Rapid Assessment for Avoidable Blindness (RAAB)

in Takeo Province, Cambodia

2012

Centre for Eye Research Australia

World Health Organization
Collaborating Centre for Prevention of Blindness

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TAKEO EYE HOSPITAL
Your Vision, Our Mission

Caritas CAMBODIA

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DEFINITIONS

Aphakia | the absence of the lens of the eye

Pseudophakia |the presence of an artificial lens

Blindness | visual acuity <3/60 in the better eye

Severe vision impairment (SVI) | visual acuity <6/60 - 3/60 in the better eye

Vision impairment (VI) | visual acuity <6/18 - 6/60 in the better eye (moderate visual impairment)

Low vision | severe and moderate vision impairment combined - best corrected visual acuity < 6/18 to 3/60

Uncorrected refractive error | presenting visual acuity < 6/18 improving to ≥ 6/18 with pinhole

Presenting visual acuity | visual acuity with available correction, if used

Best corrected visual acuity | visual acuity with best correction - pinhole visual acuity was used as a proxy for best correction

Prevalence | the number of affected persons present within a population at a specific point in time divided by the number of persons in the population at that time (generally expressed as a percentage).

95% Confidence Intervals (CI 95%) | a range of values within which we can be 95% sure the true value of an estimate may lie.

ACRONYMS

CBM | an International development organisation, committed to improving the quality of life of persons with disabilities in the poorest countries of the world

CERA | Centre for Eye Research Australia

IOV | Inter Observer Variation

IOL | Intra Ocular Lens

RAAB | Rapid Assessment of Avoidable Blindness

CTEH | CARITAS Takeo Eye Hospital

TT | Trachoma trichiasis

VA |Visual Acuity

SUMMARY OF KEY FINDINGS

Within Takeo Province the age-adjusted prevalence of bilateral blindness in those aged ≥ 50 years was 3.4% (±0.61%). There was a statistically significant difference between genders for blindness, but not for severe or moderate visual impairment.

The main causes of blindness in Takeo were un-operated cataract and diseases of the posterior segment. The main causes of severe and moderate visual impairment were un-operated cataract and un-corrected refractive error.

Cataract surgical coverage was 48% (VA<6/60) and the main barriers to surgery were the inability to afford surgery (33%) and no company for the person undergoing surgery (17%).

Within the last 5 years 89.3% of eyes operated for cataract (IOL) could see 6/18 (BCVA).

Only 79 (1.8%) of the survey participants had glasses and roughly one in four were visually impaired to some extent.

When compared to the 2007 national RAAB survey there are particular improvements in the prevalence of corneal scars and the awareness of cataract surgery amongst women.

LIST OF FIGURES, IMAGES AND TABLES

INTRODUCTION

A Rapid Assessment of Avoidable Blindness (RAAB) was conducted in Takeo Province, Cambodia during December 2011 and January 2012. All ten districts within Takeo were visited so the survey results can be generalised to all of Takeo Province:

Angkor Borei; Bathi; Bourei Cholsar; Kiri Vong; Koh Andeth; Prey Kabbas; Samraŏng; Doun Kaev; Tram Kak; Treang.

Takeo Province is located in south east Cambodia bordering Vietnam and the provinces of Kampot, Kampong Speu and Kandal. The provincial capital is Takeo town. The province is largely rural with the economy being based around agriculture, farming and fishing. In 2007, the national census estimated the population of Takeo province to be 925,000 (approximately 6.5% of the national population).

FIGURE 1. MAP OF DISTRICTS WITHIN TAKEO PROVINCE

SAMPLE SIZE AND DESIGN

A RAAB uses a standard methodology which is documented in the 'RAAB Instruction Manual' [1]. The methodology is outlined in the following sections.

A sample size of 4,650 people aged ≥ 50 years across the 10 districts in Takeo Province was determined using RAAB software (Version 4.02).

This assumed:

- Prevalence of blindness in people aged ≥ 50 years = 2.9% [2].
- Population aged ≥ 50 years in Takeo = 122,808
- Required confidence = 95%
- Non-response = 5%
- Design Effect (DEFF) = 1.5

DEFF is used to help calculate the sample size to allow for the effect of clustering, the fact that this survey looks at clusters of people who may be more similar than if persons were randomly selected.

RAAB samples people ≥ 50 years of age as it is estimated that worldwide more than 85% of blindness occurs within this age group. This means that a far smaller sample size is required than for a survey covering all age groups. 93 clusters were selected with probability proportionate to size, using data from the 2008 census as the sampling frame. 93 villages (one from each cluster) were then randomly selected to be visited for the survey. Households within the villages were selected by compact segment sampling [3]. For compact segment sampling, the village has to be divided into segments of approximately equal population size and with well-demarcated boundaries. The number of segments per village is derived from the village population aged ≥ 50 years of age, divided by the desired cluster size (50 people). Maps of each village were not available, so they were hand drawn by village leaders or health workers. On the day of the survey the enumeration area was divided into segments, each including approximately 50 people aged ≥ 50 years, and one segment was selected at random by drawing lots. All households within the selected segment were visited consecutively until 50 people aged ≥ 50 years were examined. If the segment did not include enough individuals, then a backup a segment was visited. If an eligible person was absent, the survey teams returned at least once in an attempt to examine the individual. If the person still could not be examined, demographic information and perceived vision status (not blind, bind due to cataract, blind due to other causes, operated for cataract) were collected from neighbours or relatives.

OPHTHALMIC EXAMINATION

Visual Acuity (VA) for all available participants was measured using a tumbling E-chart with available correction (symbol size equivalent to 6/18 on one side and 6/60 on the other). If presenting VA was <6/18 in either eye, pinhole vision was measured. Lens status in each eye was assessed by an ophthalmologist using a direct ophthalmoscope. If VA was <6/18 and not due to cataract, corneal scar or refractive error (RE), pupils were dilated and examined with a direct ophthalmoscope to determine the main cause of vision loss in each eye. Where there were two or more disorders equally contributing to poor vision the main cause per person was recorded as the easiest condition to either treat or prevent. For example, if a person had a globe abnormality and cataract, cataract would be deemed the main cause per person. If the main cause was cataract or the subject had received cataract surgery, additional information was obtained specifically relating to these. All information was recorded on the standard RAAB survey form which had been translated into Khmer.

