RAPID ASSESSMENT OF AVOIDABLE BLINDNESS

INHAMBANE PROVINCE, MOZAMBIQUE, 2016

SUMMARY OF RESULTS

21 November 2016

LIST OF ACRONYMS

BCVA	Best Corrected Visual Acuity
ODM	Olhos do Mundo
CEHI	Community Eye Health Institute, University of Cape Town
CSR	Cataract Surgical Rate
CSC	Cataract Surgical Coverage
EA	Enumeration Areas
FLV	Functional Low Vision
IOL	Intraocular Lens
MISAU	Ministério da Saúde
CNB	Comité Nacional de Bioética
MVI	Moderate Visual Impairment
PVA	Presenting Visual Acuity
RAAB	Rapid Assessment of Avoidable Blindness
SVI	Severe Visual Impairment
URE	Uncorrected Refractive Errors
VA	Visual Acuity
WHO	World Health Organisation

1. BACKGROUND

A rapid assessment of avoidable blindness (RAAB) was conducted in Inhambane Province, one of 11 provinces of Mozambique, situated in the southern region of the country from October to November 2016. This population based survey was organised by the Ministry of Health, in partnership with Olhos do Mundo (ODM), a public benefit organisation working in eye care in Mozambique, and with facilitation by the Community Eye Health Institute, University of Cape Town.

The data collection was preceded by a 5-day training programme, which all survey teams completed. The training covered all aspects of the field work, including enrolment and examination of participants, recording of data into a smart phone application and preparing clusters for the examination teams. The latter activity involved drawing maps and connecting with local guides.

The research was funded through ODM. The aim was to determine the prevalence of blindness and visual impairment in Inhambane Province. In this report, all data refer to the population of people aged 50 years or older, unless another age group is specified.

No national survey on blindness and visual impairment has been conducted in Mozambique before. There had been two provincial blindness survey previously, one in Nampula (in 2007) and another in Sofala Province (2012). Looking at the prevalence of blindness in these two provinces, 7.1 and 3.2% respectively, the prevalence of blindness in Inhambane Province in people aged 50 years or older was estimated to be between 4.0 and 6.0%, as these provinces had similar health care infrastructure, population composition and socio-economic conditions. Ophthalmic services in Sofala Province are more developed than those of Inhambane

2. METHODOLOGY

a. Sampling

The last national census, conducted in 2007 reported a total population for Mozambique of 20.2 million and 1.25 million for Inhambane Province. The projected total population in 2016 of Inhambane Province is 1523635, the population aged 50 years or older is 181613, a proportion of 11.9% of the total population. There are 67620 males and 113993 females (M:F ratio = 0.59).

With the resources and time available a sample size of 3000-4000 was considered feasible. This sample size would, with an expected prevalence of 5.0% and non-compliance of 10%, be powerful enough for a variation of 20% around the estimate with 95% confidence. The sampling frame is based on the 2007 national census, consisting of 145 enumeration areas (EAs) called *bairros*. The population in the *bairros* varied from 594 to 50651, with an average population of 8771.

Using the cluster selection module in the RAAB software, a total sample size of 3011 was calculated for Inhambane Province, made up of 61 clusters of 50 each, with design effect of 1.5), with a probability proportional to the size of the population. A list of selected clusters is included as Appendix 1.

b. Data collection

Four teams, comprised of ophthalmic technicians, optometrists and information officers were used in the field. One of the teams, led by an ophthalmologist, was used as the gold standard (see *CEHI RAAB Training report*) for the intra-observer variation test. Because of the distances involved, the data collection teams were allocated clusters according to the origin of the team members.

Using high level maps downloaded from the internet, the cluster informers created detailed maps with the help of village chiefs and local guides.

With 11.9% of the population aged 50 years or older, about 50/11.9=420 people or 500 people (rounded for ease of calculation) would be required to provide a cluster of 50 people of 50 years or older. Each EA with a larger population was divided into segments of around 500 persons. The segment to be examined was then selected randomly. It was also decided that a second segment would be selected randomly at the same time in the event that the first segment does not yield the required 50 participants.

