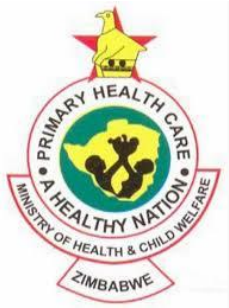
Rapid Assessment of Avoidable Blindness: Matabeleland South, Zimbabwe 2019

Study details

Photograph of a survey field work team completing an examination as part of the pilot cluster exercise, October 2019. Ian McCormick.

Project duration	October 2019 – November 2019
Institutional partners	Zimbabwe Council for the Blind Zimbabwe Ministry of Health and Child Care Christian Blind Mission (CBM) Zimbabwe & CBM International
Investigators	Principal: Dr Gilbert Moyo Co-principal: Dr Boniface Macheka
Coordinators	Ms Nancy Makande, Ms Busisiwe Mzyece, Mr Jacob Marangwanda, Mr Prosper Mararike
RAAB trainers	Mr Ian McCormick, Dr Islay Mactaggart, Mr Deon Minnies

Acknowledgements:
This project was funded by CBM International.



Council For The Blind
Zimbabwe

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Acronyms & Definitions

BCVA	Best corrected visual acuity
Blind	Visual Acuity <3/60 with available correction
CI	Confidence interval, usually with 95% probability
CSC	Cataract surgical coverage
CSR	Cataract surgical rate
DR	Diabetic retinopathy
eCSC	Effective cataract surgical coverage (corrected for 'good' visual outcome)
IAPB	International Agency for the Prevention of Blindness
ICEH	International Centre for Eye Health
IOL	Intra-ocular lens
LSHTM	London School of Hygiene & Tropical Medicine
MOHCC	Ministry of Health and Child Care
MRCZ	Medical Research Council of Zimbabwe
MVI	Moderate visual impairment – presenting VA <6/18 – 6/60
PCO	Posterior capsular opacification
PVA	Presenting visual acuity (with correction, if available)
RAAB	Rapid Assessment of Avoidable Blindness
SVI	Severe visual impairment – presenting VA <6/60 – 3/60
URE	Uncorrected refractive error
VA	Visual acuity
WHO	World Health Organization
ZIMSTAT	Zimbabwe National Statistics Office

1. Executive Summary

1.1 Background

A Rapid Assessment of Avoidable Blindness (RAAB) survey was conducted in Matabeleland South Province, Zimbabwe during October and November 2019. No previous population-based survey of vision impairment had be undertaken in the Province. This project was organised by the Zimbabwe Council for the Blind in collaboration with the Ministry of Health and Child Care, and funded by CBM International. Technical support was provided by RAAB trainers from the London School of Hygiene & Tropical Medicine and the University of Cape Town.

1.2 Study Aim and Objectives

The aim of this project was to conduct a RAAB7 survey amongst people aged 50 and older in order to estimate the magnitude and causes of blindness and vision impairment, to provide information for the planning of efficient eye care services. The objectives of the study were:

1. To report the prevalence of blindness and vision impairment in people aged 50+
2. To report the main causes of blindness and vision impairment in people aged 50+
3. To report the coverage and quality of cataract surgical services in people aged 50+
4. To report barriers to cataract surgical services in people aged 50+

1.3 Methods

Ethical approval for the study was obtained from the Medical Research Council of Zimbabwe. According to the national census of 2012, the population of Matabeleland South aged 50 years or older was 91,642. The expected prevalence of blindness in this age group was 3.6%. To achieve a precision of 20% of the estimate, with 95% confidence, allowing for a design effect of 1.5 and a non-response rate of 10%, the required sample size was 4400, or 88 clusters of 50 people aged 50 years and older. The standard RAAB two-stage sampling and examination procedures were used, while data was collected and reviewed using RAAB7's mobile data collection tool and web-based administration console.

1.4 Key Findings

Of the 4,375 people aged 50 years and older who were eligible and enrolled for the study, 4065 were examined (response rate 92.9%).

The age and sex adjusted prevalence of blindness amongst the population aged 50 years and older was 4.3% (95% CI 3.5 - 5.0%). Cataract was the main cause of blindness, accountable for 63.5% of cases. Glaucoma was responsible for 23.0% of blindness.