IMAGE 1. MEASURING VISUAL ACUITY WITH A TUMBLING E-CHART

TEAMS AND TRAINING

The survey, managed by Dr Manfred Mörchen, Mr El Nimeth and Mr Te Serey Bonn from CARITAS Takeo Eye Hospital (CTEH), was carried out by four teams in December 2011 and January 2012. Dr Mörchen was present throughout the survey to ensure that the teams were maintaining the RAAB protocol and to respond to any challenges the field teams were facing, and to encourage team members.

Each team consisted of three people; one lead ophthalmologist and two ophthalmic nurses. The ophthalmologist was responsible for the ophthalmic examinations, diagnosing the cause of vision loss and ensuring the survey forms were completed correctly. The ophthalmic nurses were responsible for the visual acuity, the questionnaire and helping to identify eligible participants. Data entry clerks were responsible for double entry of data, but were not specific to each team. During the survey, teams were accompanied by a local village guide, usually from the local health centre. The responsibility of the local guide was to identify eligible participants and to provide a link to the community.

IMAGE 2. TRAINING DAY, CARITAS TAKEO EYE HOSPITAL

All staff received 1 week of training hosted at CARITAS Takeo Eye Hospital (CTEH) by Toby Langdon (CERA) and Dr Manfred Mörchen (CTEH). The training consisted of both formal classroom training and field-based practice. Inter-observer Variation (IOV) for VA measurement was assessed between teams to ensure it was of an acceptable standard (kappa≥0.60). This was carried out using forty people who were patients and relatives present at CTEH during the training. Training followed the recommended schedule in the RAAB manual (*Appendix 1*) [1].

IMAGE 3. VISUAL ACUITY TESTING, CARITAS TAKEO EYE HOSPITAL

DATA MANAGEMENT AND STATISTICAL ANALYSIS

After initial review by the lead ophthalmologist, the survey data were entered twice and validation checks completed in the RAAB software. The data were analysed using RAAB Version 4.02 (ICEH, London) for pre-defined reports relating to both crude and age and gender adjusted results. More detailed analyses were undertaken using SPSS Version 19 (SPSS Inc., Chicago).

IMAGE 4. SURVEY FORMS BEING THOROUGHLY CHECKED, PSA TA KOR, TAKEO PROVINCE

ETHICS APPROVAL AND INFORMED CONSENT

Ethics approval for this research was granted by the National Ethics Committee for Health Research (NECHR), Cambodia in November 2011 and the Royal Victorian Eye and Ear Hospital Human Research and Ethics Committee (HREC), Melbourne, Australia in June 2012 (Ref: 12/1073H).

All participants provided informed consent for the examination and people with treatable ophthalmic conditions were referred for treatment.

IMAGE 5. INFORMED CONSENT USING THUMB PRINT

SURVEY FINDINGS

The survey was conducted in people aged ≥ 50 years, so the results are confined to this age group. Where results are weighted to the age and gender structure of the population, results can be applied to all the people aged ≥ 50 years and living Takeo Province

Care must be taken when inferring from the results in three areas:

1. Some results are descriptive of the study participants (also known as 'the sample') and not the Takeo population.
2. Unless specified, results have not been adjusted for the effects of age as a confounder. For respondents aged 70 and above only 9.4% (n=419) of the sample was male, yet 16.6% (n=743) was female.
3. Results are measures of occurrence not of association or effect.
4. Comparison will be made to the 2007 national RAAB survey in Cambodia (n=5,902). The 2007 results reported are those of the national survey and not Takeo specifically (n=400).

RESPONSE RATES

Of the 4,650 persons sampled there were only 179 non-respondents, resulting in a 96.2% response rate. Of the non-respondents (56% male and 44% female) 157 were not available, 8 refused and 14 were unable to communicate with the survey teams. Non-respondents were evenly distributed among the villages surveyed and 46% were between the ages of 50 and 59.

Of the 4,471 respondents, 1,538 (34.4%) were male and 2,933 (65.6%) were female.

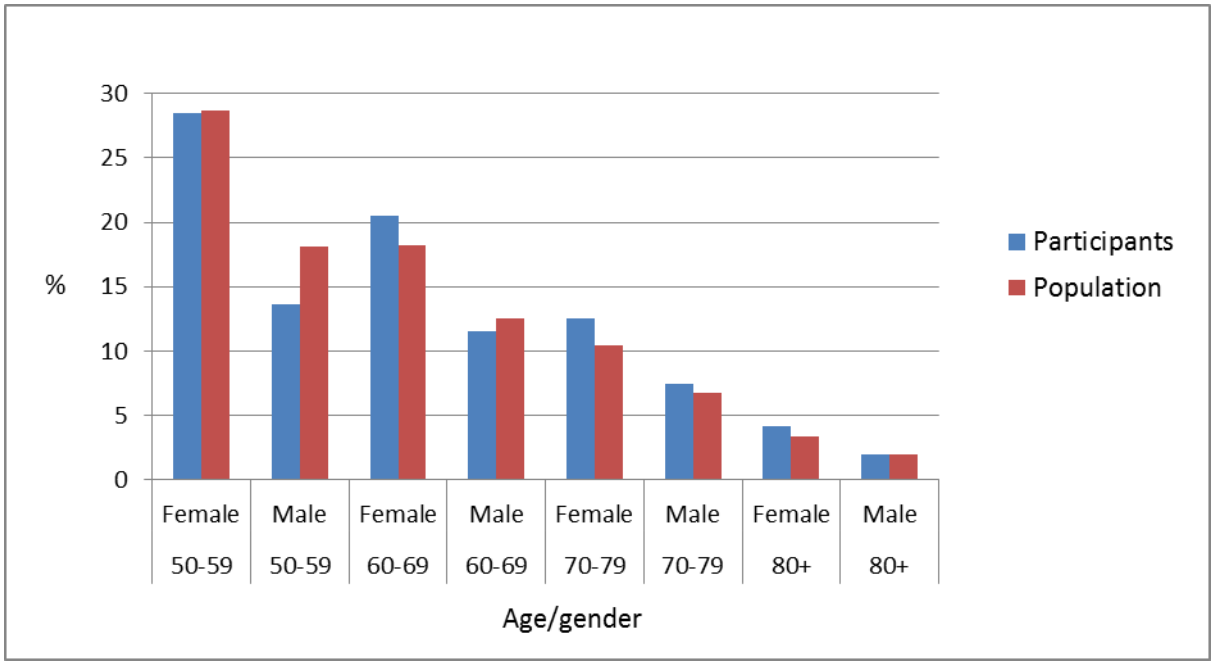

FIGURE 2. AGE AND GENDER DISTRIBUTION OF THE OF THE TAKEO RAAB PARTICIPANTS (N=4,471) AND POPULATION (N=122,208)