There was one cluster deemed by the survey teams to be unsafe due to recent civil unrest. The RAAB facilitator selected an alternative cluster within the same district with similar population characteristics.

The four survey teams commenced with data collection on 14 October, using the mRAAB application on mobile smartphones. The data was sent to the survey coordinator via email, who in turn sent it to the RAAB trainer for verification and upload. The facilitator provided regular updates of progress to the coordinator and principal investigators, including reports of errors and guidance for correction. Halfway through the data collection, the co-principal investigator made a monitoring visit to the field teams to identify challenges and provide support where needed.

The first round of data collection was characterised by incorrect assignment of cluster numbers due to confusion with the setting up of new surveys. Fortunately this was picked up on the first day, and teams were alerted to the correct use of cluster numbers. One team seemed to have set up a RAAB6 survey, which uses a 6/12 definition of visual impairment, as opposed to the 6/18 used in RAAB5 format. This was also corrected, albeit after some difficulty. Age errors were most common: a total of 12 were identified, mostly related to age of previous operations. These errors were difficult to correct as survey teams struggled to recall historical information of participants two or more days after enrolment / exaamination. The mRAAB app should be more sturdy in ensuring that these errors cannot be committed. The above errors as well as two diagnostic type errors were corrected in consultation with the examination teams.

Upon perusal of the uploaded data, the RAAB facilitator noticed two patterns: a) a reasonably random dispersion of normal and abnormal records in the database, and b) consistency around reporting barriers to cataract surgery amongst the survey teams. One team consistently cited one barrier while the other three teams consistently cited another barrier. Our concerns about the validity of these findings are hereby registered. To make this part of the survey more reliable, a better way of collecting this information should be considered.

The data collection concluded on 3 November 2016, less than 3 weeks after the data collection commenced. The whole training and data collection aspects of the RAAB were completed in less than a month! The survey coordinator made arrangements to collect the paper consent forms (as required by the National Bioethics Committee and investigate any ethical issues that may have arisen during the data collection. All relevant research materials and equipment were also collected as well as transport logs, detailed maps, etc. These are kept in storage at the ODM office.

3. RESULTS

The smartphone method of data collection was used.

a. Response rate

The survey included 3011 people aged 50 years or older, of whom 2966 were actually examined. The response rate was 97.2%, 65 persons (2.1%) were absent, 7 (0.2%) refused to participate in the study, and 12 (0.4%) were not able to participate. (See Table 1 of Summary report appended)

The overall population M:F ratio for persons 50 years and over is 0.593 while that for the sample is 0.588. There are some minor deviations notable in the age-group representations (see below).