The prevalence was similar to the 2019 adjusted findings from a RAAB in neighbouring Masvingo Province (3.9% (95% CI 3.2 - 4.5%)), where cataract and glaucoma were also the main cause of blindness (65.2% and 16.3% respectively).

Cataract surgical coverage (the proportion of people with cataract who have had surgery) for people with blinding cataract was 50.8%. The coverage of cataract surgery resulting in a good visual outcome (6/18 or better) for the same level of vision impairment was 34.3%. In the survey sample, the majority of surgery was carried out at the government hospital; 57.6% of eyes operated for cataract achieved a good outcome with available correction, while 25.5% had a poor visual outcome (less than 6/60). The main barriers to surgery amongst people with severe vision impairment and cataract were a lack of awareness that treatment was possible (31.8%), that treatment was too expensive (27.2%) or that they could not access treatment (23.2%). Cataract surgical coverage and quality

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findings in the Province were similar to those reported in the Masvingo Province RAAB.

Only 5% of participants reported owning near vision correction.

1.5 Recommendations

The quantity and quality of cataract surgery (effective cataract surgical coverage) should be improved to reduce avoidable blindness in the province. The low level of near vision correction ownership is likely to lead to a high burden of near vision impairment, which could be addressed with a strategy to distribute simple near vision spectacles. The ophthalmic nurse workforce could be trained to improve early identification of cataract cases and glaucoma suspects.

2. Introduction

2.1 Background

2.1.1 What is RAAB?

RAAB is a standardised survey methodology that is widely used in the global eye care sector.[1] It provides representative, population-based estimates of the prevalence and causes of blindness and vision impairment and collects data on existing eye care service indicators for the purpose of planning of and advocacy for eye care services. It focuses on vision impairment in the population 50 years and older as the higher prevalence in this age group allows for a smaller sample size than if the all-age population were surveyed. A smaller sample size, along with a simplified exam protocol, means the survey can be completed relatively quickly, and consequently with less expense, compared to a conventional survey. RAAB is a complete system and includes provision for standardised data collector training, data collection and analysis. RAAB is a is an 'end-to-end' methodology, supported by bespoke software, which provides standardised sample size calculation, cluster selection and automated analysis and report generation. The most recent version of the methodology – RAAB7 – is presently under development at the International Centre for Eye Health, in collaboration with Peek Vision. RAAB7 integrates mobile data collection with a cloud-based server via automatic data upload, and allows administrators to set up and review survey progress via a web-based platform. All RAAB7 data is uploaded via data SIM card or Wi-Fi from encrypted, password-protected mobile devices to the cloud-based Peek Vision encrypted Amazon Web Server.

2.1.2 Matabeleland South, Zimbabwe

The Republic of Zimbabwe is a landlocked country in southern Africa, bordered by Mozambique to the east, South Africa to the south, Botswana and Zambia to the west and north. Zimbabwe is divided into eight administrative provinces and two cities with provincial status. These provinces are further divided into 62 districts. According to the 2017 Inter-Censal Demographic Survey, an estimated 13.6 million people live in the country, with 40% below the age of 15 years and 68% living in rural areas.

Matabeleland South is a largely rural province in the south-west of the country. According to the 2012 census, the all-age population was 683,893, with 91,642 people aged 50 years or older (13.4%). According to the 2017 Inter-Censal Demographic Survey, the all-age population of Matabeleland South had increased to 810,074; nationally, in 2017, 11.8% of the population was aged 50+ (not reported by province).

The province is serviced by an ophthalmologist stationed at Richard Morris Eye Hospital in Bulawayo. There are four static outreach sites where regular cataract surgeries are performed. Each district has resident ophthalmic nurses.

