

**MINISTRY OF HEALTH  
MEDICAL SERVICE ADMINISTRATION**

**NATIONAL SURVEY ON  
AVOIDABLE BLINDNESS  
VIET NAM, 2015**

Using the Rapid Assessment for  
Avoidable Blindness (RAAB) methodology

**This survey was implemented by local ophthalmologists under supervision of:**

Medical Service Administration  
of Viet Nam Ministry of Health  
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## Foreword

Visual impairment and blindness has caused serious consequences for health and to individuals and society. Although 80% of all causes of visual impairment are preventable and curable, according to WHO's estimation in 2010 there were 285 million people visually impaired, of which 39 million were blind. The Rapid Assessment of Avoidable Blindness Survey in Viet Nam 2007 indicated that, the blindness prevalence was 3.1% among people aged from 50 years old and above, which was equivalent to 385,000 people suffering from bilateral blindness. More than 1.6 million people in this age group were suffering from visual impairment. Ministry of Health Viet Nam approved the National Action Plan for Blindness Prevention and Control period 2010-2013 to provide guidance and support in reducing the burden of avoidable blindness.

Rapid Assessment of Avoidable Blindness Survey in Viet Nam 2015 was conducted to provide updated information on current situation of avoidable blindness, which is very important to the development of Strategy of Blindness Prevention and Control in the new period. This survey will help Ministry of Health and other eye care partners in evaluating the impact of blindness prevention and control activities in the last period, as well as to provide necessary information for developing action plan in the new period.

We highly appreciated the great contribution to the success of this survey made by international and national organizations, namely World Health Organization and Non-government organizations from Eye care Working Group, Viet Nam National Institution of Ophthalmology, provincial Ophthalmology hospitals and provincial eye care centers.

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## Main findings and recommendations

### Introduction

Viet Nam has a long history of conducting population-based surveys on blindness and visual impairment (Table 1). Earlier surveys were conducted in 1986, 1990, 1995, 2000-'02, 2007-'08 and 2015. The first three surveys covered all age groups, the last three series of 2000-'02, 2007-'08 and 2015 all used the same methodology and protocol and the findings are comparable. These RAABs were well spread over all ecological zones of the country. For each of these three series of surveys, national data has then been estimated based on the weighted average of the provincial data. These national ('weighted average') data have been compared in Table 33. This same table also shows that RAABs were repeated in a number of provinces, so that over the years, trends in reduction of blindness could be measured more accurately.

With a total population of 91.582 million in 2015, constituted of 54 different ethnic groups and spread over 6 distinct ecological zones, there is no real 'average' Vietnamese citizen. If one national survey of blindness and visual impairment was conducted, it would provide just such an 'average' picture. Because eye care services are organized at provincial level, and the variation by ethnic group, climate, cultural and socio-economic factors and distance to health and eye care services is likely to be less in each province, it is much more useful to conduct provincial population-based surveys and use these findings for evaluation of past services and planning of future intervention activities at provincial level.

The sample size for each of the provincial RAABs has increased from 1,800 in 2000-'02 and in 2007-'08 to 2,000 in 2015, to compensate for the expected reduction in prevalence of blindness. The sample size of 2,000 should provide enough power to estimate a prevalence of 3.1% (the weighted average prevalence in 2007-'08) with a variation of 32% and a non-compliance of 10% at 95% probability (see Figure 3). The combined data will provide a weighted average estimate, that may be applied to entire Viet Nam, with a much higher accuracy. Most provinces showed a Design Effect of around 1.5 or less, as expected. Some provinces showed a much higher Design Effect, like Vung Tau (1.80), Binh Duong (1.93) and Ha Tinh (4.21), suggesting a very uneven distribution of bilateral blindness in these provinces (Table 10).

Separate reports were produced for each of the 14 provinces, and these findings should be used to evaluate past services and to provide baseline data for future planning of eye care services in the individual provinces. This report compares the findings from the 14 individual provinces, calculates weighted averages a proxy for the situation in entire Vietnam, and compares results from individual provinces and the weighted averages from this 2015 survey with earlier surveys in 2007-'08 and 2000-'02 that used the same survey methodology.

In this report the main focus lies on the variation between the provinces, the extrapolation of the findings from the provinces to national level, and the comparison between the surveys in 2000-'02, 2007-'08 and 2015. For conclusions, recommendations and planning in individual provinces, findings in the RAAB reports of each of these provinces should be analysed.

### Main findings:

The findings below are focusing on the national (weighted average) trends as indicated in the surveys of 2000-'02, 2007-'08 and 2015. This may not do justice to the variations between the different provinces, but these will be covered in the reports of each of the 14 individual provinces.

The good news is that the prevalence of bilateral blindness, of cataract blindness; in people aged 50+, has reduced significantly between 2000 and 2007 and between 2007 and 2015; and reduction trends has been found in the prevalence of cataract low vision. However, the bad

news is that the magnitude of reduction is lower in 2007-2015 than in 2000-2007; the estimated number of people with cataract blindness between those two period remained the same and bilateral low vision due to cataract nearly doubled between 2007 and 2015. This indicates that the cataract backlog is on the increase.

**1. The prevalence of bilateral blindness and the number of blind people went down.**

The adjusted prevalence of blindness (presenting VA<3/60 in the better eye) varied between 1.1% in Ha Tinh, Quang Ngai and Lam Dong province and 2.6% in Dien Bien province. The weighted average was 1.8%. The weighted average prevalence in males (1.2%) was significantly lower than the weighted average prevalence in females (2.2%). (table 11). The national estimates (weighted average) show a significant reduction in the adjusted prevalence of bilateral blindness from 4.1% in 2000-'02 to 3.1% in 2007-'08, and again a significant reduction between 2007-'08 and 2015 (1.8%) (Table 33). That is a reduction with 57% between 2000-'02 and 2015. Despite the ageing trend, also the estimated number of cases went down from 443,706 in 2000-'02 to 370,640 in 2007-'08 and 329,333 in 2015, a reduction of 26% (Figure 9, Figure 10).

The individual provinces with a repeat RAAB all show a decline in prevalence, but due to the small sample size in each province, the variation is wider and differences are less likely to be significant. Nevertheless, the decline is significant between 2007-'08 and 2015 in Phu Tho and Bac Ninh, and between 2000-'02 and 2015 in Gia Lai and in Tien Giang (Table 33).

**2. The prevalence of cataract blindness went down, but the reduction of people bilateral blind from cataract stagnated.** The adjusted prevalence of bilateral cataract blindness (best corrected VA<3/60 in the better eye) varied between 0.5% in Quang Ngai and Lam Dong province and 1.9% in Dien Bien province. This difference is significant ( $p<0.05$ ). The weighted average prevalence was 1.0%, with the prevalence in males (0.6%) significantly lower than the weighted average prevalence in females (1.4%) (Table 14).

The adjusted prevalence of bilateral cataract blindness in Viet Nam in 2015 (1.0%) improved significantly compared with 2007 (1.6%) and with 2000 (2.3%), a reduction by 57% between 2000-'02 and 2015, despite the aging trend that caused an increase of people at risk for cataract blindness by over 25%. The estimated number of bilateral cataract blind people in Viet Nam reduced from 247,659 in 2000 to 192,298 in 2007 but remained stable at 193,987 in 2015 (Table 35, Figure 9, Figure 10).

The main contribution in the decline of the prevalence of blindness was the increase of cataract operations from 84,633 in 2007 (CSR: 1059) to 169,597 in 2014 (CSR: 1,869). However, this was clearly not sufficient to compensate for the fast increase of people at risk for cataract due to the aging trend.

**3. Prevalence of low vision reduces slightly, but number of cases increases by 500,000.**

The weighted average prevalence of low vision reduced significantly from 14.7% in 2000 to 13.6% in 2007 and further to 11.4% in 2015. Some provinces showed a reduction in prevalence while others show an increase. However, the estimated number of people aged 50+ with bilateral low vision, which reduced slightly from 1.583 million in 2000 to 1.570 million in 2007, increased to 2.099 million in 2015. (Table 34, Figure 9, Figure 10). The national prevalence of low vision due to cataract reduced slightly from 6.3% in 2000 to 6.0% in 2007 and remained at 6.0% in 2015. However, the number of people aged 50+ with bilateral low vision increased slightly from 678,079 in 2000 to 695,131 in 2007, but nearly doubled to 1.131 million in 2015 (Table 36). That clearly shows that the present

capacity of the eye care services is not sufficient to compensate for the increased incidence, caused by the ageing trend. That clearly shows that the present capacity of the eye care services is not sufficient to compensate for the increased incidence, caused by the ageing trend.

4. **Cataract Surgical Coverage for bilateral blind persons increased, but hardly for bilateral low vision.** The CSC (persons,  $<3/60$ ) varies between 41% in Dien Bien and 84% in Tien Giang, with a weighted average of 74%. There is a considerable variation between provinces, but the CSC in males and in females does not differ much. The average weighted CSC in persons at VA $\geq 6/60$  is 59% and in persons at VA $<6/18$  is 37%. These levels are relatively low, indicating that the number of cataract operations at these levels of VA is limited (Table 18).

The average Cataract Surgical Coverage (persons) with BCVA $<3/60$  in Viet Nam increased from 52% in 2000-'02 to 67% in 2007-'08 and further to 74% in 2015 (Table 37). Similar increases were seen in all provinces where repeat RAABs were conducted, except for Nghe An and Bac Ninh province where the CSC declined.

The average CSC (persons)  $<6/60$  and CSC (persons)  $<6/18$  remain relatively low at 59% and 37% respectively, and there was a minimal change compared to 2007-'08. This indicates that less people come for surgery with cataract and BCVA  $<6/60$  and only few with BCVA  $<6/18$ . In some provinces (Bac Ninh, Binh Dinh, Nghe An, Vung Tau and Binh Phuoc) there is even a decline in CSC. This indicates that with the increase in cataract patients with BCVA $<6/60$  and  $<6/18$  due to the ageing trend, the eye care services are not able to keep up with the demand.

The proportion of IOL implantations increased from 47% in 2000-'02 to 98% in 2015 (Table 41). Although this modern technique permits cataract surgery at a much earlier stage, allowing patients to be operated before they actually become disabled and thus maintain their productivity, it seems not to be used that much in early stage cataract.

5. **Present output on cataract surgery is not sufficient and of poor quality.** The low decline in the number of people with bilateral blindness, the increase in the number of people with bilateral low vision and the stagnating CSC at  $<6/60$  and  $<6/18$  level are all indicators that the present output is barely enough to cover the incidence, but not enough to reduce the backlog of unoperated cataract. Visual outcome does not meet the WHO standards. The main barriers why people do not come for cataract surgery are 'fear for surgery or for poor outcome', 'cannot afford' and 'no access to treatment because of distance'. These all point at a provider's problem in services delivery.
6. **Visual outcome after cataract surgery still poor.** The proportion of good outcome (presenting VA $\geq 6/18$  in operated eye) in 2015 varied from 41% in Bac Ninh to 72% in Quang Ngai. On average 60% of the patients can see 6/18 or better in the operated eye, 22% sees  $<6/18$ -6/60 and 18% cannot see 6/60. This is well below the recommended levels of 80%, 15% and 5% respectively. Some provinces have proportions of good outcome below 50% and poor outcome of 25% and higher. With pinhole, the weighted average good outcome increased with 11%, varying from 2% in Nam Dinh to 21% in Bac Ninh. Overall, borderline outcome reduced by 42% and poor outcome by 11% with pinhole, indicating that adequate optical services and biometry could improve outcome considerably. (Table 26-28).

Visual outcome after cataract surgery in 2015 (60% good outcome) improved compared to 2007 (51%) and 2000 (36%). The proportion of IOL's implanted increased from 47% in

2000 to 84% in 2007 and to 98% in 2015. Surgical techniques and equipment also improved during the past 15 years. In the light of these developments it is disappointing that the visual outcome has not improved more. (Table 40).

**7. The principal cause of blindness did not change much between 2000-'02 and 2015.**

Untreated cataract is by far the main cause of avoidable blindness and low vision in Viet Nam. This can be attributed to the increasing number of people at risk for cataract and the inadequate number of cataract operations. Uncorrected aphakia is declining, because nearly all surgeries are with IOL these days. Complications from cataract surgery are increasing, possibly one of the causes of poor outcome, and also contributing to fear for surgery or poor outcome in the public. Blindness due to trachoma and phthisis are declining, as expected, while diabetic retinopathy and AMD are increasing. Glaucoma remains stable (Table 42).

The 2015 RAABs showed moderate variation in causes between provinces (Table 19). Untreated cataract is the main cause in all 14 provinces (48-87%) and blindness due to complications varied between 0 and 14%. Blindness due to Trachoma seems limited to a few provinces. Glaucoma also varies between provinces, while DR and AMD are more stable.

**8. Spectacle coverage is very low.** The weighted average spectacle coverage – people aged 50 years and older who actually use glasses – is 30%, but it varies hugely between 1% in Dien Bien and 61% in Binh Duong (Table 31). Table 28 shows that considerable improvement of visual outcome can be achieved with adequate optical correction. This includes adequate biometry to measure the optimal power of the IOL to be implanted. These figures indicate that optical services are hugely inadequate in many provinces.

**9. Females have significantly more blindness than men.** In 2015, the weighted average adjusted prevalence of blindness in males (1.2%(1.0-1.4)) was significantly lower than in females (2.2%(2.0-2.5)). In all provinces, the adjusted prevalence of blindness was lower in males compared to females and this difference was significant in Nam Dinh, despite the small sample size. An estimated 99,782 males and 229,551 females are bilaterally blind (Table 11).

Also the prevalence of bilateral cataract blindness and of low vision due to cataract is significantly lower in males (0.6%) compared to females (1.4%). 47,527 males and 146,460 females are blind due to cataract (Table 14).

However, the weighted average CSC for persons and for eyes is similar in males and females for BCVA<3/60, <6/60 as well as for <6/18 (Table 17, 18). The conclusion must be that the excess of (cataract) blindness in females is caused by the aging trend. There are nearly 2 million more females than males aged 50+ in Viet Nam and they live longer compared to males as well. Therefore, there are more women at risk to develop cataract, and, because they are older, they have a higher risk as well.

**10. The main barriers to cataract surgery are 'Fear', 'Cannot afford', 'No access' and 'No need'.** There is considerable variation between provinces in reasons why people with pinhole VA<6/60 due to cataract do not come for cataract surgery (Table 24-25). The main barriers given are 'Fear' for surgery or for poor outcome (25%), 'Cannot afford' (23%), 'No access' (21%), 'Need not felt' (19%) and 'Unaware' (9%). 'Fear' is the most frequent barrier in provinces where visual outcome is relatively poor. Improvement of outcome and awareness campaigns may reduce fear and motivate more patients to come for surgery.

Effective health information campaigns about the benefits of cataract surgery are likely to generate more demand for cataract surgery. At the same time, the quality of the surgery needs to be improved to reduce the fear for poor outcome, the distribution and availability of eye care services has to be expanded to provide better access, especially for patients in remote areas, and the costs have to be reduced to attract more patients.

### Conclusion and Recommendations

1. **Cataract output needs to be increased considerably.** The past and current output of cataract operations is barely enough to cover the people bilaterally blind due to cataract, but totally inadequate to cover the present and future demand of people with cataract and low vision.
  - a. Increase the Cataract Surgical Rate from the current 1,869 to at least 4,000-5,000 per year.
  - b. Expand the VA indication for cataract surgery to <6/60.
  - c. Start provincial and nation-wide health education campaigns to inform the public about the advantages of timely cataract surgery
2. **Visual outcome of cataract surgery needs to be improved.** The proportion of good outcome after cataract surgery is far below the 80% recommended by the WHO (Table 40). Also the proportion of blindness due to complications after cataract is disturbingly high. Poor outcome undermines the confidence and trust of the public in the eye care services and this should be avoided at all cost.
  - a. Introduce mandatory monitoring of visual outcome after cataract surgery.
  - b. Investigate the reasons for poor visual outcome after cataract surgery in some provinces and take appropriate action to improve outcome
3. **Reduce the costs of cataract surgery.** Many countries are using the high-volume cataract surgery practices developed in India and Nepal with the low cost. This ensures optimal use of cataract surgeons and mid-level ophthalmic staff. Because of the high volume, the costs per operated patient are also strongly reduced.
  - a. Introduce high volume high quality surgical facilities.
  - b. Use more low cost surgical techniques like small incision cataract surgery (SICS) for low-income groups.
4. **Equal distribution of eye care services over the country.** There is a strong variation in the availability and use of eye care services between provinces.
  - a. Provinces with weak performance should be investigated about the causes of the poor performance. In case of inadequate resources, these should be provided. In case of ineffective services, management support should be given.
  - b. Make provisions for cataract surgery for poor people and for people in remote areas
5. **Development and use of a robust national Management Information System (MIS) for Eye Care.** Eye care services in a large country like Viet Nam can only be managed effectively if essential information is provided on a regular basis to the managers. This requires a simple, comprehensive and robust computerized MIS system with regular feedback to eye care staff at district and provincial level.
6. **More focus on blindness and visual impairment in women.** Organise special campaigns to mobilize female patients with cataract to come forward and get operated.
7. **Strengthening of optical services.** Supply of glasses to improve vision is one of the most cost-effective interventions and the spectacle coverage needs to be increased.

- a. Identify the reasons why the use of spectacles is so low.
- b. Improve refraction services in provinces where uncorrected refractive error is an important cause of low vision

**8. Identify priorities for intervention.** Correction of refractive errors, trichiasis surgery and cataract surgery are among the most cost-effective medical interventions. These are still the major causes of blindness in Viet Nam and the highest priority should be given to combat these. It has been demonstrated that restoration of sight causes a significant improvement in both the socio-economic status of the operated person, as well as the direct family.<sup>1</sup>

Intervention programmes for glaucoma and diabetic retinopathy are expensive and far less cost-effective than cataract surgery. These should only be started on pilot basis in the most affected provinces and only be expanded when cataract, refractive errors and trichiasis are well under control.

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<sup>1</sup> <http://iceh.lshtm.ac.uk/cataract-impact-study/>

## Chapter 1. Introduction

### 1.1 The current situation on eye care in Viet Nam

The eye care system in Viet Nam consists mostly of public sector and some private eye hospitals. The Viet Nam National Institute of Ophthalmology (VNIO) is the leading institution for blindness prevention and treatment in Viet Nam. The eye care model varies in provinces: there are 63 eye departments in 63 general hospitals. Besides these, there are 25 provincial eye hospitals, 6 eye care centers and 25 eye departments in Social Prevention Centers. Meanwhile, 7 provinces, like Long An, Dong Nai, Dong Thap, Hau Giang, Tay Ninh, Khanh Hoa and Ben Tre do not have any established eye center. In addition, there are 21 private eye hospitals and ophthalmic departments in private general hospitals, mostly concentrated in the big cities.

There are about 1,350 ophthalmologists working in the two health care systems (public and private), giving a rate of 14.7 ophthalmologists per million population. These include about 500 cataract surgeons mostly doing phaco-surgery. Besides, there are 1.350 ophthalmic nurses in the country, giving a rate of 14.7 mid-level ophthalmic personnel per million population. the relative number of ophthalmic staff is sufficient compared with demand but unevenly distributed, mostly concentrated in the cities and plains. Staff is lacking in mountainous and central highlands. Many districts do not have any eye nurse or ophthalmologist.

At provincial level, they do principally cataract surgery and delivery some kind of eye care service. Their capacity of early diagnosis and treatment is still limited. Diseases patterns are very different between regions.

Along with the social-economic development, lifestyle changes are the new challenges appearing in eye care. We need the prognoses in the future the changing of disease model of blindness, from cataract and trachomatous corneal opacity to others like AMD, glaucoma and Diabetic Retinopathy. Because of socio-economic development, public demand will increase to lower the VA threshold for cataract surgery from  $<3/60$  to  $<6/60$  and even to  $<3/18$  in several hospitals, which will cause an enormous increase in workload.

In order to achieve the goal of reducing avoidable blindness, the workload is still huge, from quantity backlog of cataract to visual outcome of surgery. We need the support from Government, NGO's and others, but need a real, recent image of blindness situation of nation, of each province of every geographic area in whole country. But due to the financial resource is limited, we have to choose 14 provinces that presents for the 7 geographic areas in Vietnam.

## 1.2 Earlier surveys

Several surveys on blindness have been conducted earlier in Viet Nam. The surveys in 1986, 1990 and 1995 covered all age groups. The clusters were few and they were large, raising doubts about how representative they were for the total population in these provinces. With such large clusters, the Design Effect tends to become high as well, thereby reducing the accuracy of the estimates.

In 2000-'02 rapid assessments for cataract surgical services (RACSS) were conducted in eight provinces. In 2007-'08 Rapid Assessments for Avoidable Blindness (RAABs) were conducted in 16 provinces, 8 of which were also covered in 2000-'02. In 2015, 14 RAABs were conducted of which 5 were also covered in 2007-'08. Table 1 gives an overview of the main findings of these earlier surveys.

