of of perceived VI in the Southwest region of Cameroon, as well as describe functional limitations, economic hardships, and care-seeking practices in this population. We hypothesized that this population likely experiences significant disability from their vision loss and may represent a critical group to engage in care.

## **Materials & Methods**

### **Study Design and Setting**

This study was designed as a sub-analysis of a broader cross-sectional community-based survey on injury and unmet surgical need in the Southwest region of Cameroon.<sup>18</sup> It followed the STROBE cross sectional reporting guidelines.<sup>19</sup>

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2  
3 The Southwest region is one of two predominantly Anglophone speaking areas in Cameroon.  
4 It is comprised of 18 health districts, 36 health areas, and had an estimated population of  
5 1,575,224 in 2016.<sup>20,21</sup>  
6

### 7 **Study Population**

8  
9 The study population consisted of all individuals residing in the Southwest region of  
10 Cameroon. Members who were currently living in each surveyed household were included in  
11 the study sample. Households without an eligible family representative (aged 18 years or  
12 over) present at the time of data collection or those that denied consent were excluded from  
13 the study.  
14  
15

### 16 **Sampling Method**

17  
18 Enumeration areas were selected using a three-stage cluster sampling framework. Clusters of  
19 nine health districts and four health areas per district were selected using a probability  
20 proportionate to size. Two health districts (Akwaya and Bakassi) were excluded from the  
21 sampling framework due to security concerns. Following the selection of clusters at the first  
22 two sampling levels, a starting point was then randomly selected in each sampled health area  
23 using geolocation data. Data collection commenced at the closest settlement to this starting  
24 point. Households were approached contiguously and circumferentially until a target sample  
25 size of 200 households per cluster was attained. To prevent bias, households without an  
26 eligible family representative at the time of data collection were approached at least twice.  
27  
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### 31 **Sample Size Calculations**

32  
33 The sample size for the community-based survey, in which this sub-analysis was nested, was  
34 calculated to provide 78% power to detect a 6% yearly incidence of injury (based on prior  
35 population-based surveys in Sub-Saharan Africa<sup>22,23</sup>). A precision level of  $\pm 5\%$  and a 95%  
36 tolerable error rate were used. The sample size calculation was also adjusted for a predicted  
37 20% non-response rate and design effect of 2 to account for the multi-cluster sampling  
38 framework. A minimum sample size of 4680 was generated and then purposively exceeded  
39 by 50% during data collection to allow for multiple sub-analyses of rare events. We  
40 conducted an additional sample size calculation using a 11.2% prevalence of self-reported  
41 visual difficulty in South Africa to verify that our sample was large enough for a sub-analysis  
42 of perceived VI.<sup>24</sup>  
43  
44  
45

### 46 **Development and Piloting of Study Questionnaire**

47  
48 We developed a study questionnaire that was closely adapted from the *Surgeons OverSeas*  
49 *Assessment of Surgical Needs* (SOSAS) version 3.0. The SOSAS tool is a household survey  
50 designed to measure unmet surgical need in the community.<sup>25</sup> It has been validated in  
51 multiple LMIC settings,<sup>26,27</sup> and a study in Nepal demonstrated a 94.6% correlation between  
52 self-reports of vision loss and results of visual physical examinations using this survey.<sup>28</sup>  
53  
54

55 Our study questionnaire was first reviewed internally by a panel of US and Cameroonian  
56 clinicians for its relevance and subsequently piloted for suitability in a community in Buea,  
57 located in Southwest Cameroon. The questionnaire was subsequently modified based on  
58 feedback obtained during this process.  
59  
60

## Training of Survey Team

A survey team, consisting of 8 medical and master's level students and a practicing physician, were trained on the research protocol and study questionnaire. They additionally took an online course on human subjects training to meet HIPAA compliance requirements. Prior to data collection, each survey team member practiced simulated exercises in front of study investigators so that their interactions with participants could be evaluated. Those demonstrating proficiency were cleared to proceed with data collection activities.

## Data Collection

The survey team collected data from sampled areas over an 8-week period, between January 3rd and March 3rd, 2017. Each target household was asked to designate a family representative who was approached for consent using a standard oral consent script. If consent was granted, members of the survey team verbally administered the piloted questionnaire to the representative who enumerated and provided information on all members of the household. Data collected included demographics and indicators of economic status. The type of cooking fuel used by the household served as a marker of socio-economic status (SES) since the use of liquid petroleum gas (LPG) as oppose to wood, correlates with a higher SES in the Cameroonian context.<sup>29-31</sup>

To ascertain household members affected by a perceived VI, family representatives were asked to identify any household member who was blind or had lost most of their vision. Households reporting a member with a perceived VI were then asked to provide additional information on: the onset and duration of vision loss, care seeking practices, barriers to care, functional limitations and economic hardships on the household due to the VI, and diagnosis and treatment at the hospital. Lastly, family representatives were surveyed on their beliefs about the surgical treatability of certain types of blindness. (**Supplementary Table A**)

## Data Management and Analysis

Data was stored and manually entered into REDCap, an encrypted online database.<sup>32</sup> All statistical analyses were conducted using Stata 14 and adjusted as appropriate for the clustered sampling framework using the *svy* command.<sup>33</sup> Descriptive analyses generated frequencies, means, and proportions, medians, and interquartile ranges. Comparisons between groups were conducted using the Adjusted Wald and Pearson Chi-Square tests as appropriate. Missing data were excluded from all our analyses, and statistical significance was set at a P value of 0.05. Univariate and multivariate analyses were performed to identify factors associated with perceived VI and the belief that certain types of blindness can be surgically corrected. Final logistic regression models were built using a backward stepwise regression procedure, and included the following covariates: age, urban household setting, use of LPG as a cooking fuel, and the highest education level achieved by a member of the household.

## Ethical Considerations

Approval for this study was granted by the Institutional Review Boards of the University of Douala as well as the Committee for Human Research at the University of California, San



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2  
3 Francisco. The conduct of this study adhered to all tenets outlined in the Declaration of  
4 Helsinki.  
5

## 6 **Results**

### 7 **Characteristics of Households and the Study Sample**

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10 We approached 1551 households of which 1287 (83%) consented to participate in the study.  
11 Individual data on 8,046 study subjects were collected from consenting households. The  
12 median age of the study sample was 20 years [IQR: 10, 34], and over half of study subjects  
13 were female (52%, n=4181). Most households reported at least one subject who had either  
14 achieved a tertiary (39.7%, n=3133) or secondary (37.4%, n=2955) level of education. The  
15 vast majority of households were also located in a rural setting (70.7%, n=5620).  
16  
17

### 18 **Prevalence of Vision Impairment and Associated Socio-Demographic Factors**

19  
20 Eighty-three study subjects reported conditions of total blindness (44.6%, n=37) or  
21 significant vision loss (55.4%, n=46). The overall prevalence of perceived VI in the study  
22 population was 0.87% (95% CI: 0.62 -1.21). This prevalence increased to 2.61% (95% CI:  
23 1.74 – 3.90) when restricting the study population to individuals aged  $\geq 40$  years. Subjects  
24 with a perceived VI were significantly older than subjects with no perceptible VI ( $p < 0.01$ ).  
25 Moreover, they were less likely to use LPG ( $p < 0.01$ ) as a source of cooking fuel - a marker  
26 of higher SES. There were not significant differences between subjects with a perceived VI  
27 and the remaining study sample based on sex and highest education level achieved by a  
28 household. (Table 1)  
29  
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32 A multiple logistic regression analysis identified older age as a significant predictor of a  
33 perceived VI (aOR 1.06, 95% CI [1.04 -1.07]). The use of LPG as a cooking fuel in the  
34 household was associated with lower odds of reporting a VI (aOR 0.35, 95% CI [0.19 -0.64]).  
35 Furthermore, residing in an urban setting (aOR 1.16) and using LPG as a cooking fuel (aOR  
36 1.13) were significant predictors of a fam's belief that certain types of blindness could be  
37 surgically treated or reversed. (Table 2)  
38  
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### 41 **Patterns of Vision Loss, Functional Limitations, and Economic Hardships**