Figure 2 illustrates the age and gender distribution of the Takeo population and the survey participants in the study. It is evident that the sample slightly under represents the population in the 50-59 year age group for males. In most other age and gender strata the sample is similar to the population. Subsequently, for population level analysis, the sample data were weighted by age and gender to reflect the population from which it was drawn. Age and gender distributions of the sample and population structures (and weighting) are in *Appendix 2*.

It should be noted that in all age groups for both the participants and population there are proportionately more females than males. This may be attributed to gender differences in average life expectancy which in 2007 were reported as 63 for females and 59 for males. The genocide between 1975 and 1979 is estimated to have killed between 1 million and 3 million people with life expectancy during this period dropping to around 30 years of age. This will explain in part why only 3% of the total population of Cambodia is aged 65 years or above. Current low life expectancy in Cambodia is attributed to some of the highest under-5 and maternal mortality rates in the region and that the nation has reportedly the highest mortality rate of people aged 15-60 years in SE Asia (243/1,000 population in 2010) [4].

Data from the 2004 Global Burden of Disease (WHO) suggest that the burden of communicable disease in Cambodia is also alarmingly high at around 12,000 DALYs per 100,000 population [5]. To put this into context this is around 3,000 to 4,000 DALYs more than for countries such as Laos and Myanmar.

TABLE 1. PREVALENCE OF BILATERAL BLINDNESS, SEVERE VISUAL IMPAIRMENT (SVI) AND VISUAL IMPAIRMENT (VI), BY GENDER (TOTAL N=4,471)

Visual acuity	Male %; CI 95% (n)	Female %; CI 95% (n)	Total %; CI 95% (n)
Blindness: Presenting VA<3/60 in the better eye, with available correction	2.7; 1.8-3.5 (41)	4.4; 3.6-5.2 (129)	3.8; 3.2-4.4 (170)
Blindness: Best corrected VA<3/60 in the better eye, with best correction or pinhole	2.0; 1.3-2.7 (30)	3.7; 3.0-4.3 (107)	3.1; 2.6-3.6 (137)
SVI: Presenting VA<6/60 - 3/60 in the better eye, with available correction	3.4; 2.5-4.3 (52)	5.1; 4.3-6.0 (150)	4.5; 3.8-5.2 (202)
VI: Presenting VA<6/18 - 6/60 in the better eye, with available correction	18.9; 16.6-21.1 (290)	17.4; 15.8-19.0 (510)	17.9;16.3-19.4 (800)

Table 1 demonstrates that within the survey participants there was a significant difference in the prevalence of blindness (presenting vision) between males and females, 2.7% (95% CI 1.8% to 3.5%) and 4.4% (95% CI 3.6% to 5.2%) respectively. The pattern was similar for blindness with best corrected vision and presenting severe visual impairment, but with lower prevalence estimates. Regardless of gender, the prevalence of blindness was a 0.7% lower when a pinhole was used so vision can potentially be improved with glasses.

The majority of blindness (81.8%) was caused by un-operated cataract (*Table 3*). Of the 4,471 persons surveyed, all aged 50 years or above, only 79 (1.7%) possessed distance glasses. Moderate visual impairment was similar between males and females 18.9% (95% CI 16.6% to 21.1%) and 17.4% (95% CI 15.8% to 19.0%), with most due to uncorrected refractive error.

Amongst participants, the prevalence of blindness (presenting vision) was 3.8% (95% CI 3.2% to 4.4%). It should be noted that the estimates in *Table 1* have not been adjusted for age; however, the confidence intervals have been adjusted to allow for the effect of clustering. Age-adjusted population estimates are in *Table 14*.

TABLE 2. PREVALENCE OF BILATERAL BLINDNESS, SEVERE VISUAL IMPAIRMENT (SVI) AND MODERATE VISUAL IMPAIRMENT (VI), BY AGE (TOTAL N=4,471)

Visual acuity	50-59 n (%)	60-69 n (%)	70-79 n (%)	80+ n (%)	Total n (%)
Blindness: Presenting VA<3/60 in the better eye, with available correction	10 (0.5)	32 (2.2)	72 (8.1)	56 (20.3)	170 (3.8)
Blindness: Best corrected VA<3/60 in the better eye, with best correction or pinhole	7 (0.4)	25 (1.8)	60 (6.8)	45 (16.3)	137 (3.1)
SVI: Presenting VA<6/60 - 3/60 in the better eye, with available correction	25 (1.3)	67 (4.7)	81(9.1)	29 (10.5)	202 (4.5)
VI: Presenting VA<6/18 - 6/60 in the better eye, with available correction	118 (6.3)	305 (21.4)	269 (30.4)	108 (39.1)	800 (17.9)

Table 2 illustrates that the prevalence of all levels of visual impairment were heavily confounded by increasing age and that this is a necessary consideration when inferring from the results.