Figure 1: Proportion of males in total survey area and sample

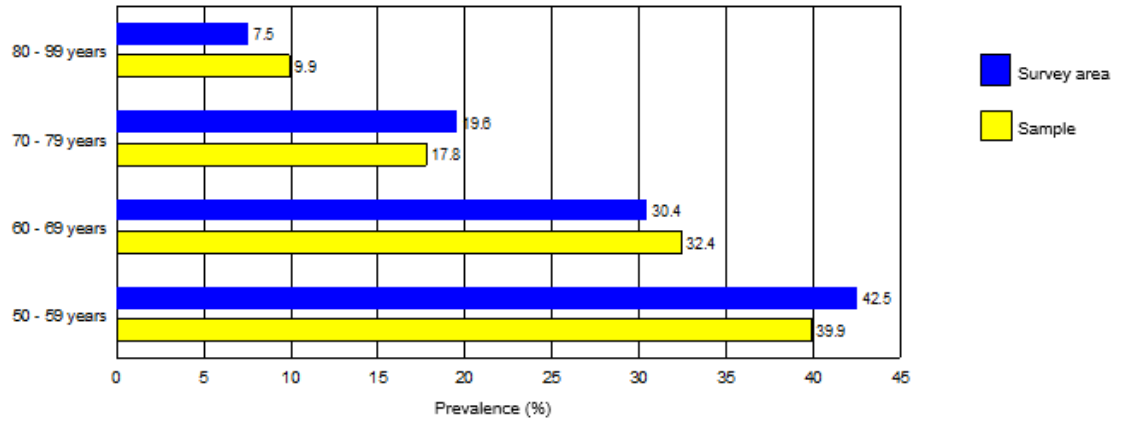
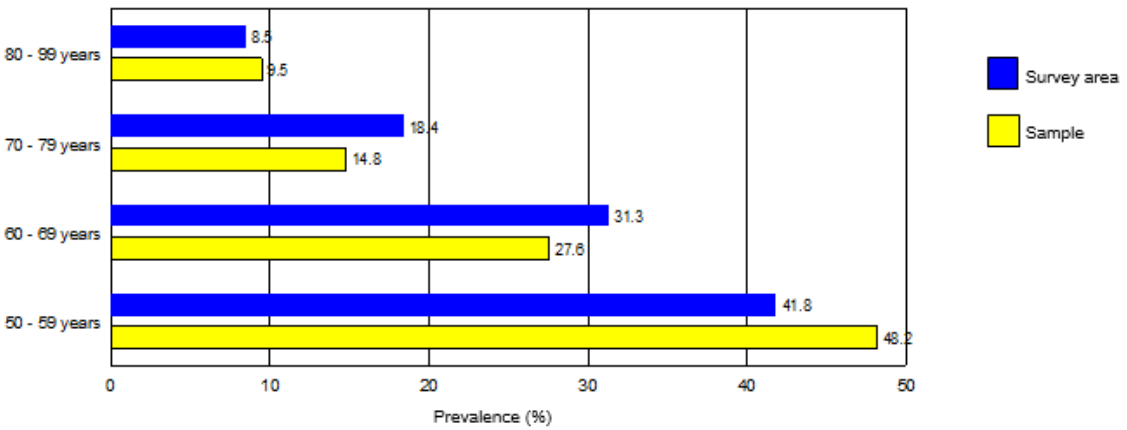


Figure 2: Proportion of females in total survey area and sample



b. Blindness and visual impairment in the sample (See Summary report)

The sample prevalence of bilateral blindness with available correction (presenting visual acuity: PVA) <3/60 in people aged 50 years or older in the better eye is 6.4%, 5.7% in males and 6.8% in females. The prevalence of bilateral severe visual impairment (SVI) is 4.0% (males 3.9%, females 4.0) and bilateral moderate visual impairment (MVI) 8.3% (8.5%, 8.1%). The prevalence of functional low vision, requiring low vision services, is 2.6% (2.6%, 2.7%).

c. Age and sex adjusted blindness and visual impairment (See Summary report)

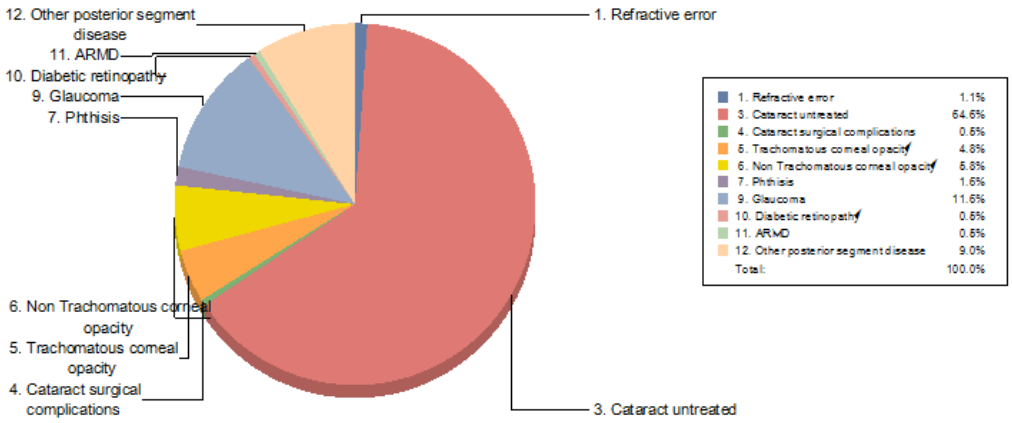
The prevalence of blindness and visual impairment increases strongly with age and in all categories (blindness, SVI and MVI) females are more affected than males.