42 Most study subjects developed their VI slowly over time (69.6%, n =55). Others were born  
43 with their condition (8.9%, n=7) or developed it following an injury (8.9%, n=7). Some  
44 subjects also reported that their VI developed suddenly (7.6% , n= 6). The mean duration of  
45 vision loss among among all affected subjects was 9.1 years (SD:  $\pm 8.6$ ).  
46  
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48 A majority of study subjects with a perceived VI (91.6 % , n =76) cited at least one functional  
49 limitation due to their vision loss. The most commonly reported limitations included:  
50 difficulty working (20.5%), trouble going to school (12.0%), trouble interacting with others,  
51 shopping, or traveling (10.8 %), and feeling ashamed or depressed (7.2%). Moreover, 52% (n  
52 = 43) of subjects with a perceived VI noted that their condition had an economic impact on  
53 their households. This was primarily due to their families spending assets, savings, or having  
54 to borrow money (48.8%), or their household earning less money as a result of a subject's  
55 vision loss (34.9%). (Table 3)  
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### 59 **Care-Seeking Practices and Barriers to Surgery**

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3 Approximately 81.9% (n=68) of study subjects with a perceived VI sought formal medical  
4 care for their vision loss. Among subjects who provided information about their care-seeking  
5 practices (n=49), 16.3% (n=8) failed to seek any source of care for their condition. Other  
6 subjects first sought care from alternative sources (n=6), including traditional medicine and  
7 home treatment from family or friends (**Figure 1**). Subjects cited the high cost of formal  
8 medical care (52.9%, n=9), the perception that their vision problem was not serious (23.5%, n  
9 = 4), their personal preference (17.7%, n=4), and a lack of awareness that their vision loss  
10 could be treated (5.9%, n=1) as reasons for not first seeking formal medical care as a source of  
11 care.  
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15 Over two-thirds of study subjects who sought formal medical care received a diagnosis  
16 (67.6% ,n=46). Most reported a diagnosis of cataracts (43.2%, n=16), followed by glaucoma  
17 (6.2% (n=6), filariasis (5.4%, n=2) and the presence of a foreign body (5.4%, n=2). The vast  
18 majority of study subjects had not obtained any surgical treatment after seeking formal care  
19 (95.4%, n=63). Moreover, 93.8% (n=15) of reported cataract cases had not been surgically  
20 treated. The primary reasons indicated for not obtaining surgery were a lack of perceived  
21 need for surgery (43.2%, n= 36) and no finances to afford a surgical procedure (14.5%,  
22 n=12). (**Figure 2**)  
23  
24  
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## 26 **Discussion**

27 This community-based survey investigated the prevalence and care-seeking practices of  
28 persons able to perceive vision loss in the Southwest region of Cameroon. It also described  
29 the impact of this VI on their daily functioning and households as a means of understanding  
30 barriers to the utilization of surgical care. The study found a 0.87% prevalence of perceived  
31 VI in the region. Although this prevalence increased to 2.61% among high-risk individuals  
32 (aged 40 years or older), it was still considerably lower than prior published estimates of VI  
33 in the region that were based on visual physical examinations.<sup>15-16</sup> The discrepancy in  
34 prevalence of perceived versus exam-detected VI has important implications for policy  
35 improvements in Southwest Cameroon, as it suggests that a substantial proportion of  
36 individuals harboring progressive eye disorders may not be aware of their visual problems. It  
37 also highlights a critical role for routine screening to detect pre-clinical eye disease and  
38 preempt disability associated with more advanced VI.  
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43 Subjects who were reported to have a VI were more likely to belong to households of lower  
44 SES, corroborating evidence from prior literature linking poverty to blindness.<sup>34,35</sup> Moreover,  
45 being of a higher SES and residing in an urban setting were predictive factors of a subject's  
46 belief that certain blindness could be surgically treated. These findings raise concerns about  
47 socioeconomic disparities in access to eye health services and health information in the  
48 region. Indeed, economic analyses have demonstrated that the use of fee-for-service in  
49 Cameroon has created an inequitable health system, where access to care is largely dependent  
50 on income. Moreover, the distribution of health providers in Cameroon is largely  
51 concentrated in urban settings, which has resulted in disparities in health outcomes between  
52 socio-economic groups in rural and urban areas.<sup>36</sup> Although this study does not specifically  
53 investigate sources of health information, identifying where people receive health  
54 information, particularly rural populations, could help develop effective strategies for  
55 disseminating eye health education campaigns in the Southwest region.  
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3 Our findings also revealed low surgical care utilization among subjects with a perceived VI.  
4 Over 90% of cataract cases reported in this study were not surgically treated, despite surgery  
5 being a highly effective intervention to recover vision loss from this condition.<sup>7</sup> Surgery is  
6 especially recommended when the patient's vision loss detrimentally affects their quality of  
7 life. Although most affected subjects in our study reported at least one limitation as a result of  
8 their VI, this deficit may not have had a major impact on their functioning. For instance, less  
9 than a quarter of affected subjects revealed difficulty working or going to school. These  
10 results could imply that many subjects with a perceived VI may not be experiencing  
11 significant enough functional limitations compelling them to obtain surgical treatment.  
12 Indeed, 43% of subjects who sought formal medical care indicated not perceiving a need for  
13 surgery. This perception was the most significant barrier to receiving surgical care,  
14 suggesting that subjects chose not to receive treatment even when eye care services are  
15 available. Competing priorities and limited disposable income may influence people's  
16 decisions to prioritize surgical treatment, particularly if they do not perceive their VI to have  
17 a major impact on their day-to-day activities.

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21  
22 The high cost of care was another major barrier to obtaining surgical care. Study subjects also  
23 indicated that the cost of care placed a significant economic burden on their households, as  
24 nearly half of affected families reported having to spend assets or borrow money to treat a  
25 subject's VI. The absence of universal health coverage and cost financing schemes prevent  
26 many in developing countries from accessing needed surgical treatment.<sup>37</sup> Cost restructuring  
27 mechanisms are thus critically needed to make eye care services more accessible to  
28 populations in Cameroon. The Cameroonian government should engage with the private  
29 sector and international donors to prioritize and scale up surgical capacity in the country,  
30 particularly in rural areas. Adapting the Aravind model of eye care to the Cameroonian  
31 setting could be a potential solution to meet the current demand for cataract surgery. This  
32 social enterprise model enables the provision of cataract surgeries to the poor at low or no  
33 cost by relying on cross subsidization schemes and a high volume of services. A new hospital  
34 in Cameroon (The Magrabi ICO Cameroon Eye Institute) was recently allocated a cataract  
35 bond to establish the Aravind model of care.<sup>38</sup> There is thus an opportunity for future studies  
36 to investigate whether this model of care is replicable and sustainable in the Sub-Saharan  
37 African context.

### 38 39 40 41 42 43 *Limitations*

44  
45 A number of limitations from the study should be noted. Data was collected from one  
46 designated representative in each sampled household who provided information on behalf of  
47 all other household members. This representative may not have always been aware of every  
48 aspect influencing a subject's care-seeking behaviour, as it would depend on the household  
49 dynamics and the relationship that particular respondent had with other members of the  
50 household. Thus, the prevalence of perceived VI and its impact on functioning could have  
51 been underestimated. Future population-based surveys relying on self-reports should  
52 preferably collect data directly from individual subjects to ensure greater accuracy and  
53 completeness of information about patterns of vision loss, beliefs, and practices. Findings for  
54 this community based survey are specific to the Southwest region, and may not generalizable  
55 to other areas of Cameroon and Sub-Saharan Africa.

