



## Provision and demand for eye care services in urban slums of Lahore, Pakistan

# Study authors and contributors

Guillaume Trotignon, Sightsavers, UK

Dr Muhammad Zahid Jadoon, Consultant Epidemiologist, Pakistan

Dr Sarah Basharat, HEEDs Consulting Firm, Pakistan

Thomas Engels, Sightsavers, UK

Muhammed Bilal, Sightsavers, Pakistan

Munazza Guillani, Sightsavers, Pakistan

Dr Elena Schmidt, Sightsavers, UK

Dr Sarity Dodson, The Fred Hollows Foundation, Australia

## Study funding and logistics

The study was funded by Fred Hollows Foundation and Sightsavers

All logistics were provided by the Sightsavers' Country Office in Pakistan

# Acknowledgements

The study team would like to acknowledge and thank a wide range of stakeholders and collaborators working on this study. All contributors and participants made this project possible demonstrating high levels of efficiency, quality and coordination.

We are also grateful to the College of Ophthalmology and Allied Vision Sciences who provided significant logistical support to this study.

Last but not least, we would like to express our gratitude to a number of consultants contributing to the study. Mr Muhammad Rizwan Alvi, Mr Hassan Zahid and Mr Khalid Bashir, who led on the GIS mapping component, Mr Shakeel Ahmed who led on in-depth interviews, and Ms Safoora Tariq Malik, who led on the analysis of quantitative data.

# Contents

Study authors and contributors .....	2
Acknowledgements .....	3
Contents.....	4
Table of tables.....	6
Table of figures .....	7
Acronyms .....	9
Executive summary.....	10
1. Introduction .....	13
1.1. Study rationale.....	13
1.2. Aim and objectives .....	14
2. Methodology.....	15
2.1. Study design.....	15
2.2. GIS mapping and facility assessment.....	15
2.2.1. Mapping and assessment of slums .....	15
2.2.2. Mapping and assessment of facilities.....	16
2.3. Household survey .....	16
2.3.1. Survey components .....	16
2.3.2. Survey sampling.....	17
2.3.3. Socio-demographic assessment and wealth.....	18
2.3.4. Health seeking behaviour.....	18
2.3.5. Disability status .....	18
2.3.6. Rapid assessment of Refractive Error.....	19
2.3.7. Rapid assessment of Avoidable Blindness .....	20
2.3.8. Willingness to pay methodology.....	21
2.3.9. In-depth interviews (IDIs) .....	22
2.3.10. Ethics approval.....	23
3. Results .....	24
3.1. Facility mapping and assessment.....	24
3.1.1. Number and type of general health facilities .....	24
3.1.2. Distribution of eye health facilities .....	25
3.1.3. Eye health facilities' financing .....	26
3.2. The household survey .....	28
3.2.1. Socio-demographic characteristics of participants .....	28
3.2.2. Health seeking behaviour.....	30
3.2.3. Factors associated with eye health seeking behaviour .....	38
3.3. Prevalence and type of disability .....	39

3.4. Clinical assessment .....	41
3.4.1. Clinical assessment: RARE .....	41
3.4.2. Clinical assessment: RAAB.....	44
3.5. Willingness to pay.....	51
3.5.1. Willingness to pay for cataract surgery .....	51
3.5.1. Willingness to pay for spectacles .....	54
3.5.2. Willingness to pay – theoretical validation.....	57
3.6. In-depth interviews .....	59
3.6.1. Perception of eye health and decisions about eye care .....	59
3.6.2. Perception and experiences of eye health services .....	60
4. Discussion.....	62
5. Conclusion .....	65
6. References.....	66
7. Annexes .....	68
7.1. Annex: Study objectives, methods and tools .....	68
7.2. Annex – Results of slum mapping .....	69
7.3. Annex – Facility assessment .....	71
7.4. Annex – List of selected clusters .....	74
7.5. Annex – Equity Tool .....	76
7.6. Annex – Washington Group questions on disability.....	77
7.7. Annex – In-depth interview guide .....	78
7.8. Annex - Causes of visual impairment by gender .....	80
7.9. Annex – Willingness to pay for spectacles of respondents with refractive error .....	83

# Table of tables

Table 1: Types of facilities in the surveyed clusters .....	24
Table 2: Sources of funding in eye care facilities who answered to the questionnaire (n=608) .....	26
Table 3: Characteristics of participants who answered the socio-demographic survey (n=4,934) .	28
Table 4: Participants' economic status (n=4,934).....	29
Table 5: Compliance by treatment .....	36
Table 6: Why did you not comply with the prescribed treatment? .....	36
Table 7: Factors associated with eye care seeking behaviour among respondents with an eye problem within four weeks before the survey (n=1,390) .....	38
Table 8: Description of Washington Group variables (n=2,660).....	39
Table 9: Number of difficulties experienced (n=2,660).....	39
Table 10: Factors associated with disability – participants who responded to socio-demographic, economic and disability components (n=2,575).....	40
Table 11: Presenting vision by sex and age.....	41
Table 12: Prevalence of refractive errors by sex and age .....	41
Table 13: Types of refractive error by sex and age .....	42
Table 14: Prevalence of presbyopia by age and sex.....	42
Table 15: Use of distance spectacles by age and sex .....	43
Table 16: Spectacle coverage amongst people with presbyopia by age and sex .....	43
Table 17: Unadjusted prevalence of blindness, severe (SVI), moderate (MVI) and early (EVI) visual impairment - bilateral PVA .....	44
Table 18: Unadjusted Blindness prevalence (PVA<3/60 in better eye) by age group and sex.....	44
Table 19: Principal causes of blindness (<3/60), severe (SVI<6/60-3/60)), moderate (MVI<6/18- 6/60)) and early visual impairment (EVI <6/12-1/18)) in persons (PVA) .....	45
Table 20: Barriers to cataract surgery - bilateral VA<6/60 due to cataract.....	46
Table 21: Place of surgery .....	47
Table 22: Outcome after cataract surgery with available correction (eyes).....	47
Table 23: Post-operative VA with available correction by place of surgery .....	47
Table 24: Cataract surgical coverage (persons) – percentage.....	48
Table 25: Effective cataract surgical coverage (persons) – percentage.....	48
Table 26: Cause of PVA<6/12 (good, borderline and poor outcome) after cataract surgery .....	48
Table 27: Persons with Functional Low Vision: BCVA<6/18 - PL+ in the better eye; incurable .....	49

Table 28: Principal cause of functional low vision in persons: BCVA<6/18 - PL+ in better eye, incurable .....	49
Table 29: Uncorrected refractive error and uncorrected presbyopia .....	50
Table 30: Avoidable Blindness, SVI, MVI and EVI in persons by intervention category .....	50
Table 31: Willingness to pay for cataract surgery (n=932) .....	51
Table 32: Ability and strategy to pay for cataract surgery .....	52
Table 33: Factors associated with willingness to pay for cataract surgery for participants who answered WTP and socio-economic components (n=708).....	53
Table 34: Willingness to wear and pay for spectacles (simulation of refractive error and best correction).....	54
Table 35: Ability and strategy to pay for spectacles .....	55
Table 36: Factors associated with willingness to pay for spectacles for participants who answered WTP and socio-economic components (n=432) .....	56

## Table of figures

Figure 1: Respondents flow chart.....	17
Figure 2: Triple-bounded dichotomous choice (TBDC) format .....	22
Figure 3: Area surveyed and eye care facilities in Lahore city district .....	25
Figure 4: During the past 12 months, have you seen or heard something about eye health or eye diseases? (n = 5,169) .....	31
Figure 5: How did you come across information about eye health or eye disease? (n = 1,920) ....	31
Figure 6: Do you know where to get eye care services (when needed)? (n = 5,169).....	31
Figure 7: Where do you or your family usually go for eye health services? (n = 4,440) .....	32
Figure 8: What problems did you have in the last four weeks? (n = 1,442)* .....	32
Figure 9: Reason for not seeking treatment (n= 676).....	33
Figure 10: When did you first consult for this/these problem/s? (n = 766).....	33
Figure 11: What was the main reason for seeking treatment? (n = 766).....	34
Figure 12: What was the first place you went to seek treatment? (n = 766).....	34
Figure 13: What was the main reason for choosing that provider? (n=766) .....	35
Figure 14: How did you travel to that facility? (n = 766) .....	35
Figure 15: What treatment was prescribed to you? (n = 766) .....	36

Figure 16: How much did the spectacles cost you in rupees? (n = 401) ..... 37

Figure 17: How much did the cataract surgery cost you in rupees? (n = 142) ..... 37

Figure 18: Causes of blindness..... 46

Figure 19: Demand curves for spectacles for hypothetical users (no visual impairment) and respondents diagnosed with Refractive Error ..... 57

Figure 20: Demand curves for cataract surgery for hypothetical users by socioeconomic status .. 58

# Acronyms

AIDS	Acquired Immunodeficiency Syndrome
ARMD	Age Related Macular Degeneration
CVM	Contingent Valuation Method
GIS	Geographic Information Systems
GPS	Global Positioning System
ICF	International Classification of Functioning, Disability and Health
IDIs	In-depth interviews
IOL	Intraocular Cataract Lens
MSVI	Moderate to Severe Visual Impairment
PPS	Probability Proportionate to Size
PSU	Primary Sampling Unit
RARE	Rapid Assessment of Refractive Errors
RE	Refractive Error
SSU	Secondary Sampling Unit
TBDC	Triple-bounded dichotomous choice
URE	Uncorrected Refractive Error
VA	Visual Acuity
WG	Washington Group on Disability Statistics
WGSS	Washington Group Short Set
WHO	World Health Organisation
WTP	Willingness to Pay

# Executive summary

Visual impairment is a leading and largely avoidable cause of disability worldwide. The national survey of blindness and low vision conducted in Pakistan in 2002-2004 estimated the average national prevalence of blindness at 2.7% among adults aged 30 years and above, with cataract being the leading cause responsible for 51.5% of blindness. Refractive errors (RE) were the leading cause of visual impairment followed by cataract. The prevalence of both blindness and low vision was higher among rural populations but there were also significant differences between urban population subgroups.