In Inhambane, an estimated 11601 persons aged 50 years or older are bilaterally blind, comprising 3580 males and 8023 females. The low M:F ratio in the general population should be kept in mind when interpreting the differences between male and female prevalence. A further 7223 (2512, 4718) persons aged 50 years or older are severely visually impaired and another 15294 (5562, 9731) persons have moderate visual impairment. Among them 4797 (1690, 3106) persons aged 50 years or older have functional low vision, requiring low vision services.

d. Causes of bilateral blindness and visual impairment (See Summary report)

A graph of the main causes of blindness in persons aged 50 years or older shows that untreated cataract is the most common cause of bilateral blindness (PVA<3/60 in the better eye) with 64.6%, followed by glaucoma (11.6%), other posterior segment disease (9.0%) and non-trachomatous corneal opacity (5.8%). For SVI, untreated cataract is also the main cause with 71.2%, followed by other posterior segment disease and uncorrected refractive error (6.8% and 5.91% respectively). For MVI, untreated cataract and uncorrected refractive errors (46.5% and 40.8% respectively) are the main causes.

Figure 3: Causes of blindness

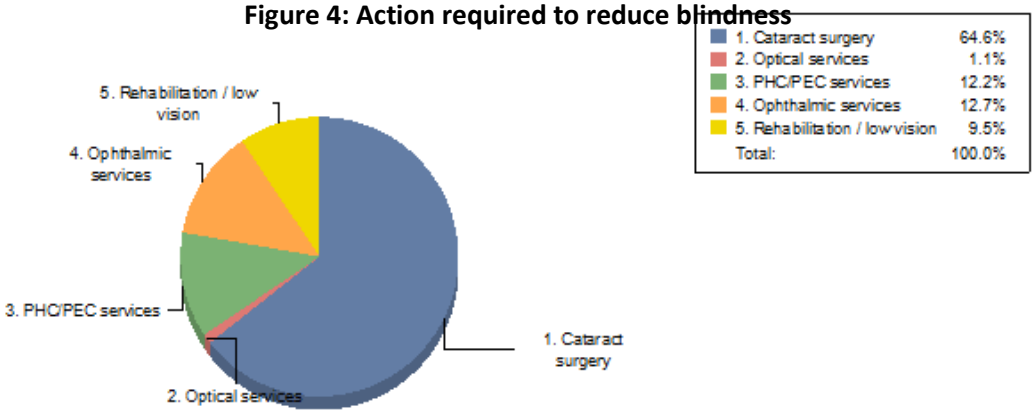


Of all bilateral blindness, 90.5% is considered avoidable, where 65.6% is considered treatable, 12.2% preventable by primary eye care and 12.7% preventable by specialised ophthalmic care. Blindness due to posterior segment conditions constitutes 21.7% of the total causes. Of all SVI, 77.1% is considered avoidable and of all MVI 87.4% is avoidable.

There seems to be a significant difference between the cause-specific prevalence of blindness between males and females with cataract responsible for 54.0% of male persons' blindness and 65.3% of female persons' blindness; glaucoma responsible for 22.2% and 6.3% respectively. The pattern is similar for other conditions. The differences in prevalence of causes resulting in SVI and MVI are less pronounced. The main causes of blindness, SVI and MVI in eyes are not significantly different between the sexes. **(See Sample results – not adjusted)**

The main intervention strategies to reduce avoidable blindness in Inhambane are shown in figure 4. Priority should be given to cataract surgery, followed by the development of ophthalmic services, which collectively would be addressing 87.5% (56.8% +17.2%+13.5%) of the causes of blindness in eyes and 90.5% (65.6%+12.2%+12.7% of the blindness in persons). Although the development of ophthalmic services may be more costly, it may be justified because of the high prevalence of posterior segment disease, especially glaucoma. **(See Summary report)**