### 56 57 58 59 **Conclusion**

1  
2  
3 The prevalence of perceived VI in Southwest Cameroon is lower than exam-based estimates  
4 of visual deficits, underscoring the need for routine screening at the community-level to pre-  
5 empt disability. Although perceived VI did not significantly impact functioning among  
6 affected individuals in this study, it was associated with economic hardships on their  
7 households. Surgical treatment among subjects with a perceived VI was low, primarily due to  
8 the prohibitive cost of care and the perception that surgery was not a necessary treatment  
9 option for their conditions. Cost restructuring mechanisms and eye health education  
10 campaigns are critically needed to improve utilization of surgical services for eye disorders in  
11 the region, particularly among populations in rural and low-income households. Health  
12 promotion approaches should specifically target information to patients at risk of opting out  
13 of care, ensuring they understand the benefits of surgery in reversing vision loss and  
14 reducing disability.  
15  
16  
17  
18

### 19 **Author Contributions:**

20 SC and CJ conceived and designed the study. SM, SC, DD, TN, FE were responsible for the  
21 acquisition of the data, under the supervision and support of ACM, RD, and CJ. SC analyzed  
22 the data, and SM, SC and MC interpreted the data. SM and MC drafted the manuscript, with  
23 critical revisions from SC, DD, TN, FE, ACM, RD, and CJ. All authors have given their final  
24 approval and agree to be accountable for all aspects of the work.  
25  
26  
27

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37  
38  
39

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**Table 1: Socio-economic comparisons of study subjects by perceived vision impairment status (n=8046)**

Characteristics	VI <sup>a</sup> (n=83)	No VI (n=7,963)	p-value
Age (mean, [95% CI])	55 [47, 63]	23 [23, 24]	p < 0.001**
Sex			p= 0.275
Male	34 (41.0 %)	3,831 (48.1%)	
Female	49 (59.0%)	4,132 (51.9%)	
Household possesses a cell phone	77 (93.0%)	7438 (93.4%)	p= 0.518
Highest Education level achieved by a member of their household			p= 0.799
No formal	1 (1.3%)	156 (2.0%)	
Primary	16 (20.3%)	1631 (20.5%)	
Secondary	38 (48.1%)	2917 (36.6%)	
Tertiary	24 (30.4%)	3109 (39.0%)	
Household setting			p= 0.570
Urban	25 (30.1%)	2308 (29.0%)	
Rural	58 (69.9%)	5562 (70.0%)	
Usage of Cooking Fuel in Household			
Wood	81 (97.6%)	7325 (92.0%)	p= 0.079
Charcoal	4 (4.8%)	1274 (16.0%)	p= 0.016**
Kerosene	7 (8.4%)	1279 (16.1%)	p=0.05
Liquid Petroleum Gas (LPG)	16 (19.3%)	3432 (43.1%)	p =0.004**
Household Owns Agricultural Land	54 (65.1%)	5111 (64.2%)	p= 0.866
Household owns/rents/lives for free in residence:			p= 0.318
Own	66 (79.52)	5001 (63.41)	
Rent	11 (13.25)	1999 (25.35)	
Live for free	6 (7.23)	887 (11.25)	

Note: VI= Visual Impairment; An asterisk (\*) represents a p-value of  $\leq 0.05$ ; Percentages based on non-missing values.

**Table 2: Factors associated with a belief in the surgical reversibility of certain types of blindness**

Variable	Unadjusted OR	[95% CI]	Adjusted OR	[95% CI]
Age	1.00	0.998 -1.003	1.00	0.998 -1.00
Urban household setting	1.17	1.048 – 1.298	1.16*	1.037 – 1.303
Use of LPG as cooking fuel	1.18	1.068 -1.297	1.13*	1.022 – 1.259
Highest education level achieved by any household member	1.00	.993-1.016	1.00	0.991 – 1.014

Note: OR = odds ratio ; CI = confidence interval; An asterisk represents a significant odds ratio

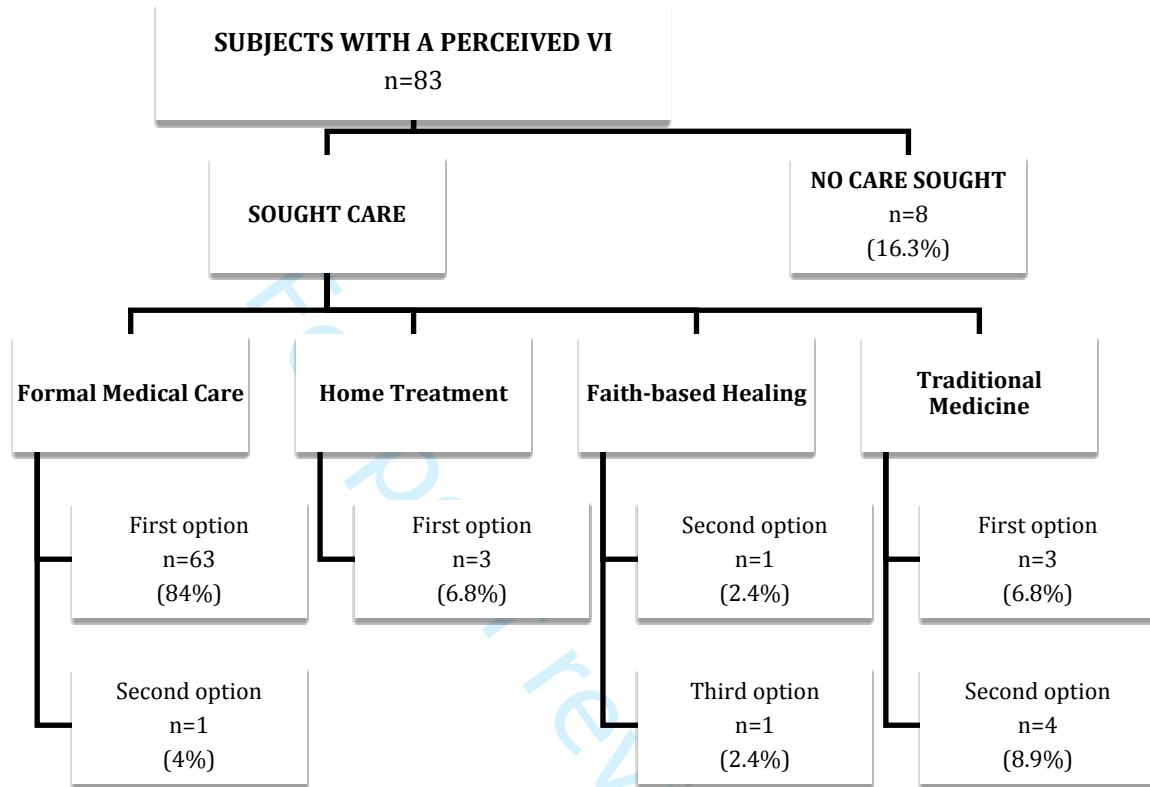


**Table 3: Functional limitations and economic hardships associated with a perceived VI**

<b>Disabilities at the Individual Level (n=83)</b>	<b>N (%)</b>
Difficulty working/ working in the home	17 (20.5 %)
Trouble going to school	10 (12.0 %)
Trouble interacting with others, shopping, traveling	9 (10.8 %)
Feeling ashamed or depressed	6 (7.2 %)
Needing assistance dressing, eating, or toileting	4 (4.8%)
Difficulty standing or walking or sitting	4 (4.8%)
Difficulty picking things up or using arms or hands	1 (1.20 %)
<b>Disabilities at the Household Level (n=43)</b>	<b>N (%)</b>
Family has spent assets/savings or borrowed money	21 (48.8%)
Family earns less money	15 (34.9%)
Family members psychologically affected	9 (20.9%)
Person with visual impairment requires caretaker from the household	8 (18.6 %)
Harder to afford necessities like food and rent	3 (7.0%)