**Table 1.** Blindness surveys in Viet Nam

SURVEY YEAR	1986	1990	1995	2000-'02	2007-'08	2015
<b>Sample size</b>	50,447	15,071	26,606	14,400	28,800	28,000
<b>Sampling unit</b>	Household	Households	Households	Households	Households	Households
<b>Provinces</b>	Hanoi Haiphong Habac Hatay Thanh Hoa Nghe'an HCM city	Thai Binh Ha Nam Ninh Hau Giang Tien Giang Nghe'an Khanh Hoa Haiphong, HCM city	Hanoi Hue HCM city Hatay Hai Hung Soc Trang Tien Giang Haiphong Ninh Thuan Minh Hai Thai Nguyen Yen Bai Gia Lai	Phu Tho Haiphong Hatay Nghe'an Binh Dinh Gia Lai Binh Phuoc Tien Giang	Lao Cai Thai Nguyen Phu Tho Haiphong Bac Ninh Hatay Nghe'an Hue Binh Dinh Gia Lai Binh Phuoc Ho Chi Minh Vung Tau Ninh Thuan Can Tho Tien Giang	Dien Bien Phu Tho Tuyen Quang Bac Ninh Nam Dinh Ha Tinh Quang Tri Quang Ngai Gia Lai Lam Dong Vung Tau Binh Duong Tien Giang Ca Mau
<b>Total no. of clusters (communes)</b>	14	16	24	240	480	560
<b>Coverage</b>		<b>83.7%</b>	<b>94.3%</b>	<b>96.5%</b>	<b>97.4%</b>	<b>97.2%</b>
<b>Cause of blindness</b>						
1. Uncorr. refr. error	3.6%	2.3%	1.2%		2.5%	0.5%
2. Cataract	39.4%	82.3%	70.7%		66.1%	74.0%
3. Complications					4.1%	4.6%
4. Trachoma corn. scar	14.1%	3.1%	5.2%		1.7%	1.5%
5. Other corneal scar	5.5%	2.3%	2.6%		5.6%	4.1%
6. Phtisis					3.2%	0.2%
7. Pterygium						0.6%
8. Glaucoma	6.3%	2.3%	6.3%		6.4%	4.0%
9. Diabetic Retinopathy					0.6%	0.8%
10. ARMD						1.4%
11. Other post. Segm.	8.9%	3.1%	4.2%		9.7%	6.3%
12. Globe / CNS						2.0%
12. Other	22.2%	4.6%	9.8%			
<b>Bilateral Blindness *</b> (in whole population)	<b>0.92%</b>	<b>0.86%</b>	<b>1.25%</b>	<b>0.63%</b>	<b>0.59%</b>	<b>0.43%</b>

\*: Extrapolated to the entire population of Viet Nam in the respective year and assuming that 20% of all blindness occurs in people younger than 50



The first three surveys included people from all ages, the last three surveys focused on people aged 50 years and older. In none of the surveys listed above the clusters were randomly selected from all communes in entire Viet Nam. It is questionable how representative the results are for entire Viet Nam. In the last three surveys the cluster size reduced from over 1,000 to 60 and 50 in 2015, while the number of clusters increased from 240 in 2000-'02 to 560 in 2015. In the last three surveys the provinces covered were well distributed over the country and each geographical zone was included. In these surveys weighted average indicators were calculated which could then be extrapolated to the population aged 50+ of entire Viet Nam, which may be considered as indicative.

### 1.3 Definitions

The visual acuity (VA) measurements in RACSS and RAAB surveys are using the following definitions, which conform the World Health Organization's guidelines:

**Blindness:** visual acuity  $<3/60$  in the better eye with available correction (presenting vision).

This includes blindness due to refractive errors. The visual field is not measured. Visual acuity is also measured with pinhole correction as a proxy for best corrected vision. The RAAB software also calculates the prevalence of pinhole VA  $<3/60$ , the earlier WHO definition.

**Severe Visual Impairment (SVI):** visual acuity  $<6/60$  but equal to or better than  $3/60$  in the better eye with available correction (presenting vision).

This includes SVI due to refractive errors. The visual field is not measured. Visual acuity is also measured with pinhole correction as a proxy for best corrected vision.

**Moderate Visual Impairment (MVI):** visual acuity  $<6/18$  but equal to or better than  $6/60$  in the better eye with available correction (presenting vision).

This includes MVI due to refractive errors. The visual field is not measured. Visual acuity is also measured with pinhole correction as a proxy for best corrected vision.

**Mild or Early Visual Impairment (EVI):** visual acuity  $<6/12$  but equal to or better than  $6/18$  in the better eye with available correction (presenting vision).

This includes EVI due to refractive errors. The visual field is not measured. Early visual acuity is also measured with pinhole correction as a proxy for best corrected vision..

**Low vision:** visual acuity  $<6/18$  but equal to or better than  $3/60$  in the better eye with available correction (presenting vision).

This includes low vision due to refractive errors. It is equal to SVI + MVI. The visual field is not measured. Visual acuity is also measured with pinhole correction as a proxy for best corrected vision.

**Functional Low Vision (FLV):** visual acuity <6/18 but equal to or better than light perception in the better eye

FLV is permanent low vision that is not correctable or treatable, requiring low vision aids and/or mobility training.

## Chapter 2. RAAB - Survey design

### 2.1 The RAAB methodology

The Rapid Assessment of Avoidable Blindness (RAAB) is a simple and rapid population-based survey method that can provide data on the prevalence and causes of blindness. More than 230 RAABs have been successfully undertaken in over 40 countries, including Viet Nam in 2000 and 2007.

The main aims of RAAB are:

- to estimate the prevalence and causes of avoidable blindness and visual impairment in people aged 50 and above
- to assess cataract surgical coverage
- to identify the main barriers to the uptake of cataract surgery
- to measure visual outcome after cataract surgery.

Using sound epidemiological methods, these data are used to design and monitor eye care programmes in the surveyed area. RAAB focuses primarily on the prevalence of avoidable blindness because the aim of VISION 2020: The Right to Sight is to eliminate 80 per cent of avoidable blindness by the year 2020. RAAB is rapid, because it only includes the over-50 age group, where the prevalence is the highest, so that sample size requirements are minimised. Also, data analysis is automatic, fast and does not require a statistician. RAAB is simple, because it uses straightforward sampling and examination techniques, and RAAB is relatively cheap, as it does not take a long time, does not require expensive ophthalmic equipment, and can be carried out by local staff.

A RAAB is ideally carried out at the level of a district or province that has a population size of 0.5 to 5 million people. The sample size required is usually between 2,000 and 5,000 people. Clusters of people to include in the survey are randomly selected from across the survey area. Each day, a team visits one census enumeration area, a small, clearly demarcated area with a known population, often corresponding to a village or a town suburb. The team goes door to door until it has visited 50 people aged over 50 (the cluster). All selected people undergo visual acuity (VA) screening with a tumbling E chart and their lenses are examined. When the VA is lower than 6/12, an ophthalmologist determines the main cause. The information collected in the RAAB is used to estimate the prevalence and causes of blindness in the survey area. Data from a RAAB can also be used to assess outcome after cataract surgery, barriers to cataract surgery, and cataract surgical coverage.

RAAB uses cluster sampling and the RAAB software package contains an automated programme to select a list of population units for the survey from the complete list of enumeration areas in the area (sampling frame). Sampling is effected through probability proportionate to size, so that population units with a larger population size have a greater chance of being included than those that are smaller.

Households within clusters are selected through compact segment sampling. A map is obtained of the enumeration unit, showing major landmarks and the approximate distribution of neighbourhoods and households. The enumeration area is then divided into segments, so that each segment includes approximately 50 people aged over 50. For instance, if 300 people aged over 50 live in the area, it will be divided into six segments. One of the segments is chosen at random by drawing lots. The team, accompanied by a village guide, then visits all households in the segment door-to-door, until 50 people aged over 50 are identified. If the segment does not include 50 people aged over 50, another segment is chosen at random and sampling continues. If people are not available when the team arrives at the house, the team should revisit them so that they can be screened. This compact segment sampling is less subject to bias and has therefore replaced the 'random walk' method that was used in RACSS.

All eligible people undergo a standardized ophthalmic examination in their households. The team measures a distance of 3 and 6 meters with a rope. Visual acuity (VA) is measured with a Snellen tumbling E chart, using opto-types size 12, 18 and 60 at a 6 or 3 metre distance. This allows each eye to be classified as:

- can see 6/12
- cannot see 6/12 but can see 6/18
- cannot see 6/18 but can see 6/60
- cannot see 6/60 but can see 3/60
- cannot see 3/60 but can see 1/60
- light perception
- no light perception.

If the person cannot see 6/12 in either eye with available correction, pinhole vision will also be measured. The lens status of all participants is assessed by both torch and distant direct ophthalmoscopy, by an ophthalmologist in a shaded or dark environment. All eyes that cannot see 6/12 with available correction are examined with a direct ophthalmoscope (and with a portable slit lamp if available) to assess the cause of the visual impairment. Only the primary cause of blindness or visual impairment is recorded. If there are two or more primary disorders, equally contributing to the visual loss, then the WHO convention is to record the cause that is easiest to treat or to prevent. All information is recorded on a standardised form. People who have a vision-impairing cataract are asked why they have not undergone cataract surgery, and up to two responses are marked per person in pre-coded categories. Those who have undergone cataract surgery are asked about the details of their operation (e.g. place, age, type of operation, cost of surgery). People with a treatable eye condition should be referred for appropriate treatment.

Each team should consist of one ophthalmologist, who can diagnose the eye diseases, and of one assistant who can measure visual acuity. The teams will be accompanied every day by a local village guide. It is useful to have between two and five teams to minimise the duration of fieldwork. All teams are trained for at least four days, including a field practice where all teams cover one selected cluster. Training is conducted by a certified RAAB trainer. The survey will usually take between 4 and 12 weeks, depending upon the sample size and the number of teams. RAAB 2015 was conducted in 3 months from end of May to early August 2014,

### **Data entry and data analysis**

A special software programme is developed for data entry and automatic standardised data analysis. In-built consistency checks and validation through double entry are used to identify and correct any errors in recording and data entry. Automated data analyses are performed on the cleaned data set.

These produce estimates of:

- prevalence of blindness, severe (SVI) and moderate visual impairment (MVI)
- age- and sex-adjusted prevalence of blindness, SVI, and MVI
- prevalence of avoidable blindness, SVI, and MVI
- causes of blindness, SVI, and MVI
- cataract surgical coverage
- outcome after cataract surgery
- causes of poor outcome
- satisfaction with cataract surgery
- barriers to uptake of cataract surgery.

All tables report results for men and women separately, as well as together.

A report of the RAAB, including the results, should be written and circulated to stakeholders in the programme. The results from the RAAB should be used to develop a VISION 2020 action

plan, to plan the cataract surgical services required, or to identify problems, such as poor outcomes after surgery or significant barriers to surgery, so that strategies can be developed to overcome these difficulties.

## 2.2 Population of Viet Nam

The total population of Viet Nam in 2015 is estimated at 91,582,000 with 45,410,000 males (49.6%) and 46,172,000 females (50.4%). On average 30.77 million people (33.6%) live in urban areas and 60,83 million (66.4%) in rural areas. The average annual growth rate for the period 2009-'14 is projected at 1.09%.<sup>2</sup> Using the population projections for 2015, 20.4% of the total population of Viet Nam is 50 years or older (18,717,000). Of all males 18.6% is 50+ (8,439,000), of the females 22.3% (10,278,000).<sup>1</sup>

**Figure 1.** Increase in the proportion of population aged 50 years and older, by sex, between 2009 and 2040 <sup>1</sup>

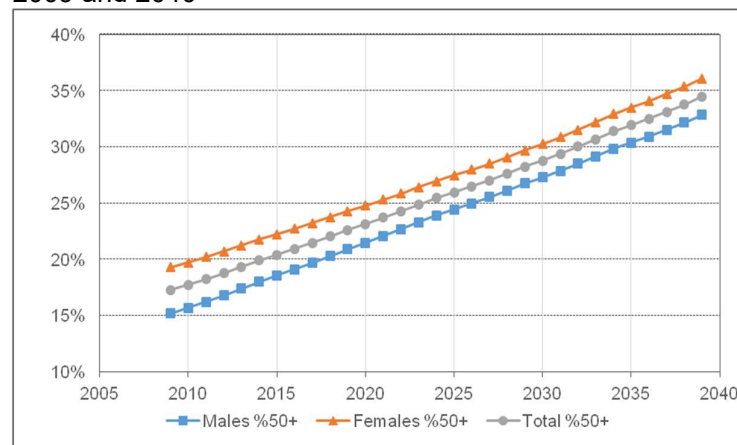
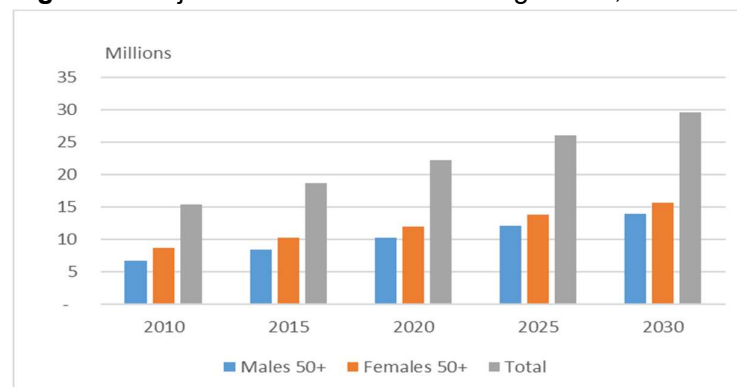


Figure 1 shows that the proportion of the population aged 50 years and older is projected to double from 17.3% in 2009 to 34.5% in 2039. The actual number of people aged 50+ is projected to grow from 14,851 million in 2009 to 36,868 million in 2039, an increase of nearly 2.5 times. In 2015, 8,439 million males are 50 or older and 10,278 million females (Figure 2). The total

population (all ages) is projected to increase from 85.85 million in 2009 to 106.89 million in 2039, an increase of 1.25 times. Viet Nam is experiencing the aging trend and its population is aging rapidly. This will cause a sharp increase in the incidence of age related diseases, including blindness and visual impairment.

**Figure 2.** Projected males and females aged 50+, between 2010 and 2030



The life expectancy increases from 71 in 2005 to 79 in 2040; for males from 68 to 76 and for females from 74 to 82 over the same period.<sup>3</sup> This will also increase the incidence of age related eye diseases, visual impairment and blindness.

Eye care services and their output throughout Viet Nam

have to increase as well in order to balance this annual increase in incidence and to reduce the backlog further.

<sup>2</sup> Population Projections for Viet Nam 2009 – 2049. Ministry of Planning and Investment. General Statistics Office, Hanoi, February 2011

<sup>3</sup> US Census Bureau, International Database.

<https://www.census.gov/population/international/data/idb/informationGateway.php>

### 2.3 Selection of 14 provinces

For the surveys on blindness and low vision in 2015, 14 provinces were selected where a RAAB would be conducted. Table 2 shows these 14 provinces (third column) and the total projected population of the selected province and the region in 2015.

These 14 provinces were selected purposely for the RAAB 2015 survey. Five of these provinces (Bac Ninh, Phu Tho, Gia Lai, Vung Tau and Tien Giang) also had a RAAB survey in 2007-'08 and three (Phu Tho, Gia Lai and Tien Giang) in 2000 – '02. (see Table 1). Findings from these surveys in 2015 can easily be compared with those from 2007–'08 and 2000 – '02 to measure any changes in blindness indicators since then. The other provinces were selected to provide an even spread over the different regions of Viet Nam. All ecological zones have one or more provinces where a RAAB is conducted.

**Table 2.** Provinces selected for RAAB surveys in 2015 <sup>1</sup>

Region	Population in Region	Province	Population in province	Population 50+ in province	% 50+
Northern Midlands and Mountains	11,743,000	Tuyen Quang	758,235	147,450	19.4
		Phu Tho	1,365,105	319,238	23.4
		Dien Bien	532,211	68,415	12.9
Red River Delta	20,770,000	Bac Ninh	1,096,580	239,611	21.9
		Nam Dinh	1,876,655	504,044	26.9
North and South Central Coast	19,494,000	Ha Tinh	1,235,828	313,904	25.4
		Quang Tri	618,131	128,850	20.8
		Quang Ngai	1,234,996	262,570	21.3
Central Highlands	5,628,000	Gia Lai	1,407,289	199,239	14.2
		Lam Dong	1,297,786	220,488	17.0
Southeast	16,077,000	Vung Tau	1,086,968	156,803	16.5
		Binh Duong	1,929,721	225,345	11.7
Mekong River Delta	17,887,000	Tien Giang	1,722,767	399,073	23.2
		Ca Mau	1,258,170	239,608	19.0
<b>Viet Nam</b>	<b>91,582,000</b>		<b>17,420,442</b>	<b>3,472,742</b>	<b>21.0</b>

Although the 14 provinces were not selected at random from entire Viet Nam, they are well spread over the country and each region is represented. The total population in the 14 sampled provinces is 17.42 million, 19.0% of the total population of Viet Nam. With a total sample size of 28,000 (560 clusters of 50 people from 14 provinces well spread over entire Viet Nam), the weighted average findings from all 14 provincial RAABs should give a good picture of blindness in entire Viet Nam. Besides that the data for each province provide valuable information to monitor progress in provinces that were surveyed earlier and to start need based planning of eye care services in the new provinces.

The province is the management unit for eye care services in Viet Nam and has an average population of 1.45 million people (all age groups).

## 2.4 Location of 14 provinces

Figure 3 shows the location of the selected provinces and their distribution over the country.

**Figure 3.** Map of all provinces of Viet Nam and those selected for RAAB survey in 2015

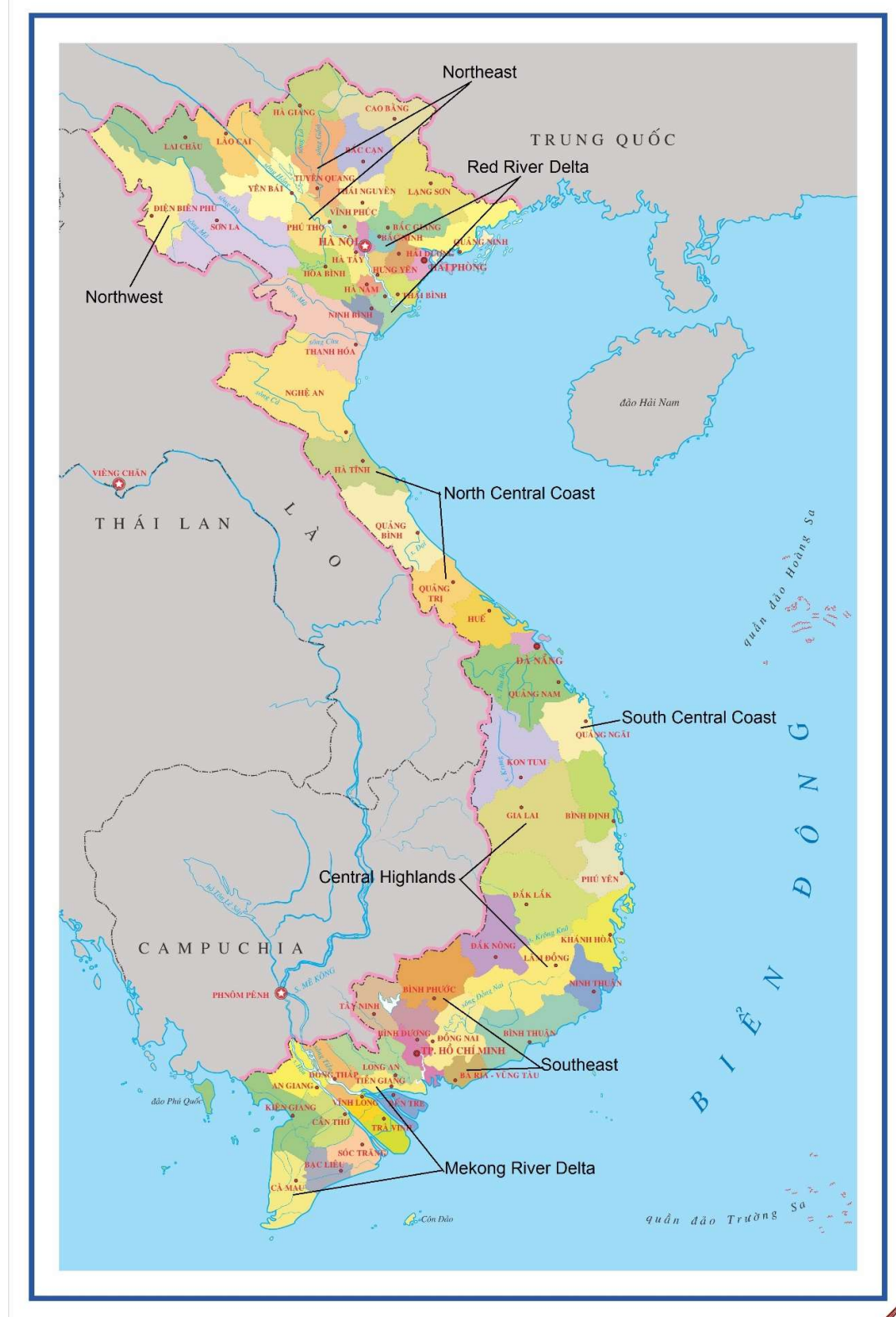


Table 3 shows the projected population in each of the 14 selected provinces in 2015, and the composition by gender. On average 49.5% of the total population is male, varying from 48.1% in Binh Duong to 50.4% in Tuyen Quang province.

**Table 3.** Total population by province in 2015 and % males <sup>1</sup>

Province	Population in 2015			
	Male	Female	Total	% Male
Tuyen Quang	381,812	376,423	758,235	50.4
Phu Tho	675,373	689,732	1,365,105	49.5
Dien Bien	266,153	266,058	532,211	50.0
Bac Ninh	540,782	555,798	1,096,580	49.3
Nam Dinh	922,962	953,693	1,876,655	49.2
Ha Tinh	615,184	620,644	1,235,828	49.8
Quang Tri	306,197	311,934	618,131	49.5
Quang Ngai	612,207	622,789	1,234,996	49.6
Gia Lai	706,295	700,994	1,407,289	50.2
Lam Dong	650,073	647,713	1,297,786	50.1
Vung Tau	543,779	543,189	1,086,968	50.0
Binh Duong	928,428	1,001,293	1,929,721	48.1
Tien Giang	849,670	873,097	1,722,767	49.3
Ca Mau	632,569	625,601	1,258,170	50.3
<b>Total</b>	<b>8,631,484</b>	<b>8,788,958</b>	<b>17,420,442</b>	<b>49.5</b>

## 2.5 Weighting factors

The total population in the 14 provinces varies from 532,211 in Dien Bien to 1,929,721 in Binh Duong Province. In each province the same sample size of 2,000 people aged 50 years and older is used: 40 clusters of 50 people aged 50+. This design is chosen to provide fairly reliable and comparable data on blindness and low vision at provincial level.