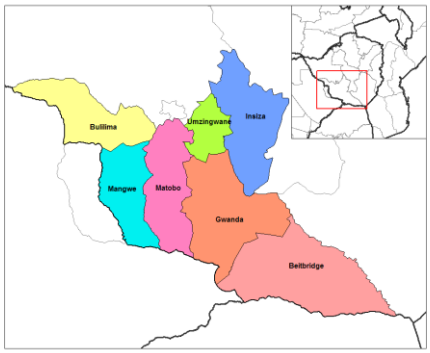

Figure 1 Districts of Matabeleland South Province, Zimbabwe (via www.wikipedia.com)

2.1.3 Stakeholders

This project was organised by the Zimbabwe Council for the Blind in collaboration with the Ministry of Health and Child Care, and funded by CBM International. Technical support was provided by RAAB trainers from the London

School of Hygiene & Tropical Medicine and the University of Cape Town.

2.2 Rationale

In 2015, it was estimated that globally, 36 million people were blind and 217 million people were moderately or severely vision impaired. In total, 253 million people were living with vision impairment.[2] The World Health Organisation (WHO) recognises that the majority are aged 50 years and older.[3]

The prevalence of blindness and visual impairment in sub-Saharan Africa has been shown to have decreased between 1990 and 2010,[4] however, in 2015, amongst global regions, the age-standardised prevalence of blindness was still highest in areas of sub-Saharan Africa.[2] In addition, whilst prevalence is decreasing, global population growth and ageing are contributing to higher numbers of people experiencing vision impairment and blindness.[2]

According to the International Agency for the Prevention of Blindness's (IAPB) Vision Atlas, the major global causes of blindness amongst all ages in 2015 were: cataract (35%), uncorrected refractive error (21%) and glaucoma (8%). The major causes of moderate to severe vision impairment amongst all ages in 2015 were: uncorrected refractive errors (53%), cataract (25%) and age-related macular degeneration (4%).[5]

A literature search of blindness and/or vision impairment in Zimbabwe found no academic publications on the subject, however, it is known that two RAAB surveys have been undertaken in recent years.

The first RAAB conducted in Zimbabwe, in Manicaland Province, in 2016, found the prevalence of blindness in people aged 50 years and older was 3.1%. Cataract was the main cause of blindness (67.2%), with cataract surgical coverage (CSC) only 50% at the level of blindness (<3/60). These findings were successfully used to promote the need for an increased volume of cataract surgery.

A RAAB conducted in Masvingo Province in February-March 2019 found that the prevalence of blindness in people 50 years and older was 3.9% (95% confidence interval 3.2-4.5%). The main causes of blindness were cataract (65.2%), glaucoma (16.3%) and non-trachomatous corneal opacity (10.4%). Almost all cases of blindness were avoidable (94.8%). The CSC was found to be 52.7% at the level of blindness (<3/60).

2.3 Aim and Objectives

The aim of this project was to conduct a RAAB7 survey amongst people aged 50 and older in Matabeleland South in order to estimate the magnitude and causes of blindness and vision impairment and to provide information for the planning of efficient eye care services. The objectives of the study were:

1. To report the prevalence of blindness and vision impairment in people aged 50+
2. To report the main causes of blindness and vision impairment in people aged 50+
3. To report the coverage and quality of cataract surgical services in people aged 50+
4. To report barriers to cataract surgical services in people aged 50+

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3. Methods

3.1 Study design

This was a population-based, cross-sectional study, following the standardised RAAB survey methodology.[1]

3.2 Ethical approval

Ethical approval for the study was obtained from the Medical Research Council of Zimbabwe prior to the study commencing.

3.3 Sample size and sampling strategy

The sample size was calculated based on an expected prevalence of blindness in the population 50 years and older derived from the most recent RAAB survey in Zimbabwe - (3.6% in Masvingo Province, 2019). According to the national census of 2012, the population of Matabeleland South aged 50 years and older was 91,642. To achieve a precision of 20% of the estimate, with 95% confidence, allowing for a design effect of 1.5 and a non-response rate of 10%, the required sample size was 4400, or 88 clusters of 50 people aged 50 years and older.