TABLE 3. MAIN CAUSES OF BLINDNESS IN PERSONS: PRESENTING VA<3/60 IN BETTER EYE, WITH AVAILABLE CORRECTION, BY GENDER

Main cause	Male n (%)	Female n (%)	Total n (%)
Cataract, un-operated	29 (70.7)	110 (85.3)	139 (81.8)
Other posterior segment/CNS	4 (9.8)	6 (4.7)	10 (5.9)
Corneal scar	0 (0.0)	6 (4.7)	6 (3.5)
Glaucoma	2 (4.9)	2 (1.6)	4 (2.4)
Phthysis	3 (7.3)	1 (0.8)	4 (2.4)
Aphakia, uncorrected	1 (2.4)	2 (1.6)	3 (1.8)
Surgical complications	2 (4.9)	0 (0.0)	2 (1.2)
Globe abnormality	0 (0.0)	1 (0.8)	1 (0.6)
Trachoma (TT)	0 (0.0)	1 (0.8)	1 (0.6)
Total	**41 (100.0)**	**129 (100.0)**	**170 (100.0)**

Within the survey participants the main cause of blindness (presenting vision) was overwhelmingly un-operated cataract (81.1%). 8.3% of blindness was caused by disorders of the posterior segment, which includes conditions such as optic atrophy, retinal/arterial

occlusions, retinal detachment, macular scars/atrophies and glaucoma. These results are similar to those from the 2007 national RAAB survey of Cambodia (un-operated cataract 74.7% and disorders of the posterior segment 4.9%) [2]. Consideration should be given to such disorders in planning future service delivery and resource allocation as with the increasing health of the population (and subsequently life expectancy and longevity) the prevalence of such conditions will be likely to rise further. Such conditions will require more than 'one off' treatments with multiple visits to a health setting required, often for the remainder of an individual's life. Similarly, in terms of public health, with population growth and an ageing population the absolute numbers of people with these conditions will most likely escalate. It should also be noted that there was a shift in blindness resulting from corneal scar from 8% in 2007 to 3.5% in 2012 (corneal scar being the second main cause in 2007 is now the third main cause in 2012).

TABLE 4. MAIN CAUSES OF VISUAL IMPAIRMENT IN PERSONS: PRESENTING VA<6/18 - 3/60 IN BETTER EYE, WITH AVAILABLE CORRECTION, BY GENDER

Main cause	Male n (%)	Female n (%)	Total n (%)
Cataract, un-operated	227 (66.4)	484 (73.3)	711 (71.0)
Refractive error	105 (30.7)	163 (24.7)	268 (26.7)
Other posterior segment	7 (2.0)	5 (0.8)	12 (1.2)
Surgical complications	0 (0.0)	3 (0.5)	3 (0.3)
Corneal scar	0 (0.0)	2 (0.3)	2 (0.2)
Glaucoma	0 (0.0)	2 (0.3)	2 (0.2)
Globe abnormality	1 (0.3)	1 (0.2)	2 (0.2)
Aphakia, uncorrected	1 (0.3)	0 (0.0)	1 (0.1)
Diabetic retinopathy	1 (0.3)	0 (0.0)	1 (0.1)
Total	**342 (100.0)**	**660 (100.0)**	**1,002 (100.0)**

The main causes of visual impairment (presenting VA<6/18 - 3/60) in the survey participants were un-operated cataract (71%), refractive error (26.7%). These results for Takeo are quite different to those observed in the 2007 national RAAB survey of Cambodia (un-operated cataract 49.9% and refractive error 45.1%).

Females are more likely to have visual impairment resulting from un-operated cataract than males (73.3% and 66.4%, respectively). Males are more likely to suffer visual impairment resulting from refractive error than females (30.7% and 24.7%, respectively). For persons where the main cause of vision loss was refractive error, only 7 (2.6%) possessed glasses.

It should be taken into consideration that it is likely that there were many more people with posterior segment diseases that would cause vision loss. Where there are co-morbidities, the standard method in such surveys is to assign the cause of vision impairment to the one most easily treated, namely cataract or un-corrected refractive error. Similarly, in the

presence of cataract, diseases of the posterior segment are often obscured and may only become apparent after surgery.

TABLE 5. MAIN CAUSES OF VISION LOSS IN PERSONS: PRESENTING VA≤6/18 IN BETTER EYE, WITH AVAILABLE CORRECTION, BY GENDER

Main cause	Male n (%)	Female n (%)	Total n (%)
Cataract, un-operated	256 (66.8)	594 (75.3)	850 (72.5)
Refractive error	105 (27.4)	163 (20.7)	268 (22.9)
Other posterior segment	11 (2.9)	11 (1.4)	22 (1.9)
Corneal scar	0 (0.0)	8 (1.0)	8 (0.7)
Glaucoma	2 (0.5)	4 (0.5)	6 (0.5)
Surgical complications	2 (0.5)	3 (0.4)	5 (0.4)
Aphakia, uncorrected	2 (0.5)	2 (0.3)	4 (0.3)
Phthysis	3 (0.8)	1 (0.1)	4 (0.3)
Globe abnormality	1 (0.3)	2 (0.3)	3 (0.3)
Diabetic retinopathy	1 (0.3)	0 (0.0)	1 (0.1)
Trachoma (TT)	0 (0.0)	1 (0.0)	1 (0.1)
Total	**383 (100.0)**	**789 (100.0)**	**1,172 (100.0)**

Table 5 lists the main causes of vision loss for all levels of visual acuity ≤6/18. The two main causes within Takeo Province were cataract (un-operated) (72.5%) and refractive error (22.9%). Of the 4,471 participants 26.2% (n=1,172) had vision loss (presenting vision).

The International Diabetes Federations Diabetes Atlas estimates the prevalence of diabetes in Cambodia to be 5.2%, yet only one case of diabetic retinopathy was recorded in the survey [6]. It is likely there were more cases as persons with diabetes are more likely to have cataract and cataract will subsequently be assigned as the main cause of vision impairment. In addition, patients with mild/moderate retinopathy may not suffer from visual impairment. Diabetes is an emerging disease in Cambodia and it may take another couple of years before patients present with end-stage retinopathy on a regular basis.

TABLE 6. LOW VISION: PEOPLE WITH VA<6/18 IN THE BETTER EYE WITH BEST CORRECTION, NOT DUE TO REFRACTIVE ERROR OR CATARACT, BY AGE AND GENDER

Age (years)	Male n (%)	Female n (%)	Total n (%)
50-59	8 (1.3)	4 (0.3)	12 (0.6)
60-69	4 (0.8)	3 (0.3)	7 (0.5)
70-79	1 (0.3)	5 (0.9)	6 (0.7)
80+	2 (2.2)	2 (1.1)	4 (1.4)
Total	**15 (1.0)**	**14 (0.5)**	**29 (0.7)**

The prevalence of low vision across the survey participants not due to cataract or refractive error was 0.7% and was proportionately higher in men.