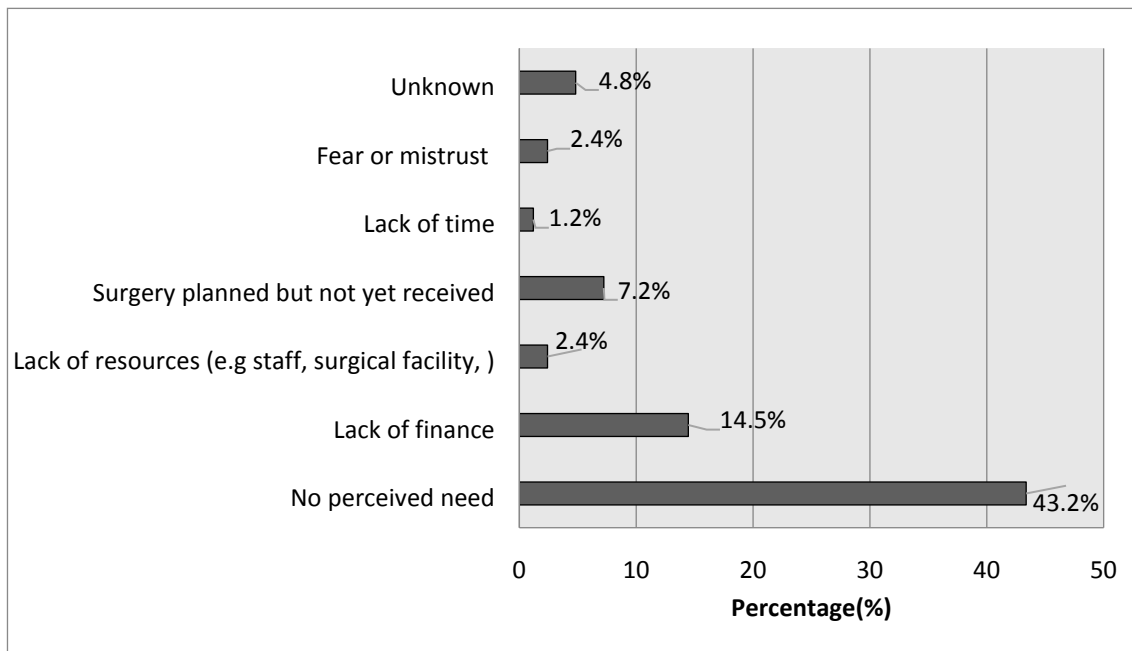
Note: VI= Visual Impairment

**Figure 1: Care-seeking practices among study subjects with a perceived vision impairment**



Note: Percent based on non-missing values

**Figure 2: Barriers to obtaining surgery among subjects with a perceived vision impairment**



**Supplementary Table A: Survey questions ascertaining perceived vision impairment and other factors**

<p><b>Vision impairment</b></p>	<p><i>Is there anyone in this house who is blind or has lost most of their vision?</i></p>
<p><b>Onset and duration of vision loss</b></p>	<p><i>How did the vision problem start?</i></p> <ul style="list-style-type: none"> <li>• They were born with it</li> <li>• After an injury</li> <li>• It developed slowly</li> <li>• It developed suddenly</li> <li>• Unknown</li> </ul> <p><i>When did the vision problem start? _____ (days/weeks/years)</i></p>
<p><b>Care seeking practices &amp; Barriers to care</b></p>	<p><i>Has the [affected] person gone to any of the following for treatment or medical care? (mark all that apply, indicate order if known)</i></p> <ul style="list-style-type: none"> <li>• No treatment sought</li> <li>• Friend/acquaintance</li> <li>• Church</li> <li>• Traditional healer/bonesetter</li> <li>• Family/Home treatment</li> <li>• Doctor/nurse/hospital/clinic</li> <li>• Unknown</li> <li>• Other (specify)</li> </ul> <p><i>If formal medical care was NOT sought FIRST [as a source of care], which best describes why?</i></p> <ul style="list-style-type: none"> <li>• Problem not serious</li> <li>• Too Expensive</li> <li>• Personal preference</li> <li>• No access to formal health services/ too far away</li> <li>• Unknown/Unsure</li> <li>• Other (specify)</li> </ul>
<p><b>Functional limitations and Economic hardships</b></p>	<p><i>How does the vision problem impact the person's daily life? (select all that apply)</i></p> <ul style="list-style-type: none"> <li>• It is not disabling</li> <li>• They are blind</li> <li>• They have difficulty speaking or communicating</li> <li>• The person needs help dressing, eating or toileting</li> <li>• They have trouble interacting with others, shopping, traveling</li> <li>• They have trouble going to school</li> <li>• They have trouble working/ working in the home</li> <li>• They have difficulty standing or walking</li> <li>• They have difficulty picking things up or using their arms/hands</li> <li>• They have weakness, shortness of breath, or fatigue</li> <li>• They have trouble understanding or remembering things</li> <li>• They feel ashamed or depressed</li> <li>• Unknown/Unsure</li> <li>• Other (specify) _____</li> </ul> <p><i>How does the vision problem impact the family? (select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Nothing has changed</li> <li>• The family earns less money</li> <li>• The family has spent assets/savings or borrowed money</li> <li>• It is harder to afford necessities like food and rent</li> <li>• Another person must help care for the person with the problem</li> <li>• Unknown/Unsure</li> <li>• Other : _____</li> </ul>
<p><b>Diagnosis &amp; Treatment</b></p>	<p><b>IF FORMAL MEDICAL CARE WAS SOUGHT</b></p> <p><i>Did the doctor/nurse ... make a diagnosis ? (If diagnosis known, use patient words)</i></p> <ul style="list-style-type: none"> <li>• Yes: _____ (Describe)</li> <li>• No</li> <li>• Unknown/Unsure</li> </ul> <p><i>At the doctor/nurse ... what treatment did you receive for the problem (select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Minor procedure = dressings, wound care, punctures, suturing</li> <li>• Major procedure = brought to the theatre for an operation, had general anesthesia</li> <li>• No surgical treatment</li> <li>• Unknown/Unsure</li> </ul>

	<p><i>If no surgical treatment was received, why not? (Select all that apply)</i></p> <ul style="list-style-type: none"> <li>• No Need</li> <li>• No Money</li> <li>• No transportation</li> <li>• No time</li> <li>• Facility, Personnel or Equipment not available</li> <li>• Person prefers traditional treatment or payer</li> <li>• Surgery planned but not yet received</li> <li>• Person avoided due to fear, mistrust, previous experience</li> </ul>
<b>Beliefs about surgical treatability of blindness</b>	Do you believe <u>some types of blindness</u> can be treated or reversed with surgery ?

For peer review only

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

			Page Number
<b>Title and abstract</b>			
Title	<a href="#">#1a</a>	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	<a href="#">#1b</a>	Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background / rationale	<a href="#">#2</a>	Explain the scientific background and rationale for the investigation being reported	3
Objectives	<a href="#">#3</a>	State specific objectives, including any prespecified hypotheses	3
<b>Methods</b>			
Study design	<a href="#">#4</a>	Present key elements of study design early in the paper	3
Setting	<a href="#">#5</a>	Describe the setting, locations, and relevant dates, including periods of	3-4

recruitment, exposure, follow-up, and data collection

1				
2				
3	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of selection of participants.	4
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6		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential	5
7			confounders, and effect modifiers. Give diagnostic criteria, if applicable	
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10	Data sources /	<a href="#">#8</a>	For each variable of interest give sources of data and details of methods	5
11	measurement		of assessment (measurement). Describe comparability of assessment	
12			methods if there is more than one group. Give information separately	
13			for for exposed and unexposed groups if applicable.	
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17	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	4
18				
19	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	4
20				
21	Quantitative	<a href="#">#11</a>	Explain how quantitative variables were handled in the analyses. If	5
22	variables		applicable, describe which groupings were chosen, and why	
23				
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25	Statistical	<a href="#">#12a</a>	Describe all statistical methods, including those used to control for	5
26	methods		confounding	
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29	Statistical	<a href="#">#12b</a>	Describe any methods used to examine subgroups and interactions	n/a
30	methods			
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33	Statistical	<a href="#">#12c</a>	Explain how missing data were addressed	5
34	methods			
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37	Statistical	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of sampling	5
38	methods		strategy	
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41	Statistical	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
42	methods			
43				
44	<b>Results</b>			
45				
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47	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg numbers	6
48			potentially eligible, examined for eligibility, confirmed eligible,	
49			included in the study, completing follow-up, and analysed. Give	
50			information separately for for exposed and unexposed groups if	
51			applicable.	
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55	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	n/a
56				
57	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
58				
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1	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	4
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6	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each variable of interest	n/a
7				
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10	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	6-7, 12-15
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14	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	5
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19	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were categorized	n/a
20				
21	Main results	<a href="#">#16c</a>	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
22				
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25	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/a
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29	<b>Discussion</b>			
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31	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	7
32				
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34	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	8
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39	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	7-8
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44	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study results	8
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47	<b>Other</b>			
48	<b>Information</b>			
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51	Funding	<a href="#">#22</a>	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1
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# BMJ Open

## The prevalence, care-seeking practices, and impact of self-reported vision impairment in Southwest Cameroon: A community-based study

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**Authors and Affiliations:**

Susana N. Mbeboh MD<sup>1</sup>, S. Ariane Christie MD<sup>2</sup>, Melissa M. Carvalho MPH<sup>3</sup>, Drusia Dickson MD<sup>2</sup>, Theophile Nana MD<sup>4</sup>, Frida N. Embolo MD<sup>1</sup>, Rochelle Dicker MD<sup>3</sup>, Catherine Juillard MD MPH<sup>3</sup>, Alain Chichom Mefire MD<sup>1</sup>

<sup>1</sup> Faculty of Health Sciences, University of Buea, Buea, Cameroon.