## Aim and approach

The study presented here was conducted in urban slums in Lahore and aimed at better understanding the provision of and demand for eye care services in this population. A mixed methods design was deployed and the study was conducted in three phases: i) GIS mapping of eye health facilities around surveyed slum clusters, ii) a household survey of visual impairment, uptake of services and willingness to pay, and iii) in-depth interviews exploring health seeking behaviour.

The mapping of health facilities providing eye care services was undertaken within a one-kilometre radius around 61 randomly selected clusters of slums. A total of 648 eye health service providers were identified and surveyed.

The household survey included four modules: i) a household questionnaire completed by the head of the household; ii) a disability survey of adults aged 50+ years using the Washington Group Short Set of Questions; iii) a visual impairment survey using either the Rapid Assessment of Refractive Error (RARE) for individuals aged 15-49 years or the Rapid Assessment of Avoidable Blindness (RAAB) for individuals aged 50+ years; and iv) a willingness to pay for spectacles and cataract surgery survey.

## Results

**Key characteristics of eye health services available to slum communities.** Similarly to many other settings, eye care services were not equally distributed across the city with a higher concentration of facilities in central parts and around major roads - and some outskirts areas having no eye care facilities at all. The vast majority of facilities available were private for profit and had user fees as their major source of funding, although provisions for poor and vulnerable populations, including slum dwellers, were available in most public and private non-for-profit facilities and the majority of study participants reported that they could access eye care services free at the point of use.

**Study participants.** A total of 4,934 individuals residing in the selected slums took part in the household survey; 41% were female. About 32% of survey respondents had no formal education but only 1.9% were below the national poverty line (PKR 3,100 (USD 29.3) per month per individual, or PKR 103.3 (USD 0.8) per day)<sup>1</sup>. The results obtained using the Equity Tool (relative poverty) showed that study participants were only marginally poorer than the rest of the urban population in Pakistan, with about 15.6% of respondents being in the poorest quintile and about 10.5% belonging to the wealthiest quintile. Data on disability was available for only half of the sample. The prevalence among respondents aged 50+ for whom the data was available was 20%.

**Health seeking behaviour and barriers to available eye care services.** The knowledge of eye diseases among survey participants was generally low but 86% knew where to seek care. Word of mouth and friends were the main sources of information about eye care services and 66% of respondents preferred visiting a government hospital for care. The uptake of eye care services was also low with many reporting visits to an eye care provider only when their vision started to deteriorate. Proximity to home and ease of access were the main factors influencing the decision of where to seek care. Most people reportedly received the care they were referred (86%). The main reasons participants reported not obtaining spectacles were perceptions that they were not needed, or that the cost was too high. The main reasons for not taking up a cataract surgery were other priorities for spending the money and fear of treatment.

The qualitative study corroborated the survey findings and showed that various cultural factors influenced slum dwellers' health seeking behaviour, particularly among women. For example, many women were not willing to ask their husband or son to take them to hospital after their busy day at work. The findings also suggest that many slum dwellers had to trade-off between lower quality government facilities providing free or heavily subsidised services and higher quality but costly private clinics.

**Magnitude and causes of visual impairment.** The RARE and RAAB samples included 3,000 and 3,050 respondents respectively. The prevalence of blindness among people aged 50+ years was low (1.7%). The prevalence of RE among people aged 15-49 years was 7.9%. Cataract surgical coverage was high (86.3% at VA < 6/60) but there were significant differences between men and women (95% and 75.8% respectively).

**Willingness to pay for cataract surgery and spectacles among slum dwellers.** The majority of those participating in the Willingness to Pay (WTP) for cataract surgery component of the study were willing to take up surgery, but only 46% were willing to pay. One reason may be that free cataract surgeries are available in this community and over 80% of patients reporting having received it for free. Respondents belonging to the wealthier quintile had a higher willingness to pay for cataract surgery, on average 1,042PKR more (coefficient=1,042, p.value=0.006). Only 55% of study respondents reported as being willing to wear spectacles. The average WTP among those who were willing to wear them was PKR 592 (USD 5.6), which is higher than the average price of a pair of spectacles reported in Pakistan PKR 300-350 (USD 2.8-3.3).

---

<sup>1</sup> PKR/USD 0.00945 exchange rate for March 2017, OANDA

## Conclusion

This study concludes that there are many eye care facilities available to slum dwellers in Lahore and this population generally knows where to get care, as shown by the relatively low prevalence of visual impairment. The population is also willing and able to pay for eye care, particularly spectacles, but the uptake of services is often undermined by cultural factors, stigma and other spending priorities. However, there are significant differences between different population sub groups living in slums where women and those living in poor household are significantly more disadvantaged. Calling for targeted eye health policies - reaching out to women and to the ones from the poorest households - as they tend to be the least informed on available health services. The gathered evidence could be used by policy makers to improve the delivery of eye care services in order to reduce the burden of avoidable blindness and refractive error in urban slum areas of Lahore.

# 1. Introduction

About 80% of visual impairment is either preventable or treatable and yet 253 million people live with visual impairment globally, 36 million of whom are blind. Blindness is inextricably linked to poverty, with the majority of those affected living in low and middle income countries (LMICs) [1].

The national survey of blindness conducted in Pakistan in 2002-2004 estimated the prevalence of blindness among adults aged 30 years and older at 2.7% with cataract being the leading cause responsible for 51.5% of blindness [2]. Refractive errors (RE) followed by cataract were the leading causes of visual impairment responsible for 43% and 42% of the total burden respectively. The estimates extrapolated from the survey suggested that around 900,000 adults suffered from cataract in Pakistan at the time of the survey, and 85.5% of all blindness was avoidable” [2].

In order to tackle eye health issues, three national plans for the prevention of blindness were developed in Pakistan with the latest plan launched in 2010. The national measures undertaken in 2006-2008 allowed for an upgrade of 88 facilities, with eye care services resulting in an increase of the number of eye outpatients by 279% and the number of eye surgeries by 375% [3]. Despite these significant improvements and a reported decrease in the prevalence of blindness, 55% of surgeries in Pakistan continue to be provided by non-governmental organisations (NGOs) and visual impairment remains a significant public health problem [3].

Although the prevalence of visual impairment is higher in rural areas, health disparities in urban settings are also significant, in particular between slum and non-slum populations [4]. Data on deplorable water and sanitation conditions, low levels of education and poor health service coverage in the slum populations in Pakistan has been previously reported. Earlier research also showed that a large proportion of slum dwellers suffered from eye infections and had poor access to eye care services, despite government efforts to organise free eye health camps for these populations [4]. Research conducted outside Pakistan also suggests that the prevalence of blindness in poorer urban settlements can be up to three times higher compared to more affluent urban settings [5].

## 1.1. Study rationale

There has been a rapid increase in urbanisation globally and the global urban population is expected to double in the next 20 years [6, 7]. In the first decade of the 21<sup>st</sup> century, the urban population of South Asia increased by 130 million and it is projected to grow further and reach approximately 250 million by the year 2030 [8, 9]. Although this growth is indicative of the region’s progress towards greater economic development, it has significant impact on both individuals and societies.

About 68% of Pakistan’s population resides in rural areas, mostly in Punjab [10]. The country, however, is urbanising at an annual rate of 3% - the fastest pace in South Asia [11]. It is estimated that by 2025, nearly 50% of the Pakistan population will live in urban settings.

Migration from rural areas to cities for livelihood, education and better quality of life is a major contributor to the development of urban slums in Pakistan. Currently there is no policy pertaining to

urban development of the country, as after the devolution following the 18th constitutional amendment, urban development moved from the federal government to the provincial authorities.

Poverty is a significant issue in Pakistan with nearly 12.4% of the population living below the national poverty line [12]. Various socio-economic factors have been found to be associated with blindness and poor access to eye care services. Poor sanitation, low incomes, lack of awareness and low levels of education are among them [13]; and although eye care services are more widely available in urban areas, they are not always accessible to those who are particularly poor or marginalised.

There is limited data on eye health in urban populations in Pakistan. A study conducted by Sightsavers in slums in Delhi estimated the prevalence of blindness among slum residents aged 40+ years at 1.2% and the prevalence of visual impairment at 11.4%.

The research reported here builds on previous studies and aims to better understand the provision of and demand for eye care services in urban slums. The research focused on slum-dwelling populations in Lahore and used a methodological approach similar to two earlier studies, in Dhaka, Bangladesh (2015) and Jaipur, India (2016).

Lahore is the largest city of Punjab province and the second largest city in the country [14]. This study limited its geographical scope to the urban slums of the city and investigated the health needs of urban slum residents with the focus on eye health and access to eye care services.