TABLE 7. VISUAL IMPAIRMENT DUE TO CATARACT, BY AGE AND GENDER BEST CORRECTED VA<6/18 IN THE BETTER EYE

Age (years)	Male n (%)	Female n (%)	Total n (%)
50-59	14 (2.3)	35 (2.8)	49 (2.6)
60-69	62 (12.1)	172 (18.9)	242 (16.9)
70-79	97 (29.5)	190 (34.1)	287 (32.4)
80+	42 (46.7)	80 (43.0)	122 (44.2)
Total	**215 (14.0)**	**477 (16.3)**	**692 (15.5)**

Cataract was the primary cause of low vision in Takeo Province, affecting 15.5% of those surveyed. In both genders the prevalence of low vision due to cataract increases greatly with age to 44.2% in those aged 80 and above.

KEY FINDINGS:

- The prevalence of blindness (PVA) in the survey participants was 3.8% (CI 95% 3.2% to 4.4%).
- The prevalence of blindness and SVI were different between genders in the survey participants, with prevalence significantly higher in women.
- The two main causes of blindness in the survey participants (persons VA<3/60 in better eye, with available correction) were 'un-operated cataract' (81.8%) and 'other posterior segment' (5.9%).
- Compared to the 2007 RAAB, "corneal scar" moved from the second main cause of blindness (8%) to the third main cause (3.5%).
- The prevalence of (moderate) visual impairment appears similar between genders in the survey participants and the main cause was un-operated cataract.
- Approximately 1 in 4 participants had some form of vision impairment.
- Vision impairment due to cataract was over 15%.

CATARACT

TABLE 8. VISUAL ACUITY, BY GENDER, WHERE THE PRINCIPAL CAUSE OF VISION LOSS IS UN-OPERATED CATARACT (TOTAL N=4,471)

Visual acuity	Male %; CI 95% (n)	Female %; CI 95% (n)	Total %; CI 95% (n)
Blindness: Presenting VA<3/60 in the better eye, with available correction	1.9; 1.3-2.7 (29)	3.8; 3.1-4.5 (110)	3.1; 2.6-3.7 (139)
Blindness: Best corrected VA<3/60 in the better eye, with best correction or pinhole	1.2; 0.8-1.9 (19)	3.1; 2.5-3.8 (90)	2.4; 2.0-2.9 (109)
SVI: Presenting VA<6/60 - 3/60 in the better eye, with available correction	3.1; 2.4-4.1 (48)	4.8; 4.1-5.7 (142)	4.2; 3.7-4.9 (190)
VI: Presenting VA<6/18 - 6/60 in the better eye, with available correction	11.6; 10.1-13.3 (179)	11.7: 10.5-12.9 (342)	11.7; 10.7-12.6 (521)

* continuity-corrected confidence intervals

Table 8 illustrates that within the participants there was a significant difference in the prevalence of cataract blindness between genders (both presenting and best corrected) and that there was a 0.7% difference in prevalence between presenting and best corrected

vision, regardless of gender. There was no gender difference in visual impairment (presenting VA < 6/18 - 6/60) due to cataract, but amongst participants the overall prevalence of cataract blindness (presenting VA) was 3.1%

It should be noted that the estimates in *Table 8* have not been adjusted for age and there are many more women than men in the older age groups within the sample. To see the effect of gender, see *Table 16* (age-adjusted population estimates).

TABLE 9. CATARACT SURGICAL COVERAGE (PERSONS), BY GENDER

Visual acuity	Male %	Female %	Total %
VA < 3/60	77.9	59.5	64.2
VA < 6/60	52.4	46.5	48.1
VA < 6/18	23.2	23.0	23.0

Cataract surgical coverage measures the proportion of people, blind or visually impaired due to cataract, which have been operated in one or both eyes in the survey area. The Vision 2020 target for cataract surgical coverage is 85%**.** Within survey participants, cataract surgical coverage was biased towards males where VA<3/60 and VA<6/60. See *Table 16* for age-adjusted estimates of cataract surgical coverage.

TABLE 10. BARRIERS TO CATARACT SURGERY, OF SURVEY PARTICIPANTS WITH VISION IMPAIRMENT (BCVA<6/60) DUE TO UN-OPERATED CATARACT, BY GENDER

Barriers *	**Male n (%)**	**Female n (%)**	**Total n (%)**
Cannot afford operation	116 (32.6)	273 (33.1)	389 (32.9)
No company	53 (14.9)	149 (18.0)	202 (17.1)
Fear of painful operation	40 (11.2)	122 (14.8)	162 (13.7)
Old age: no need	46 (12.9)	112 (13.6)	158 (13.4)
Fear of losing sight	24 (6.7)	53 (6.4)	77 (6.5)
No time available, other priorities	24 (6.7)	38 (4.6)	62 (5.2)
Wait for maturity of cataract	10 (2.8)	18 (2.2)	28 (2.4)
Contra-indication	11 (3.1)	17 (2.1)	28 (2.4)
Unaware cataract is treatable	12 (3.4)	15 (1.8)	27 (2.3)
Don't know how to get surgery	10 (2.8)	16 (1.9)	26 (2.2)
No surgical services available/too far	6 (1.7)	11 (1.3)	17 (1.4)
One eye adequate vision, no need	4 (1.1)	2 (0.2)	6 (0.5)
Total	**356 (100.0)**	**826 (100.0)**	**1,182 (100.0)**

* Up to two barriers to cataract surgery can be recorded per person

The main barrier to cataract surgery was affordability of the surgery. Having no one to accompany the patient for surgery (the second main barrier) was clearly a major concern for patients. For those who believed there was no need for surgery due to their age, the median age for women was 78 and 77 for men.

Fear of the operation (13.7%) and fear of losing sight (6.5%) were also reported as major concerns and barriers to surgery. One point of interest is that when compared to the 2007 RAAB, in blind persons there has been a sizeable decrease in those who reported that they were "unaware of treatment", mainly in women (from 13.8% to 2.5%).

The pattern between genders in terms of barriers to cataract surgery was very similar. These results can be triangulated with the results from the 2010 KAP Survey in Takeo and the Takeo Outreach Follow-up Study (currently underway) to gain insight into specific issues in Takeo [7].