A two-stage cluster random sampling methodology was used. In the first stage, 88 clusters were selected with probability proportionate to their population size by the Zimbabwe National Statistics Office (ZIMSTAT), from a sampling frame consisting of their 2012 census Matabeleland South enumeration areas. For the second stage, 50 people aged 50 years and older were enrolled per cluster via compact segment sampling. In clusters with less than 50 eligible participants, the next closest population unit was visited until the required number was achieved. Enumeration area maps were provided by ZIMSTAT for each of the selected clusters.

3.4 Inclusion and exclusion criteria

All persons aged 50 years and older, residing in a household in a selected cluster and segment for six months or more of the year, were eligible to participate in the survey. Visitors were excluded. Residential institutions were also excluded from the survey.

3.5 Training, validity & reliability

A training week facilitated by three RAAB trainers took place at the Holiday Inn hotel, Bulawayo from 14th to 18th October 2019. The four data collection teams, made up of ophthalmic nurses from Matabeleland South and Bulawayo were in attendance. Each team consisted of three nurses - one acting as cluster informer and two as examiners. Training covered sampling and survey protocol, including informed consent, examination protocol and standardised definitions and how to enter, save and upload data via the mobile data collection tool. An interobserver variation (IOV) exercise was conducted as part of the training week and any areas with less than good agreement were highlighted and discussed as a learning exercise. The survey principal investigator and co-investigator visited the teams in the field to identify any areas of concern and provide support as required.

3.6 Data collection

Data collection was carried out over 27 days from 18th October to 23rd November 2019. Two teams, working in tandem, typically completed two clusters per day.

Survey data was collected on the mRAAB7 mobile data collection application on Nokia 6.1 mobile phones and automatically uploaded with available internet connectivity.

The survey was conducted door-to-door and examinations took place at participants' homes.

Written, informed consent was taken for every participant before they were enrolled in the survey. Participant information including age, sex and use of spectacles was recorded.

Examination included measurement of presenting visual acuity (PVA; with distance spectacle correction if worn) and pinhole visual acuity in eyes with PVA less than 6/12. WHO definitions of vision impairment were used throughout (Table 1).

Table 1 Definitions of WHO vision impairment categories

WHO level of vision impairment (VI)	Presenting visual acuity range
Blind	Less than 3/60
Severe VI	Less than 6/60 but can see 3/60
Moderate VI	Less than 6/18 but can see 6/60
Early VI	Less than 6/12 but can see 6/18

Vision testing was conducted outdoors using 6/60, 6/18 and 6/12 tumbling E optotypes at 6 metres, 3 metres and 1 metre as required.

All participants underwent a lens examination with pen torch and distant direct ophthalmoscope and eyes with PVA less than 6/12 not due to obvious cataract, corneal opacity or refractive error, were dilated to determine a cause of vision impairment.

Participants with a history of cataract surgery were asked about the details of their operation(s) and those with cataract vision impairment were asked about barriers to surgery.

Eligible persons unavailable at the time of a cluster visit were added to a 'mop-up' list and revisited at least once before a cluster was complete. Clusters with low response rates were revisited on a separate occasion to examine those who were eligible but still unavailable after the first re-visit.

3.7 Analysis and interpretation

Following completion of field work, data uploaded to the Peek platform was cleaned in preparation for analysis. RAAB's automated analysis was run on the dataset to generate a suite of standardised survey reports.

Cataract surgical coverage (CSC) was defined as the number of people in the population with operated cataract as a proportion of those having operable plus operated cataract. Operable cataract was defined at three levels: blindness, severe VI and moderate VI. Effective cataract surgical coverage (eCSC) included only those people with operated cataract and a good visual outcome (PVA ≥6/18) in the denominator.

Uncorrected refractive error was defined as the cause of vision impairment in a person where better eye PVA >6/12 improved to 6/12 with pinhole VA. Refractive error prevalence in the sample was estimated based on the sum of people diagnosed as having uncorrected refractive error as the main cause of vision impairment and people who reported wearing distance spectacles. Refractive error coverage in the sample was calculated as the corrected refractive error divided by the total refractive error. Presbyopic correction coverage was calculated by dividing the number of people with near vision correction by the total sample.

The proportion of the population aged 50 years and older disaggregated by 5-year age group and sex - according to 2019 population projections from ZIMSTAT - was used to calculate age-sex adjusted prevalence estimates.