This survey was not designed to calculate a prevalence estimate for entire Viet Nam because the clusters were not randomly selected from the whole country. However, with detailed data from 14 of the total 64 provinces, well spread over the country and covering 19.0% of the total population of Viet Nam, a fair estimate can be made. When we combine all the survey records from all 14 provinces, we have a total of 28,000 records. But because the sample size is the same for a province with a small population as for a province with a large population, their 'weight' to determine the final prevalence is the same. Ideally, the weight should be proportional to the number of people aged 50 years and older in each province.

Table 4 shows the number of males, females and total people aged 50+ in each of the 14 provinces. By dividing the number of males 50+ in each province by the total of males aged 50+ in all 14 provinces (100%), the percentage of males living in that province can be calculated. This percentage is the weighting factor for males for that province. A province with many males 50+ will have a high weighting factor (percentage males 50+), a province with few males 50+ will have a lower weighting factor. The sum of all weighting factors together adds to 100%. The same procedure is followed for females and for all people aged 50+. Each province has a weighting factor for males, females and the total population.

To calculate the weighted average, the prevalence of a condition in each of the 14 provinces is multiplied by the weighting factor of the corresponding province and the sum of these resulting coefficients is the weighted average for that condition. We assume that the weighted average for all 14 provinces is indicative for entire Viet Nam.



**Table 4.** Population aged 50+ by sex and by province in 2015 and weighting factors

Province	Number of people aged 50+			Weighting factor		
	Males	Females	Total	Males	Females	Total
Tuyen Quang	67,197	80,253	147,450	4.28%	4.22%	4.25%
PhuTho	144,991	174,247	319,238	9.23%	9.16%	9.19%
Dien Bien	32,518	35,897	68,415	2.07%	1.89%	1.97%
BacNinh	107,724	131,887	239,611	6.86%	6.93%	6.90%
Nam Dinh	228,470	275,574	504,044	14.55%	14.49%	14.51%
Ha Tinh	141,688	172,216	313,904	9.02%	9.05%	9.04%
Quang Tri	57,691	71,159	128,850	3.67%	3.74%	3.71%
Quang Ngai	113,283	149,287	262,570	7.21%	7.85%	7.56%
Gia Lai	92,979	106,260	199,239	5.92%	5.59%	5.74%
Lam Dong	103,036	117,452	220,488	6.56%	6.17%	6.35%
Vung Tau	95,290	109,617	204,907	6.07%	5.76%	5.90%
Binh Duong	100,579	124,766	225,345	6.40%	6.56%	6.49%
Tien Giang	171,844	227,229	399,073	10.94%	11.95%	11.49%
Ca Mau	113,255	126,353	239,608	7.21%	6.64%	6.90%
<b>Total</b>	<b>1,570,545</b>	<b>1,902,197</b>	<b>3,472,742</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

Table 5 shows the percentage of the population aged 50 years and older from each of the 14 provinces where a RAAB was done in 2015. The highest proportion of people aged 50 years and older is found in Nam Dinh (26.86%), the lowest proportion in Dien Bien province (12.85%). In all provinces the proportion of women aged 50+ is higher than in men.

**Table 5.** Percentage of population aged 50+ by sex and by province in 2015

Province	% males 50+	% females 50	% total 50+
Tuyen Quang	17.60	21.32	19.45
PhuTho	21.47	25.26	23.39
Dien Bien	12.22	13.49	12.85
BacNinh	19.92	23.73	21.85
Nam Dinh	24.75	28.90	26.86
Ha Tinh	23.03	27.75	25.40
Quang Tri	18.84	22.81	20.85
Quang Ngai	18.50	23.97	21.26
Gia Lai	13.16	15.16	14.16
Lam Dong	15.85	18.13	16.99
Vung Tau	17.52	20.18	18.85
Binh Duong	10.83	12.46	11.68
Tien Giang	20.22	26.03	23.16
Ca Mau	17.90	20.20	19.04
<b>Weighted average 14 provinces</b>	<b>19.14</b>	<b>22.94</b>	<b>21.05</b>
<b>Viet Nam (estimated %50+ in 2015)</b>	<b>18.58</b>	<b>22.26</b>	<b>20.44</b>

The weighted average of the percentage of people aged 50+ in the 14 provinces is slightly higher (3%) than the projected percentage of people aged 50+ for 2015 in entire Viet Nam.

## 2.6 Determination of the sample size

In the previous national surveys, the sampling design used was 30 clusters of size 60. This time we used 40 clusters of 50, whereby the sample size increased from 1,800 to 2,000 in each province, and the design effect reduced because of the smaller cluster size. This will compensate for the expected reduction in prevalence and provide an acceptable level of

accuracy. A sample size of 2,000 was considered to be the maximum possible in each province, considering the available manpower and funds. A sample of 2,000 will have enough power to estimate a prevalence of 3.1% (the weighted average prevalence in 2007-'08) with a variation of 32% and a non-compliance of 10% at 95% probability (see Figure 4). The combined data will provide a weighted average estimate, that may be applied to entire Viet Nam, with a much higher accuracy.

**Figure 4.** Calculation of the sample size

Parameters		Simple Random Sampling			Select
Population size	200,000	Confidence		Sample size	
Expected frequency	3.10 %	80%		569	<input type="radio"/>
Worst acceptable	4.08 %	90%		936	<input type="radio"/>
Non-compliance	10 %	95%		1,327	<input checked="" type="radio"/>

Cluster sampling with confidence 95% and interval 2.12% - 4.08%			
Cluster size	Design effect	Sample size	No. of clusters
40	1.4	1,858	47
50	1.5	1,991	40
60	1.6	2,123	36

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## 2.7 Selection of subjects within each province

For each of the 14 provinces we used a sampling frame consisting of all enumeration areas (EAs) and the number of households in each EA, from the 2009 national census, provided by the General Statistics Office (GSO) in Hanoi. The size of the EAs varied between 9 and 474 households, with an average of 125 households. With an average of 5 persons per household, the average EAs is expected to have at around 600 people of all ages, of whom 20% (125) are aged 50+. In case selected EAs had less than 100 households, a second ('geographically next nearest') EA was selected where the examinations could be continued in case there were less than 50 eligible persons in the selected EA. Hand-drawn maps are available from the provincial offices to show the location of the selected EA with the main roads and its boundaries. This detailed information makes it very easy for the survey teams to locate the households that are eligible for examination.

In each of the 14 provinces, 40 EAs were selected by systematic sampling, using the special module in the RAAB software. This ensures that the selection is done with a probability proportional to the size of the population in each EA.

With on average 20% of the population aged 50+, it is expected that among 250 people of all ages there would be 50 people aged 50+. With an average household size of 5, an EA with 50 HH could be expected to provide 50 people aged 50+.

If the selected EA has more than 100 households, the selected EA had to be divided in segments with an equal number of households, enough to provide 50 people aged 50+. The map of the EA was essential to find the exact locality, and to divide the EA into segments with approximately 50 households each, if needed. Each segment was given a number on the map. Then ballot papers were made with the same numbers, these were folded and tossed and the village headman was asked to draw two ballots: the first number for the segment of the

segment where all households were visited to find the 50 eligible people for examination. The second ballot was to be used in case the first segment would not provide all 50 people for the cluster.

Within the selected segment the survey team went door-to-door to find eligible people and asked them to be examined. If they refused, or were not found at home, efforts were made to revisit them. People who were absent for a long time or kept refusing were included in the survey, and were not replaced by others who happened to be at home. The team continued in the same segment until 50 forms were completed.

### **Ethnic differences**

No information was collected about the ethnic background of the survey participants. Therefore, no information is available about any relation between ethnic background and prevalence of visual impairment in Viet Nam.

### **Reports**

In accordance with WHO recommendations, the RAAB software reports both the best corrected or pinhole VA, as well as the presenting VA, that is with the correction available to the patient. The prevalence of presenting VA includes patients blind due to refractive errors and uncorrected aphakia.

The sampling error for the prevalence estimates of most conditions, as well as the design effect (DEFF), are calculated for cluster sampling by the RAAB software, using the formula's provided by Bennett, Woods et al (1991).<sup>4</sup> The sampling error is expressed in the variation around the prevalence estimates and their corresponding 95% Confidence intervals given in reports generated by the RAAB software and in the tables below.

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<sup>4</sup> Bennett S, Woods T, Liyanage WM, Smith DL. A simplified general method for cluster-sample surveys of health in developing countries. *World Health Stat Q.* 1991;44(3):98-106.

### Chapter 3. Survey findings 2015

#### 3.1 Sample results from RAAB surveys per province and weighted average

Table 6 shows the sample size and the coverage in the 14 provinces. The coverage varied between 91.8% in Tien Giang to 100% in Quang Tri (Table 6).

**Table 6.** Sample size and coverage in 14 provinces

Province	Sample size	Examined	Coverage
Tuyen Quang	1,999	1,919	96.0%
Phu Tho	1,997	1,955	97.9%
Dien Bien	1,999	1,965	98.3%
Bac Ninh	1,974	1,889	95.7%
Nam Dinh	1,999	1,931	96.6%
Ha Tinh	1,983	1,971	99.4%
Quang Tri	1,998	1,998	100.0%
Quang Ngai	2,000	1,995	99.8%
Gia Lai	2,000	1,961	98.1%
Lam Dong	2,000	1,966	98.3%
Vung Tau	2,000	1,933	96.7%
Binh Duong	1,999	1,971	98.6%
Tien Giang	1,999	1,835	91.8%
Ca Mau	1,999	1,862	93.1%
<b>Total</b>	<b>7,946</b>	<b>27,151</b>	<b>97.2%</b>

Table 7 shows the sample prevalence of blindness in people aged 50+ (old WHO definition: pinhole VA<3/60 in the better eye) for all 14 provinces. A weighted prevalence estimate is also calculated, which gives an indication of the prevalence in the whole of Viet Nam. The difference is significant if the two 95% Confidence intervals do not overlap.

**Table 7.** Prevalence of blindness (pinhole VA<3/60 in the better eye) in sample

Province	Males			Females			Total		
	n	%	95%CI	n	%	95%CI	n	%	95%CI
Tuyen Quang	12	1.5%	(0.6-2.4)	51	4.5%	(3.0-6.0)*	63	3.3%	(2.3-4.3)
Phu Tho	8	1.1%	(0.4-1.8)	23	1.9%	(1.0-2.8)	31	1.6%	(1.0-2.2)
Dien Bien	24	2.9%	(1.8-3.9)	49	4.4%	(2.8-5.9)	73	3.7%	(2.7-4.7)
Bac Ninh	14	1.8%	(0.5-3.1)	54	4.8%	(3.7-6.0)*	68	3.6%	(2.6-4.6)
Nam Dinh	12	1.5%	(0.6-2.4)	45	4.0%	(2.9-5.0)*	57	3.0%	(2.2-3.7)
Ha Tinh	6	0.8%	(0.1-1.6)	21	1.7%	(0.4-3.0)	27	1.4%	(0.4-2.4)
Quang Tri	17	2.2%	(1.2-3.1)	47	3.9%	(2.6-5.1)	64	3.2%	(2.3-4.1)
Quang Ngai	10	1.4%	(0.6-2.3)	15	1.2%	(0.6-1.8)	25	1.3%	(0.7-1.8)
Gia Lai	13	1.6%	(0.7-2.6)	23	2.0%	(1.2-2.8)	36	1.8%	(1.2-2.5)
Lam Dong	10	1.3%	(0.6-2.0)	18	1.5%	(0.9-2.1)	28	1.4%	(1.0-1.9)
Vung Tau	15	1.7%	(0.7-2.8)	22	2.1%	(1.1-3.0)	37	1.9%	(1.2-2.7)
Binh Duong	12	1.7%	(0.9-2.5)	28	2.2%	(1.1-3.3)	40	2.0%	(1.2-2.8)
Tien Giang	11	1.6%	(0.6-2.5)	32	2.8%	(1.9-3.8)	43	2.3%	(1.6-3.1)
Ca Mau	15	2.0%	(1.0-3.0)	35	3.2%	(2.0-4.4)	50	2.7%	(1.8-3.5)
<b>Weighted average</b>	<b>179</b>	<b>1.5%</b>	<b>(1.3-1.8)</b>	<b>463</b>	<b>2.8%</b>	<b>(2.5-3.0)*</b>	<b>642</b>	<b>2.3%</b>	<b>(2.1-2.5)</b>

\*: Significant difference

The sample prevalence of bilateral blindness (pinhole VA<3/60 in the better eye) in people aged 50+ ranged from 1.3% in Quang Ngai to 3.7% in Dien Bien. In males the prevalence varied from 0.8% in Ha Tinh province to 2.9% in Dien Bien province, in females from 1.2% in Quang Ngai province to 4.8% in Bac Ninh. The weighted average prevalence of blindness for Viet Nam is 2.3% (95%CI: 2.1-2.5%): 1.5% (1.3-1.8) for males and 2.8% (2.5-3.0) for females, a significant difference ( $p<0.0001$ ).

Table 8 shows the prevalence of bilateral blindness with available correction (includes cases with uncorrected refractive errors) in the sample. The prevalence in females is significantly higher than in males in Tuyen Quang, Bac Ninh and Nam Dinh province. Also the weighted average sample prevalence in females is significantly higher compared to males ( $p<0.0001$ ).

**Table 8.** Prevalence of bilateral blindness in sample (presenting VA<3/60 in the better eye)

Province	Males			Females			Total		
	n	%	95%CI	n	%	95%CI	n	%	95%CI
Tuyen Quang	15	1.9%	(0.9-2.9)	51	4.5%	(3.0-6.0)*	66	3.4%	(2.4-4.4)
Phu Tho	9	1.2%	(0.5-1.9)	27	2.2%	(1.3-3.2)	36	1.8%	(1.2-2.5)
Dien Bien	25	3.0%	(2.0-4.0)	50	4.4%	(2.9-6.0)	75	3.8%	(2.8-4.8)
Bac Ninh	14	1.8%	(0.5-3.1)	54	4.8%	(3.7-6.0)*	68	3.6%	(2.6-4.6)
Nam Dinh	12	1.5%	(0.6-2.4)	45	4.0%	(2.9-5.0)*	57	3.0%	(2.2-3.7)
Ha Tinh	6	0.8%	(0.1-1.6)	24	1.9%	(0.5-3.4)	30	1.5%	(0.4-2.6)
Quang Tri	17	2.2%	(1.2-3.1)	49	4.1%	(2.8-5.3)	66	3.3%	(2.4-4.2)
Quang Ngai	11	1.6%	(0.6-2.5)	18	1.4%	(0.7-2.1)	29	1.5%	(0.8-2.1)
Gia Lai	13	1.6%	(0.7-2.6)	26	2.2%	(1.3-3.2)	39	2.0%	(1.3-2.7)
Lam Dong	10	1.3%	(0.6-2.0)	21	1.7%	(1.1-2.4)	31	1.6%	(1.1-2.1)
Vung Tau	17	2.0%	(0.8-3.1)	26	2.4%	(1.3-3.5)	43	2.2%	(1.3-3.1)
Binh Duong	15	2.2%	(1.2-3.1)	33	2.6%	(1.4-3.8)	48	2.4%	(1.5-3.4)
Tien Giang	11	1.6%	(0.6-2.5)	33	2.9%	(2.0-3.9)	44	2.4%	(1.7-3.1)
Ca Mau	18	2.4%	(1.2-3.5)	35	3.2%	(2.0-4.4)	53	2.8%	(2.0-3.7)
<b>Weighted average</b>	<b>193</b>	<b>1.6%</b>	<b>(1.4-1.9)</b>	<b>492</b>	<b>2.9%</b>	<b>(2.7-3.2)*</b>	<b>685</b>	<b>2.4%</b>	<b>(2.2-2.6)</b>

\*: Significant difference

Table 9 shows the sample prevalence of bilateral cataract blindness (pinhole VA<3/60 in the better eye) in people aged 50+.

**Table 9.** Sample prevalence bilateral cataract blindness (pinhole VA<3/60 in the better eye)

Province	Males			Females			Total		
	n	%	95%CI	n	%	95%CI	n	%	95%CI
Tuyen Quang	4	0.5%	(0.0-1.0)	33	2.9%	(1.6-4.3)*	37	1.9%	(1.1-2.7)
Phu Tho	6	0.8%	(0.2-1.4)	18	1.5%	(0.7-2.3)	24	1.2%	(0.7-1.7)
Dien Bien	16	1.9%	(0.9-2.9)	41	3.6%	(2.1-5.1)	57	2.9%	(1.9-3.9)
Bac Ninh	3	0.4%	(0.0-0.8)	31	2.8%	(1.9-3.7)*	34	1.8%	(1.2-2.4)
Nam Dinh	7	0.9%	(0.3-1.5)	33	2.9%	(2.0-3.9)	40	2.1%	(1.4-2.7)
Ha Tinh	4	0.6%	(0.0-1.2)	16	1.3%	(0.3-2.3)	20	1.0%	(0.2-1.8)
Quang Tri	10	1.3%	(0.6-2.0)	36	3.0%	(1.8-4.2)	46	2.3%	(1.4-3.2)
Quang Ngai	5	0.7%	(0.1-1.3)	8	0.6%	(0.1-1.1)	13	0.7%	(0.2-1.1)
Gia Lai	6	0.7%	(0.1-1.4)	15	1.3%	(0.6-2.0)	21	1.1%	(0.5-1.7)
Lam Dong	6	0.8%	(0.2-1.4)	8	0.7%	(0.2-1.1)	14	0.7%	(0.3-1.1)
Vung Tau	8	0.9%	(0.3-1.6)	17	1.6%	(0.7-2.5)	25	1.3%	(0.7-1.9)
Binh Duong	6	0.9%	(0.2-1.5)	21	1.6%	(0.9-2.4)	27	1.4%	(0.8-1.9)
Tien Giang	6	0.8%	(0.2-1.5)	21	1.9%	(1.0-2.8)	27	1.5%	(0.9-2.1)
Ca Mau	11	1.4%	(0.7-2.2)	24	2.2%	(1.3-3.1)	35	1.9%	(1.2-2.6)
<b>Weighted average</b>	<b>98</b>	<b>0.8%</b>	<b>(0.7-1.0)</b>	<b>322</b>	<b>1.9%</b>	<b>(1.7-2.1)*</b>	<b>420</b>	<b>1.5%</b>	<b>(1.3-1.6)</b>

\*: Significant difference

The prevalence ranged from 0.7% in Quang Ngai and Lam Dong to 2.9% in Dien Bien. In males the prevalence varied from 0.4% in Bac Ninh to 1.9% in Dien Bien province, in females from 0.6% in Quang Ngai to 3.6% in Dien Bien.

The weighted average sample prevalence of bilateral cataract blindness is 1.5% (1.3-1.6%): 0.8% (0.7-1.0) for males and 1.9% (1.7-2.1) for females, a significant difference ( $p < 0.0001$ ).

Because of the relatively low sample size in each province, the variation around the estimate at 95% probability is relatively high. For the sample prevalence of bilateral blindness it varies between 27.0% in Dien Bien to 73.6% in Ha Tinh, with an average of 36.5%, which is slightly higher than the assumed 32% at the planning stage. For the weighted average, the Sampling Error (0.10) was much lower because of the large sample size of the combined records (27,946), resulting in a variation of 8.2% around the estimate (Table 10).

**Table 10.** Prevalence of bilateral blindness (presenting VA  $< 3/60$  in the better eye), variation, variation as proportion of prevalence and Design Effect

Province	Prev. (%)	SE	Var. (95%CI)	Var/Prev	DEFF
Tuyen Quang	3.44	0.51	(2.42-4.46)	29.6%	1.52
Phu Tho	1.84	0.32	(1.21-2.47)	34.0%	1.08
Dien Bien	3.82	0.52	(2.79-4.85)	27.0%	1.45
Bac Ninh	3.60	0.51	(2.60-4.60)	27.8%	1.39
Nam Dinh	2.95	0.40	(2.15-3.75)	27.1%	1.10
Ha Tinh	1.52	0.57	(0.40-2.64)	73.6%	4.21
Quang Tri	3.30	0.48	(2.36-4.25)	28.7%	1.43
Quang Ngai	1.45	0.34	(0.79-2.12)	45.9%	1.58
Gia Lai	1.99	0.38	(1.25-2.73)	37.4%	1.42
Lam Dong	1.58	0.25	(1.09-2.06)	30.9%	0.77
Vung Tau	2.22	0.45	(1.33-3.12)	40.1%	1.80
Binh Duong	2.44	0.48	(1.48-3.39)	39.2%	1.93
Tien Giang	2.40	0.36	(1.69-3.11)	29.5%	1.00
Ca Mau	2.85	0.44	(1.98-3.71)	30.5%	1.29
<b>Weighed average</b>	<b>2.41</b>	<b>0.10</b>	<b>(2.21-2.61)</b>	<b>8.2%</b>	<b>1.57</b>

SE: Sampling error

DEFF: Design Effect

Var/Prev: variation as percentage of prevalence

In some provinces, notably Ha Tinh, Binh Duong and Vung Tau, the Design Effect was relatively high, but in most provinces the DEFF was around 1.5 or even less. The weighted average DEFF was 1.57, lower than assumed in the sample size calculation. A high DEFF indicates that the condition under examination is not evenly spread in the examined population. When DEFF is around 1 it means that the condition is even spread among the participants. We may have to look in more detail at Ha Tinh, Binh Duong and Vung Tau to understand why service uptake is so unevenly distributed. Are there certain areas in these provinces without services? Are there certain population groups that don't have access or don't want to use services?