TABLE 11. VISUAL ACUITY WITH AVAILABLE AND BEST CORRECTION IN EYES OPERATED LESS THAN 5 YEARS AGO, BY TYPE OF SURGERY (N=248)

Visual acuity	IOLs Eyes (%) PVA	IOLs Eyes (%) BCVA	Non-IOLs Eyes (%) BCVA	Total Eyes (%) BCVA
Can see 6/18	185 (75.8)	218 (89.3)	2 (50.0)	220 (88.7)
Cannot see 6/18, can see 6/60	41 (16.8)	9 (3.7)	0 (0.0)	9 (3.6)
Cannot see 6/60	18 (7.4)	17 (7.0)	2 (50.0)	19 (7.7)
Total	**244 (100.0)**	**244 (100.0)**	**4 (100.0)**	**248 (100.0)**

In eyes that were operated for cataract in the last 5 years, 244 out of 248 (98.4%) had intra-ocular lenses (IOL). It was particularly notable that the outcome of 89.3% of IOL operations was 'Can see 6/18' with best correction compared to 75.8% with available correction and that the prescription of glasses after surgery may yield significant improvements in outcome. The quality of IOL surgery over the last 5 years has improved substantially as prior to this only 66.3% (PVA) and 78.2% (BCVA) could see 6/18.

For the 110 eyes where BCVA<6/18 after cataract surgery (for all operations) 43.6% (n=48) could have vision improved with glasses and 34.5% (n=38) resulted from ocular comorbidities. The remaining 24 cases were due to either surgical complications (n=17) or long-term sequelae (n=7). Age at surgery (for all operations) was 70 years of age or above in 50% (n=55) of males and 60.3% (n=158) of females. 85.2% (n=317) of operations were conducted in CARITAS Takeo Eye Hospital, 9.4% (n=35) in a hospital outside of Takeo province, 3% in eye camps and 2.4% in private practice.

TABLE 12. LEVEL OF SATISFACTION WITH RESULTS OF CATARACT SURGERY (EYES WITH IOL*), BY POST-OPERATIVE PRESENTING VISUAL ACUITY (PVA) (TOTAL N=345)

Visual acuity	Satisfied n (%)	Indifferent n (%)	Dissatisfied n (%)	Total n (%)
Can see 6/18	252 (73.0)	0 (0.0)	0 (0.0)	252 (73.0)
Cannot see 6/18, can see 6/60	58 (16.8)	0 (0.0)	1 (0.3)	59 (17.1)
Cannot see 6/60	21 (6.1)	1 (0.3)	12 (3.5)	34 (9.9)
Total	**331 (95.9)**	**1 (0.3)**	**13 (3.8)**	**345 (100.0)**

* for cataract surgery with IOL n=345, without IOL n=27

95.9% (n=331) of IOL implants were deemed satisfactory by patients, although it should be noted that for 79 implants (22.9%) presenting visual acuity was <6/18. Visual acuity would

undoubtedly improve for many patients by prescribing spectacles and investigating how many patients return after surgery to receive these is worth investigating. There is of course less chance of follow-up post-surgery if the clinics are only temporarily in a given location (unless repeat visits are made to the same area). Where patients could not see 6/60 yet still deemed the surgery satisfactory, this suggests the presence of comorbidities. Only 3.8% (n=13) were dissatisfied with the surgery.

KEY FINDINGS:

- The prevalence of blindness where the cause was cataract was 3.1%.
  - Within the last 5 years 89.3% of eyes operated for cataract (IOL) could see 6/18 (BCVA).
- The cataract surgical coverage (for people with VA < 6/60 due to cataract) was 48.1%.
- The four main barriers to surgery were 'inability to afford' (32.9%), 'no one to accompany' (17.1%), 'fear of painful operation' (13.7%) and 'old age: no need' (13.4%).
- 96% of cataract operations (IOL implants) were deemed satisfactory by those who had undergone the surgery.
- Of the 273 persons operated only 18 had spectacles.
- There has been a notable decrease in the proportion of women "unaware of treatment" in Takeo when compared to the 2007 national survey (13.8% to 2.5%).

TABLE 13. PREVALENCE OF TRICHIASIS, BY AGE AND GENDER (TOTAL N=4,471)

Age (years)	Male %; CI 95% (n)	Female %; CI 95% (n)	Total %; CI 95% (n)
50-59	0.3; 0.1-1.2 (2)	0.6; 0.3-1.2 (8)	0.5; 0.3-1.0 (10)
60-69	0.4; 0.1-1.4 (2)	2.3; 1.5-3.5 (21)	1.6; 0.1-2.4 (23)
70-79	2.7; 1.4-5.1 (9)	3.8; 2.5-5.7 (21)	3.4; 2.4-4.8 (30)
80+	2.2; 0.6-7.7 (2)	3.8; 1.8-7.6 (7)	3.3; 1.7-6.1 (9)
Total	**1.0; 0.1-1.6 (15)**	**1.9; 1.5-2.5 (57)**	**1.6; 1.3-2.0 (72)**

* continuity-corrected confidence intervals

The prevalence of trichiasis was proportionately higher for females than males across all age groups; however, this is a trend but not statistically significant difference within any age group. Prevalence generally increases with age peaking at 3.4% in those aged 70 to 79. The overall prevalence of trichiasis was 1.6% (95% CI 1.3% - 2.0%). 55.5% of cases had trichiasis in both eyes.

KEY FINDINGS:

- The prevalence of trichiasis in survey participants was 1.6%.
- The prevalence of trichiasis increased with age and was not a statistically significant difference between genders.

The following results have been adjusted to the age and gender structure of the population of Takeo Province. Where prevalence and confidence intervals are present, these have been calculated to allow for the effect of clustering within and between the sample clusters in terms of variance. 'N' refers to the estimated number of persons with vision impairment in Takeo Province.