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4. Key Findings

4.1 Survey response rate

Of the 4,375 people aged 50 years and older who were eligible and enrolled for the study, 4065 were examined (response rate 92.9%). Those not examined included 221 persons unavailable (5.1%), 82 who refused to participate (1.9%) and 7 who were unable to communicate (0.2%). Males accounted for 38.0% of the sample. According to ZIMSTAT's 2019 population projection, the proportion of males in the population 50 years and older in Matabeleland South was 39.6%.

4.2 Prevalence of blindness and vision impairment

The age and sex adjusted prevalence of blindness amongst the population aged 50 years and older was 4.3% (95% CI 3.5 - 5.0%). The prevalence of severe VI, moderate VI and early VI were 1.6% (95% CI 1.2 - 2.0%), 7.8% (95% CI 6.7 - 8.8%) and 8.4% (95% CI 7.5 - 9.3%) respectively (Table 1).

Table 2 Age and sex adjusted prevalence of vision impairment by WHO impairment category

WHO level of vision impairment	Age and sex adjusted prevalence % (95% CI)
Blind	4.3 (3.5 - 5.0)
Severe VI	1.6 (1.2 - 2.0)
Moderate VI	7.8 (6.7 - 8.8)
Early VI	8.4 (7.5 - 9.3)

The age and sex adjusted prevalence of blindness in males and females was similar, 4.1% (95% CI (2.9 - 5.4%) and 4.3% (95% CI 3.5 - 5.2%) respectively.

Extrapolating the adjusted findings to the 2019 population estimates for Matabeleland South, there are an estimated 14,396 people aged 50 years or older with moderate VI or worse, of whom 4,484 are blind.

4.3 Causes of blindness and vision impairment

Untreated cataract was the main cause of blindness (PVA <3/60), accountable for 63.5% of cases in the sample (n=94/148). Glaucoma was responsible for 23.0% of blindness. Untreated cataract was also the main cause of severe and moderate VI cases (59.6% and 62.9% respectively). Uncorrected refractive error was the main cause of early VI, responsible for 63.4% of cases.

Almost all causes of vision impairment were avoidable (95.7%), with 87.1% treatable (untreated cataract or uncorrected refractive error). Avoidable vision loss (glaucoma, diabetic retinopathy and surgical complications) accounted for 7.7% of causes.

4.4 Cataract surgical coverage

CSC for people with operable cataract was 50.8% at the level of blindness (cataract causing corrected VA <3/60). This decreased to 43.3% at the level of severe VI (<6/60) and 28.4% at the level of moderate VI (<6/18). Effective CSC, was lower for all levels of operable cataract: 34.3% at the level of blindness, 29.2% at severe VI and 19.5% at moderate VI (Table 3).

Table 3 Comparison of cataract surgical coverage and effective cataract surgical coverage in persons at three levels of vision-impairing cataract

Cataract vision impairment	CSC (%)	eCSC (%)
Blind	50.8	34.3
Severe VI	43.3	29.2
Moderate VI	28.4	19.5

4.5 Place of surgery

The majority of eyes were operated on at the government hospital (71.2%) with 22.3% of

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surgeries carried out at eye camps and 4.9% done in a private setting.

4.6 Cataract surgical outcomes

With available spectacle correction, the percentage of operated eyes (n=184) with a good visual outcome was 57.6%, while 16.8% had a borderline outcome (less than 6/18 but can see 6/60) and 25.5% had a poor visual outcome (less than 6/60). Poor or borderline outcomes were due to 'sequelae', or long-term complications, such as posterior capsular opacification or retinal detachment, in 66.0% and 71.0% of cases respectively.

4.7 Barriers to cataract surgery

The main barriers to surgery amongst people with severe VI and cataract (n=151) were a lack of awareness that treatment was possible (31.8%), that treatment was too expensive (27.2%) or that they could not access treatment (23.2%).

4.8 Refractive error and near vision correction

The prevalence of refractive error in the sample was 9.9%. Refractive error coverage (the proportion with spectacles) amongst this group was 28.4%. Only 5.4% of the sample had near vision correction.