### 3.2 Age and sex adjusted prevalence

Most blinding eye diseases are age-related and their prevalence may also differ by sex. Ideally, the age and sex composition of the sample is similar to that of the entire province. In that case the sample is representative for the province and the sample prevalence is equal to the age and sex adjusted prevalence. However, often the age and sex composition of the sample differs from the actual population. To correct this, and to be able to make extra-polations to the actual population in the province, the RAAB software compares the age and sex composition of the sample with that of the entire province and adjusts the age and sex specific prevalence from the sample to that of the actual population of the province.



To correct this, and to be able to make extra-polations to the actual population in the province, the RAAB software compares the age and sex composition of the sample with that of the entire province and adjusts the age and sex specific prevalence from the sample to that of the actual population of the province. Hence the age and sex adjusted prevalence represents the actual situation in the province.

*For the data analysis in the 14 provinces population data were used from the report 'Population Projections for Viet Nam 2009 – 2049', published by the Ministry of Planning and Investment, General Statistics Office, Hanoi, February 2011. During data analysis it was noticed that in all 14 provinces the age group 50-59 was under-represented in the sample, while the age groups 60-69, 70-79 and 80+ were over-represented. As a result, the age and sex adjusted prevalence was considerably lower than the sample prevalence in all 14 provinces. The population projections in this report are based on the data from the latest national census in 2009, and the population data for 2009 are consistent with those from the census report. Also in 2007, the age group 50-59 was under-represented in all 16 provinces, although to a lesser degree than in 2015.*

In table 11 the age and sex adjusted prevalence of bilateral blindness and the estimated number of cases in each province are shown. The highest adjusted prevalence is found in Dien Bien and Bac Ninh (2.5%), the lowest in Quang Ngai Province (0.9%). Although the adjusted prevalence in women is higher than in men in all provinces, the difference is not significant, with exception of Nam Dinh province and the weighted average.

**Table 11.** Adjusted prevalence of blindness (presenting VA<3/60 in the better eye) and estimated number of cases

Province	Males			Females			Total		
	n	%	CI 95%	n	%	CI 95%	n	%	CI 95%
Tuyen Quang	818	1.2% (0.2-2.2)		2,504	3.1% (1.6-4.7)		3,322	2.3% (1.2-3.3)	
Phu Tho	1,244	0.9% (0.2-1.6)		2,449	1.4% (0.4-2.4)		3,693	1.2% (0.5-1.8)	
Dien Bien	694	2.1% (1.1-3.1)		1,085	3.0% (1.5-4.6)		1,779	2.6% (1.6-3.6)*	
Bac Ninh	1,611	1.5% (0.2-2.8)		4,370	3.3% (2.1-4.5)		5,981	2.5% (1.5-3.5)	
Nam Dinh	2,303	1.0% (0.1-1.9)*		8,209	3.0% (1.9-4.0)*		10,512	2.1% (1.3-2.9)	
Ha Tinh	991	0.7% (0.0-1.4)		2,558	1.5% (0.0-2.9)		3,549	1.1% (0.1-2.2)	
Quang Tri	856	1.5% (0.5-2.5)		1,923	2.7% (1.4-4.0)		2,779	2.2% (1.2-3.1)	
Quang Ngai	1,112	1.0% (0.0-2.0)		1,654	1.1% (0.4-1.8)		2,766	1.1% (0.4-1.7)	
Gia Lai	868	0.9% (0.0-1.9)		1,583	1.5% (0.6-2.4)		2,451	1.2% (0.5-2.0)	
Lam Dong	905	0.9% (0.2-1.6)		1,595	1.4% (0.7-2.0)		2,500	1.1% (0.7-1.6)*	
Vung Tau	1,267	1.3% (0.2-2.5)		2,541	2.3% (1.2-3.4)		3,808	1.9% (1.0-2.7)	
Binh Duong	1,488	1.5% (0.5-2.4)		2,530	2.0% (0.8-3.2)		4,018	1.8% (0.8-2.7)	
Tien Giang	2,413	1.4% (0.4-2.4)		5,907	2.6% (1.6-3.6)		8,320	2.1% (1.4-2.8)	
Ca Mau	2,000	1.8% (0.6-2.9)		3,576	2.8% (1.6-4.0)		5,576	2.3% (1.5-3.2)	
<b>Weighted average</b>	<b>18,570</b>	<b>1.2% (1.0-1.4)</b>		<b>42,484</b>	<b>2.2% (2.0-2.5)*</b>		<b>61,054</b>	<b>1.8% (1.6-2.0)</b>	
<b>Viet Nam</b>	<b>99,782</b>	<b>1.2%</b>		<b>229,551</b>	<b>2.2%</b>		<b>329,333</b>	<b>1.8%</b>	

\*: Significant difference

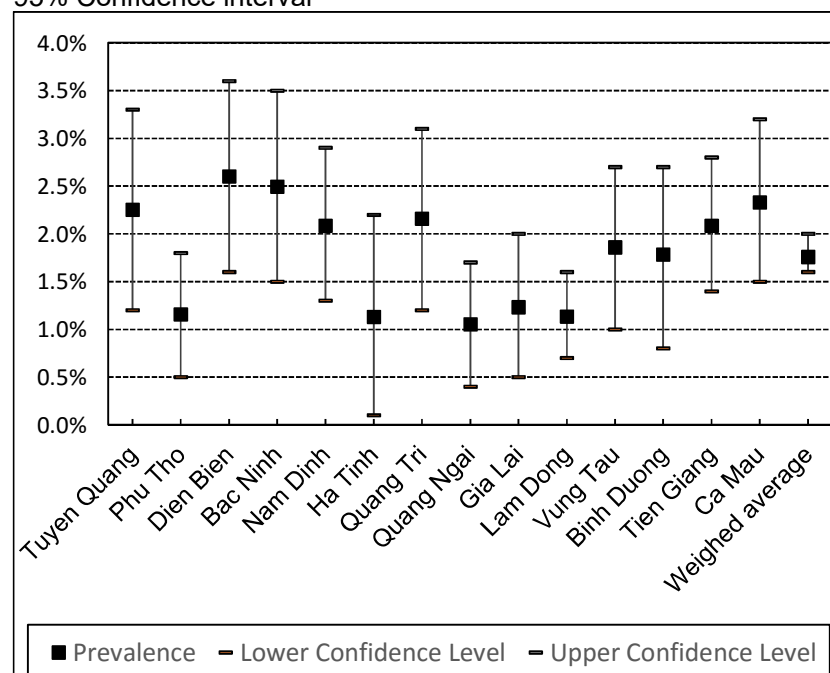
There is a factor 2.4 difference between the highest (Dien Bien: 2.6%) and lowest (Lam Dong: 1.1%) adjusted prevalence of blindness and this is significant. The difference with the other provinces is not statistically significant.

Assuming that the weighted average is a fair representation of the situation in entire Viet Nam, the weighted average of 1.8% (CI95%: 1.6-2.0%) can be extrapolated to the total projected population aged 50+ in Viet Nam in 2015. That would give an estimated 329,333 people who are blind in that

year: 99,782 males and 229,551 females. The prevalence in males (1.2% (CI95%: 1.0-1.4%)) is significantly lower than in females (2.2% (2.0–2.5)).

The data from table 11 is also shown in figure 5. The square represents the calculated prevalence and the line the variation around that estimate. It is clearly visible that Dien Bien province has the highest prevalence but also a wide variation around the estimate. Because of the large sample size, the variation around the weighted average is very narrow compared to that of the individual provinces with their much smaller sample sizes. The width of the variation is also an indicator whether the condition under investigation (blindness) is evenly spread in the population of the provinces. When it is spread evenly, the variation is less (Lam Dong) than when the condition is spread unevenly (Ha Tinh) within the province.

**Figure 5.** Adjusted prevalence of bilateral blindness (presenting VA<3/60 in the better eye) with 95% Confidence interval



Comparing the sample prevalence (Table 8) and adjusted prevalence (Table 11) for bilateral blindness (presenting VA<3/60 in the better eye) shows that the adjusted prevalence was 13% (Tien Giang) to 38% (Gia Lai) lower compared to the sample prevalence. Using sample results would have resulted in a considerable over-estimation of blindness and low vision. This is caused by the fact that in all provinces relatively more elderly people were seen and less people in the younger age groups, compared to the actual population in the province (Table 12).



**Table 12.** Comparing sample prevalence and adjusted prevalence of bilateral blindness (presenting VA <3/60 in the better eye)

Province	Sample Prev. (%)	Adjusted Prev. (%)	Difference	Difference (%)
Tuyen Quang	3.44	2.25	-1.19	-34%
Phu Tho	1.84	1.16	-0.68	-37%
Dien Bien	3.82	2.60	-1.22	-32%
Bac Ninh	3.60	2.50	-1.10	-31%
Nam Dinh	2.95	2.09	-0.87	-29%
Ha Tinh	1.52	1.13	-0.39	-26%
Quang Tri	3.30	2.16	-1.15	-35%
Quang Ngai	1.45	1.05	-0.40	-28%
Gia Lai	1.99	1.23	-0.76	-38%
Lam Dong	1.58	1.13	-0.44	-28%
Vung Tau	2.22	1.86	-0.37	-16%
Binh Duong	2.44	1.78	-0.65	-27%
Tien Giang	2.40	2.08	-0.31	-13%
Ca Mau	2.85	2.33	-0.52	-18%
<b>Weighed average</b>	<b>2.41</b>	<b>1.76</b>	<b>-0.65</b>	<b>-27%</b>

SE: Sampling error

DEFF: Design Effect

Var/Prev: variation as percentage of prevalence

Table 13 shows the adjusted prevalence of severe visual impairment (SVI) and moderate visual impairment (MVI). The highest prevalence of SVI is found in Ha Tinh, the lowest in Phu Tho and Lam Dong province. For MVI, the highest prevalence is found in Ha Tinh, the lowest in Dien Bien province. In the 14 provinces together there are 67,231 people with SVI and 328,521 with MVI. Extrapolated to the total population of Viet Nam there are an estimated 362,493 people with SVI and 1,771,353 people with MVI: 667,911 men and 1,103,441 women.

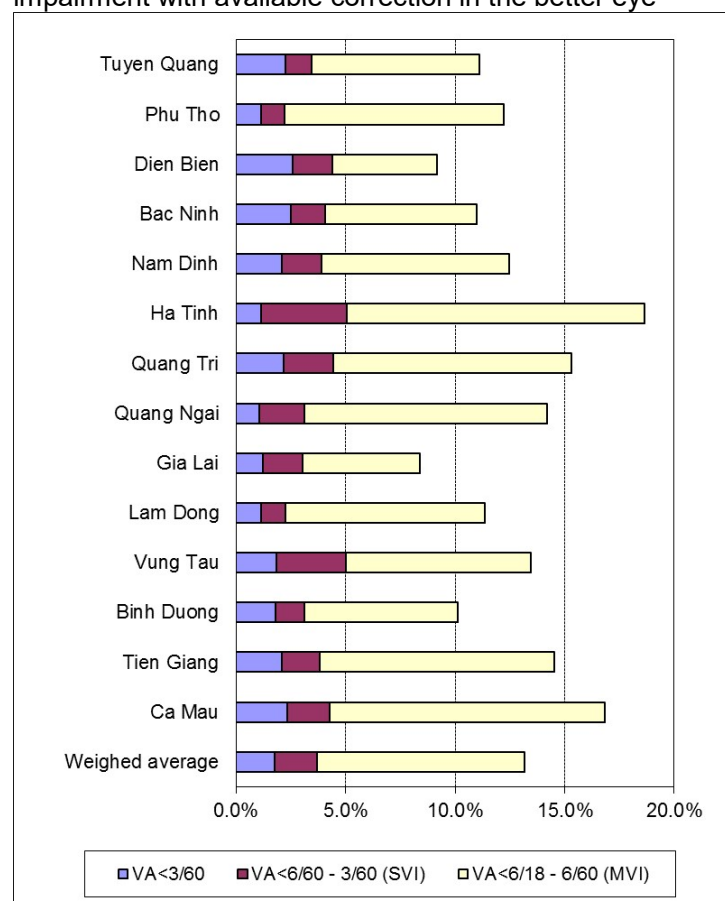
**Table 13.** Adjusted prevalence of severe (SVI) and moderate bilateral visual impairment (MVI) and estimated number of cases in people aged 50+

Province	Presenting VA<6/60 – 3/60 (SVI)			Presenting VA<6/18 – 6/60 (MVI)		
	n	Prev.	Var.(CI 95%)	n	Prev.	Var.(CI 95%)
Tuyen Quang	1,763	1.2%	(0.6-1.8)	11,268	7.6%	(6.1-9.2)
Phu Tho	3,419	1.1%	(0.6-1.5)	31,859	10.0%	(7.6-12.4)
Dien Bien	1,218	1.8%	(0.6-3.0)	3,280	4.8%	(3.2-6.4)
Bac Ninh	3,782	1.6%	(0.9-2.3)	16,507	6.9%	(5.3-8.5)
Nam Dinh	9,131	1.8%	(1.0-2.6)	43,287	8.6%	(6.4-10.8)
Ha Tinh	12,355	3.9%	(2.4-5.4)	42,607	13.6%	(10.9-16.3)
Quang Tri	2,932	2.3%	(1.5-3.1)	14,015	10.9%	(9.3-12.4)
Quang Ngai	5,382	2.0%	(1.2-2.9)	29,126	11.1%	(8.0-14.2)
Gia Lai	3,636	1.8%	(1.0-2.6)	10,592	5.3%	(4.2-6.5)
Lam Dong	2,514	1.1%	(0.5-1.8)	20,066	9.1%	(7.4-10.8)
Vung Tau	6,448	3.1%	(1.9-4.4)	17,338	8.5%	(6.8-10.1)
Binh Duong	3,011	1.3%	(0.6-2.1)	15,809	7.0%	(4.8-9.3)
Tien Giang	6,934	1.7%	(1.2-2.3)	42,759	10.7%	(9.0-12.4)
Ca Mau	4,706	2.0%	(1.2-2.7)	30,008	12.5%	(10.4-14.7)
<b>Weighted average</b>	<b>67,231</b>	<b>1.9%</b>	<b>(1.8-2.1)</b>	<b>328,521</b>	<b>9.5%</b>	<b>(9.1-9.8)</b>
<b>All Viet Nam</b>	<b>362,493</b>	<b>1.9%</b>		<b>1,771,353</b>	<b>9.5%</b>	

SVI and MVI combined are also called low vision (PVA<6/18-3/60). The adjusted prevalence of low vision (presenting VA<6/18-3/60) due to all causes in Viet Nam is 11.4%, an estimated 2.1 million people: 791,524 males (9.4%) and 1,307,886 females (12.7%).

The data from Table 11 and Table 13 is also shown in figure 6. The weighted average of the 14 provinces is assumed to represent the prevalence for entire Viet Nam.

**Figure 6.** Adjusted prevalence of bilateral blindness, severe (SVI) and moderate (MVI) visual impairment with available correction in the better eye



The adjusted prevalence for bilateral blindness due to cataract has been calculated as well for each of the 14 provinces. (Table 14) The highest adjusted prevalence of cataract blindness is found in Dien Bien province (1.9%), the lowest in Quang Ngai and Lam Dong (0.5%). This difference is significant ( $p < 0.05$ ).

There are an estimated 35,951 people blind due to cataract in the 14 provinces: 8,845 men and 27,106 women. The adjusted prevalence of cataract blindness in women is higher than in men, except in Lam Dong province, but the difference is never significant. This is caused by the fact that women live longer and therefore have a higher risk of developing cataract. A second factor is that, except for Lam Dong province, less women are operated upon. We may see this also reflected in the cataract surgical coverage and in the barriers to cataract surgery.

Extrapolation of the weighted prevalence against the total population of Viet Nam indicates that there are an estimated 193,987 people aged 50+ blind due to cataract in Viet Nam: 47,527 men (25%) and 146,460 women (75%). Also here the prevalence in females is significantly higher than in males. One out of every 4 persons blind due to cataract is a male, the other 3 are female.

**Table 14.** Adjusted prevalence of bilateral cataract blindness (pinhole VA<3/60 in the better eye) and estimated number of cases in people aged 50+

Province	Males		Females		Total		
	n	%	n	%	n	%	Var. (CI95%)
Tuyen Quang	201	0.3%	1,645	2.0%	1,846	1.3%	(0.5-2.0)
Phu Tho	712	0.5%	1,617	0.9%	2,329	0.7%	(0.2-1.2)
Dien Bien	450	1.4%	872	2.4%	1,322	1.9%	(0.9-2.9)*
Bac Ninh	369	0.3%	2,417	1.8%	2,786	1.2%	(0.5-1.8)
Nam Dinh	1,209	0.5%	6,004	2.2%	7,213	1.4%	(0.8-2.1)
Ha Tinh	377	0.3%	1,657	1.0%	2,034	0.6%	(0.0-1.5)
Quang Tri	483	0.8%	1,419	2.0%	1,902	1.5%	(0.6-2.3)
Quang Ngai	502	0.4%	689	0.5%	1,191	0.5%	(0.0-0.9)*
Gia Lai	317	0.3%	845	0.8%	1,162	0.6%	(0.0-1.2)
Lam Dong	571	0.6%	549	0.5%	1,120	0.5%	(0.1-0.9)*
Vung Tau	565	0.6%	1,669	1.5%	2,234	1.1%	(0.5-1.6)
Binh Duong	659	0.7%	1,594	1.3%	2,253	1.0%	(0.4-1.6)
Tien Giang	1,215	0.7%	3,662	1.6%	4,877	1.2%	(0.6-1.8)
Ca Mau	1,215	1.1%	2,467	2.0%	3,682	1.5%	(0.9-2.2)
<b>Weighed average</b>	<b>8,845</b>	<b>0.6%</b>	<b>27,106</b>	<b>1.4%</b>	<b>35,951</b>	<b>1.0%</b>	<b>(0.9-1.2)</b>
<b>All Viet Nam</b>	<b>47,527</b>	<b>0.6%</b>	<b>146,460</b>	<b>1.4%</b>	<b>193,987</b>	<b>1.0%</b>	

\*: Significant difference

Many people with visual impairment due to cataract do not want to wait until their vision has reduced to less than 3/60. Many of them want to remain productive and independent and ask for cataract surgery at an earlier stage. Therefore people with severe and moderate visual impairment should be taken into consideration as well when assessing the need for cataract surgery. Table 15 shows the adjusted prevalence of people with bilateral SVI and MVI due to cataract, the 95% confidence interval and the estimated number of cases with this condition in each province, the weighted average prevalence for the 14 provinces and the estimates for entire Viet Nam. In the whole country an estimated 224,525 people aged 50+ are severely and another 906,302 people aged 50+ moderately visually impaired from cataract.

**Table 15.** Adjusted prevalence of SVI (pinhole VA<6/60–3/60) and VI (pinhole VA<6/18–6/60) due to cataract and estimated number of cases in people aged 50+

Province	Pinhole VA<6/60 – 3/60 (SVI)			Pinhole VA<6/18 – 6/60 (VI)		
	n	Prev. (%)	Var. (CI 95%)	n	Prev. (%)	Var. (CI 95%)
Tuyen Quang	714	0.5%	(0.2-0.7)	3,118	2.1%	(1.5-2.8)
Phu Tho	1,536	0.5%	(0.3-0.7)	15,528	4.9%	(3.4-6.4)
Dien Bien	1,037	1.5%	(0.7-2.3)	507	0.7%	(0.3-1.2)
Bac Ninh	2,187	0.9%	(0.5-1.3)	8,690	3.6%	(2.7-4.5)
Nam Dinh	6,542	1.3%	(0.6-2.0)	20,832	4.1%	(3.2-5.1)
Ha Tinh	9,228	2.9%	(1.7-4.1)	28,996	9.2%	(7.3-11.2)
Quang Tri	1,412	1.1%	(0.6-1.6)	7,083	5.5%	(4.2-6.8)
Quang Ngai	2,606	1.0%	(0.4-1.6)	16,440	6.3%	(4.9-7.7)
Gia Lai	1,927	1.0%	(0.4-1.5)	4,573	2.3%	(1.6-3.0)
Lam Dong	1,312	0.6%	(0.1-1.1)	6,034	2.7%	(1.8-3.7)
Vung Tau	4,293	2.1%	(1.5-2.7)	11,036	5.4%	(3.9-6.9)
Binh Duong	2,184	1.0%	(0.4-1.5)	8,096	3.6%	(2.4-4.8)
Tien Giang	3,688	0.9%	(0.6-1.3)	21,221	5.3%	(4.1-6.5)
Ca Mau	2,969	1.2%	(0.9-1.6)	15,919	6.6%	(5.4-7.9)
<b>Weighted average</b>	<b>41,635</b>	<b>1.2%</b>	<b>(1.1-1.3)</b>	<b>168,073</b>	<b>4.8%</b>	<b>(4.6-5.1)</b>
<b>All Viet Nam</b>	<b>224,525</b>	<b>1.2%</b>		<b>906,302</b>	<b>4.8%</b>	

If all people with pinhole VA<6/60 due to bilateral cataract would be considered for cataract surgery, then the backlog would be 418,512 people in entire Viet Nam: 126,219 men and 292,293 women. If all people with pinhole VA<6/18 due to bilateral cataract would be considered for cataract surgery, then the backlog would be 1,324 million people in entire Viet Nam: 455,569 men and 869,244 women.