Figure 4: Action required to reduce blindness



e. Cataract (See Age and sex adjusted prevalence reports)

The age and sex adjusted prevalence of bilateral blindness due to cataract is 3.7% (males 2.5%, females 4.5%), which is an estimated 6769 people in Inhambane Province. This represents approximately 58% of those who are blind; 1598 males (0.9%) and 5171 females (2.9%). There is a more than threefold difference in cataract blindness between the sexes, which should be further investigated. There are an estimated 23485 eyes blind due to cataract in the province.

With an indication for cataract surgery of best corrected visual acuity (BCVA) of <6/60 an estimated 10959 (3150, 7809) people aged 50 years and older require surgery in both eyes and an estimated 33 222 (11056, 22166) eyes would require surgery.

f. Cataract Surgical Coverage (CSC) (see table 10 of Age and sex adjusted prevalence reports)

In Inhambane Province only 29.0% of people of blind due to cataract (VA<3/60) have been operated on, 45.0% of males and 22.0% of females. This is extremely low. The coverage for people with VA<6/60 is 20.2% (males 29.4%, females 15.8%) and for VA<6/18 is 14.0% (20.6% and 11.0%).

Further, only 22.2% of eyes blind due to cataract (VA<3/60) have been operated on, 31.2% for males and 16.7% for females. This is also very low. The coverage for eyes with VA<6/60 is 16.8% (males 24.4%, females 12.3%) and eyes with VA<6/18 is 11.9% (18.2 and 8.5%).

This means that cataract blindness is poorly controlled in Inhambane Province. The extremely low coverage rates for females relative to those of males partly explain the difference in cause-specific and overall prevalence of blindness and visual impairment.

g. Visual outcome after cataract surgery (See Visual outcome report)

Of all eyes operated for cataract, 42.9% can see 6/18 ("Good outcome") or better and 37.5% cannot see 6/60 ("Poor outcome") with available correction. With pinhole the results improve to 55.4% "Good outcome" and 34.8% "Poor outcome". 92% of the operated eyes had an IOL implanted, males 97.3% and females 94.3%.

Visual outcome of eyes operated during the last 3 years (38.6% Good; 36.4% Poor) is worse when compared to other periods for good outcomes, but better when compared for poor outcomes. Usually, the longer time has passed since cataract surgery and the higher the age, the higher the risk of getting other sight threatening eye diseases. However, these findings should be taken with reserve as the errors in historical age records may significantly skew the results of this parameter. Regardless of these possible inaccuracies, the visual outcomes after surgery are well below the recommended standards of the WHO.

Surgery is the main cause of poor outcome (61.9%), followed by sequelae (21.4%) of surgery and selection (14.2%). Review of the surgical procedures (including techniques, equipment and supplies) may lead to improvement of the visual outcome. Adequate pre-operative examination of cataract patients may reduce the number of patients with concurrent blinding conditions who may not regain vision after surgery. Patients with concurrent blinding conditions may need counselling to provide them realistic expectations about their future vision. Improvement of the pre-operative examination and individual adjustment of IOLs are likely to improve the visual outcome considerably.

h. Place of surgery (See Visual outcome report)

Of the 112 cataract operations recorded, a total of 80 (71.4%) were conducted in the government provincial hospital in Inhambane City, 29 (25.9%) in other government hospitals as part of outreach camps and 3 in private hospitals, mostly outside the province.

The difference between where males and females underwent surgery is only significant where the males underwent surgery outside provincial government facilities. Visual outcome results are best in eyes operated in other government hospitals, i.e. during outreach camps, but only relatively so. (44.8% Good, 34.5% Poor).