<sup>2</sup> Center for Global Surgical Studies, Department of Surgery, University of California, San Francisco, CA

<sup>3</sup> Department of Surgery, University of California Los Angeles, CA

<sup>4</sup> Department of Surgery, Limbe Regional Hospital, Limbe, Cameroon

**Corresponding Author:** Catherine Juillard MD MPH

Postal Address:

UCLA Center for Health Sciences

10833 LeConte Ave, 72-215

Los Angeles, CA 90095

Email: [c.juillard@gmail.com](mailto:c.juillard@gmail.com)

Telephone: 310-825-9425

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**Data sharing statement:** The raw data used to support the findings of this study are available from the corresponding author upon request.

**Word Count:** 3,029 words

**Keywords:** Vision Impairment; Global Health; Sub-Saharan Africa; Barriers to Surgical Care; Care-seeking Behavior

## **Abstract**

**Objectives:** To establish the prevalence of self-reported impairment (VI) in Southwest Cameroon, and describe associated care seeking practices, functional limitations, and economic hardships.

**Design:** A three-stage clustered sampling household community-based survey

**Setting:** The Southwest region of Cameroon

**Participants:** 8,046 individuals of all ages residing in the Southwest region of Cameroon

**Primary and secondary outcome measures:** Prevalence of self-reported VI, onset of vision loss, care-seeking practices, diagnosis and treatment, functional limitations, economic hardships on household, beliefs about surgical treatability of blindness, and barriers to surgical care.

**Results:** The estimated prevalence of self-reported VI in Southwest Cameroon was 0.87% (95% CI: 0.62 -1.21). Among participants aged  $\geq 40$  years, the prevalence increased to 2.61% (95% CI: 1.74 – 3.90). Less than a quarter of affected participants reported difficulty working (20.5%) or trouble going to school (12.0%) as a result of their VI. Yet over half (52% (n=43) of affected households experienced significant economic hardships due to the VI. Residing in an urban setting (aOR: 1.16, 95% CI: 1.04 -1.30) and belonging to a higher socio-economic status (aOR: 1.13, 95% CI: 1.02 -1.26) were factors associated with the belief that certain types of blindness were surgically reversible. Formal care was not sought by 16.3% (n=8) of affected participants. Cataracts was the leading diagnosis among participants who did seek formal care (43.2%, n=16), though 93.8% of these cases were not surgically treated, primarily due to a lack of perceived need.

**Conclusion:** The prevalence of individuals who report vision loss in Southwest Cameroon is considerably lower than prior published estimates based on visual physical examinations. Routine community-level screening and cost financing schemes could improve detection of pre-clinical eye disease and the utilization of surgical care. It could also pre-empt disability and economic hardships associated with advanced VI in the region.

## **Article Summary**

Strengths and limitations of this study:

- This was a community-based household survey of the Southwest region of Cameroon that employed a three-stage cluster sampling framework
- Demographic, socio-economic, and behavioral data of over 8000 study participants were collected.
- At times, only the designated family representative provided information on behalf of all household members in each sampled household.
- This may have led to an under-reporting of cases and their associated care-seeking behaviors and functional impairments.

## **Introduction**

Vision impairment (VI) is the functional limitation of the visual system as a result of a disease or disorder, which interferes with an individual's ability to perform daily activities.<sup>1</sup> Globally, an estimated 253 million people are visually impaired, amongst which 36 million are blind; 217 million have moderate to severe vision loss.<sup>2</sup> The loss of vision presents significant consequences to an individual, increasing risk of death, adversely affecting quality of life, and considerably impeding economic and educational opportunities.<sup>3</sup> VI is a major global public health issue, particularly in low- and middle-income countries (LMICs) where a majority of the world's vision impaired are found.<sup>4</sup>

The World Health Organization (WHO) estimates that 80% of VI is curable or preventable.<sup>1,5</sup> Surgically reversible causes of vision loss, such as cataracts, are particularly prevalent in LMICs and contribute to significant disability. Cataracts account for 48% of all VI worldwide and are the leading cause of blindness in LMICs.<sup>6</sup> Cataract surgery can be feasibly provided in LMICs; it is the second most cost-effective health intervention after vaccinations.<sup>7,8</sup> Several studies in LMIC settings have also highlighted its positive impact on improving patients' autonomy and productivity.<sup>8-11</sup>

Despite their treatability, many people in LMICs still live with surgically reversible eye conditions. Health system strengthening and sustainable healthcare financing measures are needed to address low surgical coverage and poor utilization of eye care services.<sup>12-14</sup> There is also a critical knowledge gap strategies to expand treatment of surgically reversible VI, particularly in Sub-Saharan Africa (SSA) where the lowest cataract surgical rates are reported.<sup>12</sup>

To eradicate surgically reversible VI, we need an understanding of the care-seeking patterns of persons experiencing vision loss in the community and their commonly held beliefs about surgical treatment of blindness. Most community-based studies of surgically reversible blindness in SSA have focused on establishing the prevalence of VI via direct physical examinations, but have largely overlooked perceived impairment and functional disability criteria.<sup>15-18</sup> Investigating these factors, however, would provide key information on barriers to care and could effectively guide policy to promote the utilization of surgical services. To our knowledge, no surveys investigating care-seeking behaviors among persons reporting their VI had thus far been carried out in the Central African country of Cameroon. This study aimed to establish the prevalence and patterns of self-reported VI in the Southwest region of Cameroon, and describe functional limitations, economic hardships, and care-seeking practices in this population. We hypothesized that this population likely experiences significant disability from their vision loss and may represent a critical group to engage in care.

## **Materials & Methods**

### **Study Design and Setting**

This study was designed as a sub-analysis of a broader cross-sectional community-based survey on injury and unmet surgical need in Southwest, Cameroon.<sup>19</sup> It followed the STROBE cross sectional reporting guidelines.<sup>20</sup>

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3 The Southwest region is one of two predominantly Anglophone speaking areas in Cameroon.  
4 It is comprised of 18 health districts, 36 health areas, and had an estimated population of  
5 1,575,224 in 2016.<sup>21,22</sup>  
6  
7

## 8 **Study Population**

9

10 The target population consisted of all individuals residing in Southwest, Cameroon.  
11 Household members living in each surveyed household were included in the study  
12 population. Households without an eligible family representative (aged  $\geq 18$  years) present or  
13 those that denied consent were excluded from the study.  
14  
15

## 16 **Sampling Method**

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18 Enumeration areas were selected using a three-stage cluster sampling framework. Clusters of  
19 nine health districts and four health areas per district were selected using a probability  
20 proportionate to size. Two health districts (Akwaya and Bakassi) were excluded from the  
21 sampling framework due to security concerns. Following the selection of clusters at the first  
22 two sampling levels, a starting point was randomly selected in each sampled health area using  
23 geolocation data. Data collection commenced at the closest settlement to this starting point.  
24 Households were approached contiguously and circumferentially until a target sample size of  
25 200 households per cluster was attained. To prevent bias, households without an eligible  
26 family representative present were approached at least twice.  
27  
28  
29

## 30 **Sample Size Calculations**

31

32 The sample size for the community-based survey, in which this sub-analysis was nested, was  
33 calculated to provide 78% power to detect a 6% yearly incidence of injury (based on prior  
34 population-based surveys in Sub-Saharan Africa<sup>23,24</sup>). We conducted an additional sample  
35 size calculation using a 11.2% prevalence of self-reported visual difficulty in South Africa to  
36 verify that our sample was large enough for our sub-analysis.<sup>25</sup> This sub-calculation used a  
37 precision level of  $\pm 1\%$ , confidence interval of 95%, and design effect of 2 to account for the  
38 multi-cluster sampling framework. A minimum sample size of 7623 was generated.  
39  
40

## 41 **Study Questionnaire Development**

42

43 We adapted our study questionnaire from the *Surgeons Overseas Assessment of Surgical*  
44 *Needs* (SOSAS) version 3.0. The SOSAS tool is a household survey designed to measure  
45 unmet surgical need in the community.<sup>26</sup> It has been validated in multiple LMIC settings;<sup>27,28</sup>  
46 and demonstrated a 94.6% correlation between self-reports of vision loss using this survey  
47 and results of visual physical examinations.<sup>29</sup> Our questionnaire was reviewed internally by a  
48 panel of US and Cameroonian clinicians for its relevance and subsequently piloted for  
49 suitability in Buea, located in Southwest Cameroon. The questionnaire was modified based  
50 on feedback obtained during this process.  
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## 54 **Training of Survey Team**