Especially amongst urban professionals the demand for early cataract surgery is likely to increase in the near future. They do not like to lose their job first because they have to wait for cataract surgery and they will insist on being operated at an early stage.

The prevalence data from the two tables above (14 and 15) is also shown in figure 7. The weighted average of the 14 provinces is indicative for the prevalence in entire Viet Nam. There is a considerable variation in the prevalence visible. The highest prevalence of operable cataract is found in Ha Tinh, the lowest in Lam Dong province.

**Figure 7.** Adjusted prevalence of bilateral cataract blindness, SVI and VI

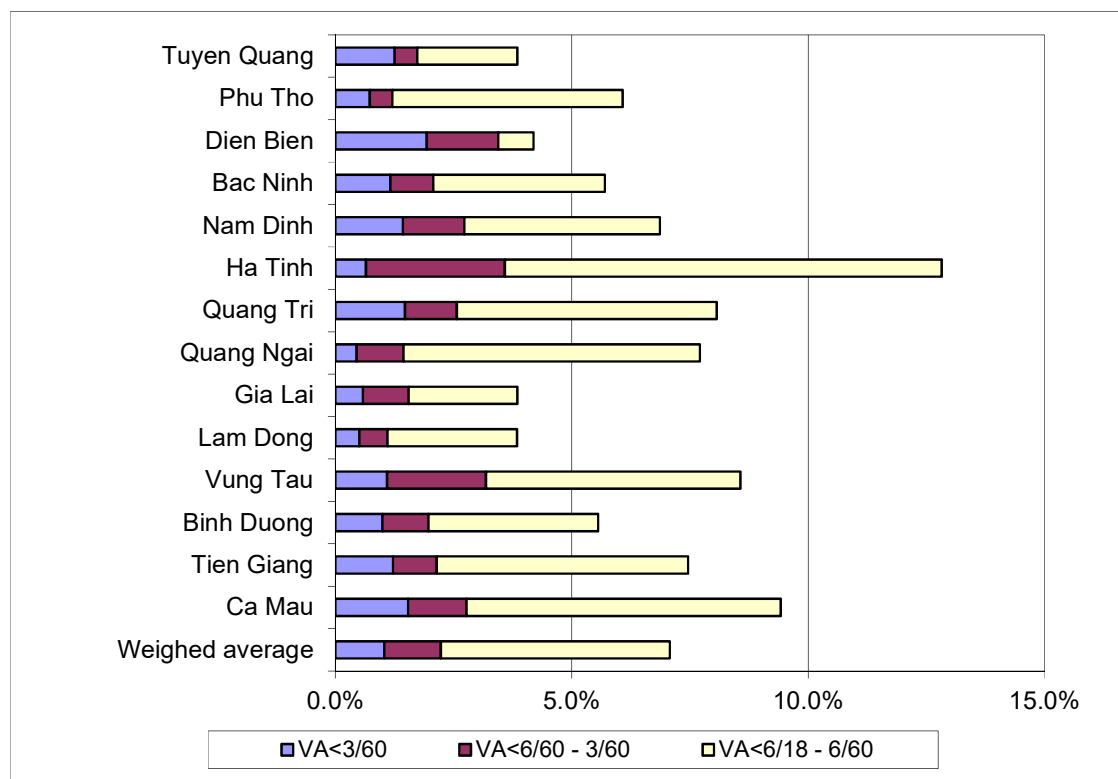
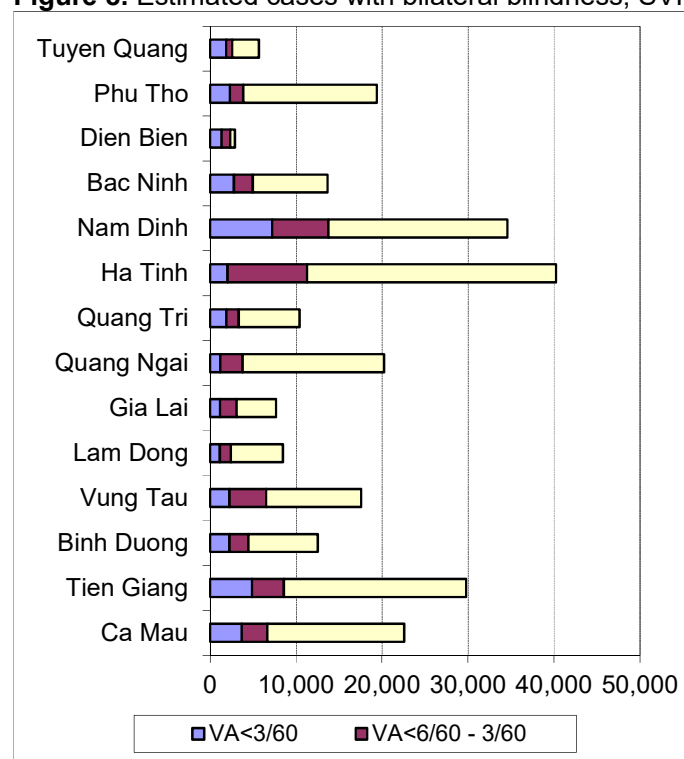


Figure 7 shows the estimated number of patients with bilateral blindness, SVI and MVI due to cataract. Ha Tinh, Nam Dinh and Tien Giang Province have the highest number of patients with operable cataract. Figure 7 may help to identify where most surgical capacity is needed

**Figure 8.** Estimated cases with bilateral blindness, SVI and VI due to cataract

The estimated number of people with bilateral blindness or low vision due to cataract is shown in Table 14 and 15 and Figure 7. However, there are also many people with one eye affected by cataract. Many of them also want cataract surgery. Therefore the number of eyes blind, severely or moderately visually impaired due to cataract may be a better indicator of the total workload on cataract surgery.

**Table 16.** Adjusted prevalence and estimated number of eyes with pinhole VA<3/60, <6/60 and <6/18 due to cataract (cumulative)

Province	Eyes cataract (pinhole VA<3/60)		Eyes cataract (pinhole VA<6/60)		Eyes cataract (pinhole VA<6/18)	
	Eyes	Prev. (%)	Eyes	Prev. (%)	Eyes	Prev. (%)
Tuyen Quang	7,119	2.4	8,556	2.9	16,438	5.6
Phu Tho	11,055	1.7	17,004	2.7	56,648	8.9
Dien Bien	3,811	2.8	5,653	4.1	7,008	5.1
Bac Ninh	12,004	2.5	16,649	3.5	38,965	8.1
Nam Dinh	28,202	2.8	45,018	4.5	89,691	8.9
Ha Tinh	11,499	1.8	34,582	5.5	98,047	15.6
Quang Tri	6,656	2.6	11,056	4.3	27,757	10.8
Quang Ngai	5,438	1.0	15,389	2.9	62,012	11.8
Gia Lai	5,319	1.3	9,513	2.4	20,071	5.0
Lam Dong	3,649	0.8	5,595	1.3	12,854	2.9
Vung Tau	10,322	2.5	20,701	5.1	48,283	11.8
Binh Duong	10,779	2.4	16,953	3.8	36,639	8.1
Tien Giang	24,548	3.1	35,539	4.5	94,780	11.9
Ca Mau	21,150	4.4	28,760	6.0	69,655	14.5
<b>Weighted average</b>	<b>161,551</b>	<b>2.3</b>	<b>270,968</b>	<b>3.9</b>	<b>678,848</b>	<b>9.8</b>
<b>All Viet Nam</b>	<b>870,757</b>	<b>2.3</b>	<b>1,460,404</b>	<b>3.9</b>	<b>3,658,776</b>	<b>9.8</b>

Table 16 gives the prevalence and the estimated number of eyes with cataract at three levels of visual acuity: pinhole VA<3/60, <6/60 and <6/18, allowing for estimates of the surgical workload at the intake criteria for cataract surgery in the province. The highest number of eyes with operable cataract are found in Ha Tinh, Tien Giang and Nam Dinh province. If we assume the weighted average to be representative for entire Viet Nam then there are nearly 871,000 eyes blind due to cataract in Viet Nam. If all cataract eyes with VA<6/60 need to be operated the total workload is 1.46 million eyes. If the threshold is taken at <6/18 then 3.66 million eyes need surgery.

### 3.3 Cataract Surgical Coverage

Cataract surgical coverage (persons) is an impact indicator to measure which proportion of people with pinhole VA<3/60, <6/60 or <6/18 due to bilateral cataract, have been operated in one or both eyes. Similarly, Cataract surgical coverage (eyes) is used to measure the proportion of eyes with pinhole VA<3/60, <6/60 or <6/18 due to cataract that have been operated upon. Because the VA at the time of surgery is usually not known, the CSC is calculated at three different levels of VA: <3/60, <6/60 and <6/18. These levels are intended to represent the threshold VA below which cataract surgery is usually indicated in the country of concern. In Viet Nam the level in rural areas may lie at <6/60, while in urban areas <6/18 should be the norm. The CSC indicators give an impression about which part of the cataract problem has been addressed so far. The outcome of the cataract surgery is not included in this indicator.

Table 17 shows the CSC (eyes) for the 14 provinces. The CSC (eyes; <3/60) is highest in Quang Ngai (77%) and lowest in Dien Bien Province (41%). The weighted average indicates that for every 2 operated eyes there is 1 un-operated eye blind from cataract. If cataract surgery is done at VA<6/60, then for every operated eye there is one un-operated eye. If the VA threshold for cataract surgery is <6/18, then for every operated eye there are 2 un-operated eyes.

**Table 17.** Cataract surgical coverage (in %) in eyes

Province	CSC (eyes) <3/60			CSC (eyes) <6/60			CSC (eyes) <6/18		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Tuyen Quang	60	42	46	53	38	42	31	26	27
Phu Tho	64	68	67	56	57	57	25	30	28
Dien Bien	45	38	41	37	29	31	34	25	27
Bac Ninh	59	49	51	46	42	43	27	26	26
Nam Dinh	53	51	52	39	41	40	22	28	26
Ha Tinh	68	67	67	38	41	40	19	19	19
Quang Tri	67	59	61	49	48	48	25	29	27
Quang Ngai	67	80	77	41	60	54	16	27	23
Gia Lai	51	56	55	36	42	40	19	28	25
Lam Dong	60	70	67	56	56	56	37	35	36
Vung Tau	69	65	67	53	48	50	31	29	30
Binh Duong	72	72	72	63	61	62	48	40	43
Tien Giang	65	74	72	57	66	64	31	44	40
Ca Mau	58	55	56	50	49	49	26	30	28
<b>Weighted Average</b>	<b>62</b>	<b>63</b>	<b>62</b>	<b>48</b>	<b>50</b>	<b>49</b>	<b>27</b>	<b>30</b>	<b>29</b>

Table 18 shows the CSC (persons), indicating the proportion of people with bilateral cataract and pinhole VA<3/60, <6/60 or <6/18 in the better eye who had a cataract operation in one or both eyes. The CSC (persons) is always higher than the CSC (eyes) because when a person bilateral blind due to cataract is operated in one eye only, he is counted as 'covered', while in CSC (eyes) only one of the two eyes is covered. The reasoning is that the operation of one eye in a bilateral cataract blind person may change that person into a sighted person.

The highest CSC (persons; <3/60) is seen in Tien Giang (84%), the lowest in Dien Bien (41%) province, a high variation. The CSC <6/18 is considerably lower than for VA<6/60, indicating that not that many people with MVI due to cataract get operated. The CSC does not differ much for males and for females.

**Table 18.** Cataract surgical coverage (in %) in persons

Province	CSC (persons) <3/60			CSC (persons) <6/60			CSC (persons) <6/18		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Tuyen Quang	78	56	60	64	49	52	37	35	35
Phu Tho	79	77	77	70	69	69	33	37	36
Dien Bien	48	37	41	40	25	29	35	23	27
Bac Ninh	85	58	63	61	48	51	35	32	32
Nam Dinh	72	62	64	54	48	50	29	34	32
Ha Tinh	83	76	78	45	47	47	24	25	25
Quang Tri	71	67	68	52	57	56	27	32	31
Quang Ngai	67	85	81	47	71	64	25	39	35
Gia Lai	60	67	66	38	47	44	19	32	28
Lam Dong	71	86	82	72	65	67	47	41	42
Vung Tau	83	76	79	59	57	58	39	36	37
Binh Duong	88	81	83	76	69	71	56	48	50
Tien Giang	84	84	84	71	78	76	44	55	52
Ca Mau	77	77	77	68	66	66	36	41	39
<b>Weighted Average</b>	<b>76</b>	<b>73</b>	<b>74</b>	<b>59</b>	<b>59</b>	<b>59</b>	<b>34</b>	<b>38</b>	<b>37</b>

### 3.4 Causes of blindness

**Table 19.** Principal causes of bilateral blindness (presenting VA<3/60 in the better eye) in people 50+ in the sample population in 14 provinces.

Province	Bilateral blindness - main cause in person												
	URE	Aph	Cat	Compl	Trach	Other scar	Phthis	Ptery	Glau	DR	AMD	Other PSD	Globe /CNS
Tuyen Quang	0	0	70	5	6	5	2	0	2	0	3	8	2
Phu Tho	0	0	67	14	0	3	0	0	0	3	0	14	0
Dien Bien	0	0	84	4	0	0	3	0	0	1	1	5	1
Bac Ninh	0	0	63	0	0	10	1	1	4	0	0	18	1
Nam Dinh	0	2	81	4	2	4	0	2	2	0	4	2	0
Ha Tinh	0	0	87	3	3	3	0	0	0	3	0	0	0
Quang Tri	0	0	80	0	0	3	0	0	6	0	0	6	5
Quang Ngai	0	0	72	7	3	3	0	0	7	0	3	0	3
Gia Lai	0	0	69	0	0	8	0	0	13	0	3	5	3
Lam Dong	0	0	48	0	6	10	0	0	13	3	3	16	0
Vung Tau	0	0	81	2	0	7	0	0	2	0	2	2	2
Binh Duong	0	2	73	13	0	2	0	0	4	0	0	6	0
Tien Giang	0	0	77	2	0	0	0	0	2	0	0	9	9
Ca Mau	2	0	79	8	0	2	0	4	6	0	0	0	0
<b>Weighted average</b>	<b>0</b>	<b>0</b>	<b>74</b>	<b>5</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>2</b>

URE: Uncorrected refractive error

Trach: Trachomatous corneal scar

AMD: Age related macular degeneration

Aph: Uncorrected aphakia

DR: diabetic retinopathy

CNS: Central nervous system

Compl: Surgical complications

Other scar: Other corneal scar

PSD: Posterior segment disease

Phthis: Phthisis

Ptery: Pterygium

Glau: Glaucoma

The causes of blindness, SVI and VI are calculated from the sample data only and not adjusted to the actual population of the province. The reason is that the number of cases for each cause per 5-year age group will be so low that one case more or less may cause a huge change in prevalence and extrapolation to the actual population may in fact enhance inaccuracy. Diagnostic



facilities for posterior segment disease are limited and less obvious cases of glaucoma, diabetic retinopathy or ARMD can also be reported under other posterior segment disease. Table 19 shows the principal cause of bilateral blindness (PVA<3/60 in the better eye) in people 50+. Cataract is also the main cause in bilateral SVI and MVI with 85.0% and 73.1% respectively. In MVI, uncorrected refracted errors are the second cause with 12.4%

Cataract is clearly the most common cause of bilateral blindness, ranging from 63% in Bac Ninh to 84% in Dien Bien province. Complications after cataract surgery are high in Phu Tho and Binh Duong province and may need further investigation. Trachomatous corneal opacity seems to be limited to Tuyen Quang, Lam Dong, Ha Tinh, Quang Ngai and Nam Dinh province. Glaucoma is reportedly high in Gia Lai and Lam Dong province.

Vision loss from certain eye disease is treatable, like uncorrected refractive errors, aphakia, pterygium and un-operated cataract. For other causes it can be prevented through primary health care (PHC) or primary eye care (PEC), like trachoma scars, other corneal scars and phthisis. Specialized ophthalmic services may prevent complications of cataract surgery or that patients with diabetes or glaucoma become visually impaired or blind. Treatable and preventable blindness combined are called avoidable blindness (Table 20).

**Table 20.** Intervention strategies for bilateral blindness in 14 provinces.

	Treatable (%)	Preventable		Avoidable (%)	PSD (%)
Province		PHC-PEC (%)	Ophthal (%)		
Tuyen Quang	70	12	6	88	12
PhuTho	67	3	17	86	17
Dien Bien	84	3	5	92	8
BacNinh	65	12	4	81	22
Nam Dinh	84	5	5	95	7
Ha Tinh	87	7	7	100	3
Quang Tri	80	3	6	89	12
Quang Ngai	72	7	14	93	10
Gia Lai	69	8	13	90	21
Lam Dong	48	16	16	81	35
Vung Tau	81	7	5	93	7
Binh Duong	75	2	17	94	10
Tien Giang	77	0	5	82	11
Ca Mau	85	2	13	100	6
<b>Weighed average</b>	<b>75</b>	<b>6</b>	<b>9</b>	<b>90</b>	<b>12</b>

PHC-PEC: Primary Health Care – Primary Eye Care

PSD: Posterior segment disease

In the 14 provinces 75% of the causes of bilateral blindness in people 50+ is treatable, varying from 48% in Lam Dong to 87% in Ha Tinh. Adequate PHC-PEC services can prevent on average 6% (range 0-16%) of the bilateral blindness and adequate specialist ophthalmic services may prevent another 9% (range 4-17%). Combined, 90% (range 81-100%) of all causes of bilateral blindness in people aged 50+ is avoidable.

The principal causes of bilateral low vision (presenting VA<6/18-3/60 in the better eye) are shown in Table 21. Cataract is still the main cause with 75% (range 43-90%). Uncorrected refractive error is the second cause with 10% (range 4-45%). Surprising is the 45% in Dien Bien, which may deserve some extra attention.



**Table 21.** Principal causes of bilateral low vision (presenting VA<6/18 - 3/60 in the better eye) in people 50+ in the sample population in 14 provinces.

Province	Bilateral blindness - main cause in person												
	URE	Aph	Cat	Compl	Trach	Other scar	Phthis	Ptery	Glau	DR	AMD	Other PSD	Globe /CNS
Tuyen Quang	11	0	61	1	0	1	0	1	0	0	6	17	2
Phu Tho	4	0	81	8	0	0	0	0	1	0	0	6	0
Dien Bien	45	0	43	4	0	0	0	1	1	4	0	3	0
Bac Ninh	12	0	74	1	0	2	0	0	0	0	0	11	0
Nam Dinh	10	0	69	4	1	0	0	0	1	0	5	8	1
Ha Tinh	5	0	90	3	0	0	0	0	1	0	0	1	0
Quang Tri	10	0	82	0	0	0	0	0	2	0	2	3	0
Quang Ngai	10	0	85	3	0	0	0	1	0	0	0	0	0
Gia Lai	10	0	75	1	0	2	0	0	0	1	1	7	1
Lam Dong	22	0	62	1	0	2	0	1	1	2	2	7	1
Vung Tau	6	0	80	1	0	0	0	0	0	0	0	10	2
Binh Duong	9	0	75	12	0	1	0	0	0	0	0	1	1
Tien Giang	11	0	70	9	0	0	0	1	0	0	4	5	1
Ca Mau	6	0	83	7	0	0	0	3	0	0	0	0	0
<b>Weighted average</b>	<b>10</b>	<b>0</b>	<b>75</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>1</b>

URE: Uncorrected refractive error

Aph: Uncorrected aphakia

Compl: Surgical complications

Phthis: Phthisis

Trach: Trachomatous corneal scar

DR: diabetic retinopathy

Other scar: Other corneal scar

Ptery: Pterygium

AMD: Age related macular degeneration

CNS: Central nervous system

PSD: Posterior segment disease

Glau: Glaucoma

In the 14 provinces 86% of the causes of bilateral low vision (presenting VA<6/18-3/60 in the better eye) in people 50+ is treatable, varying from 73% in Tuyen Quang to 96% in Quang Ngai. Adequate PHC-PEC services can prevent on average 1% (range 0-3%) of the bilateral low vision and adequate specialist ophthalmic services may prevent another 5% (range 1-12%). Combined, 92% (range 75-100%) of all causes of bilateral low vision in people aged 50+ is avoidable. (Table 22)

**Table 22.** Intervention strategies for bilateral low vision in 14 provinces.

Province	Treatable (%)	Preventable		Avoidable (%)	Treatable (%)
		PHC-PEC (%)	Ophthal (%)		
Tuyen Quang	73	1	1	75	9
PhuTho	84	0	9	94	11
Dien Bien	89	0	8	97	11
BacNinh	86	2	1	89	1
Nam Dinh	79	1	5	86	8
Ha Tinh	95	0	4	99	0
Quang Tri	92	0	2	94	0
Quang Ngai	96	0	4	100	0
Gia Lai	86	3	2	91	0
Lam Dong	85	3	3	90	0
Vung Tau	86	0	1	88	0
Binh Duong	84	2	12	98	85
Tien Giang	82	0	9	91	105
Ca Mau	92	0	8	100	108
<b>Weighed average</b>	<b>86</b>	<b>1</b>	<b>5</b>	<b>92</b>	<b>28</b>

PHC-PEC: Primary Health Care – Primary Eye Care

PSD: Posterior segment disease

**3.4.1 Trachoma**

In these 14 RAABs there were no detailed questions on Trachoma, as in the previous RAABs. Trachomatous corneal opacity caused 1% of bilateral blindness and seems to be limited to Tuyen Quang, Lam Dong, Ha Tinh, Quang Ngai and Nam Dinh province. (Table 19). Bilateral low vision due to trachomatous scarring only occurred sporadically in nam Dinh province.