## 1.2. Aim and objectives

The aim of this study was to understand the demand for and provision of eye care services in urban settings with the focus on slum-dwelling populations in Lahore. The study-specific objectives were;

1. To describe key characteristics of eye health services available to slum communities.
2. To explore health seeking behaviour and identify barriers to available eye care services.
3. To assess the magnitude and causes of visual impairment among slum-dwelling populations in Lahore.
4. To identify spectacle and cataract surgical coverage and the quality of visual outcomes following treatment.
5. To ascertain slum-dwellers' willingness to pay (WTP) for cataract surgery and spectacles and how it varies by socio-economic status and disability.

## 2. Methodology

### 2.1. Study design

The study used a cross-sectional study design involving mixed methods data collection approaches: 1) GIS (Geographic Information Systems) Mapping and facility assessments; 2) household surveys; and 3) in-depth interviews with household members. Annex 7.1 maps the methods and tools deployed in this study against study specific objectives.

### 2.2. GIS mapping and facility assessment

#### 2.2.1. Mapping and assessment of slums

---

A team of GIS mapping experts was recruited for this assignment. The team travelled within the city and searched for slums. The definition of “a slum” used in this study was based on the definition by the UN Habitat modified following a pilot in Lahore. The community was considered to be a slum if it met four out of five criteria outlined below:

- Predominantly poor housing, i.e. flimsy structures of non-permanent materials like bamboo, cheap wood, scraps, or semi-pucca (semi-permanent) with flimsy structures but with brick walls and corrugated iron sheet roofs, and dilapidated fragile old buildings, possibly associated with high structural risk.
- Very high population density and room crowding, i.e. 300 persons per acre (or 751 persons per hectare) for overall settlement density and three or more adults of mixed sexes per room; 37 sq. ft (or 4 sq. m.) per person floor space and predominantly (over 75 percent of units) single room family occupancy.
- Very poor environmental services, particularly water and sanitation facilities, i.e. when the majority of households are not served with a sanitary latrine (i.e. sewerage, septic tank or water-sealed latrine), drinking water connection, electricity or drainage.
- Very low socio-economic status for the majority of residents, i.e. the majority of people with an income below the national poverty level, PKR 3,100 per adult per month (the new poverty line from the Multidimensional Poverty in Pakistan, 2016).
- Lack of security of tenure and informal settlements (temporary or permanent).

The GIS team visited 50 out of 276 Union Councils with slums, identified slum areas, demarcated the slum boundaries and estimated their populations. In total 56 slums were visited and mapped over a one-month period (Annex 7.2). All data were collected on smartphones using KoboToolbox software<sup>2</sup>. The list of the mapped settlements was combined with the list of registered slums

---

<sup>2</sup> More information here: <https://www.kobotoolbox.org/>

(Katchi Abadis) provided by the Lahore Development Authority. In total, 61 clusters of slum settlements were included in the study.

## 2.2.2. Mapping and assessment of facilities

---

The objective was to identify public and private facilities providing eye health services to slum residents and record their location and characteristics. To fulfil the objective, three activities were carried out:

- i. **Facility listing** Setting a comprehensive inventory of health facilities within a one kilometre radius around each selected clusters (see 2.3.1 Survey Sampling) using existing information from municipality and local development authorities, health departments, NGOs etc. (desk review).
- ii. **GIS mapping** Using existing base maps and updating these maps by sending data collection teams in the field to identify health providers and update base maps in selected clusters (ground truthing). GPS coordinates and basic characteristics were recorded for each facility identified during the ground truthing.
- iii. **Facility assessment** This consists of visiting facilities which provide eye care services to collect basic information through a structured questionnaire (Annex 7.3). The questionnaire comprised a general information part and a health financing part.

## 2.3. Household survey

### 2.3.1. Survey components

---

The household survey included a number of modules for different household members (Figure 1).

The head of the household completed the household schedule and the wealth index questionnaire, which measured relative wealth of the household using the asset-based Equity Tool.

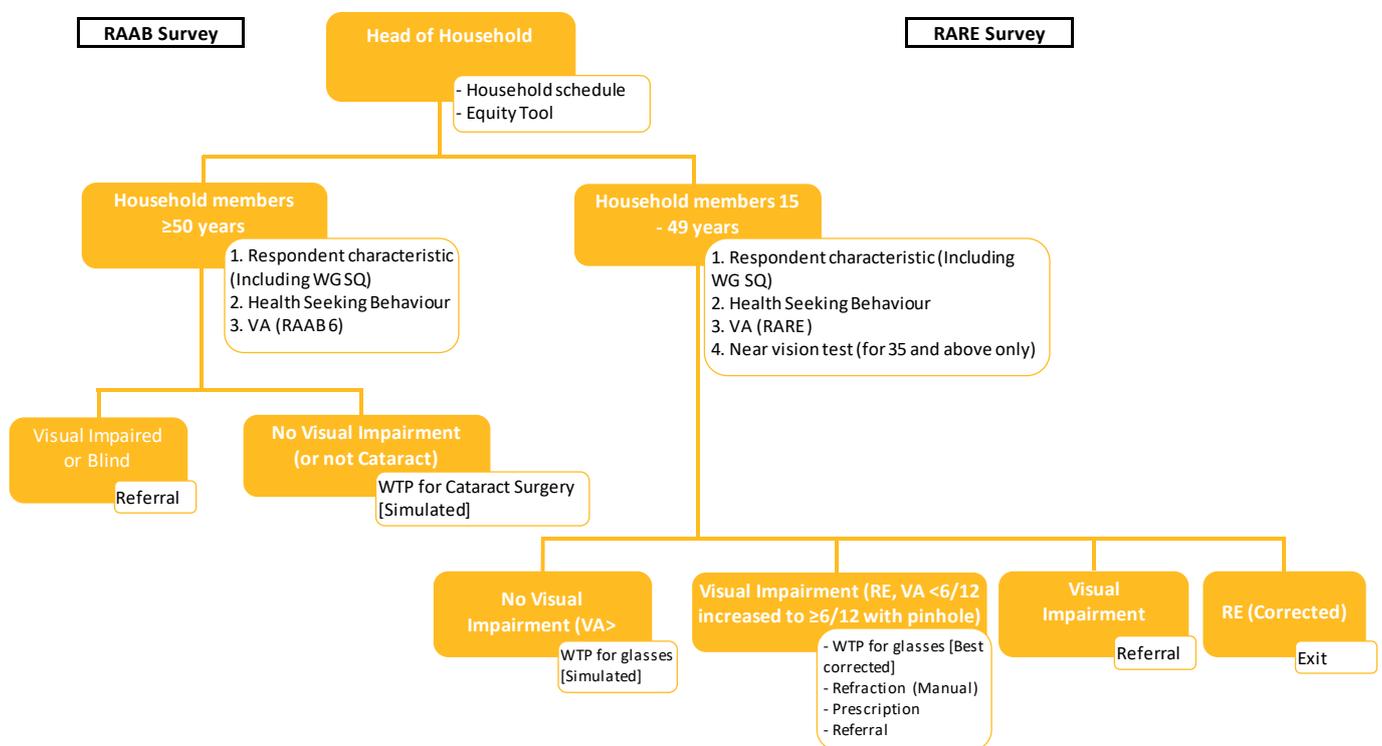
Household members aged 15 years old and above completed a module on eye health seeking behaviour and disability.

Household members aged 50 years old and above undertook a distant visual acuity test and an eye examination following the standard Rapid Assessment of Avoidable Blindness 6 (RAAB 6) methodology. Those without visual impairment were asked about their willingness to pay for cataract surgery after simulating visual impairment caused by cataract using cataract simulation glasses.

Household members aged 15-49 years took part in the Rapid Assessment of Refractive Error (RARE) module, which included a distant visual acuity test and a near vision test (for respondents aged 35 years old and above). Participants without visual impairment were asked about their willingness to pay for spectacles. Visual impairment caused by refractive error was simulated using ready-made spectacles. Those diagnosed with refractive error had their willingness to pay elicited using the adequate correction (best correction).

If an eligible person was absent, the survey team returned at least twice on the same day. If the respondent was still absent, information about their visual status was collected from their relative or neighbour.

**Figure 1: Respondents flow chart**



### 2.3.2. Survey sampling

The sample size calculation was based on 5% expected prevalence of visual impairment with 20% precision; 95% confidence, alpha error of 0.05% and a design effect of 1.5. The required sample size in each of the two age groups (15-49 and 50+ years) was 2,765. The sample size was increased to 3,040 to accommodate for 10% non-response.

A multi-stage cluster random sampling methodology was deployed, with the primary sampling unit being the slum (PSU), and the secondary sampling unit being the household (SSU).

The list of registered slums (Katchi Abadis) provided by the Lahore Development Authority and the list of slums identified during the field visits by the GIS team was used as a sampling frame from which 61 clusters were randomly selected (Annex 7.4). Households from each cluster were selected using compact segment sampling, which involved dividing slums into segments of equal population size and selecting randomly a pre-determined number of segments. All households in the selected segments were included in the sample.

All household members aged 15+ years were included in the study. The RAAB methodology was used with individuals aged 50+ years; the RARE methodology was used with those aged 15-49 years. For the WTP module, study participants were selected in two ways: i) all participants with diagnosed refractive error (15-49 years cohort); and ii) one respondent per household selected at random among the participants with normal vision (both 15-49 and 50+ cohorts). To link data from the respondents participating in different modules, each individual was assigned a unique identifier based on the combination of their cluster number, household number, and respondent number.

### 2.3.3. Socio-demographic assessment and wealth

---

A structured questionnaire comprising nine questions was used to collect respondents' socio-demographic data.