55

56 A survey team of 8 medical and master's level students and a practicing physician, were  
57 trained on the research protocol and questionnaire; and took an online course on human  
58 subjects training to meet HIPAA compliance requirements. Prior to data collection, each  
59 survey team member practiced simulated exercises in front of study investigators to evaluate  
60

1  
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3 their interactions with participants. Those demonstrating proficiency were cleared to proceed  
4 with data collection activities.  
5

## 6 **Data Collection**

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9 Data collection occurred over an 8-week period, between January 3rd and March 3rd, 2017.  
10 Each target household designated a family representative who was approached for consent  
11 using a standard oral consent script. If granted, members of the survey team verbally  
12 administered the questionnaire to the representative who enumerated and provided  
13 information on all members of the household. Data collected included demographic and  
14 socio-economic indicators. The type of cooking fuel used by the household served as a  
15 marker of socio-economic status (SES) since liquid petroleum gas (LPG) as oppose to wood,  
16 correlates with a higher SES in the Cameroonian context.<sup>30-32</sup>  
17  
18

19 Vision impairment in this study was defined as total or partial blindness and low vision that  
20 cannot be corrected by visual aids. To identify persons with a VI, family representatives were  
21 asked if any member of their household was totally blind or had significant difficulty seeing.  
22 Households reporting a member with total blindness or significant vision loss (partial  
23 blindness or low vision not corrected by visual aids) were asked to provide additional  
24 information on the onset of vision loss, care-seeking practices, diagnosis and treatment,  
25 barriers to care, functional limitations, and economic hardships associated with the VI.  
26 Visually impaired household members, if present and not a minor, directly reported this  
27 information to the survey team. Lastly, family representatives were surveyed on the  
28 household's belief about the surgical treatability of certain types of blindness.  
29  
30

31 **(Supplementary Table A)**  
32

## 33 **Data Management and Analysis**

34  
35 Data was stored and manually entered into REDCap, an encrypted online database.<sup>33</sup>  
36 Statistical analyses were conducted using Stata 14 and adjusted as appropriate for the  
37 clustered sampling framework using the *svy* command.<sup>34</sup> Descriptive statistics, including  
38 frequencies, proportions, medians and means were generated. Groups were compared using  
39 the Adjusted Wald and Pearson Chi-Square tests as appropriate. Missing data were excluded  
40 from analyses, and statistical significance was set at a P value of 0.05. Factors associated with  
41 self-reported VI and the belief that certain types of blindness can be surgically corrected were  
42 identified through univariate and multivariable analyses. A multivariable logistic regression  
43 model was built using demographic variables, spoken language in the household and at health  
44 facilities, and socioeconomic indicators. These variables were selected based prior literature  
45 investigating VI risk factors in LMICs. Variables included in the final model were  
46 determined using a backward stepwise regression procedure. These covariates consisted of  
47 the following: age, urban household setting, use of LPG as a cooking fuel, and the highest  
48 education level achieved by a member of the household.  
49  
50  
51

## 52 **Ethical Considerations**

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54  
55 Approval for this study was granted by the Institutional Review Boards of the University of  
56 Douala and the University of California, San Francisco.  
57

## 58 **Patient and Public Involvement**

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3 Patients or the public were not involved in the design, or conduct, or reporting, or  
4 dissemination plans of our research. The development of the research question and outcome  
5 measures were informed by the need to fill in critical knowledge gaps and target difficult to  
6 access populations who fail to present to care. The study results are available to all  
7 participants upon request.  
8  
9

## 10 **Results**

### 11 **Characteristics of Households and the Study Population**

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13  
14 We approached 1551 households of which 1287 (83%) consented to participate in the study.  
15 Individual data on 8,046 participants were collected from consenting households. The median  
16 age of the study population was 20 years [IQR: 10, 34]; over half were female (52%, n=4181).  
17 Most households reported at least one member achieving a tertiary (39.7%, n=3133) or  
18 secondary (37.4%, n=2955) level education. The vast majority of households were located in  
19 a rural setting (70.7%, n=5620).  
20  
21  
22

### 23 **Prevalence of Vision Impairment and Associated Socio-Demographic Factors**

24  
25 Eighty-three participants reported conditions of total blindness (44.6%, n=37) or significant  
26 vision loss (55.4%, n=46). The overall prevalence of self-reported VI in the study population  
27 was 0.87% (95% CI: 0.62 -1.21). This prevalence increased to 2.61% (95% CI: 1.74 – 3.90)  
28 when restricting the study population to individuals aged  $\geq 40$  years. Participants with a self-  
29 reported VI were significantly older than participants with no VI ( $p < 0.01$ ). Moreover, they  
30 were less likely to use LPG ( $p < 0.01$ ) as a source of cooking fuel - a marker of higher SES.  
31 There were no significant differences between participants with a self-reported VI and the  
32 remaining study population based on sex and highest education level achieved by a  
33 household member. (**Table 1**)  
34  
35

36  
37 A multivariable logistic regression analysis identified older age as a significant predictor of a  
38 self-reported VI (aOR 1.06, 95% CI [1.04 -1.07]). The use of LPG as a cooking fuel in the  
39 household was associated with lower odds of reporting a VI (aOR 0.35, 95% CI [0.19 -0.64]).  
40 Furthermore, residing in an urban setting (aOR 1.16) and using LPG as a cooking fuel (aOR  
41 1.13) were factors associated with a household's belief that certain types of blindness were  
42 surgically reversible. (**Table 2**)  
43  
44

### 45 **Onset of Vision Loss, Functional Limitations, and Economic Hardships**

46  
47 Most participants developed their VI slowly over time (69.6%, n =55); a minority developed  
48 their condition suddenly (7.6% , n= 6). Others were born with their condition (8.9%, n=7) or  
49 developed it following an injury (8.9%, n=7). The mean vision loss duration among affected  
50 participants was 9.1 years (SD:  $\pm 8.6$ ).  
51  
52

53  
54 A majority of participants with a self-reported VI (91.6 %, n =76) cited at least one  
55 functional limitation due to their vision loss. Most commonly reported were: difficulty  
56 working (20.5%), trouble going to school (12.0%), trouble interacting with others, shopping,  
57 or traveling (10.8 %), and feeling ashamed or depressed (7.2%). Moreover, 52% (n = 43) of  
58 participants reporting a VI noted that their condition had an economic impact on their  
59 households. Primarily due to their families spending assets, savings, or having to borrow  
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1  
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3 money (48.8%), or their household earning less money as a result of a subject's vision loss  
4 (34.9%). (Table 3)  
5

### 6 **Care-Seeking Practices and Barriers to Surgery**

7  
8  
9 Approximately 81.9% (n=68) of participants with a self-reported VI sought formal care.  
10 Among participants who provided information about their care-seeking practices (n=49),  
11 16.3% (n=8) did not seek treatment for their condition. Others first sought care from  
12 alternative sources (n=6), including traditional medicine and home treatment from family or  
13 friends (Figure 1). Participants cited the high cost of medical care (52.9%, n=9), their  
14 perceptions that their VI was not serious (23.5%, n = 4), their personal preference (17.7%,  
15 n=4), and a lack of awareness that their VI could be treated (5.9%, n=1) as reasons for not  
16 first seeking formal care.  
17

18 Over two-thirds of participants who sought formal care received a diagnosis (67.6% ,n=46).  
19 Among participants who could recall their diagnosis, most reported a diagnosis of cataracts  
20 (43.2%, n=16), followed by glaucoma (6.2% (n=6), filariasis (5.4%, n=2) and the presence of  
21 a foreign body (5.4%, n=2). The vast majority of participants had not obtained surgical  
22 treatment after seeking formal care (95.4%, n=63), including 93.8% (n=15) of reported  
23 cataract cases. The primary reasons being: a lack of perceived need (43.4%, n= 36) and  
24 finances to afford surgery (14.5%, n=12). (Figure 2)  
25  
26

### 27 **Discussion**

28  
29 This study investigated the prevalence and care-seeking practices of persons reporting a VI in  
30 Southwest, Cameroon. It also described the functioning and economic impact of VI as a  
31 means of understanding barriers to surgical care utilization. The study found a 0.87%  
32 prevalence of self-reported VI in the region. Although this prevalence increased to 2.61%  
33 among high-risk individuals (aged 40 years or older), it was still considerably lower than  
34 prior estimates of VI in the region based on visual physical examinations (10.2% in Muyuka  
35 district, 4.4% in Limbe).<sup>16,17</sup> The discrepancy between prevalence estimates of reported  
36 versus exam-detected VI has important implications for policy improvements in Southwest  
37 Cameroon. It suggests that a substantial proportion of individuals harbouring progressive eye  
38 disorders may not be aware of their visual problems. It also highlights a critical role for  
39 routine screening to detect pre-clinical eye disease and preempt disability associated with  
40 more advanced VI.  
41  
42  
43