4.9 Limitations

The RAAB survey methodology is intended to generate reliable estimates of blindness in the population 50 years and older. It is not a survey of eye conditions, and is not powered to detect differences in sub-groups. The examination protocol focuses on detecting the most important causes of avoidable blindness using basic examination equipment and as such does not provide data on non-vision impairing conditions. The contribution of posterior segment causes to vision impairment may be underestimated where cataract and uncorrected refractive error are prioritised as the cause of vision loss in a person. This survey used ophthalmic nurses in place of ophthalmologists to carry out eye examinations; less familiarity with posterior segment eye conditions means that the causes assigned to vision impairment should be interpreted with a degree of caution. The cause of borderline or poor visual outcomes following cataract surgery should also be interpreted with caution for the same reason. The calculation of refractive error and presbyopia rely on assumptions that mean these estimates should also be interpreted with caution.

5. Discussion and Recommendations

5.1 Discussion

The prevalence of blindness in Matabeleland South was similar to the 2019 adjusted findings from neighbouring Masvingo Province (3.9% (95% CI 3.2 - 4.5%)) and the 2016 adjusted estimate from a RAAB survey in Manicaland (3.1%).

The causes of blindness were also very similar, with around two-thirds of blindness due to untreated cataract in all three recent RAAB surveys.

The WHO target for the proportion of eyes with a good post-cataract surgery visual outcome is 80%. Poor outcomes should occur in less than 5% of eyes.[6] In Matabeleland South, 25.5% of operated eyes had a poor visual outcome. To reduce this, providers should look to make improvements in all areas, such as improving the selection of cases, the accuracy of biometry, reducing operative complications, access to post-operative refraction and follow-up to manage long-term complications such as posterior capsular opacification.

Alongside the previous RAAB surveys, these findings suggest that the main challenge to reducing vision impairment in Zimbabwe is increasing effective cataract surgical coverage. This priority is likely to be relatively uniform across the country and would benefit from national-level oversight and shared planning and learning between provinces.

Only 5% of participants reported owning near vision correction. In the population 50 years and older, this low coverage of presbyopic correction will lead to a high burden of near vision impairment with associated implications for reduced productivity.

Feedback from the teams of ophthalmic nurses who undertook the survey fieldwork highlighted that they felt they would benefit from regular access to ophthalmoscopes and slit-lamps in clinical practice. A structured training programme to accompany any such investment in equipment could be of benefit in improving case finding and referral for cataract and glaucoma.

5.2 Recommendations

The following actions may be considered, with a full appreciation of the cost implications and inclusion of all key eye health stakeholders at provincial and national level.

A. Improve effective cataract surgical coverage

This requires consideration of two aspects of universal health coverage - access and quality.

A detailed analysis of existing cataract surgical provision should be undertaken using data from all relevant stakeholders. This should place the provincial resources and output in the context of the national-level cataract control programme.

Eye care outreach services could be reinstated in the province. The lack of community awareness of treatment for cataract suggests a strategy to advertise outreach and cataract surgery should be undertaken. Informing the population 50 years and older via, e.g., primary health care, could be helpful in raising awareness of vision loss. Outreach must be supported by a referral pathway that supports people facing difficulties in reaching services. The cost of treatment was a notable barrier to surgery - this may include the cost of transport as well as hospital costs.

The quality of cataract surgery must improve to ensure good visual outcomes for those accessing surgery. Routine monitoring and reporting of surgical outcomes should be in place. A facility-level review of surgical

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equipment, training and supervision would be of value to identify any gaps. Long-term complications of surgery was noted as the main cause of poor outcomes. Some of these issues may be identified and managed where community outreach is re-instated.

B. Increase access to near vision correction

Near vision spectacle correction is a relatively cheap and simple way to reduce the burden of vision impairment in the population. For example, outreach services could distribute simple near vision correction at the same time as screening for operable cataract.

C. Upskill ophthalmic nurses

The capacity of the human resources for eye care available in the province should be maximised with structured training. Early detection of glaucoma cases will provide an opportunity to reduce the burden of vision impairment associated with the disease.

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