To measure participants' wealth, the Equity Tool was used (Annex 7.5). The tool measures socio-economic differences and assigns scores based on dwelling characteristics and possession of durable assets (house structure, roof, water source etc.). The scores are used to categorise respondents into five quintiles, where the cut-off points are based on the national level data. The Equity Tool validated for Pakistan includes 14 questions. As we surveyed an urban population, the urban wealth quintile cut-off points were used (calculated based on the Demographic and Health Survey (DHS) of 2013 [15]). Each respondent's quintile represented their relative wealth compared to the rest of the urban population in Pakistan.

### 2.3.4. Health seeking behaviour

---

Data on health seeking behaviour was collect using both quantitative and qualitative methods.

A health seeking behaviour questionnaire was administered to determine respondents' exposure to eye health messages, and their awareness of eye health services and use. The survey examined respondents' health seeking behaviour for eye problems in general, including non-visually impairing conditions, such as conjunctivitis.

### 2.3.5. Disability status

---

The Washington Group Short Set (WGSS) Questions were used to measure prevalence of disability. The tool was developed by the United Nations Statistical Commission to facilitate the comparison of disability data cross-nationally [16]. The tool is based on the International Classification of Functioning, Disability and Health (ICF) and was designed to be applied and

understood in any cultural setting. The six questions do not use the word 'disability' to avoid under-reporting due to stigma, but ask about difficulty in functioning in six domains: seeing, hearing, walking or climbing, remembering or concentrating, washing or dressing (self-care) and communicating. The answers are given on a four-point scale: no difficulty, some difficulty, a lot of difficulty or cannot do at all (Annex 7.6). The recommended cut-off point for disability is a lot of difficulty or unable to do in at least one domain [16].

## 2.3.6. Rapid assessment of refractive error

---

### 2.3.6.1. Ophthalmic examination procedure

Eligible participants (aged 15-49 years) had their right and left eye distance visual acuity measured with a LogMAR chart with tumbling "E" optotype at a standard distance of four metres. Each respondent was asked to read the centre optotype on the 1.0 LogMAR row and continue down until they made a mistake, where they were asked to read the row above. Subjects unable to see the 1.0 LogMAR row were tested at a distance of two metres. The LogMAR scores were recorded for the row where the respondent could read at least four optotypes.

All respondents aged 35+ years were tested binocularly using a Near LogMAR chart with tumbling "E" optotype at a standard 40cm test distance. Those who failed to read four out of five 0.3 LogMAR size optotypes were reassessed for near correction. All subjects with distant visual acuity less than 0.0 LogMAR went through objective refraction using retinoscope and subjective refraction with trial frame. Subjects with less than 0.3 LogMAR with best correction underwent a thorough eye examination with an ophthalmoscope in a dark room to assess the cause.

### 2.3.6.2. Definitions used

Refractive error was defined if a respondent had one of the following conditions in the better eye.

- Myopia: with VA < 6/12 improving to 6/12 or better with  $\leq -0.5D$ .
- Hyperopia: VA < 6/12 improving to 6/12 or better with  $\leq +2 D$ .
- Astigmatism: VA < 6/12 improving to 6/12 or better with  $\geq 0.75 D$  cylinder power

For this study, spherical equivalents were used i.e.  $\frac{1}{2}$  of cylindrical power were added to the spherical powers.

Presbyopia was defined as  $\leq 0.4$  logMAR (N8 at 40cm)

Spectacle coverage was defined and calculated as follows:

- Spectacle coverage =  $[\text{met need}/(\text{met need} + \text{unmet need}) \times 100] \%$ .

## 2.3.7. Rapid assessment of avoidable blindness

---

### 2.3.7.1. Ophthalmic examination procedure

All household members aged 50+ years had an ophthalmic examination carried out by an ophthalmologist and an ophthalmic assistant. The examination followed a standard RAAB format. Visual acuity was measured with a Snellen tumbling E chart, using optotype size 18 on one side and size 60 on the other side, at a six or three-metre distance.

Eyes were classified as follows

- 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 a person was not able to see 6/18 in either eye with available correction, pinhole vision was measured. All eyes that could not see 6/18 with available correction were examined with a direct ophthalmoscope.

Only the primary cause of visual impairment was recorded for each eye. If there were two or more primary disorders equally contributing to visual loss, the cause that is more amenable to treat or prevent was recorded.

Participants who had vision-impairing cataract were asked why they had not received cataract surgery and up to two responses per person were recorded.

Those who had had cataract surgery were asked for the details of their operation (e.g. place, age, type of operation). The causes of poor visual outcome were also identified and recorded.

### 2.3.7.2. Definitions used

Visual impairment was defined as follows:

- Blindness: presenting VA (with glasses for distance if normally worn or unaided if glasses for distance not worn) of  $<3/60$  in the better eye.
- Severe visual impairment: presenting VA  $<6/60$ - $3/60$  in the better eye
- Moderate visual impairment: VA  $<6/18$  –  $6/60$  in better eye
- Mild visual impairment: VA  $<6/12$  –  $6/18$  in better eye

Aphakics or Pseudophakics were persons who had undergone cataract surgery in one or both eyes. A person was Aphakic when the entire lens had been removed without the insertion of an artificial lens, and Pseudophakic when an artificial lens had been placed inside the eye.

Cataract Surgical Coverage (CSC) measured the extent to which people who are cataract impaired have accessed services. CSC at the person level was calculated for three VA cut-offs: <3/60, <6/60 and <6/18 using the formula:  $(x + y)/(x + y + z) * 100$  where:

- x = persons with unilateral pseudo/Aphakia and visual impairment in contralateral eye.
- y = persons with bilateral pseudo/Aphakia, regardless of acuity.
- z = persons with <3/60, <6/60 and <6/18 in whom the principal cause was cataract (unilateral or bilateral).

Effective CSC shows the proportion of operated cataract with good outcome, defined as presenting vision of 6/18 or better, among operable and operated cataract using the following formula [17]:  $(a + b)/(x + y + z) * 100$  where:

- a = persons with unilateral pseudo/Aphakia presenting visual acuity of 6/18 or better in the operated eye and operable cataract in the other.
- b = persons with bilateral pseudo/Aphakia presenting visual acuity of 6/18 or better in at least one eye.

### 2.3.8. Willingness to pay methodology

To assess respondents' willingness to pay for cataract surgery (small-incision) and spectacles, we used the contingent valuation method (CVM). The method can be used with individuals who have little or no experience of a particular service or product and are asked to consider a hypothetical scenario (i.e. a health condition or intervention which is described in detail) before enquiring about their WTP using various elicitation techniques (elicitation format).

The WTP module was administered to respondents taking part in the household survey. Respondents aged 50+ years were asked about their WTP for cataract surgery; respondents aged 15 - 49 years were asked about their WTP for spectacles.

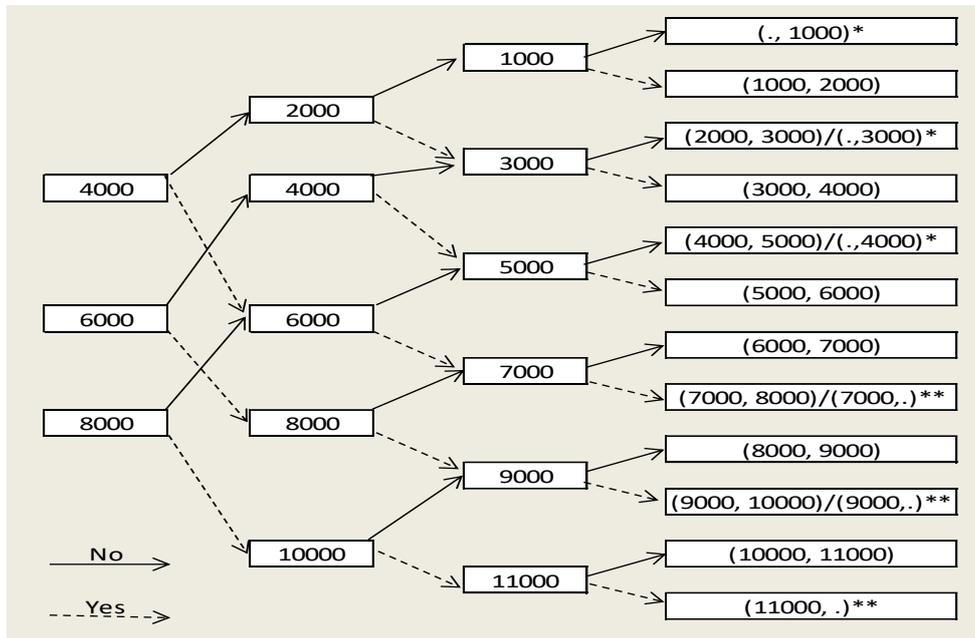
The WTP for cataract surgery was measured among randomly selected respondents (one per household) with no visual impairment (VA  $\geq 6/12$ ). The WTP for spectacles was measured in two categories of respondents: (i) any respondent diagnosed with uncorrected refractive error following the ophthalmic examination; and (ii) one household member selected randomly among those with no visual impairment (VA  $\geq 6/12$ ) in the RARE survey.

The first stage of the WTP elicitation was the description of the scenario, which contained information about cataract surgery and spectacles. Visual impairment caused by cataract was then simulated using simulation glasses with different degrees of severity (VA 6/24, 6/60, 6/120, and 6/240). Ready-made spectacles with different powers (+1, +2.5, +5) were used to simulate refractive error for people with no visual impairment (hypothetical users). For those with diagnosed RE, their vision was corrected using trial lens set and frame before eliciting WTP (best correction).