The few private hospital cases show better percentage good outcome than the other locations. There might be a bias in the outcome findings because in many setting the private hospitals tend to select the easy, uncomplicated cataracts for surgery while they refer the more complicated cases to the government hospitals. The visual outcomes in the provincial hospital should raise concern. More investigation is required to find the reasons for this.

i. Barriers to cataract surgery (See Summary report)

There are three main barriers recorded: “No accompaniment available”, 45.9%; “Need not felt”, 33.0% and “Cannot access treatment”, 17.3%. Males predominantly suggested “Need not felt” while females predominantly suggested “No accompaniment available”. While there may be differences in interpretation of participant responses, the reasons for inability to access treatment may be many, including distance from hospital, cost or even lack of information about the service.

j. Aphakia and pseudophakia (See Adjusted results)

There are 1726 persons with bilateral pseudophakia in Inhambane province, 889 males and 837 females. No blindness or SVI due to aphakia was encountered in the survey. Aphakia is usually a result of cataract surgery with planned IOL implantation, which resulted in complications, hence no IOL could be implanted.

k. Refractive errors (See Sample results)

The prevalence of uncorrected refractive errors is 4.5% (males 5.7% and females 3.8%). This does not include uncorrected presbyopia, which is measured through the use or not of near vision glasses. A total of 98.6% of potential presbiopics are not using near vision glasses. Uncorrected refractive error is the second cause of bilateral moderate visual impairment (40.8%) after cataract (46.5%).

l. Diabetic retinopathy, glaucoma, ARMD and other posterior segment diseases (See Adjusted results)

Posterior segment disease causes 21.7% of all blindness, 13.62% of severe visual impairment and 8.2% of moderate visual impairment. Of these, glaucoma is the main cause of blindness in persons and in eyes, 11.8% and 10.8% respectively. This occurs more commonly in males (22.2% in persons and 15.7% in eyes) than females (6.3% in persons and 7.7% in eyes). With the limited diagnostic equipment in RAAB, Age-related macular degeneration and diabetic retinopathy may be more difficult to diagnose and these may get classified under “Other posterior segment disease”.

m. Functional low vision (FLV) requiring low vision services (See Summary report and Sample results)

The age and sex adjusted prevalence of FLV (BCVA<3/18 to PL+), not caused by cataract, refractive error, uncorrected aphakia or pseudophakia with posterior capsular opacity) and requiring low vision services is 2.6% (males 2.5%, females 2.7%). In Inhambane Province, an estimated 4797 people aged 50 years or older (1690 males and 3106 females) require low vision services or training. The prevalence of FLV increases steadily with age and is 5.9% in people aged 80 years and older.

The most common cause of FLV is other posterior segment disease (35.9%), with glaucoma (23.1%) and trachomatous cornel opacity (14.1%) second and third respectively.

n. The projected all-ages prevalence of blindness in Inhambane Province is 0.79%.

4. SUMMARY

A rapid assessment of avoidable blindness (RAAB) was conducted in Inhambane Province, Mozambique from October to November 2016. The fieldwork was carried out using the smartphone method of data collection. A total of 3050 people aged 50 years or older were enrolled, with a response rate of 97.2%. The male: female ratio for persons 50 years and over in the sample is 0.588, similar to that in the general population (0.593).

The sample prevalence of bilateral blindness with available correction in people aged 50 years or older is 6.4%, 5.7% in males and 6.8% in females. The prevalence of bilateral SVI is 4.0% and bilateral MVI 8.3%. The prevalence of FLV, requiring low vision services, is 2.6%.

In Inhambane, an estimated 11601 persons aged 50 years or older are bilaterally blind, comprising 3580 males and 8023 females. A further 7223 persons aged 50 years or older have SVI and another 15294 have MVI. Among them 4797 have FLV, requiring low vision services.

Untreated cataract is the most common cause of bilateral blindness (64.6%), followed by glaucoma (11.6%) and other posterior segment disease (9.0%) and non-trachomatous corneal opacity (5.8%). For SVI, untreated cataract is also the main cause (71.2%), followed by other posterior segment disease and uncorrected refractive error (6.8% and 5.91% respectively). For MVI, untreated cataract and uncorrected refractive errors (46.5% and 40.8% respectively) are the main causes.