TABLE 14. POPULATION WEIGHTED AND AGE-ADJUSTED PREVALENCE OF BILATERAL BLINDNESS, SEVERE VISUAL IMPAIRMENT (SVI) AND VISUAL IMPAIRMENT (VI), BY GENDER

Visual acuity	**Male** **%; CI 95% (N)**	**Female** **%; CI 95% (N)**	**Total** **%; CI 95% (N)**
Blindness: Presenting VA<3/60 in the better eye, with available correction	2.3; 1.5-3.2 (1,123)	4.1; 3.3-5.0 (3,064)	3.4; 2.8-4.0 (4,187)
Blindness: Best corrected VA<3/60 in the better eye, with best correction or pinhole	1.7; 1.0-2.4 (835)	3.4; 2.8-4.1 (2,539)	2.8; 2.2-3.3 (3,374)
SVI: Presenting VA<6/60 - 3/60 in the better eye, with available correction	3.2; 2.3-4.1 (1,529)	4.8; 4.0-5.7 (3,600)	4.2; 3.5-4.9 (5,129)
VI: Presenting VA<6/18 - 6/60 in the better eye, with available correction	17.4; 15.2-19.7 (8,420)	16.6; 15.0-18.2 (12,349)	16.9; 15.4-18.5 (20,769)

The estimated prevalence of presenting blindness for Takeo Province was 3.4% (CI 95% 2.8% to 4.0%), decreasing to 2.8% (95% CI 2.2% to 3.3%) for best corrected vision. At the 95% confidence level, there was a statistically significant difference in the estimated levels of blindness between genders. These measures are almost identical to the results gained in the 2007 national RAAB survey (male 2.4, 1.7-3.1; female 3.9, 3.2-4.6 and total 3.3, 2.7-3.9).

For persons aged 50 years and above in Takeo Province, the estimated number of blind people (PVA) is 4,187, the number of severely visually impaired 5,129, and the number of moderately visually impaired 20,769. The majority of this vision loss results from un-operated cataract (*Table 3*).

There was no statistical difference by gender for severe visual impairment or moderate visual impairment although there was only a slight overlap in confidence intervals for SVI. Similarly, the majority of this vision loss results from un-operated cataract for both severe and moderate visual impairment (*Table 4* and *Table 5*).

TABLE 15. POPULATION WEIGHTED AND AGE-ADJUSTED VISUAL ACUITY STATUS WHERE MAIN CAUSE OF VISION LOSS IS BILATERAL CATARACT, BY GENDER

Visual acuity	Male %; CI 95% (N)	Female %; CI 95% (N)	Total %; CI 95% (N)
Blindness: Best corrected VA<3/60 in the better eye, with best correction or pinhole	0.83; 0.4-1.3 (399)	2.6; 1.7-2.9 (1,914)	1.9; 1.5-2.3 (2,313)
SVI: Best corrected VA<6/60 - 3/60 in the better eye, with available correction or pinhole	1.9; 1.2-2.6 (930)	2.0; 1.5-2.6 (1,502)	2.0; 1.5-2.5 (2,432)
VI: Best corrected VA<6/18 - 6/60 in the better eye, with available correction or pinhole	10.0; 8.6-11.4 (4,841)	11.9; 10.6-13.2 (8,865)	11.2; 10.1-12.2 (13,706)

The estimated prevalence of blindness (best corrected) for Takeo Province where the main cause of vision loss was un-operated cataract was 1.9% (CI 95% 1.5% to 2.3%). There was a statistically significant difference between genders for blindness caused by un-operated cataract. Again, these measures are almost identical to the results gained in the 2007 national RAAB survey.

The estimates for severe and moderate visual impairment are much higher than the 2007 study (2007 SVI: 1.2%; CI 95% 1.0% to 2.4% and 2007 VI: 5.9%; CI 95% 5.3% to 6.5%). Unlike the 2007 results, in Takeo severe visual impairment and moderate visual impairment resulting from un-operated cataract were evenly distributed by gender.

TABLE 16. AGE-ADJUSTED CATARACT SURGICAL COVERAGE (PERSONS), BY GENDER

Visual acuity	Male %	Female %	Total %
VA < 3/60	78.1	59.5	64.7
VA < 6/60	52.2	46.6	48.3
VA < 6/18	22.5	22.9	22.8

After adjustment for age and gender, there was little difference in cataract surgical coverage when compared to the sample estimates. What is particularly evident was that at VA<3/60 and VA<6/60 the coverage was much higher than the national 2007 results (VA<3/60: 54.9%, VA<6/60: 43.7% and VA<6/18 23.4%). The results observed are similar, and in some cases higher, than those reported in recent provincial studies in Vietnam. In addition, it should also be noted that when compared to the 2007 national survey surgical coverage has improved at every level of visual acuity for women. For men it has improved at VA<3/60, but worsened for the VA<6/60 and VA<6/18.

KEY FINDINGS:

- The prevalence of blindness (BCVA), for those aged 50 years and above was calculated to be 2.8% (95% CI 2.2% to 3.3%) in Takeo Province.
- 3,374 people aged ≥ 50 years are estimated to be blind in Takeo Province (835 male and 2,539 female).
- The prevalence of blindness (BCVA) resulting from un-operated cataract, for those aged 50 years and above was calculated to be 1.9% (95% CI 1.5% to 2.3%) in Takeo Province.
- 2,313 people aged ≥ 50 years are estimated to be blind as a result of un-operated cataract in Takeo Province, the majority (1,914) being women.
- The estimated population prevalence of blindness (and blindness caused by un-operated cataract) for Takeo Province was higher in females than males. For severe and moderate visual impairment the estimates appear to be more even.
- At the population level, the estimated cataract surgical coverage has improved when compared to the national 2007 RAAB survey (from 54.9% to 64.7% for VA<3/60).

APPENDICES

APPENDIX 1. STANDARD RAAB TRAINING SCHEDULE

DAY 1: SURVEY DESIGN AND PLANNING, SELECTION OF CLUSTERS

Participants: organisers, survey coordinator, data entry clerks, team leaders of survey teams

Morning

- Background and principles of RAAB
- Quick overview of survey methodology
- Principles of the software package

Afternoon

- Calculation of sample size
- Proposal of sample design
- Selection of clusters
- Selection of cluster for field practice (inform local leaders)
- planning for inter-observer variation assessment

DAY 2: TRAINING OF FIELD STAFF

Participants: survey coordinator, data entry clerks, all members of survey teams

Morning

- How to complete the survey form
- Protocol for examination of subjects
- Exercise: visual acuity screening and examination

Afternoon

- How to conduct the survey in the villages
- Preparations for inter-observer variation assessment
- Installation of RAAB software and training of data entry clerk
- Instructions on the use of the RAAB software (data entry clerk)

DAY 3: TRAINING OF FIELD STAFF, INTER-OBSERVER VARIATION

Participants: survey coordinator, data entry clerks, all members of survey teams

Morning

- Inter-observer variation assessment
- Data entry of inter-observer variation records

Afternoon

- Analysis of results
- Discussion of findings with all the teams
- How to conduct the survey in the villages
- Informed consent

DAY 4: FIELD PRACTICE

Participants: survey coordinator, all members of survey teams

Morning

- Practical exercise in one of the selected clusters. If all goes well then this becomes the first completed cluster.