The elicitation method had a triple-bounded dichotomous choice (TBDC) format. It used a bidding-game approach, where survey respondents were asked a sequence of questions that progressively narrowed down their willingness to pay. A sequence of dichotomous ('yes/no')

answers was given to the question: “Would you purchase product X if it were offered at price Y?”. The price varied according to the respondent’s answer and the bid value either increased (if accepted) or decreased (if rejected) using a pre-determined algorithm (Figure 2).

**Figure 2: Triple-bounded dichotomous choice (TBDC) format**



This method has been shown to generate more efficient estimates than those based on a single dichotomous question (standard single-bounded model) or open-ended questions. However, an open-ended question “What is the highest price that you would be willing to pay for X?” was also used to validate the WTP answers.

Reliability of the WTP survey was tested using the methodology described by Foreit and Foreit [18]. The respondents who did not know whether they would wear glasses or take up surgery or were not sure whether they would pay were excluded from the analysis. Similarly, the data of “yea-saying” respondents and those stating their maximum WTP lower than the highest bid accepted were excluded.

As part of the theoretical validation of the WTP method, respondents who were diagnosed with refractive error were refracted by optometrists, provided spectacles and questioned on their willingness to pay for spectacles (using the same set of questions as the respondents with normal vision).

### 2.3.9. In-depth interviews (IDIs)

In-depth interviews (IDIs) were used to explore respondents’ perceptions of their eye health needs, their experiences and attitudes (Annex 7.7). IDI participants were randomly selected from seven different clusters; in total 26 individuals were interviewed. For the IDIs, respondents from different

age groups (ranging from 27 to 77 years old), gender and clusters were interviewed as to obtain a complete picture of the situation in slums as perceived by residents.

IDIs provide the respondent with an opportunity to express their needs in their own words without the question leading the response. A semi-structured interview allows defining the boundaries of the interview, while allowing respondent to respond freely.

### **2.3.10. Ethics approval**

---

Ethics clearance for this study was obtained from the Institutional Review Board (IRB) of the Pakistan Health Services Academy. The heads of the households and all eligible participants were given information about the study in their local languages and all provided informed consent. All treatable cases of ocular morbidity were referred to nearby facilities. Individuals diagnosed with refractive error and presbyopia were provided with spectacles.

## 3. Results

### 3.1. Facility mapping and assessment

#### 3.1.1. Number and type of general health facilities

In total, 1,226 facilities were identified within a one-kilometre radius of the 61 clusters included in the survey. A large proportion were stand-alone pharmacies and private doctors' chambers (36% and 26% respectively). There was also a significant number of traditional or alternative medicine practices (18%); and there were 50 general hospitals or clinics with eye care facilities. About 97% of all providers were private for profit, 2% were private not for profit and 1% were public facilities. Public facilities included two tertiary hospitals, four secondary hospitals/clinics and two doctors' chambers (Table 1).

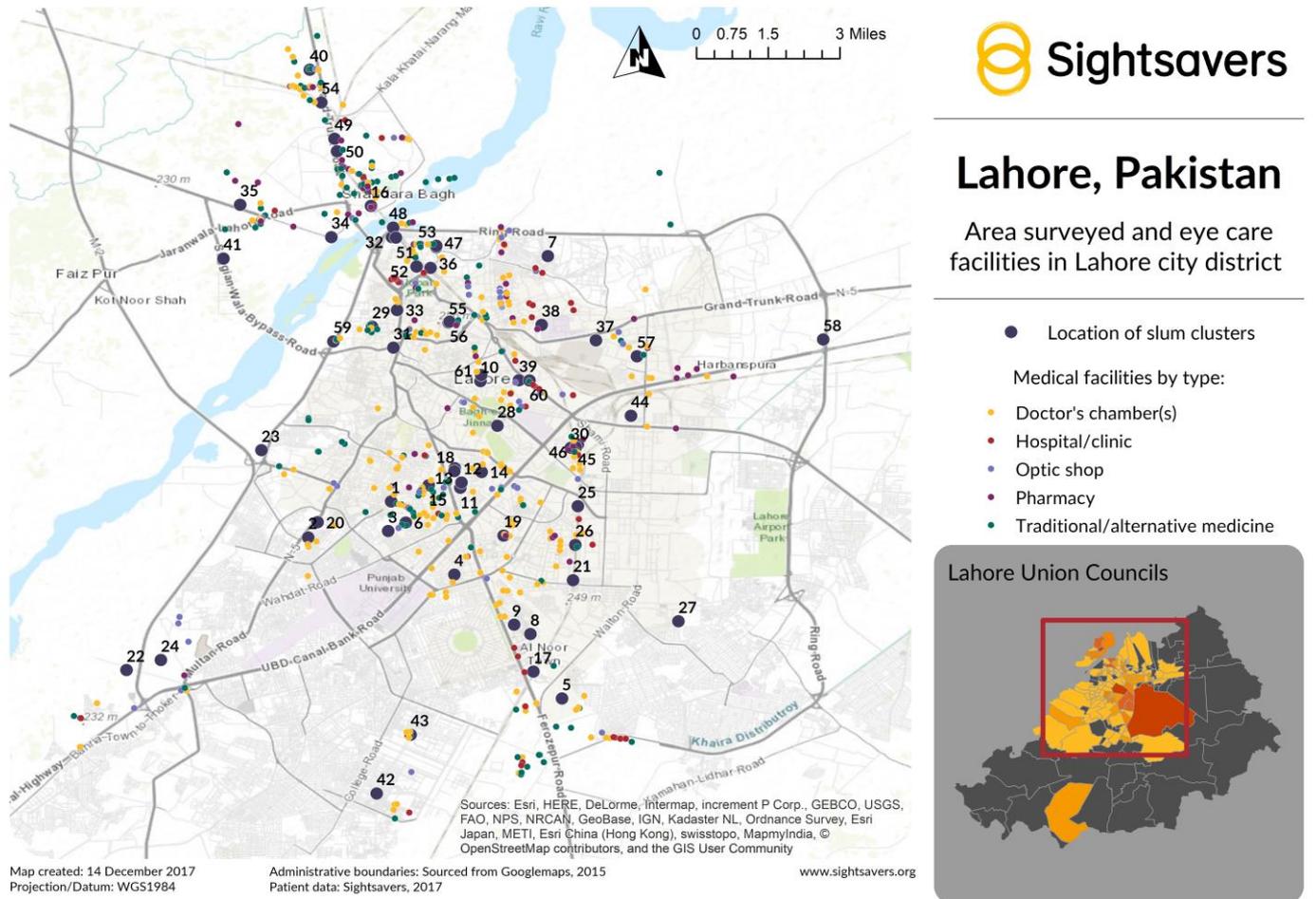
**Table 1: Types of facilities in the surveyed clusters**

Type of facility/ownership	Public	Private (non-profit)	Private (for profit)	N (total)
Doctors' chambers	2 (1%)	17 (5%)	299 (94%)	318 (26%)
General clinic or hospital with eye health department	4 (9%)	4 (9%)	38 (83%)	46 (4%)
Medical college or teaching hospital/ tertiary care	2 (50%)	0 (0%)	2 (50%)	4 (0.3%)
Optic shop with doctors' chambers	0 (0%)	0 (0%)	37 (100%)	37 (3%)
Pharmacy with doctors' chambers	0 (0%)	3 (3%)	111 (97%)	114 (9%)
Specialised clinic/hospital (eye health)	0 (0%)	2 (67%)	1 (33%)	3 (0.2%)
Stand-alone pharmacy	0 (0%)	0 (0%)	445 (100%)	445 (36%)
Stand-alone optic shop	0 (0%)	1 (3%)	37 (97%)	38 (3%)
Traditional/alternative medicine (Ayurveda, homeopathy, unani etc.)	0 (0%)	1 (0%)	220 (100%)	221 (18%)
<b>Total</b>	<b>8 (1%)</b>	<b>28 (2%)</b>	<b>(97%)</b>	<b>1226 (100%)</b>

### 3.1.2. Distribution of eye health facilities

Figure 3 shows the geographical distribution of 648 facilities with eye health services in a one-kilometre radius around surveyed clusters<sup>3</sup>. These included doctors' chambers (42%), traditional practitioners (26%), optical shops (12%), pharmacies (12%) and hospitals/clinics (8%). Health facilities with eye health services were concentrated largely around main roads and crossroads or located in the central part of Lahore city district. Fewer facilities were found around the outskirts clusters and some clusters had no facilities providing eye care services.

**Figure 3: Area surveyed and eye care facilities in Lahore city district**



<sup>3</sup> Location of 4 health facilities around cluster 58 could not be retrieved.

### 3.1.3. Eye health facilities' financing

607 of the 648 facilities (94%) with eye care services identified could or were willing to provide information on their funding sources. Among these, 572 (93.8%) said that out of pocket user fees were their main source of funding (Table 2). Public facilities were primarily funded by the government, with only one public facility indicating that their main source of funding was user fees. The majority of facilities with eye care services (97%) did not provide services under any government plans, nor worked with any health insurance schemes. However, around 5% of the facilities indicated that their services were free for all patients and another 1.6% had special provisions and exemptions for poor and vulnerable patients.