44  
45 Participants who reported a VI were more likely to belong to households of lower SES,  
46 corroborating prior evidence linking poverty to blindness.<sup>35,36</sup> Moreover, being of a higher  
47 SES and residing in an urban setting were predictive factors of a participants' belief that  
48 certain blindness were surgically reversible. These findings raise concerns about  
49 socioeconomic disparities in access to eye health education and services in the region.  
50 Indeed, economic analyses have demonstrated that the use of fee-for-service in Cameroon has  
51 created an inequitable health system, where access to care is largely dependent on income.  
52 Moreover, the distribution of health providers in Cameroon is largely concentrated in urban  
53 settings, which has resulted in disparities in health outcomes between socio-economic groups  
54 in rural and urban areas.<sup>37</sup> Although this study does not specifically investigate sources of  
55 health information, identifying where people receive health information, particularly rural  
56 populations, could help develop effective strategies for disseminating eye health education  
57 across Southwest, Cameroon.  
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3 Our findings also revealed low surgical care utilization among participants with a self-  
4 reported VI. Over 90% of reported cataract cases were not surgically treated, despite surgery  
5 being a highly effective intervention to recover vision loss from this condition.<sup>7</sup> Surgery is  
6 especially recommended when the patient's VI detrimentally affects their quality of life.  
7 Though most affected participants reported at least one limitation as a result of their VI, this  
8 deficit may not have had a major impact on their functioning. For instance, less than a quarter  
9 of affected participants revealed difficulty working or going to school. These results could  
10 imply that many participants with a self-reported VI may not be experiencing significant  
11 enough functional limitations compelling them to obtain surgical treatment. Indeed, 43% of  
12 participants reporting a VI did not perceive a need for surgery. This perception along with the  
13 high cost of care were the most significant barriers to obtaining surgical care; which suggests  
14 that competing priorities and limited disposable income may influence people's decisions to  
15 prioritize surgical treatment. This is particularly relevant if they do not perceive their VI to  
16 have a major impact on their day-to-day activities.  
17  
18  
19

20 The high cost of care placed a significant economic burden on households with a visually  
21 impaired member, as nearly half of these families reported having to spend assets or borrow  
22 money to treat the member's condition. The absence of universal health coverage and cost  
23 financing schemes prevent many in LMICs from accessing needed surgical treatment.<sup>38</sup> Cost  
24 restructuring mechanisms are thus critically needed to make eye care services more  
25 accessible to populations in Cameroon. The Cameroonian government should engage with  
26 the private sector and international donors to prioritize and scale up surgical capacity in the  
27 country, particularly in rural areas. Adapting the Aravind model of eye care to the  
28 Cameroonian setting could be a potential solution to meet the current demand for cataract  
29 surgery. This social enterprise model enables the provision of cataract surgeries to the poor at  
30 low or no cost by relying on cross subsidization schemes and a high volume of services. A  
31 new hospital in Cameroon (The Magrabi ICO Cameroon Eye Institute) was recently allocated  
32 a cataract bond to establish the Aravind model of care.<sup>39</sup> There is thus an opportunity for  
33 future studies to investigate whether this model of care is replicable and sustainable in the  
34 Sub-Saharan African context.  
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36  
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38

### 39 *Limitations*

40  
41 A number of limitations should be noted. Data was at times only collected from one  
42 designated representative in each sampled household who provided information on behalf of  
43 all other household members. This representative may not have always been aware of every  
44 aspect influencing a subject's care-seeking behaviour, as it would depend on the household  
45 dynamics and the relationship that particular respondent had with other members of the  
46 household. Thus, the prevalence of reported VI and its impact on functioning could have been  
47 underestimated. Future population-based surveys relying on self-reports should preferably  
48 collect data directly from individual participants to ensure greater accuracy and completeness  
49 of information about patterns of vision loss, beliefs, and practices. Findings for this study are  
50 specific to the Southwest region, and may not generalizable to other areas of Cameroon and  
51 Sub-Saharan Africa.  
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54

### 55 **Conclusion**

56  
57 The prevalence of self-reported VI in Southwest Cameroon is lower than exam-based  
58 estimates of visual deficits, underscoring the need for routine screening at the community-  
59 level to pre-empt disability. Although self-reported VI did not significantly impact  
60

functioning among affected individuals, it was associated with economic hardships on their households. Surgical treatment among participants reporting a VI was low, primarily due to the prohibitive cost of care and the perception that surgery was not necessary. Cost restructuring mechanisms and eye health education are critically needed to improve surgical care utilization in the region, particularly among populations in rural and low-income households. Health promotion approaches should specifically target patients at risk of opting out of care, ensuring they understand the benefits of surgery in reversing vision loss and reducing disability.

### Author Contributions:

SC and CJ conceived and designed the study. SM, SC, DD, TN, FE were responsible for the acquisition of the data, under the supervision and support of ACM, RD, and CJ. SC analyzed the data, and SM, SC and MC interpreted the data. SM and MC drafted the manuscript, with critical revisions from SC, DD, TN, FE, ACM, RD, and CJ. All authors have given their final approval and agree to be accountable for all aspects of the work.

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**Table 1: Socio-economic comparisons of study participants by reported vision impairment status (n=8046)**

Characteristics	VI <sup>a</sup> (n=83)	No VI (n=7,963)	p-value
Age (mean, [95% CI])	55 [47, 63]	23 [23, 24]	p < 0.001**
Sex			p= 0.275
Male	34 (41.0 %)	3,831 (48.1%)	
Female	49 (59.0%)	4,132 (51.9%)	
Household possesses a cell phone	77 (93.0%)	7438 (93.4%)	p= 0.518
Highest Education level achieved by a member of their household			p= 0.799
No formal school-based education	1 (1.3%)	156 (2.0%)	
Primary- level education	16 (20.3%)	1631 (20.5%)	
Secondary-level education	38 (48.1%)	2917 (36.6%)	
Tertiary-level education	24 (30.4%)	3109 (39.0%)	
Household setting			p= 0.570
Urban	25 (30.1%)	2308 (29.0%)	
Rural	58 (69.9%)	5562 (70.0%)	
Usage of Cooking Fuel in Household			
Wood	81 (97.6%)	7325 (92.0%)	p= 0.079
Charcoal	4 (4.8%)	1274 (16.0%)	p= 0.016**
Kerosene	7 (8.4%)	1279 (16.1%)	p=0.05
Liquid Petroleum Gas (LPG)	16 (19.3%)	3432 (43.1%)	p =0.004**
Household Owns Agricultural Land	54 (65.1%)	5111 (64.2%)	p= 0.866
Household owns/rents/lives for free in residence:			p= 0.318
Own	66 (79.52)	5001 (63.41)	
Rent	11 (13.25)	1999 (25.35)	
Live for free	6 (7.23)	887 (11.25)	

Note: VI= Visual Impairment; An asterisk (\*) represents a p-value of  $\leq 0.05$ ; Percentages based on non-missing values.

**Table 2: Factors associated with a belief in the surgical reversibility of certain types of blindness**

Variable	Unadjusted OR	[95% CI]	Adjusted OR <sup>1</sup>	[95% CI]
Age	1.00	0.998 -1.003	1.00	0.998 -1.00
Urban household setting	1.17	1.048 – 1.298	1.16*	1.037 – 1.303
Use of LPG as cooking fuel	1.18	1.068 -1.297	1.13*	1.022 – 1.259
Highest education level achieved by any household member	1.00	.993-1.016	1.00	0.991 – 1.014

Note: OR = odds ratio ; CI = confidence interval; An asterisk represents a significant odds ratio  
<sup>1</sup> Odds ratios were adjusted for: age, urban residence, use of LPG as a cooking fuel, and highest education level achieved by a member of the household.