### 3.4.2 Pterygium

Because Onchocerciasis is not seen in Viet Nam, this option was replaced by Pterygium. Pterygium caused 1% of bilateral blindness and 1% of bilateral low vision in 2015.

### 3.4.3 Functional low vision (FLV)

In case of visual impairment or blindness which is not caused by un-operated cataract, posterior capsular opacification, uncorrected refractive error or uncorrected aphakia, it is usually not possible to restore normal vision. In such patients visual aids and mobility training can be helpful. With increasing life expectancy the risk of functional low vision may increase, while at the same time further development of specialized eye care services and better diagnostic and therapeutic facilities may prevent people to get sight-threatening complications through timely intervention.

The weighted average prevalence of FLV was 1.4%, varying between 0.5% in Quang Ngai to 2.1% in Tuyen Quang and Nam Dinh province. There is not much difference between males and females. In the 14 provinces 47,739 people had functional low vision: 19,437 males and 28,302 females. When extrapolated to entire Viet Nam, 259,321 people aged 50+ are estimated to have FLV: 104,966 males and 152,995 females. (Table 23)

**Table 23.** Adjusted prevalence of bilateral functional low vision (pinhole VA<6/18-Perception of Light in the better eye) and estimated number of cases in people aged 50+

Province	Males		Females		Total	
	n	%	n	%	n	%
Tuyen Quang	1,555	2.3	1,510	1.9	3,065	2.1
Phu Tho	1,792	1.2	2,308	1.3	4,100	1.3
Dien Bien	172	0.5	368	1.0	540	0.8
Bac Ninh	1,930	1.8	2,563	1.9	4,493	1.9
Nam Dinh	3,182	1.4	7,328	2.7	10,510	2.1
Ha Tinh	1,307	0.9	1,085	0.6	2,392	0.8
Quang Tri	736	1.3	918	1.3	1,654	1.3
Quang Ngai	192	0.2	1,136	0.8	1,328	0.5
Gia Lai	1,201	1.3	1,622	1.5	2,823	1.4
Lam Dong	1,660	1.6	2,651	2.3	4,311	2.0
Vung Tau	1,305	1.4	2,110	1.9	3,415	1.7
Binh Duong	863	0.9	641	0.5	1,504	0.7
Tien Giang	2,908	1.7	3,153	1.4	6,061	1.5
Ca Mau	634	0.6	909	0.7	1,543	0.6
<b>Weighed average</b>	<b>19,437</b>	<b>1.2</b>	<b>28,302</b>	<b>1.5</b>	<b>47,739</b>	<b>1.4</b>
<b>All Viet Nam</b>	<b>104,966</b>	<b>1.2</b>	<b>152,995</b>	<b>1.5</b>	<b>259,321</b>	<b>1.4</b>

### 3.6 Barriers

Not all people who are blind or severely visually impaired due to cataract are operated. Many are not and often they have valid reasons for it. If the barriers to cataract surgery are known, it becomes possible to design special intervention activities to overcome such barriers.

It should be realized that the procedure in RAAB to interview patients to find out more about the reasons why they have not been operated yet is not ideal. The ophthalmologist is not a neutral person and a patient may not reveal the actual barrier(s) but perhaps one that may sound acceptable to the interviewer. Although the survey teams are trained to ask neutral questions why the cataract has not yet been operated upon, they are not experienced and skilled interviewers and may interpret answers differently.

However, the findings on barriers from the RAAB make planners aware about the importance of these factors and they can provide a good starting point for more detailed qualitative assessments on barriers to cataract surgery.

There can be considerable variation in barriers between different provinces. Local factors like the credibility of the eye services, literacy of the patients, availability, accessibility and affordability of eye care services, the approach of eye care staff, socio-economic situation in the province, all influence the uptake of cataract surgery. The above factors should be well considered during the planning of future eye care activities in the individual provinces.

Looking at the weighted average, 'Fear' (fear for the operation as well as fear for poor result) is the major barrier to surgery in people bilaterally blind due to cataract. It is the major barrier in Phu Tho, Dien Bien, Ha Tinh and Vung Tau provinces. 'Cannot afford' is the second major barrier, followed by 'Cannot access treatment', 'Need not felt' and 'Unaware treatment is possible' and 'Treatment denied by provider'. This indicates that with more emphasis on health promotion and information to patients, the utilization of cataract surgical services could increase considerably.

Barriers vary considerable between provinces. There are a few remarkable findings: 'Fear' is the main barrier in Ha Tinh and Vung Tau, while the proportion good outcome in these provinces is well above the average. The proportion 'Unaware treatment is possible' is the same in people with bilateral cataract and with unilateral cataract and BCVA<6/60, while one would expect that many people in the last group must have had prior experience with cataract surgery.

In the following tables 24 and 25 the names of the provinces are in the title bar and the barriers are listed on the left. Below are the abbreviations of the names of the provinces.

TQ = Tuyen Quang	QN = Quang Ngai
PT = Phu Tho	GL = Gia Lai
DB = Dien Bien	LD = Lam Dong
BN = Bac Ninh	VT = Vung Tau
ND = Nam Dinh	BD = Binh Duong
HT = Ha Tinh	TG = Tien Giang
QT = Quang Tri	CM = Ca Mau

**Table 24.** Barriers to cataract surgery in people bilaterally blind due to cataract (pinhole VA<6/60)

Barriers	TQ	PT	DB	BN	ND	HT	QT	QN	GL	LD	VT	BD	TG	CM	Weighted average
Need not felt	22	13	12	25	14	17	19	15	21	8	24	40	27	6	19
Fear	16	40	45	14	25	33	22	24	8	26	44	31	17	12	25
Cannot afford	8	27	4	14	29	21	2	16	29	20	14	13	20	75	23
Treatment denied *	5	0	0	3	0	2	5	2	0	16	1	0	6	0	3
Unaware **	29	9	0	1	5	1	7	9	16	0	4	10	29	0	9
No access ***	20	11	39	43	27	26	45	34	26	30	13	6	1	7	21
<b>All barriers</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

\*: Treatment is denied by provider as criteria for surgery were not met.

\*\*: Unaware that treatment is possible or unaware of having cataract.

\*\*\*: Cannot access treatment because of the long distance.

**Table 25.** Barriers to cataract surgery in people unilaterally blind due to cataract (pinhole VA<6/60)

Barriers	TQ	PT	DB	BN	ND	HT	QT	QN	GL	LD	VT	BD	TG	CM	Weighted average
Need not felt	27	21	22	43	24	55	31	25	36	19	36	30	34	34	32
Fear	21	30	33	17	24	24	30	23	8	25	31	26	23	5	23
Cannot afford	5	33	6	11	23	10	9	19	25	19	19	13	18	57	21
Treatment denied *	5	2	6	1	4	0	0	1	1	19	1	5	3	1	3
Unaware **	25	6	14	4	4	0	8	9	17	9	7	16	21	0	9
No access ***	16	8	19	24	21	10	21	24	13	8	6	11	1	3	13
<b>All barriers</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

\*: Treatment is denied by provider as criteria for surgery were not met.

\*\*: Unaware that treatment is possible or unaware of having cataract.

\*\*\*: Cannot access treatment because of the long distance.

### 3.7 Visual outcome

In RAAB all eligible persons have their visual acuity measured with the available correction and with pinhole. This also includes people who were operated for cataract in one or both eyes. Results on visual outcome after cataract surgery in RAAB are usually worse than those obtained from outcome monitoring systems. The reason is that RAAB includes people who were operated last month as well as decades ago, by good eye surgeons as well as less good surgeons, in a well-equipped hospital as well as under improvised conditions in an eye camp. However, this is the outcome as it is seen by the general public and this may determine their faith in cataract surgical services.

Visual outcome after cataract surgery is usually measured as 'good' (can see 6/18), 'borderline' (VA<6/18 – 6/60) and 'poor' (cannot see 6/60). When measured as presenting vision, it will include patients who do not have the optimal optical correction. This may also include IOLs with incorrect power. Please note that the number of cases in the non-IOL group can be small and therefore changes in a few patients may result in dramatic changes in percentages. Secondly, not all non-IOL cases are intentionally intra-capsular cataract extractions (ICCE). It may also include planned IOL surgery where no IOL could be implanted because of a surgical complication like capsular rupture or vitreous loss. That may also affect the visual outcome in this group negatively.

Table 26 shows visual outcome with presenting VA in the 14 provinces. The proportion of 'good' outcome varies from 41% in Bac Ninh to 72% in Quang Ngai Province, the proportion of 'poor' outcome from 8% in Quang Ngai to 30% in Dien Bien and Bac Ninh province.

**Table 26.** Proportion good, borderline and poor outcome (presenting VA) after cataract surgery

Province	IOL			Non-IOL			Total		
	Good (%)	B-line (%)	Poor (%)	Good (%)	B-line (%)	Poor (%)	Good (%)	B-line (%)	Poor (%)
Tuyen Quang	59	18	23	0	20	80	57	18	25
Phu Tho	45	31	25	11	33	56	43	31	26
Dien Bien	51	19	30	0	50	50	50	19	30
Bac Ninh	44	30	27	0	0	100	41	28	30
Nam Dinh	56	26	18	0	0	100	55	25	20
Ha Tinh	72	15	13	0	0	100	71	15	14
Quang Tri	58	18	23	0	0	100	58	18	24
Quang Ngai	72	21	8	0	0	0	72	21	8
Gia Lai	70	15	15	0	0	0	70	15	15
Lam Dong	61	27	12	20	20	60	60	27	13
Vung Tau	70	15	16	0	0	100	69	14	16
Binh Duong	73	16	11	0	11	89	71	16	13
Tien Giang	68	25	7	12	0	88	65	24	11
Ca Mau	61	23	16	25	25	50	61	23	16
<b>Weighted average</b>	<b>62</b>	<b>22</b>	<b>16</b>	<b>6</b>	<b>10</b>	<b>84</b>	<b>60</b>	<b>22</b>	<b>18</b>

Good outcome: presenting VA  $\geq 6/18$ Borderline outcome: presenting VA  $< 6/18 - 6/60$ Poor outcome: presenting VA  $< 6/60$ 

Table 27 gives the visual outcome after cataract surgery with pinhole correction as a proxy for best correction. By comparing the percentages by presenting vision with those by pinhole vision it can be quickly evaluated what proportion of visual outcome can be improved further by optical correction alone. (Table 28)

None of the provinces reaches the 80% good outcome, recommended by the WHO. In some provinces the proportion good outcome is alarmingly low.

**Table 27.** Proportion good, borderline and poor outcome (pinhole VA) after cataract surgery

Province	IOL			Non-IOL			Total		
	Good (%)	B-line (%)	Poor (%)	Good (%)	B-line (%)	Poor (%)	Good (%)	B-line (%)	Poor (%)
Tuyen Quang	67	14	19	20	20	60	65	14	21
Phu Tho	55	24	21	11	33	56	53	25	22
Dien Bien	62	17	22	0	50	50	61	17	22
Bac Ninh	55	20	25	0	0	100	52	19	29
Nam Dinh	57	25	18	0	0	100	56	24	20
Ha Tinh	76	11	13	0	0	100	75	11	14
Quang Tri	70	9	21	0	0	100	69	9	22
Quang Ngai	84	10	7	0	0	0	84	10	7
Gia Lai	73	14	13	0	0	0	73	14	13
Lam Dong	75	15	10	40	0	60	74	14	12
Vung Tau	74	12	14	0	100	0	74	13	14
Binh Duong	81	10	10	0	22	78	78	10	12
Tien Giang	76	18	6	12	6	82	72	18	10
Ca Mau	71	15	14	25	25	50	70	15	15
<b>Weighted average</b>	<b>69</b>	<b>16</b>	<b>15</b>	<b>9</b>	<b>17</b>	<b>74</b>	<b>68</b>	<b>16</b>	<b>16</b>

Good outcome: presenting VA  $\geq 6/18$ Borderline outcome: presenting VA  $< 6/18 - 6/60$ Poor outcome: presenting VA  $< 6/60$

Table 28 shows that considerable improvement of visual outcome after cataract surgery can be achieved in nearly all provinces by providing pinhole correction. With optimal pre-operative biometry and post-operative refraction, the improvement may even be better than with pinhole alone. This demonstrates that adequate optical correction after cataract surgery can substantially improve visual outcome. Major improvements are achieved in nearly all provinces. Best visual outcome has Quang Ngai, but even there, considerable improvement can be achieved with optimal optical correction after cataract surgery. However, none of the provinces reaches 90% good outcome with best correction (WHO recommendation).

**Table 28.** Change in proportion good, borderline and poor outcome with pinhole correction.

Province	IOL			Non-IOL			Total		
	Good (%)	B-line (%)	Poor (%)	Good (%)	B-line (%)	Poor (%)	Good (%)	B-line (%)	Poor (%)
Tuyen Quang	+12	-32	-18	+100	0	-33	+13	-29	-20
Phu Tho	+19	-27	-19	0	0	0	+19	-25	-17
Dien Bien	+17	-11	-39	0	0	0	+17	-11	-38
Bac Ninh	+21	-52	-6	0	0	0	+21	-52	-4
Nam Dinh	+2	-5	0	0	0	0	+2	-5	0
Ha Tinh	+5	-36	0	0	0	0	+5	-36	0
Quang Tri	+16	-95	-12	0	0	0	+16	-95	-12
Quang Ngai	+14	-110	-15	0	0	0	+14	-110	-15
Gia Lai	+4	-6	-14	0	0	0	+4	-6	-14
Lam Dong	+18	-81	-17	+50	0	0	+19	-85	-14
Vung Tau	+6	-18	-16	0	+100	0	+6	-13	-20
Binh Duong	+9	-65	-13	0	+50	-14	+9	-57	-13
Tien Giang	+11	-39	-16	0	+100	-7	+10	-37	-11
Ca Mau	+14	-57	-8	0	0	0	+13	-55	-8
<b>Weighted average</b>	<b>+11</b>	<b>-43</b>	<b>-11</b>	<b>+9</b>	<b>+24</b>	<b>-4</b>	<b>+11</b>	<b>-42</b>	<b>-11</b>

Good outcome: presenting VA  $\geq 6/18$

Borderline outcome: presenting VA  $< 6/18 - 6/60$

Poor outcome: presenting VA  $< 6/60$

The proportion of IOL surgeries varies from 95% in Bac Ninh and Tien Giang to 100% in Quang Ngai, Gia Lai and Vung Tau province. The weighted average is 98%: 98% for men and 98% for women. (Table 29)

**Table 29.** Proportion IOL surgeries by province and by gender

Province	Males (%)	Females (%)	Total (%)
Tuyen Quang	100	94	96
Phu Tho	98	95	96
Dien Bien	98	99	98
Bac Ninh	95	95	95
Nam Dinh	100	97	98
Ha Tinh	97	100	99
Quang Tri	100	99	99
Quang Ngai	100	100	100
Gia Lai	100	100	100
Lam Dong	92	99	97
Vung Tau	99	100	100
Binh Duong	97	98	97
Tien Giang	94	95	95
Ca Mau	98	99	98
<b>Weighted average</b>	<b>98</b>	<b>98</b>	<b>98</b>

Table 30 shows the place of surgery by province. Overall, 51% of cataract operations was conducted in district hospitals, 27% in private hospitals, 17% in national hospitals, and 5% in eye camps. However, within each province the distribution varied widely.

**Table 30.** Place of surgery

Province	National hospital* (%)	District hospital** (%)	Private hospital (%)	Eye camp / improvised (%)
Tuyen Quang	13	50	2	36
Phu Tho	20	70	7	3
Dien Bien	6	76	2	16
Bac Ninh	0	30	54	15
Nam Dinh	27	50	20	2
Ha Tinh	13	64	12	12
Quang Tri	0	13	85	2
Quang Ngai	28	71	1	1
Gia Lai	11	89	0	0
Lam Dong	0	51	47	2
Vung Tau	45	42	10	3
Binh Duong	55	43	2	0
Tien Giang	0	46	54	0
Ca Mau	0	22	75	3
<b>Weighted average</b>	<b>17</b>	<b>51</b>	<b>27</b>	<b>5</b>

\*: National Hospital: National Hospital or HCM Ophthalmology hospital

\*\*: District hospital: Provincial and district hospitals

### 3.8 Use and coverage of spectacles

All examined persons are asked whether they use glasses for distance vision and for reading (near vision). All people wearing distance glasses plus people with uncorrected distance vision together gives the prevalence of refractive errors for distance vision. The number of people with uncorrected refractive error gives the prevalence of uncorrected refractive errors for distance vision. From these two parameters the spectacle coverage for refractive errors for distance vision can be calculated. This can give a good indication of the availability, accessibility, affordability and acceptance of optical services in the 14 provinces.

**Table 31.** Spectacle coverage for distant vision (%)

Province	Prev. refractive errors			Prev. Uncorrected Refr. Error			Spectacle coverage		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Tuyen Quang	11	8	9	6	6	6	47	18	33
Phu Tho	12	10	10	8	9	8	31	11	20
Dien Bien	18	17	18	18	17	18	0	1	1
Bac Ninh	8	6	7	4	4	4	56	23	38
Nam Dinh	8	6	7	4	5	5	44	12	27
Ha Tinh	13	9	10	10	7	8	18	19	20
Quang Tri	14	11	12	11	9	9	26	14	23
Quang Ngai	21	17	18	13	13	13	39	23	29
Gia Lai	6	9	8	4	7	6	21	22	23
Lam Dong	16	18	17	13	16	14	22	15	18
Vung Tau	16	14	15	8	7	8	50	49	49
Binh Duong	16	11	13	5	5	5	71	54	61
Tien Giang	13	11	12	6	7	7	54	31	41
Ca Mau	7	6	6	5	5	5	22	16	18
<b>Weighted average</b>	<b>12</b>	<b>10</b>	<b>11</b>	<b>7</b>	<b>8</b>	<b>8</b>	<b>38</b>	<b>22</b>	<b>30</b>

Table 31 shows a lot of variation between the provinces. The weighted average prevalence of refractive errors is 11%, ranging from 6% in Ca Mau to 18% in Dien Bien and in Quang Ngai province. The average prevalence of uncorrected refractive errors is 8%, ranging from 4% in Bac Ninh to 18% in Dien Bien province. The spectacle coverage is on average 30%, varying between 1% in Dien Bien and 61% in Binh Duong province. There is a considerable difference between men and women. It seems refractive and optical services deserve more attention in nearly all 14 provinces, but most urgently in Dien Bien, Ca Mau and Lam Dong.

**Table 32.** Spectacle coverage for near vision (%)

Province	Prev. Uncorrected Refr. Error			Spectacle coverage		
	Male	Female	Total	Male	Female	Total
Tuyen Quang	39	58	50	61	42	50
Phu Tho	16	28	23	84	72	77
Dien Bien	58	69	64	42	31	36
Bac Ninh	40	69	57	60	31	43
Nam Dinh	44	61	54	56	39	46
Ha Tinh	62	81	74	38	19	26
Quang Tri	50	70	62	50	31	38
Quang Ngai	68	78	74	32	22	26
Gia Lai	72	85	80	28	15	21
Lam Dong	46	67	59	54	33	41
Vung Tau	39	45	42	61	55	58
Binh Duong	40	50	46	60	51	54
Tien Giang	54	70	64	46	30	36
Ca Mau	41	60	52	59	40	48
<b>Weighted average</b>	<b>47</b>	<b>63</b>	<b>57</b>	<b>53</b>	<b>37</b>	<b>43</b>

For near vision, it is assumed that all people aged 50+ are presbyopic and need reading glasses. On average 57% of the examined people does not have reading glasses and the coverage is 43%, 53% in males and 37% in females.



## Chapter 4. Comparing 2015 with earlier surveys

### 4.1 Comparing findings from surveys in 2000-'02, 2007-'08 and 2015

Blindness surveys in Viet Nam have been conducted in 1986, 1990, 1995, 2000-'02, 2007-'08 and in 2015 (Table 1). The last three surveys used comparable methodologies: RACSS in 2000-'02 and RAAB in 2007-'08 and in 2015. In this chapter we compare the findings from these last three surveys, covering a total of 25 provinces: 15 provinces were surveyed once, 7 twice and 3 thrice. In the tables below only those provinces are listed that are surveyed twice or thrice, as well as the weighted average prevalence for the corresponding indicators for all surveyed provinces in 2000-'02, 2007-'08 and 2015.

### 4.2 Comparing blindness and low vision

**Table 33.** Adjusted prevalence of bilateral blindness in 2000, 2007 and in 2015

Province	Blindness (presenting VA<3/60 in better eye)		
	2000-'02	2007-'08	2015
Phu Tho	3.4% (2.4-4.4)	2.7% (1.8-3.6)	1.2% (0.5-1.8)**
Bac Ninh		4.8% (3.6-6.0)	2.5% (1.5-3.5)**
Ha Tay	3.4% (2.3-4.5)	3.1% (1.7-4.4)	
Hai Phong	3.5% (2.5-4.5)	2.9% (1.8-4.0)	
Binh Dinh	6.0% (4.9-7.1)	5.8% (3.5-8.0)	
Nghe An	4.8% (3.5-6.1)	4.2% (2.4-6.0)	
Gia Lai	3.5% (2.4-4.6)	3.1% (1.8-4.5)	1.2% (0.5-2.0)***
Ba Ria - Vung Tau		3.0% (2.2-3.9)	1.9% (1.0-2.7)
Tien Giang	4.1% (3.0-5.2)	2.4% (1.4-3.4)	2.1% (1.4-2.8)***
Binh Phuoc	3.3% (2.6-4.0)	2.6% (1.4-3.9)	
<b>Weighted average</b>	<b>4.1% (3.8-4.5)</b>	<b>3.1% (2.8-3.4)*</b>	<b>1.8% (1.6-2.0)**</b>
<b>Estimated cases</b>	<b>443,706</b>	<b>370,640</b>	<b>329,333</b>

\*: significant difference 2000-2007    \*\*: significant difference 2007-2015    \*\*\*: significant difference 2000-2015

Table 33 shows that the adjusted prevalence of blindness with presenting vision in people aged 50+, including blindness due to refractive errors, reduced in all corresponding provinces between 2000 and 2007, and between 2007 and 2015. Although the reduction was not significant in all provinces, most probably due to the small sample size in each province, there was a significant reduction in Phu Tho, Bac Ninh, Gia Lai and Tien Giang province. The weighted average prevalence in 2015 was significantly lower than 2007-'08 and that of 2007-'08 was significantly lower again compared to 2000-'02. The number of estimated people aged 50+ in Viet Nam with bilateral blindness also reduced, but far less than the prevalence. This is due to the fact that the number of people aged 50+ (those at risk to develop cataract) increased considerably between 2000 and 2015 due to the aging trend.