**Table 2: Sources of funding in eye care facilities who answered the questionnaire (n=608)**

	Public	Private non-profit	Private for profit	Total
<b>Source of funding</b>				
Patient fees (out of pocket expenditures)	0.17% (1)	1.03% (6)	98.62% (572)	<b>95.39%</b> <b>(580)</b>
Government grants (central/state/district)	37.5% (6)	50% (8)	12.5% (2)	<b>2.63%</b> <b>(16)</b>
Donations (NGO, private foundations, etc.)	0% (0)	100% (12)	0% (0)	<b>1.97%</b> <b>(12)</b>
<b>Total</b>	<b>1.15%</b> <b>(7)</b>	<b>4.28%</b> <b>(26)</b>	<b>94.41%</b> <b>(574)</b>	<b>100%</b> <b>(608)</b>
<b>Are you providing services under any government health care plans?</b>				
Yes	17.6% (3)	58.82% (10)	23.53% (4)	<b>2.8%</b> <b>(17)</b>
No	0.68% (4)	2.54% (15)	96.79% (572)	<b>97.2%</b> <b>(591)</b>
<b>Total</b>	<b>1.15%</b> <b>(7)</b>	<b>4.11%</b> <b>(25)</b>	<b>94.74%</b> <b>(576)</b>	<b>100%</b> <b>(608)</b>
<b>Are you working with any private health insurance or community health insurance?</b>				
Yes	22.22% (4)	50% (9)	27.78% (5)	<b>2.96%</b> <b>(18)</b>
No	0.51% (3)	2.88% (17)	96.44% (570)	<b>97.04%</b> <b>(590)</b>
<b>Total</b>	<b>1.15%</b> <b>(7)</b>	<b>4.28%</b> <b>(26)</b>	<b>94.74%</b> <b>(576)</b>	<b>100%</b> <b>(608)</b>

<b>Do you have any specific provisions for individuals who cannot afford to pay?</b>				
No specific provision	0.18% (1)	1.23% (7)	98.42% (559)	<b>93.42%</b> <b>(568)</b>
Free services (for all patients)	16.67% (5)	56.67% (17)	26.67% (8)	<b>4.93%</b> <b>(30)</b>
Free services (for indigent patients only)	12.5% (1)	12.5% (1)	75% (6)	<b>1.32%</b> <b>(8)</b>
Reduced fees (cross-subsidies)	0% (0)	100% (1)	0% (0)	<b>0.16%</b> <b>(1)</b>
Other	0% (0)	0% (0)	100% (1)	<b>0.16%</b> <b>(1)</b>
<b>Total</b>	<b>1.15%</b> <b>(7)</b>	<b>4.28%</b> <b>(26)</b>	<b>94.41%</b> <b>(574)</b>	<b>100%</b> <b>(608)</b>

## 3.2. The Household survey

### 3.2.1. Socio-demographic characteristics of participants

Data on socio-demographic characteristics were available for 4,934 individuals, including 2,873 respondents aged 15-49 years and 2,061 respondents aged 50+ years. 41% of the respondents were female.

About a third (31%) of the respondents (n=1,531) were illiterate and another 15% (n=735) were literate but with no formal education. Around 18% (n=892) had completed primary education, 30% (n=1,486) had secondary education; 5% (n=248) had an undergraduate degree and 1% (n=41) had a post-graduate qualification.

Around 40% (n=1,960) reported household work and childcare as their main economic activity; 32% (n=1,577) had work outside their home, 14% (n=707) were in education; 7% (n=356) were looking for work; 3% (n=150) were retired and another 3% (n=161) were unable to work due to illness or disability. Among those with work, the majority (61%) were in service industries (transport, domestic, petty traders); 18% were production/manufacturing workers; and 15% had professional, technical or managerial jobs (Table 3).

**Table 3: Characteristics of participants who answered the socio-demographic survey (n=4,934)**

Variables	Percentage (frequency)
<b>Age (n=4,934; Mean 40,3 years; SD +/- 18,2)</b>	
15-19	12.65% (624)
20-29	25.48% (1,257)
30-39	13.54% (668)
40-49	6.57% (324)
50-59	24.93% (1,230)
60-69	8.98% (443)
70+	7.86% (388)
<b>Gender (n=4,934)</b>	
Male	58.65% (2,894)
Female	41.35% (2,040)
<b>Educational status (n=4,934)</b>	
No formal education (illiterate)	31.03% (1,531)
No formal education (literate)	14.9% (735)
Primary (1-5)	18.08% (892)
Secondary (6-12)	30.12% (1,486)
Undergraduate	5.03% (248)
Post-graduate	0.83% (41)

Other	0.02% (1)
<b>Occupation status (n=4,934)</b>	
Going to school/studying	14.33% (707)
Housework/childcare	39.72% (1,960)
Looking for work	7.22% (356)
Other	0.47% (23)
Retired	3.04% (150)
Unable to work/ill/disabled	3.26% (161)
Work	31.96% (1,577)

Among participants with jobs, 60.5% were salaried; 18.6% were self-employed; and 20.3% were daily labourers. The majority of respondents (60%) reported daily income between 301 and 600 rupees (USD 2.8 to 5.7). For comparison, the poverty line in Pakistan amounts to PKR 3,100 per month per individual, or PKR 103.3 (USD 0.8) per day<sup>4</sup> [19]. Only 1.9% of survey respondents reported an income below this level. Similarly, a very small proportion of respondents (0.34%) reported an income of over PKR 3,000 per day (USD 28.4). The results obtained using the Equity Tool show that, the study participants were slightly poorer than the rest of the urban population in Pakistan with about 40% of the participants being in the two poorer quintiles and about 32% being in the two wealthier quintiles (Table 4).

**Table 4: Participants' economic status (n=4,934)**

<b>Variables</b>	<b>Percentage (Frequency)</b>
<b>Type of work (n=4,934)</b>	
Housework/childcare	39.72% (1,960)
Non-employed	28.31% (1,397)
Service worker (formal)	5.57% (275)
Service worker (transport)	5.31% (262)
Service worker (informal etc.)	5.29% (261)
Professional (technical, administrative)	4.78% (236)
Production worker (skilled)	3.93% (194)
Service worker (other)	2.09% (103)
Production worker (unskilled)	1.95% (96)
Other	1.56% (77)
Service worker (domestic chores, maids)	1.22% (60)
Agriculture	0.26% (13)
<b>Employment status (n=4,934)</b>	
Non-employed	53.71% (2,650)
Salaried	19.34% (954)

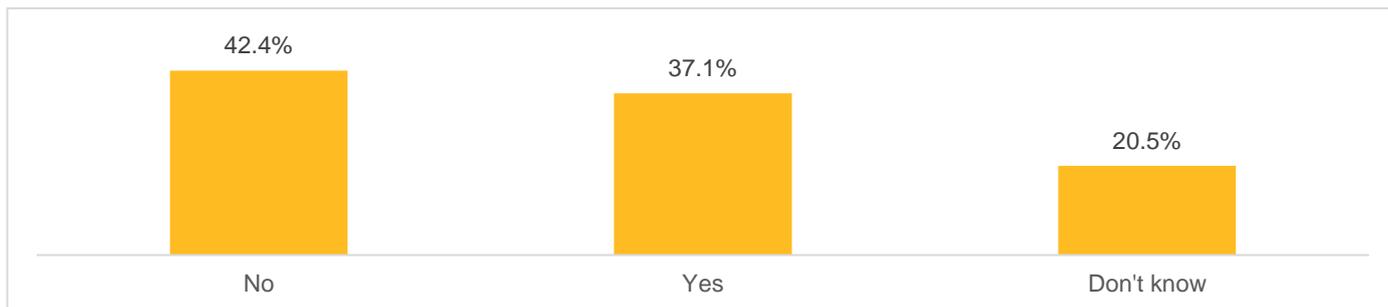
<sup>4</sup> PKR/USD 0.00945 exchange rate for March 2017, OANDA

Student	14.33% (707)
Daily labourer	6.49% (320)
Self-employed	6% (296)
Not paid	0.12% (6)
<b>Income categories (in PKR, n=4,934)</b>	
Non-responded	68.67% (3,388)
1-103	0.61% (30)
104-300	3.18% (157)
301-600	19.21% (948)
601-900	6.85% (338)
901-1,200	1.48% (73)
1,201-1,500	0.2% (10)
1,501-2,000	0.06% (3)
>3,000	0.34% (17)
<b>Wealth quintile (n=4,934)</b>	
Quintile 1 (poorest)	15.59% (769)
Quintile 2	24.58% (1,213)
Quintile 3	27.12% (1,338)
Quintile 4	22.25% (1,098)
Quintile 5 (wealthiest)	10.46% (516)

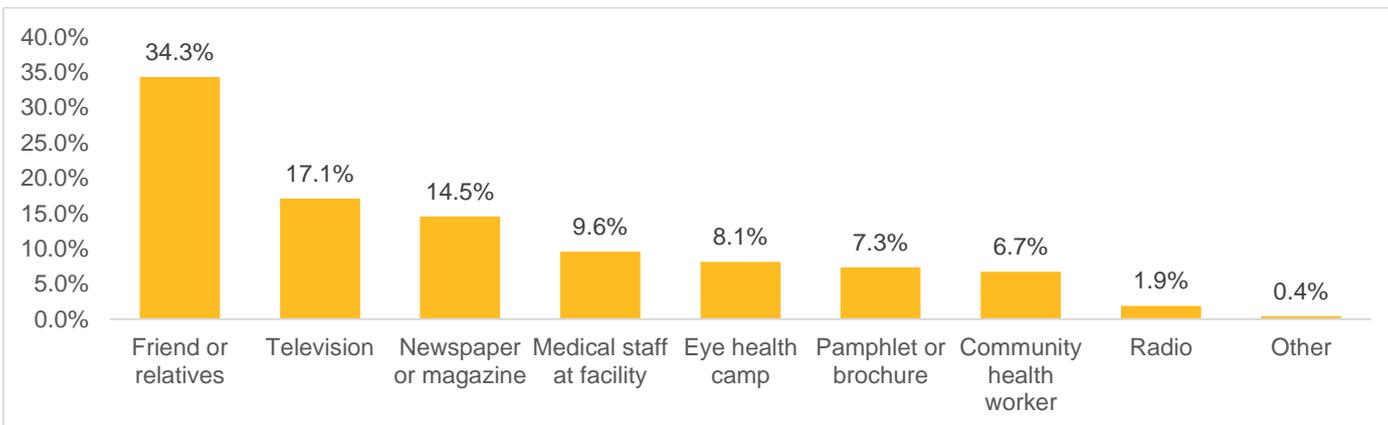
### 3.2.2. Health seeking behaviour

5,169 individuals completed the health seeking behaviour questionnaire. Around 37.1% (n=1,920) of study participants said that they had seen or heard messages about eye health or eye diseases in the past twelve months (Figure 4) with about a third of them (34.3%) obtaining this information from their friends or relatives, followed by television (17.1%) and newspapers/magazines (14.5%). About 9.6% (n=184) received eye health information from healthcare facilities and another 8.1% and 6.1% received it from eye health camps and community health workers respectively (Figure 5). Nearly 86% of respondents said that they knew where and how to access eye care services (Figure 6).