The age and sex adjusted prevalence of bilateral blindness due to cataract is 3.7% (males 2.5%, females 4.5%), which is an estimated 6769 people in Inhambane Province. There are an estimated 23485 eyes blind due to cataract in the province. Only 29.0% of people of blind due to cataract have been operated on. Further, only 22.2% of eyes blind due to cataract have been operated on.

Of all eyes operated for cataract, 42.9% can see 6/18 (“Good outcome”) or better and 37.5% cannot see 6/60 (“Poor outcome”) with available correction. With pinhole the results improve to 55.4% “Good outcome” and 34.8% “Poor outcome”. Surgery is the main cause of poor outcome (61.9%), followed by sequelae (21.4%) of surgery and selection (14.2%). Of the 112 cataract operations recorded, a total of 80 (71.4%) were conducted in the government provincial hospital,

There are three main barriers to uptake of cataract recorded: “No accompaniment available”, 45.9%; “Need not felt”, 33.0% and “Cannot access treatment”, 17.3%. Males predominantly suggested “Need not felt” while females predominantly suggested “No accompaniment available”.

There are 1726 persons with bilateral pseudophakia in Inhambane province, 889 males and 837 females. No blindness or SVI due to aphakia was encountered in the survey.

The prevalence of uncorrected refractive errors is 4.5% (males 5.7% and females 3.8%). Posterior segment disease causes 21.7% of all blindness of which glaucoma is the main cause of blindness in persons and in eyes, 11.8% and 10.8% respectively. In Inhambane Province, an estimated 4797 people aged 50 years or older (1690 males and 3106 females) require low vision services or training.

The projected all-ages prevalence of blindness in Inhambane Province is 0.79%.

5. CONCLUSION AND RECOMMENDATIONS

Inhambane Province has a higher prevalence of blindness than estimated (0.79%), and the blindness prevalence in the 50 years and older age groups (6.4%) is higher than Sofala Province (3.2%), but lower than the findings in Nampula Province (7.1%) in 2007.

Cataract blindness is poorly controlled in Inhambane Province. The backlog is too high, the surgical coverage is too low and the "Poor outcomes" following surgery is too high. There are high burdens of severe and moderate visual impairments caused by cataract, posterior segment diseases and uncorrected refractive error. The presence of trachoma requires special attention.

The gender disparity in the eye care service profile is high. Women bear greater burdens of vision-impairing conditions than men (except those caused by glaucoma), both due to the gender ratio being 0.59 (M: F) and because of lower uptake by women. These can also be due to uptake access issues.

We recommend the following:

1. Develop an eye care strategy for Inhambane Province

    a. Conduct a comprehensive situational analysis
    b. Develop a provincial eye care plan for Inhambane Province
    c. Advocate, market and fundraise to obtain support, funding and commitment
    d. Implement the plan
    e. Monitor and evaluate the plan

    NOTE: this is a medium to long term strategy

2. Improve the cataract surgical coverage by:

    a. Investigating the reasons for poor coverage
    b. Strengthening the surgical teams (increase staff numbers and develop skills)
    c. Ensure availability of adequate facilities, equipment and supplies
    d. Conduct regular case-finding and surgical outreach camps

3. Improve the cataract surgical outcomes by:

    a. Investigating the reasons for poor outcomes
    b. Training to improve diagnostic and surgical capacities
    c. Improve biometry and optical services for cataract surgery
    d. Training to reduce surgical complications

4. Develop and expand the services for glaucoma and refractive error.

5. Investigate the epidemiology of trachoma in the province.

It should be noted that the above recommendations have cost implications. Any attempts to act on these recommendations should be inclusive and involving all the key stakeholders of the Inhambane Provincial Eye Programme.

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COPIED TO: National eye care coordinator: Dr Mariamo Abdala Ulls de Mon Programme manager: Mr Francisco Sanz	
Attachments: RAAB reports, cluster list	