The weighted average prevalence of low vision reduced significantly between 2000 and 2007 ( $p=0.00233$ ) and between 2007 and 2015 ( $p<0.00001$ ). Some provinces show a reduction in prevalence while others show an increase. The number of people aged 50+ with bilateral low vision slightly reduced between 2000 and 2007, but increased in 2015. (Table 34)

**Table 34.** Adjusted prevalence of bilateral low vision in 2000, 2007 and in 2015

Province	Low Vision (presenting VA<6/18-3/60)		
	2000-'02	2007-'08	2015
Phu Tho	14.5%	9.4%	11.1%
Bac Ninh		12.3%	8.5%
Ha Tay	13.2%	11.7%	
Hai Phong	11.5%	11.3%	
Binh Dinh	20.3%	21.9%	
Nghe An	13.7%	17.1%	
Gia Lai	15.3%	11.0%	7.1%
Ba Ria - Vung Tau		16.9%	11.6%
Tien Giang	18.0%	13.6%	12.5%
Binh Phuoc	11.2%	13.0%	
<b>Weighted average</b>	<b>14.7%</b>	<b>13.6% *</b>	<b>11.4% **</b>
<b>Estimated cases</b>	<b>1,582,574</b>	<b>1,570,184</b>	<b>2,099,409</b>

\*: significant difference 2000-2007    \*\*: significant difference 2007-2015

Although the sample sizes may have been too low to demonstrate a significant difference between subsequent surveys, there is a significant reduction between 2000-'02 and 2015 in Phu Tho, Gia Lai and Tien Giang province. The weighted average does show significant reductions between 2007 and 2000 and between 2015 and 2007. However, the estimated number of patients with bilateral cataract in entire Viet Nam stabilized between 2007 and 2015, after the earlier reduction between 2000 and 2007. This means that the possible increase in the annual number of cataract operations was not enough to compensate for the increase of cataract cases due to the aging trend.

**Table 35.** Adjusted prevalence of bilateral cataract blindness in 2000, 2007 and in 2015

Province	Cataract blindness (BCVA<3/60 in better eye)		
	2000-'02	2007-'08	2015
Phu Tho	2.3% (1.4-3.2)	1.1% (0.0-2.3)	0.7% (0.2-1.2)***
Bac Ninh		1.7% (1.1-2.3)	1.2% (0.5-1.8)
Ha Tay	2.0% (1.3-2.7)	1.5% (0.6-2.3)	
Hai Phong	1.4% (0.9-1.9)	1.3% (0.4-2.1)	
Binh Dinh	3.5% (2.5-4.5)	3.0% (1.9-4.1)	
Nghe An	2.3% (1.3-3.3)	2.5% (1.1-4.0)	
Gia Lai	2.3% (1.2-3.4)	1.8% (0.6-3.0)	0.6% (0.0-1.2)***
Ba Ria - Vung Tau		1.8% (1.1-2.4)	1.1% (0.5-1.6)
Tien Giang	2.7% (1.8-3.6)	1.8% (0.9-2.6)	1.2% (0.6-1.8)***
Binh Phuoc	1.7% (1.2-2.2)	1.4% (0.6-2.2)	
<b>Weighted average</b>	<b>2.3% (2.0-2.6)</b>	<b>1.6% (1.4-1.8)*</b>	<b>1.0% (0.9-1.2)**</b>
<b>Estimated cases</b>	<b>247,659</b>	<b>192,298</b>	<b>193,987</b>

\*: significant difference 2000-2007    \*\*: significant difference 2007-2015    \*\*\*: significant difference 2000-2015

The weighted average prevalence of low vision due to bilateral cataract shows a minimal reduction, and some provinces even show an increased prevalence. Probably the criteria for cataract surgery in these provinces still limit the operation of early cataracts. The number of people aged 50+ with low vision due to bilateral cataract increased substantially between 2015 and 2007, against a marginal increase between 2000 and 2007. This means the current level of cataract surgery is too low and the backlog is increasing.

**Table 36.** Adjusted prevalence of bilateral cataract low vision in 2000, 2007 and in 2015

Province	Low Vision (BCVA<6/18-3/60)		
	2000-'02	2007-'08	2015
Phu Tho	8.8%	4.5%	5.4%
Bac Ninh		5.2%	4.5%
Ha Tay	5.4%	4.2%	
Hai Phong	4.6%	3.4%	
Binh Dinh	9.3%	14.7%	
Nghe An	4.3%	10.6%	
Gia Lai	7.4%	5.0%	3.3%
Ba Ria - Vung Tau		4.6%	7.5%
Tien Giang	8.3%	7.7%	6.3%
Binh Phuoc	4.7%	6.8%	
<b>Weighted average</b>	<b>6.3%</b>	<b>6.0%</b>	<b>6.0%</b>
<b>Estimated cases</b>	<b>678,079</b>	<b>695,131</b>	<b>1,130,827</b>

Figure 9 illustrates the weighted average prevalence in people aged 50+, as shown in Table 33 to 36. While the prevalence of bilateral blindness, bilateral cataract blindness and bilateral low vision show a steady decline over the past 15 years, the prevalence of bilateral low vision due to cataract has not declined at all.

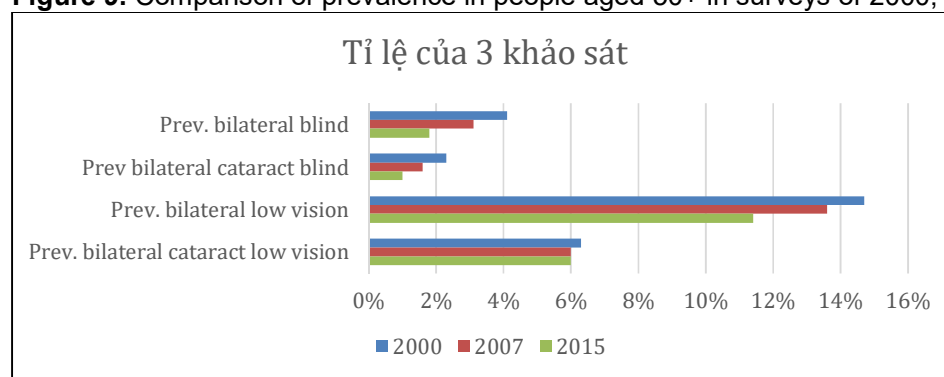
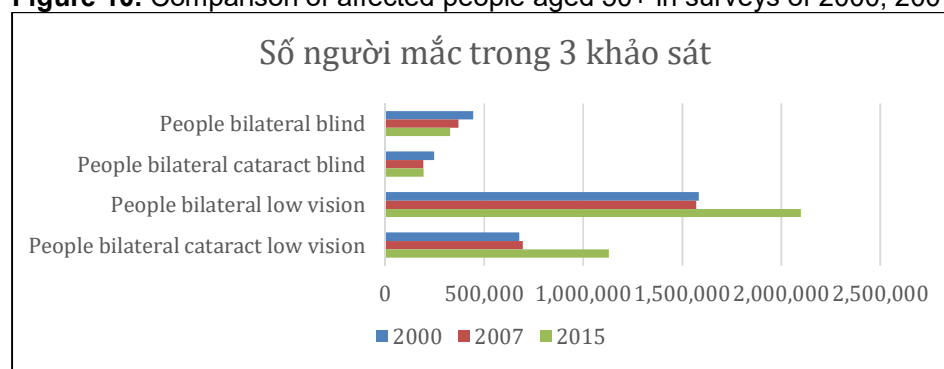
**Figure 9.** Comparison of prevalence in people aged 50+ in surveys of 2000, 2007 and 2015

Figure 10 illustrates the estimated people aged 50+ with bilateral (cataract) blindness and low vision in entire Viet Nam+, as shown in Table 33 to 36. While a slight decrease is seen in the estimated number of blind people, the strong increase in people with bilateral low vision (due to cataract) since the last survey in 2007 is clearly visible.

**Figure 10.** Comparison of affected people aged 50+ in surveys of 2000, 2007 and 2015

The conclusion from Figure 8 can only be that the number of cataract surgeries conducted in Viet Nam has not been enough to compensate for the aging trend, which causes a fast increase in the number of people aged 50+, who are at risk for cataract. Figure 8 shows the increase of the cataract backlog, especially during the period 2007-2015.

### 4.3 Cataract surgical coverage (CSC)

The cataract surgical coverage (persons) is an impact indicator estimating the proportion of people with bilateral cataract blindness that have been operated upon in one or both eyes at the time of the survey. Table 37 shows that the weighted average CSC improved from 52% in 2000 to 67% in 2007 and further to 74% in 2015. The individual provinces also show an increase in the CSC, except Nghe An and Bac Ninh province. It would be interesting to find out why the CSC reduced here.

In 2000, for every operated person with bilateral cataract there were two un-operated persons, bilaterally blind from cataract. There was one un-operated person for every two operated persons in 2007, and in 2015 there is one un-operated persons for every 3 operated persons bilaterally blind from cataract.

**Table 37.** Cataract Surgical Coverage in persons at BCVA<3/60

	<b>Cataract Surgical Coverage</b>		
<b>Province</b>	<b>2000-'02</b>	<b>2007-'08</b>	<b>2015</b>
Phu Tho	33	60	77
Bac Ninh		66	63
Ha Tay	47	63	
Hai Phong	70	73	
Binh Dinh	58	60	
Nghe An	47	40	
Gia Lai	34	55	66
Ba Ria - Vung Tau		72	79
Tien Giang	59	70	84
Binh Phuoc	55	62	
<b>Weighted average</b>	<b>52</b>	<b>67</b>	<b>74</b>

**Table 38.** Cataract Surgical Coverage in persons at BCVA<6/60

	<b>Cataract Surgical Coverage</b>		
<b>Province</b>	<b>2000-'02</b>	<b>2007-'08</b>	<b>2015</b>
Phu Tho	24	47	69
Bac Ninh		57	51
Ha Tay	39	52	
Hai Phong	57	63	
Binh Dinh	50	44	
Nghe An	43	24	
Gia Lai	25	36	44
Ba Ria - Vung Tau		65	58
Tien Giang	54	60	76
Binh Phuoc	49	48	
<b>Weighted average</b>	<b>45</b>	<b>56</b>	<b>59</b>

When comparing the CSC (persons, BCVA<6/60) and (persons, BCVA<6/18) over the same period it becomes clear that the increase is minimal or even stagnating. In nearly half of the

provinces this CSC is even going down (Table 38 & Table 39). This actually indicates that with the increase in patients with BCVA<6/60 and <6/18 due to the ageing trend, the eye care services are not able to keep up with the demand. The proportion of IOL implantations has increased from 47% in 2000-'02 to 98% in 2015. This modern technique permits cataract surgery at a much earlier stage, whereby patients can be operated before they actually become disabled.

**Table 39.** Cataract Surgical Coverage in persons at BCVA<6/18

	<b>Cataract Surgical Coverage</b>		
<b>Province</b>	<b>2000-'02</b>	<b>2007-'08</b>	<b>2015</b>
Phu Tho	13	29	36
Bac Ninh		37	32
Ha Tay	24	35	
Hai Phong	39	45	
Binh Dinh	31	24	
Nghe An	28	15	
Gia Lai	15	24	28
Ba Ria - Vung Tau		47	37
Tien Giang	30	36	52
Binh Phuoc	30	24	
<b>Weighted average</b>	<b>29</b>	<b>39</b>	<b>37</b>

#### 4.4 Visual outcome

Also the visual outcome after cataract surgery improved over the years. The weighted average proportion with good outcome (presenting VA $\geq$ 6/18) increased from 36% in 2000 to 51% in 2007 and 60% in 2015. However, this is still well below the 80% recommended by the WHO. In some of the provinces the proportion of good outcome is still alarmingly low in 2015, like in Phu Tho and Bac Ninh.

**Table 40.** Proportion good visual outcome after cataract surgery (presenting VA $\geq$ 6/18)

	<b>Proportion good outcome (%)</b>		
<b>Province</b>	<b>2000-'02</b>	<b>2007-'08</b>	<b>2015</b>
Phu Tho	43	44	43
Bac Ninh		39	41
Ha Tay	26	42	
Hai Phong	44	50	
Binh Dinh	42	41	
Nghe An	24	30	
Gia Lai	44	37	70
Ba Ria - Vung Tau		49	69
Tien Giang	44	65	65
Binh Phuoc	43	59	
<b>Weighted average</b>	<b>36</b>	<b>51</b>	<b>60</b>

#### 4.5 Proportion IOL implanted

The percentage of cataract operations whereby an IOL was implanted has increased dramatically from 47% in 2000 to 84% in 2007 and 98% in 2015. (Table 39)

**Table 41.** Proportion cataract operations with IOL

Province	Proportion IOL (%)		
	2000-'02	2007-'08	2015
Phu Tho	36	81	96
Bac Ninh		81	95
Ha Tay	40	82	
Hai Phong	59	86	
Binh Dinh	39	79	
Nghe An	43	83	
Gia Lai	74	85	100
Ba Ria - Vung Tau		83	100
Tien Giang	49	88	95
Binh Phuoc	58	83	
<b>Weighted average</b>	<b>47</b>	<b>84</b>	<b>98</b>

#### 4.6 Causes of blindness and low vision

Table 42 shows the weighted average principal cause of blindness in the three surveys. There are some minor changes in the causes, but none of them are significant.

**Table 42.** Principal cause of bilateral blindness (presenting VA<3/60 in the better eye)

Province	Bilateral blindness - main cause in person (%)												
	URE	Aph	Cat	Compl	Trach	Other scar	Phthis	Ptery	Glau	DR	AMD	Other PSD	Globe /CNS
2000-'02	0.9	2.5	68.3	1.8	3.6	2.3	2.0		5.8	0.1	0.1	12.6	0.0
2007-'08	2.5	0.0	66.1	4.1	1.7	5.6	3.2		6.4	0.6	0.0	9.7	0.0
2015	0.1	0.4	74.0	4.6	1.5	4.1	0.2	0.6	4.0	0.8	1.4	6.3	2.0

URE: Uncorrected refractive error

Trach: Trachomatous corneal scar

AMD: Age related macular degeneration

Aph: Uncorrected aphakia

DR: diabetic retinopathy

CNS: Central nervous system

Compl: Surgical complications

Other scar: Other corneal scar

PSD: Posterior segment disease

Phthis: Phthisis

Ptery: Pterygium

Glau: Glaucoma

#### Trachomatous corneal opacity

Bilateral blindness due to trachomatous corneal opacity seems to be on the decline. In the 2007-'08 survey detailed assessment of trichiasis was part of the examination. This made it possible to make detailed assessments of the workload on trichiasis surgery. In 2015, this was not included in the RAAB.

#### Pterygium

Similarly, detailed assessment of pterygium was part of the 2007-'08 survey, to assess the surgical workload of this disorder. In 2015, only the bilateral blindness due to pterygium was assessed, but this was not done in 2000 nor in 2007.

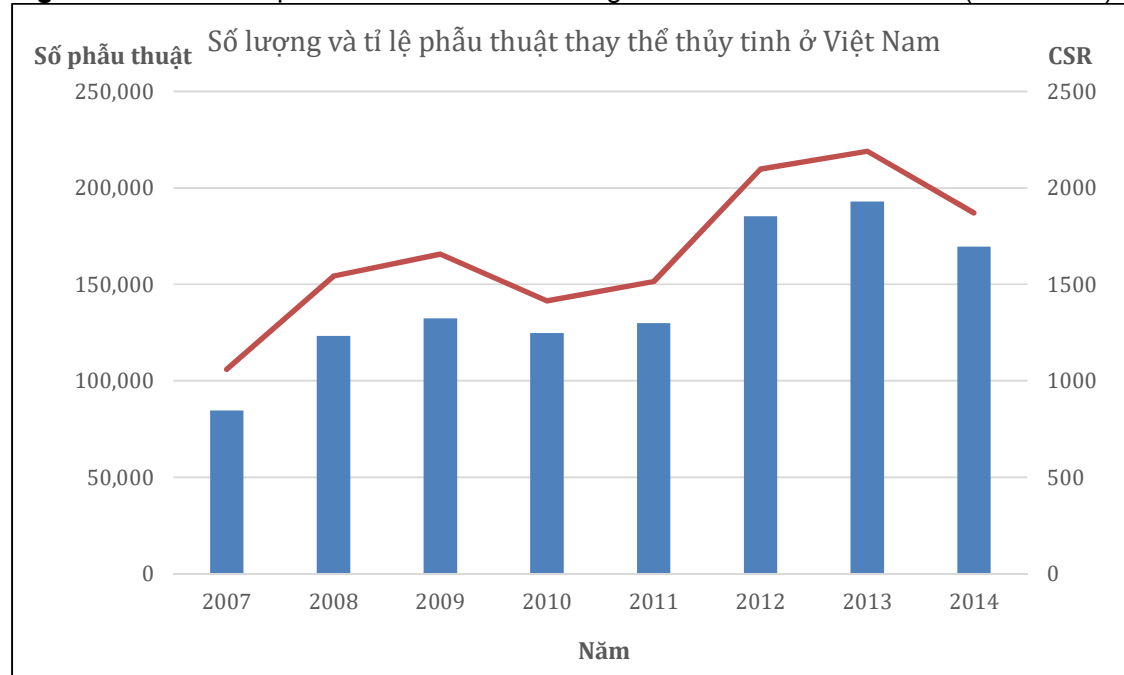
#### Childhood blindness

Childhood blindness is not included in the RAAB protocol, which covers only people aged 50 years and older. The prevalence of blindness in people younger than 50 is very low and a sample size of 30,000 or more is needed to obtain prevalence data of acceptable accuracy in this age group. The optional childhood blindness module which was used in 2007-'08 was not applied in the 2015 RAABs in the 14 provinces.

#### 4.7 Annual cataract operations 2007 – 2014

Figure 11 shows the number of cataract operations and the Cataract Surgical Rate (CSR: number of cataract operations in one year divided by the population in millions) in entire Viet Nam from 2007 to 2014. Although the number of operations is increasing, this is not a steady increase and the CSR is relatively low. At present the annual cataract output is not enough to cover the new cases that occur each year and as a result the cataract backlog is increasing.