**Table 3: Functional limitations and economic hardships associated with a reported VI**

<b>Functional limitations (n=83)</b>	<b>N (%)</b>
Difficulty working/ working in the home	17 (20.5 %)
Trouble going to school	10 (12.0 %)
Trouble interacting with others, shopping, traveling	9 (10.8 %)
Feeling ashamed or depressed	6 (7.2 %)
Needing assistance dressing, eating, or toileting	4 (4.8%)
Difficulty standing or walking or sitting	4 (4.8%)
Difficulty picking things up or using arms or hands	1 (1.20 %)
<b>Household economic hardships (n=43)</b>	<b>N (%)</b>
Family has spent assets/savings or borrowed money	21 (48.8%)
Family earns less money	15 (34.9%)
Family members psychologically affected	9 (20.9%)
Person with visual impairment requires caretaker from the household	8 (18.6 %)
Harder to afford necessities like food and rent	3 (7.0%)

Note: VI= Visual Impairment

**Caption: Figure 1: Care-seeking practices among study subjects with a perceived vision impairment**

**Legend:** Note: Percents based on non-missing values

**Caption: Figure 2: Barriers to obtaining surgery among subjects with a perceived vision impairment**



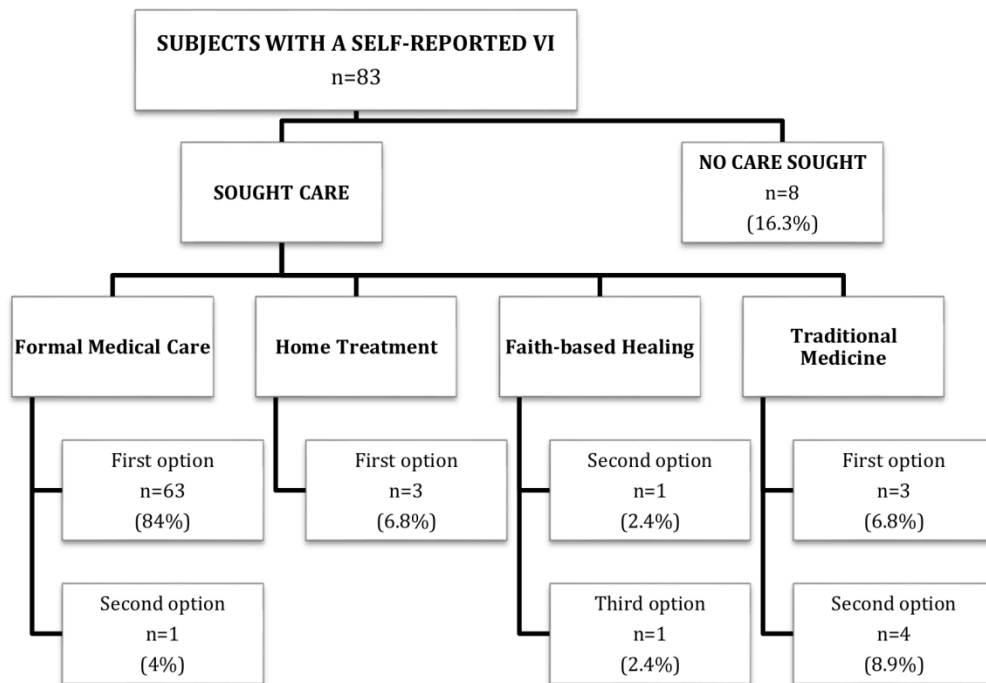


Figure 1: Care-seeking practices among participants with a self-reported vision impairment

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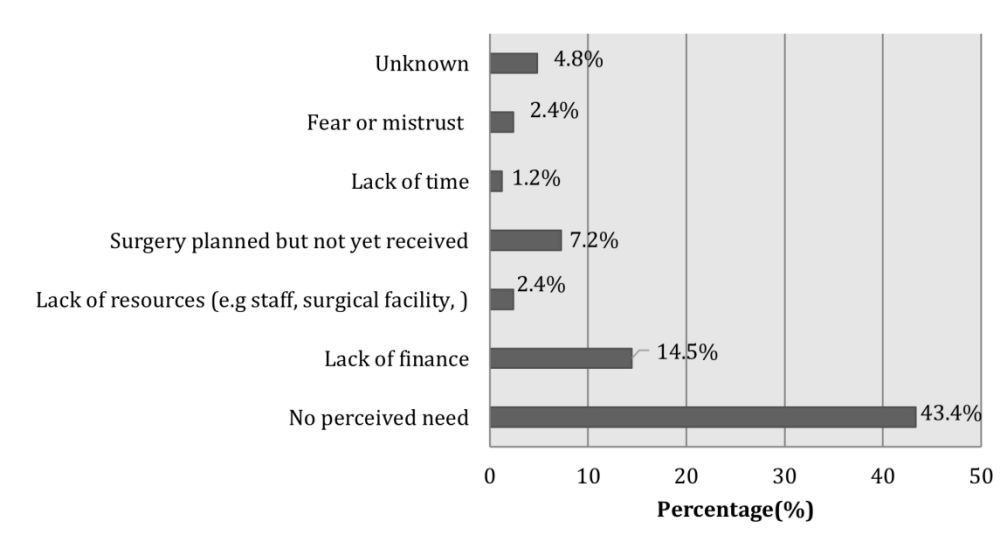


Figure 2: Barriers to obtaining surgery among participants with a self-reported vision impairment (n=83)

154x84mm (300 x 300 DPI)

**Supplementary Table A: Survey questions ascertaining vision impairment and other factors**

<b>Vision impairment</b>	Is there anyone in this house who is totally blind or has significant difficulty seeing? (Y/N)
<b>Onset and duration of vision loss</b>	<p><b>IF YES,</b></p> <p>When did the vision problem start? _____(days/weeks/years)</p> <p>How did the vision problem start? _____</p>
<b>Care seeking practices</b>	<p>Has the [affected] family member sought any care for their eye problem? (Y/N)</p> <p><b>IF YES,</b></p> <ul style="list-style-type: none"> <li>• Where did they first seek care for this eye problem ? _____</li> <li>• Where did they next seek care for this eye problem? (ask as needed) _____</li> </ul> <p><b>If formal medical care was NOT sought FIRST [as a source of care]</b></p> <p>What was the main reason why the [affected] family member did not go to the hospital first ? _____</p>
<b>Treatment and Barriers to care</b>	<p>Has the [affected] family member received any treatment for their eye problem? (Y/N)</p> <p><b>IF YES,</b></p> <ul style="list-style-type: none"> <li>• Did the doctor tell him/her what was wrong with their eye ? (Y/N)</li> <li>• IF YES, What did the doctor say was wrong with their eye? _____</li> <li>• What treatment did the family member receive at the hospital ? _____</li> </ul> <p>Did the [affected] family member receive any eye operation? (Y/N)</p> <p><b>IF NO,</b> Why was their eye not operated ?( Select all that apply)</p> <ul style="list-style-type: none"> <li>• No Need</li> <li>• No Money</li> <li>• No transportation</li> <li>• No time</li> <li>• Facility, Personnel or Equipment not available</li> <li>• Person prefers traditional treatment or payer</li> <li>• Surgery planned but not yet received</li> <li>• Person avoided due to fear, mistrust, previous experience</li> </ul>
<b>Functional limitations and Economic hardships</b>	<p>Has this eye problem affected your family member's daily life? (Y/N)</p> <p><b>IF YES,</b> How has it affected their daily life ? (select all apply)</p> <ul style="list-style-type: none"> <li>• They have difficulty speaking or communicating</li> <li>• The person needs help dressing, eating or toileting</li> <li>• They have trouble interacting with others, shopping, traveling</li> <li>• They have trouble going to school</li> <li>• They have trouble working/ working in the home</li> <li>• They have difficulty standing or walking</li> <li>• They have difficulty picking things up or using their arms/hands</li> <li>• They have weakness, shortness of breath, or fatigue</li> <li>• They have trouble understanding or remembering things</li> <li>• They feel ashamed or depressed</li> <li>• Unknown/Unsure</li> <li>• Is there any other way this problem has affected their life ? (specify) _____</li> </ul> <p>How has this problem affected your family? (select all that apply)</p> <ul style="list-style-type: none"> <li>• Nothing has changed</li> <li>• The family earns less money</li> <li>• The family has spent assets/savings or borrowed money</li> <li>• It is harder to afford necessities like food and rent</li> <li>• Another person must help care for the person with the problem</li> <li>• Unknown/Unsure</li> <li>• Is there any other way this problem has affected your family ? (specify) _____</li> </ul>
<b>Belief that certain types of blindness are surgically reversible</b>	Do you believe certain types of blindness can be treated with an operation ? (Y/N)