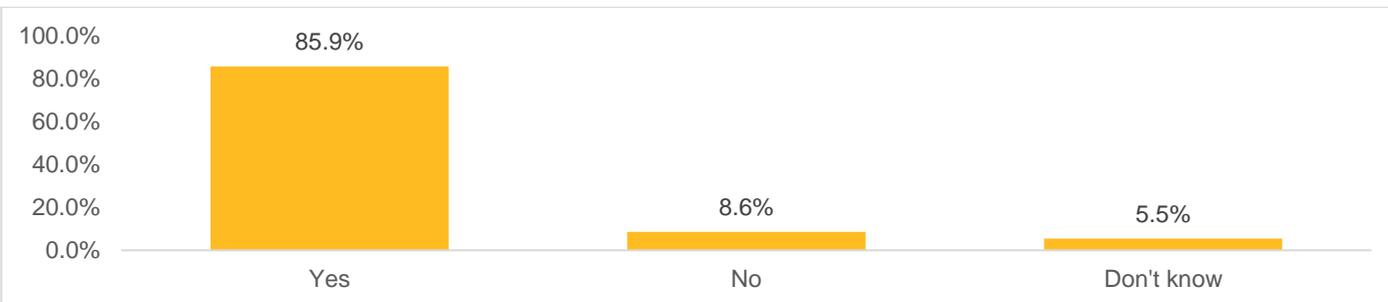
**Figure 4: During the past 12 months, have you seen or heard something about eye health or eye diseases? (n=5,169)**



**Figure 5: How did you come across information about eye health or eye disease? (n=1,920)**

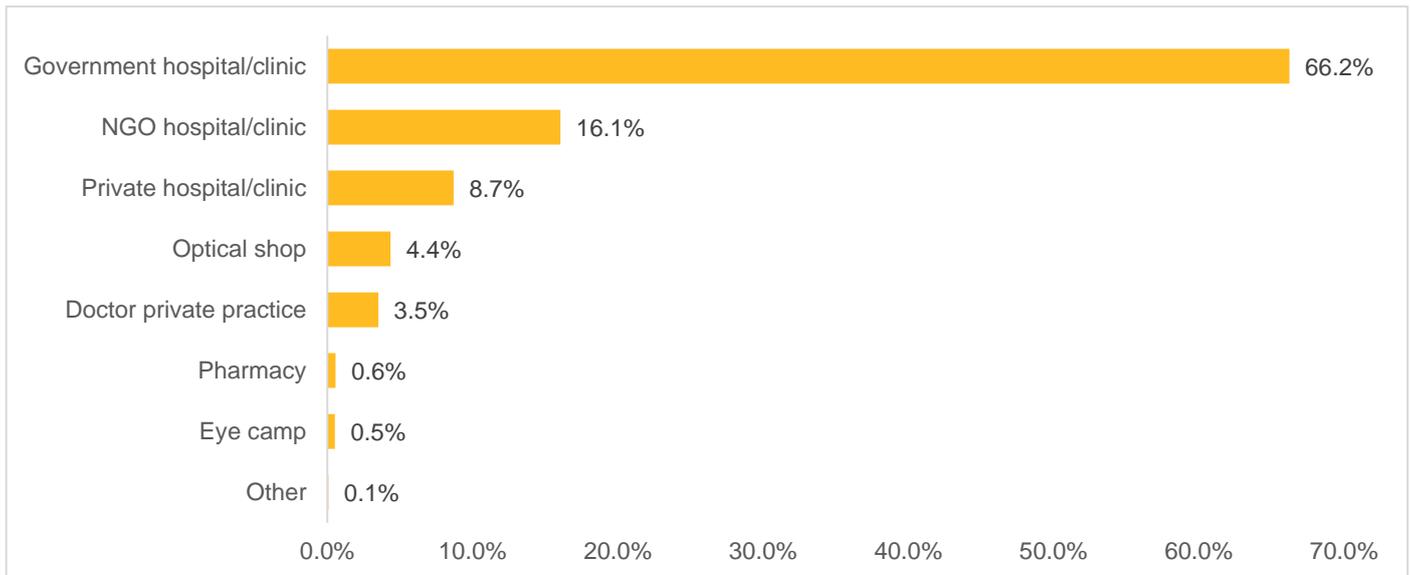


**Figure 6: Do you know where to get eye care services (when needed)? (n=5,169)**



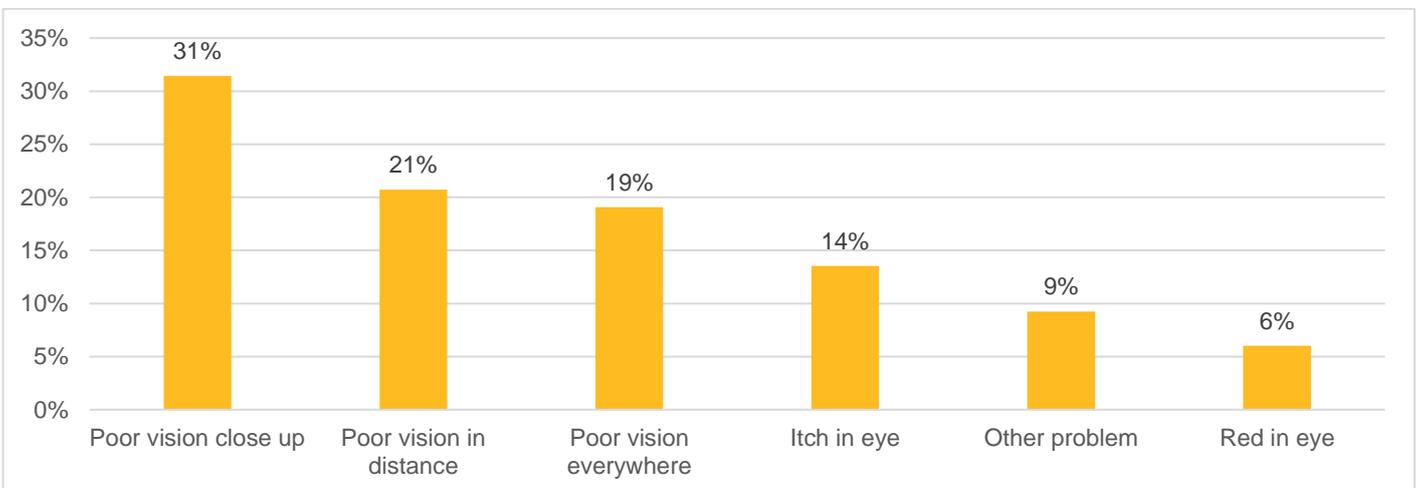
When asked about where participants would go if they needed eye care services, 66.2% (n=2 941) named government hospitals and clinics; 16.1% mentioned NGO facilities followed by private hospitals/clinics (8.7%), optical shops (4.4%) and doctors' chambers (3.5%) (Figure 7).

**Figure 7: Where do you or your family usually go for eye health services? (n=4,440)**



Nearly 28% of respondents (n=1,442) said that they had experienced an eye problem in the last four weeks. The majority of them self-reported poor vision close up (31%), at a distance (21%) or everywhere (19%). Some suffered from itching (14%) or redness (6%) in the eye (Figure 8).