**Figure 11.** Cataract operations and Cataract Surgical Rate in entire Viet Nam (2007-2014)





## Annex 1. RAAB survey form (English)

RAPID ASSESSMENT FOR AVOIDABLE BLINDNESS			
<b>A. GENERAL INFORMATION</b>			
Survey area: _____	Cluster: _____	Year - month: _____ - _____	Individual no.: _____
Name: _____	Sex: Male: O (1) Female: O (2)	Age (years): _____	
Optional 1: _____	<b>Examination status:</b>		
Optional 2: _____	Examined: O (1) (go to B)	Refused: O (3) (go to E)	
	Not available: O (2) (go to E)	Not able to communicate: O (4) (go to E)	
Always ask: "Did you ever have any problems with your eyes?" Yes: O (1) No: O (2)			
If not available - details (availability / tel number / address)			
<b>B. VISION</b>		<b>C. LENSE EXAMINATION</b>	
Uses distance glasses: No: O (1) Yes: O (2)		<b>Right eye</b>	<b>Left eye</b>
Uses reading glasses: No: O (1) Yes: O (2)			
<b>Presenting vision</b>	<b>Right eye</b> <b>Left eye</b>	Normal lens / minimal lens opacity: O (1) O (1)	
Can see 6/12 O (1) O (1)		Obvious lens opacity: O (2) O (2)	
Cannot see 6/12 O (2) O (2)		Lens absent (aphakia): O (3) O (3)	
but can see 6/18 O (3) O (3)		Pseudophakia without PCO: O (4) O (4)	
Cannot see 6/60 O (4) O (4)		Pseudophakia with PCO: O (5) O (5)	
but can see 3/60 O (5) O (5)		No view of lens: O (6) O (6)	
Cannot see 3/60 O (6) O (6)			
but can see 1/60 O (7) O (7)			
Light perception (PL+) O (7) O (7)			
No light perception (PL-) O (7) O (7)			
<b>Pinhole vision</b>	<b>Right eye</b> <b>Left eye</b>	<b>D. MAIN CAUSE OF PRESENTING VA&lt;6/12</b>	
Can see 6/12 O (1) O (1)		(Mark only one cause for each eye)	
Cannot see 6/12 O (2) O (2)		<b>Right eye</b> <b>Left eye</b>	<b>Principal cause in person</b>
but can see 6/18 O (3) O (3)		Refractive error: O (1) O (1)	O (1)
Cannot see 6/18 O (4) O (4)		Aphakia, uncorrected: O (2) O (2)	O (2)
but can see 6/60 O (5) O (5)		Cataract, untreated: O (3) O (3)	O (3) (F)
Cannot see 6/60 O (6) O (6)		Cataract surg. complications: O (4) O (4)	O (4)
but can see 3/60 O (7) O (7)		Trachoma corneal opacity: O (5) O (5)	O (5)
Cannot see 3/60 O (8) O (8)		Other corneal opacity: O (6) O (6)	O (6)
but can see 1/60 O (9) O (9)		Phthisis: O (7) O (7)	O (7)
Light perception (PL+) O (10) O (10)		Pterygium: O (8) O (8)	O (8)
No light perception (PL-) O (11) O (11)		Glaucoma: O (9) O (9)	O (9)
		Diabetic retinopathy: O (10) O (10)	O (10)
		ARMD: O (11) O (11)	O (11)
		Other posterior segment: O (12) O (12)	O (12)
		All globe/CNS abnormalities: O (13) O (13)	O (13)
		Not examined: can see 6/12 O (14) O (14)	O (14)
<b>E. HISTORY, IF NOT EXAMINED</b>		<b>G. DETAILS ABOUT CATARACT OPERATION</b>	
(From relative or neighbour)		<b>Right eye</b> <b>Left eye</b>	
<b>Believed</b>	<b>Right eye</b> <b>Left eye</b>	Age at operation (years) _____	
Not blind O (1) O (1)		Place of operation	
Blind due to cataract O (2) O (2)		Central Hospital/Specialised Hosp. O (1) O (1)	
Blind due to other causes O (3) O (3)		Provincial Hospital/District Hospital O (2) O (2)	
Operated for cataract O (4) O (4)		Private hospital O (3) O (3)	
		Mobile operation team O (4) O (4)	
		Traditional settings O (5) O (5)	
		<b>Type of surgery</b>	
		Non IOL O (1) O (1)	
		IOL implant O (2) O (2)	
		Couching O (3) O (3)	
		<b>Cost of surgery</b>	
		Totally free/Partially free O (1) O (1)	
		Paid by health insurance O (2) O (2)	
		Self fully paid O (3) O (3)	
		<b>Cause of VA&lt;6/12 after cataract surgery</b>	
		Ocular comorbidity (Selection) O (1) O (1)	
		Operative complications (Surgery) O (2) O (2)	
		Refractive error (Spectacles) O (3) O (3)	
		Longterm complications (Sequelae) O (4) O (4)	
		Does not apply - can see 6/12 O (5) O (5)	
<b>F. WHY CATARACT SURGERY WAS NOT DONE</b>			
(Mark up to 2 responses, if VA<6/18, not improving with pinhole, with visually impairing lens opacity in one or both eyes)			
Need not felt O (1)			
Fear of surgery or poor result O (2)			
Cannot afford operation O (3)			
Treatment denied by provider O (4)			
Unaware that treatment is possible O (5)			
No access to treatment O (6)			



### Appendix 3. Summary of research findings in 14 individual provinces

#### RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN BAC NINH PROVINCE IN 2015

##### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Bac Ninh from May to July, 2015. The sample size of 2000 people have eye checked which consists of 821 males, 1179 females. The research used random sampling method, choosing 40 groups and investigating 50 people in each group based on rule of door-to-door houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 26.5% in the both two eyes was 20.5%. In which, the prevalence of bilateral blindness accounted for 3.6%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 10.9% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (12.6%) was significantly higher than those in males (8.3%). The causes of blindness mainly were cataract without surgery (accounted for 53.7%); posterior segment disease (accounted for 20.2%); corneal scars due to other causes (accounted for 10.3%). Total avoidable blindness causes was 73.6%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 51.2% and with all  $VA < 6/18$  was 25.9%. The average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 63.4% and 32.3% respectively. After cataract surgery, the rate of good visual acuity was 36.6% and the rate of low vision and blindness was 30.3%. The greatest barriers preventing patients from surgery were far distance to surgery places (43.0%), feeling “no need” for surgery (24.6%) and being “fear” for surgery (13.8%) or being afraid of poor outcome.

##### Conclusion

The research showed that the prevalence of blindness of people aged over 50 in Bacninh was relatively high (3.6%); the main cause leading to visual impairment and blindness was cataract (53.7%). The successful results of cataract surgery intervention is not high, which is about 41.4%. There are many barriers preventing patients from surgery such as far distance to surgery places, being “fear” for surgery or being affraid of poor outcome.

It is necessary to intensify health education and promotion to make people regularly taking eye check, early detection of visual impairment causes, improving the quality of cataract surgeries, and proposing solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN NAMDINH PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Namdinh province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 846 males, 1154 females. The research used random sampling method, choosing 40 groups and investigating 50 people in each group based on rule of door-to-door houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 29.9% in the both two eyes was 25.7%. In which, the prevalence of bilateral blindness accounted for 3.0%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 13.4% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (15.1%) was significantly higher than those in males (10.9%). The causes of blindness mainly were cataract without surgery (accounted for 65.4%); posterior segment disease accounted for 7.9% corneal scars due to other causes (accounted for 7.9%), and total avoidable blindness causes was 81.7%. The average CSC accounted in the individual eye of visual impairment with  $VA < 3/60$  was 51.8% and with all  $VA < 6/18$  was 25.6%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  are 64% and 32.1 respectively. After cataract surgery, the rate of good visual acuity was 55% and the rate of low vision and blindness was 19.8%. The greatest barriers preventing patients from surgery were lack of money (29.3%), far distance to surgery places (43.0%), and being “fear” for surgery and afraid of poor outcome (25.0%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 in Namdinh was relatively high (3.0%); the main cause leading to visual impairment and blindness was cataract (65.4%). The successful results of cataract surgery intervention is not high, which is about 43.2%. There are many barriers preventing patients from surgery such as lack of money; far distance to surgery places, being “fear” for surgery or being afraid of poor outcome.

It is necessary to intensify health education and promotion to make people regularly taking eye check, early detection of visual impairment causes, improving the quality of cataract surgeries, and proposing solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN PHUTHO PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Phutho province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 772 males, 1228 females. The research used random sampling method, particularly, choosing 40 groups and investigating 50 people in each group based on rule of door-to-door houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 21.9% in the both two eyes was 15.3%. In which, the prevalence of bilateral blindness accounted for 1.8%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 16.1% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (17.7%) was significantly higher than those in males (13.4%). The causes of blindness mainly were cataract without surgery (accounted for 61.1%); post surgery complication accounted for 11.4%; posterior segment disease accounted for 10.9%, and total avoidable blindness causes was 84.4%. The average CSC accounted in the individual eye of visual impairment with  $VA < 3/60$  was 67.1% and with all  $VA < 6/18$  was 28.4%. The average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 77.4% and 36.1% respectively. After cataract surgery, the rate of good visual acuity was 43%, the rate of low vision and blindness was 25.9%. The greatest barriers preventing patients from surgery are being “fear” for surgery and afraid of poor outcome (40.0%); lack of money (26.7%).

### Conclusion:

The research showed that the prevalence of blindness of people aged over 50 in Phutho was not so high (1.8%); the main cause leading to visual impairment and blindness was cataract (61.1%). The successful results of cataract surgery intervention is quite low, which is about 25%. There are many barriers preventing patients from surgery such as being “fear” for surgery; lack of money; being afraid of poor outcome.

It is necessary to intensify health education and promotion to make people regularly taking eye check, early detection of visual impairment causes, improving the quality of cataract surgeries, and proposing solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN DIENBIEN PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Dienbien province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 858 males, 1142 females. The research used random sampling method, , choosing 40 groups and investigating 50 people in each group based on rule of door-to-door houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 31.4% in the both two eyes was 27.3%. In which, the prevalence of bilateral blindness accounted for 3.8%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 8.4% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (9.8%) was significantly higher than those in males (6.7%). The causes of blindness mainly were cataract without surgery (accounted for 71.7%); phthisis accounted for 9.3%; posterior segment disease accounted for 6.6%, and total avoidable blindness causes was 88.9%. The average CSC accounted in the individual eye of visual impairment with  $VA < 3/60$  was 40.5% and with all  $VA < 6/18$  was 27.3%. The average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 40.6% and 26.7% respectively. After cataract surgery, the rate of good visual acuity was 50% and the rate of low vision and blindness was 30.3%. The greatest barriers preventing patients from surgery are being “fear” for surgery and afraid of poor outcome (45.5%); far distance to surgery places (38.6%).

### Conclusion:

The research showed that the prevalence of blindness of people aged over 50 in Dienbien was relatively high (3.8%); the main cause leading to visual impairment and blindness was cataract (71.7%). The successful results of cataract surgery intervention is quite low, which is about 35.8%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; feeling “no need” for surgery; far distance to surgery places.

It is necessary to intensify health education and promotion to make people regularly taking eye check, early detection of visual impairment causes, improving the quality of cataract surgeries, and proposing solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN TUYEN QUANG PROVINCE IN 2015

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Tuyenquang province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 843 males, 1157 females. The research used random sampling method, choosing 40 groups and investigating 50 people in each group based on rule of door-to-door houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 25.7% in the both two eyes was 21.6%. In which, the prevalence of bilateral blindness accounted for 3.4%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 11.8% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (13.1%) was significantly higher than those in males (10.0%). The causes of blindness mainly were cataract without surgery (accounted for 59.7%); posterior segment disease accounted for 8.5%; all globe/CNS abnormalities accounted for 7.2%; total avoidable blindness causes was 77.5%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 46.3% and with all  $VA < 6/18$  was 27.1%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  are 60.2% and 35.2% respectively. After cataract surgery, the rate of good visual acuity is 57%, the rate of low vision and blindness is 25.0%. The greatest barriers preventing patients from surgery were unknown if cataract is curable (28.6%); feeling “no need” for surgery (22.2%) and far distance to surgery places (20.6%).

### Conclusion:

The research showed that the prevalence of blindness of people aged over 50 years in Tuyenquang compared to researched provinces was relatively high (3.4%); the main causes leading to visual impairment and blindness are refractive error (53.3%) and cataract surgeries which have not yet been performed (59.7%) in turn. The successful results of cataract surgery intervention is quite low, which is about 44.4%. There are many barriers preventing patients difficulties in accessing services cataract surgery

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN HATINH PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Hatinh province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 735 males, 1265 females. The research used random sampling method, choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 47.1% in the both two eyes was 44.3%. In which, the prevalence of bilateral blindness accounted for 3.4%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 18.2% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (23.1%) was significantly lower than those in males (23.5%). The causes of blindness mainly are cataract without surgery (accounted for 59.7%); corneal scars due to other causes (accounted for 12.6%); phthisis accounted for 10.1%; total avoidable blindness causes was 90.6%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  is 67% and with all  $VA < 6/18$  is 19.0%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  are 77.8% and 14.1% respectively. After cataract surgery, the rate of good visual acuity is 57%, the rate of low vision and blindness is 25.0%. The greatest barriers preventing patients from surgery were afraid of poor outcome (33.3%); far distance to surgery places (25.7%); lack of money (21.0%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 years in Hatinh compared to researched provinces was relatively low (1.5%); the main causes leading to visual impairment and blindness are refractive error (39.1%) and cataract surgeries which have not yet been performed (59.7%) in turn. The successful results of cataract surgery intervention is quite low, which is about 28.6%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; far distance to surgery places; lack of money.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN QUANGTRI PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Quangtri province from May to July, 2015; the sample size of 2000 people have eye checked which consists of 821 males, 1179 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 34.4% in the both two eyes was 18.3%. In which, the prevalence of bilateral blindness accounted for 3.3%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 17.8% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (19.0%) was significantly higher than those in males (16.1%). The causes of blindness mainly are cataract without surgery (accounted for 61.5%); all globe/CNS abnormalities accounted for 11.9%; posterior segment disease accounted for 7.8%; total avoidable blindness causes was 61.5%. The average cataract surgical coverage (CSC) accounting for the individual eye of visual impairment with  $VA < 3/60$  is 60.8% and with all  $VA < 6/18$  is 27.4%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 68.1% and 30.7% respectively. After cataract surgery, the rate of good visual acuity was 58%, the rate of low vision and blindness was 24.1%. The greatest barriers preventing patients from surgery were far distance to surgery places (45.4%); afraid of poor outcome (21.6%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 in Quangtri was relatively high (3.3%); the main cause leading to visual impairment and blindness was cataract (61.5%). The successful results of cataract surgery intervention is quite low, which is about 37.6%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; far distance to surgery places.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN QUANGNGAI PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Quangngai province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 711 males, 1288 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 51.1% in the both two eyes was 45.9%. In which, the prevalence of bilateral blindness accounted for 1.5%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 17.5% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (17.7%) was significantly higher than those in males (16.1%). The causes of blindness mainly were cataract without surgery (accounted for 45.6%); phthisis accounted for 13.0%; all globe/CNS abnormalities accounted for 8.3%; total avoidable blindness causes accounted for 80.5%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 77.0% and with all  $VA < 6/18$  was 23.2%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 72% and 28.3% respectively. After cataract surgery, the rate of good visual acuity was 58%, the rate of low vision and blindness was 24.1%. The greatest barriers preventing patients from surgery were far distance to surgery places (34.3%); afraid of poor outcome (23.9%); lack of money (16.4%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 years in Quang Ngai was 3.3%; the main cause leading to visual impairment and blindness was cataract (45.6%). The successful results of cataract surgery intervention is quite low, which is about 37.1%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; far distance to surgery places; lack of money.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.



## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN GIALAI PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Gialai province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 823 males, 1177 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 24.1% in the both two eyes was 20.0%. In which, the prevalence of bilateral blindness accounted for 2.0%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 10.2% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (10.9%) was significantly higher than those in males (9.5%). The causes of blindness mainly were cataract without surgery (accounted for 50.5%); corneal scars due to other causes (accounted for 16.8%); total avoidable blindness causes was 78.3%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 54.8% and with all  $VA < 6/18$  was 25.2%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 60.0% and 18.9% respectively. After cataract surgery, the rate of good visual acuity was 70%, the rate of low vision and blindness was 29.6%. The greatest barriers preventing patients from surgery were lack of money (29.3%); far distance to surgery places (26.1%); feel “no need” for surgery (20.7%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 in Gialai was relatively high (2.0%); the main cause leading to visual impairment and blindness was cataract (50.5%). The successful results of cataract surgery intervention is quite low, which is about 54.6%. There are many barriers preventing patients from surgery such as feeling “no need” for surgery; far distance to surgery places; lack of money.

It is necessary to intensify health education and promotion to make people regularly taking eye check, early detection of visual impairment causes, improving the quality of cataract surgeries, and proposing solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN LAM Dong PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Lamdong province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 777 males, 1223 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 36.9% in the both two eyes was 32.2%. In which, the prevalence of bilateral blindness accounted for 1.6%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 13.5% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (15.7%) was significantly higher than those in males (10.0%). The causes of blindness mainly were cataract without surgery (accounted for 39.4%); posterior segment disease accounted for 16.5%; corneal scars due to other causes (accounted for 13.8%); total avoidable blindness causes was 62.3%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 66.9% and with all  $VA < 6/18$  was 35.5%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 81.8% and 42.4% respectively. After cataract surgery, the rate of good visual acuity was 70%, the rate of low vision and blindness was 13.3%. The greatest barriers preventing patients from surgery were far distance to surgery places (30.3%); afraid of poor outcome (26.0%); lack of money (20%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 years in Lamdong was 1.6%; the main cause leading to visual impairment and blindness was cataract (39.4%). The successful results of cataract surgery intervention is quite low, which is about 40.6%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; far distance to surgery places; lack of money.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN BINH DUONG PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Binhduong province from May to July, 2015. The sample size of 2000 people have eye checked which consists of 713 males, 1287 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 29.0% in the both two eyes was 22.8%. In which, the prevalence of bilateral blindness accounted for 2.4%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 11.3% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (12.1%) was significantly higher than those in males (9.8%). The causes of blindness mainly were cataract without surgery (accounted for 63.4%); cataract surgery complication accounted for 8.0%; total avoidable blindness causes was 80.7%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 72.1% and with all  $VA < 6/18$  was 42.6%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 82.8% and 50.2% respectively. After cataract surgery, the rate of good visual acuity was 71%, the rate of low vision and blindness was 13.1%. The greatest barriers preventing patients from surgery are feeling “no need” (39.7%); afraid of poor outcome (30.9%); lack of money (13.2%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 years in Binhduong compared to researched provinces was relatively high (2.4%); the main causes leading to visual impairment and blindness are refractive error (49.5%) and cataract surgeries which have not yet been performed (63.4%) in turn. The successful results of cataract surgery intervention is quite low, which is about 55.5%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; feeling “no need” for surgery; lack of money.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN TIENGIANG PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Tiengiang province from May to July, 2015; the sample size of 2000 people have eye checked which consists of 805 males, 1194 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 35.2% in the both two eyes was 28.1%. In which, the prevalence of bilateral blindness accounted for 2.4%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 14.4% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (15.3%) was significantly higher than those in males (12.9%). The causes of blindness mainly were cataract without surgery (accounted for 62.6%); phthisis accounted for 11.7%; all globe/CNS abnormalities accounted for 8.6%; total avoidable blindness causes was 63.1%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 71.8% and with all  $VA < 6/18$  was 40.0%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 84.3% and 51.9% respectively. After cataract surgery, the rate of good visual acuity is 65%, the rate of low vision and blindness was 11.2%. The greatest barriers preventing patients from surgery were unknown if cataract is curable (28.8%); afraid of poor outcome (16.7%).

### Conclusion

The research showed that the prevalence of blindness of people aged over 50 in Tiengiang was relatively high (2.4%); the main cause leading to visual impairment and blindness was cataract (62.6%). The successful results of cataract surgery intervention is medium, which is about 50.3%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; feeling “no need” for surgery; unknown if cataract is curable.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN BARIA-VUNGTAU PROVINCE IN 2015:

### ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Baria-Vungtau province from May to July, 2015; the sample size of 2000 people have eye checked which consists of 891 males, 1109 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 33.7% in the both two eyes was 27.7%. In which, the prevalence of bilateral blindness accounted for 2.2%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 13.4% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (15.2%) was significantly higher than those in males (11.1%). The causes of blindness mainly were cataract without surgery (accounted for 68.3%); posterior segment disease accounted for 9.7%; all globe/CNS abnormalities accounted for 7.0%; total avoidable blindness causes was 81.2%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 66.8% and with all  $VA < 6/18$  was 29.8%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 78.6% and 37.5% respectively. After cataract surgery, the rate of good visual acuity was 52.4%, the rate of low vision and blindness was 16.2%. The greatest barriers preventing patients from surgery were afraid of poor outcome (44.0%); feeling “no need” (23.8%); lack of money (14.3%).

### Conclusion:

The research showed that the prevalence of blindness of people aged over 50 years in Baria-Vungtau compared to Bacninh, Namdinh,... provinces was lower (2.2%). The main cause leading to visual impairment and blindness was cataract (68.3%). The successful results of cataract surgery intervention is quite low, which is about 52.4%. There are many barriers preventing patients from surgery such as being “fear” for surgery and being afraid of poor outcome; feeling “no need” for surgery; lack for money.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.

## RESEARCH ON RAPID ASSESSMENT OF AVOIDABLE BLINDNESS (RAAB) IN CAMAU PROVINCE IN 2015:

## ABSTRACT

**Background:** The prevalence of visual impairment and blindness has increasing trend and is one of the public health problems in Vietnam as well as in all over the world. The research aims to identify the prevalence of visual impairment; blindness and the cause of blindness which are necessary to define the demand of people for eye care, blindness prevention and control.

**Methods:** A cross-sectional descriptive study aims to identify the prevalence of visual impairment and blindness of people aged 50 and over was conducted in Camau province from May to July, 2015; the sample size of 2000 people have eye checked which consists of 851 males, 1149 females. The research used random sampling method choosing 40 groups and investigating 50 people in each group based on rule of adjacent houses. The data was entered and analyzed on software RAAB6.

**Result:** The research findings showed that the prevalence of visual impairment from mild to severe (presenting  $3/60 \leq VA < 6/12$  in the better eye) up to blindness (presenting  $VA < 3/60$  in the better eye) in one eye is 43.7% in the both two eyes was 34.7%. In which, the prevalence of bilateral blindness accounted for 2.9%, the prevalence of moderate to severe visual impairment in both two eyes ( $3/60 \leq VA < 6/18$ ) accounted for 17.0% in the total number of people aged over 50; in which, prevalence of moderate to severe visual impairment among females (17.3%) was significantly higher than those in males (16.6%). The causes of blindness mainly were cataract without surgery (accounted for 68.8%); cataract surgery complication accounted for 10.4%; all globe/CNS abnormalities accounted for 5.7%; total avoidable blindness causes was 90.4%. The average cataract surgical coverage (CSC) accounted for the individual eye of visual impairment with  $VA < 3/60$  was 56.2% and with all  $VA < 6/18$  was 28.4%; the average CSC accounted in persons with  $VA < 3/60$  and  $VA < 6/18$  were 76.8% and 39.3% respectively. After cataract surgery, the rate of good visual acuity was 40.8%, the rate of low vision and blindness was 16.1%. The greatest barriers preventing patients from surgery were lack of money (70.5%); afraid of poor outcome (11.8%); far distance to surgery places (7.4%).

### Conclusion:

The research showed that the prevalence of blindness of people aged over 50 in Camau was relatively high (2.9%); the main cause leading to visual impairment and blindness was cataract (68.8%). The successful results of cataract surgery intervention is quite low, which is about (40.8%). There are many barriers preventing patients from surgery such as lack of money; being “fear” for surgery and being afraid of poor outcome; far distance to surgery places.

It is necessary to intensify educational propaganda to make people go for eye test, early detect the status and cause of blindness, enhance the quality of cataract surgeries, and propose solutions to intensify accessibility of people to cataract surgery at the same time.