Afternoon

- After field exercise the entire group meets again for 1-2 hours to discuss experiences from the survey work
- Data entry of survey records (data entry clerks)
- Create consistency report
- Practical exercise on use of RAAB software (consistency checks, creation of reports)

APPENDIX 2. AGE AND GENDER STRUCTURE OF THE SAMPLE AND TAKEO POPULATION

The following table describes the age and gender structure of both the sample population and the population of Takeo Province. Population weighting is calculated as (Population (%)/Sample (%)). Weighting can be applied at an individual level to adjust the sample to be representative of the overall population.

Age	Gender	Sample (n)	Sample (%)	Population (N)	Population (%)	Weighting (frequency)
50-54	Male	379	8.5	11,559	9.4	1.11
	Female	719	16.1	19,187	15.6	0.97
55-59	Male	227	5.1	10,658	8.7	1.71
	Female	556	12.4	15,958	13.0	1.04
60-64	Male	270	6.0	8,583	7.0	1.16
	Female	505	11.3	12,392	10.1	0.89
65-69	Male	243	5.4	6,823	5.6	1.02
	Female	410	9.2	9,950	8.1	0.88
70-74	Male	195	4.4	4,962	4.0	0.93
	Female	352	7.9	7,573	6.2	0.78
75-79	Male	134	3.0	3,370	2.7	0.92
	Female	205	4.6	5,210	4.2	0.93
80+	Male	90	2.0	2,407	2.0	0.97
	Female	186	4.2	4,176	3.4	0.82
Total		**4,471**	**100.0**	**122,808**	**100.0**	**1.00**

APPENDIX 3. PRINCIPAL CAUSE OF VISION LOSS (IN PERSON), BY DISTRICT & COMMUNE

The following table lists the three most frequent principal causes of vision loss (in person) (PVA < 6/18), by district and commune. This is purely to provide absolute numbers to in-country partners to determine if any locations require any public health interventions.

All other causes of vision loss, besides un-operated cataract, refractive error and other posterior segment diseases only accounted for 32 cases.

		Principal causes of vision loss (in person)			
District	**Commune**	**Cataract (un-operated)**	**Refractive Error**	**Other posterior segment diseases**	**Total Examined**
Angkor Borei	Angkor Borei	6	3	2	47
	Ba Srae	7	3	0	50
	Kouk Thlok	1	5	0	48
	Preaek Phtoul	2	1	0	46
	Prey Phkoam	4	4	0	49
Bati	Chambak	9	3	0	48
	Champei	22	1	0	50
	Doung	14	2	0	50
	Komar Reachea	16	2	0	46
	Krang Leav	12	2	0	47
	Krang thnong	11	1	0	45
	Lumpong	12	0	0	46
	Pea Ream	16	3	0	47
	Pot Sar	15	1	0	49
	Souphi	10	2	0	45
	Tang Doung	12	2	0	48
	Trapeang Krasang	9	2	0	48
	Trapeang Sab	35	4	1	97
Bourei Cholsar	Chey Chouk	4	4	0	46
	Kouk Pou	9	7	0	48
Doun Kaev	Baray	15	5	0	50
	Roka Knong	12	6	0	94
	Roka Krau	9	4	2	50
Kaoh Andaet	Krapum Chhuk	10	3	0	48
	Pech Sar	6	6	0	49

	Prey Khla	13	2	0	48
	Romenh	2	3	0	49
	Thlea Prachum	7	4	0	49
Kiri Vong	Angk Prasat	7	1	0	46
	Kampeaeng	11	0	0	47
	Kiri Chong Kaoh	9	3	1	47
	Kouk Prech	8	1	0	49
	Phnum Den	8	4	0	47
	Preah Bat Choan Chum	19	7	1	144
	Prey Rumdeng	18	4	0	96
	Saom	13	1	2	47
	Ta Ou	8	0	0	49
Prey Kabbas	Ban Kam	10	1	0	50
	Champa	6	9	0	48
	Char	18	5	0	48
	Kampeaeng	15	9	0	48
	Kampong Reab	7	5	1	46
	Kdanh	11	7	0	49
	Prey Kabbas	8	7	0	48
	Prey Lvea	15	1	3	46
	Prey Phdau	4	6	0	47
	Snao	15	5	0	47
	Tang Yab	11	1	0	48
Samraong	Boeng Tranh Khang Cheung	22	0	1	96
	Cheung Kuon	9	3	0	49
	Chumreah Pen	28	4	1	97
	Khvav	18	2	0	49
	Lumchang	14	1	2	49
	Rovieng	21	3	0	98
	Sla	8	8	0	50
	Soeng	3	3	0	49
	Trea	12	4	0	49
Tram Kak	Angk Ta Saom	14	3	0	98
	Cheang Tong	5	2	0	48
	Kus	6	4	0	49
	Leay Bour	10	3	0	96
	Nhaeng Nhang	10	5	0	49

	Otdam Souriya	2	0	0	50
	Ou Saray	13	0	1	48
	Popel	2	1	0	49
	Srae Ronoung	15	3	1	96
	Ta Phem	8	2	0	47
	Tram Kak	4	6	1	49
	Trapeang Kranhung	7	2	0	46
	Trapeang Thum Khang Cheung	8	5	0	93
Treang	Angk Kaev	7	2	0	49
	Angkanh	5	4	0	46
	Chi Khmar	9	1	0	49
	Prambei Mom	9	5	0	49
	Prey Sloek	8	4	0	49
	Roneam	4	3	0	49
	Sambuor	8	3	1	49
	Sanlung	8	9	0	49
	Smaong	8	3	0	47
	Srangae	11	4	0	48
	Thlok	13	4	1	49
Total		**850**	**268**	**22**	**4,471**

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