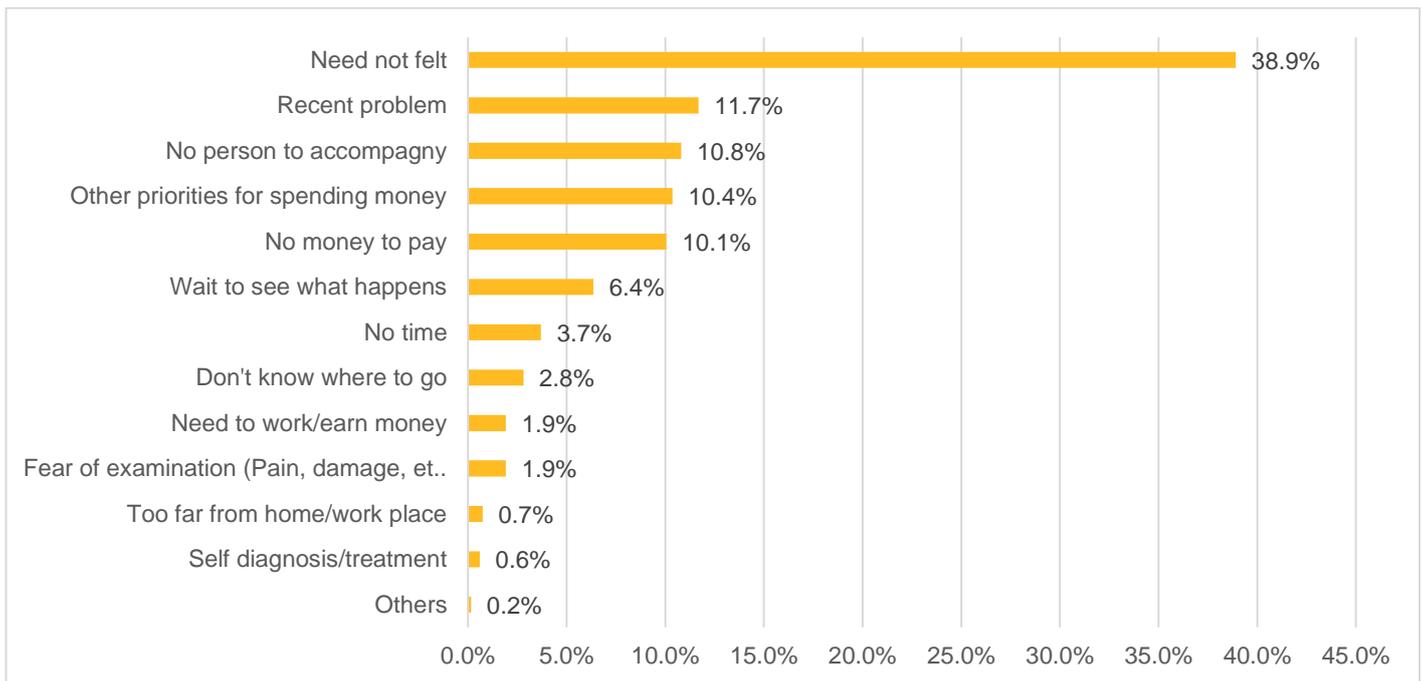
**Figure 8: What problems did you have in the last four weeks? (n=1,442)\***



\*Multiple answers possible

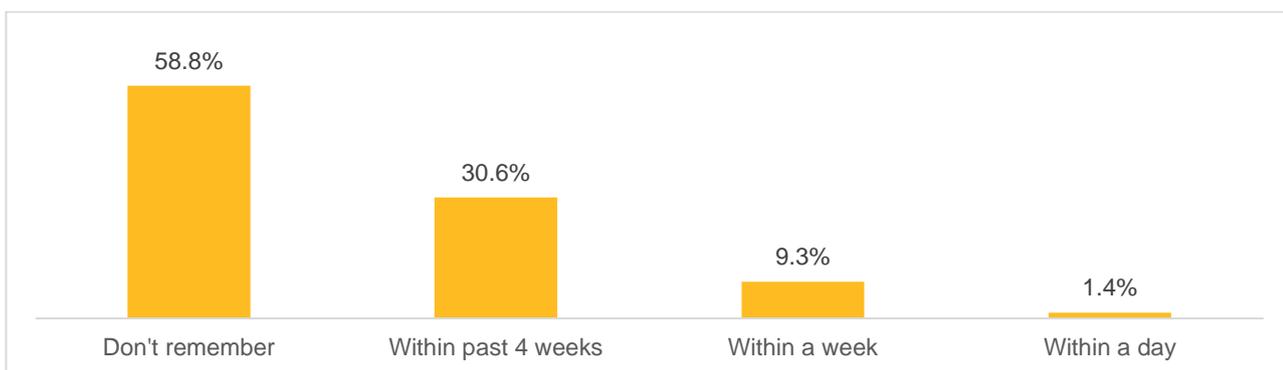
Among those who experienced an eye problem in the past four weeks (n =1,442), 53.1% had consulted a doctor or another professional. Among those who did not seek care (n = 676) about 38.9% did not feel they needed treatment. Other main reasons were waiting, as the problem was recent (11.7%), having no one to accompany them (10.8%), having other priorities to spend money on (10.4%), or having no money to pay (10.1%), (Figure 9).

**Figure 9: Reason for not seeking treatment (n=676)**

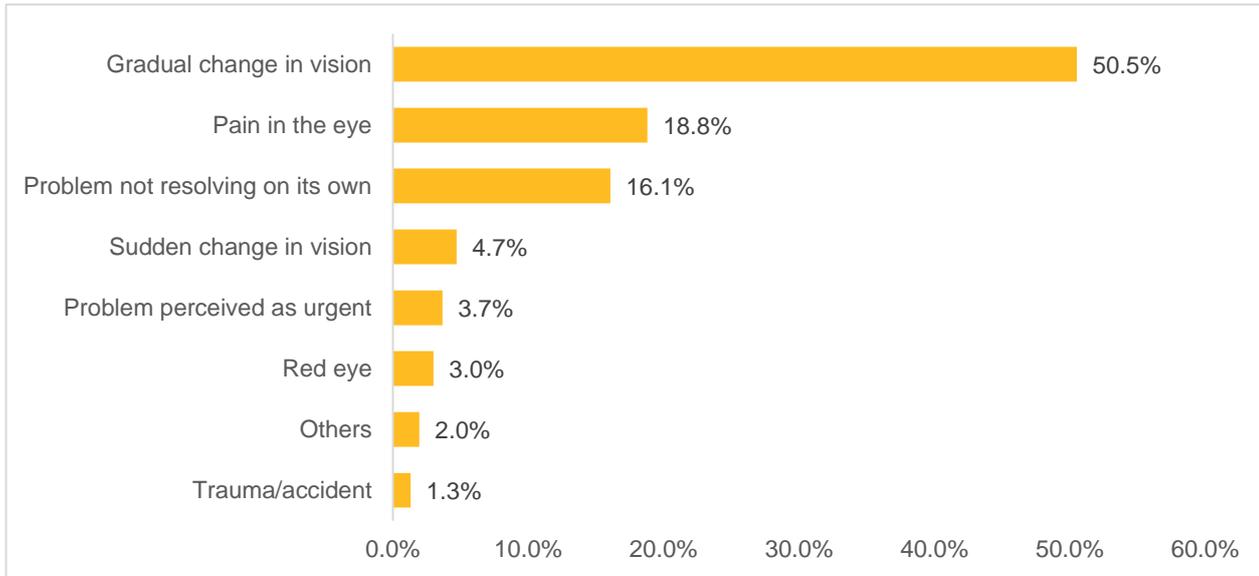


When asked about how quickly respondents with eye problems sought care, only 1.4% sought care on the same day; 9.3% sought care within a week and 30.6% within four weeks (Figure 10). Around half of the respondents who sought care (50.5%) did so because they experienced gradual change in vision; 18.8% experienced eye pain; and for 16.1% the problem had not resolved on its own (Figure 11). Over half of the respondents sought treatment in government hospitals or clinics (55.6%); 17.5% went to NGOs; and 12% visited private providers (Figure 12).

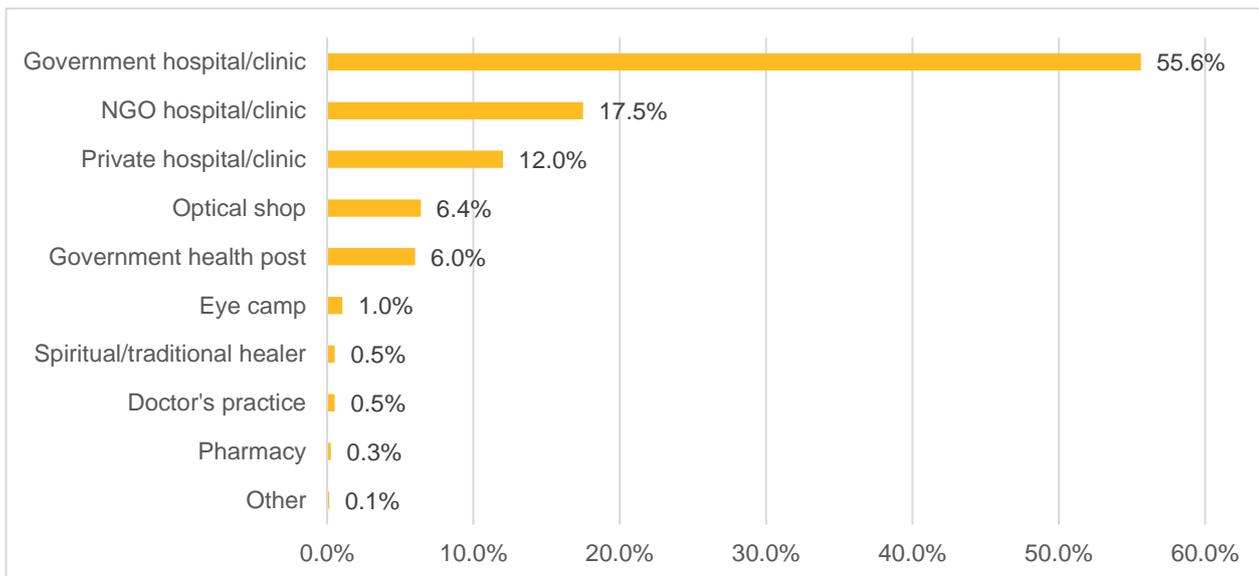
**Figure 10: When did you first consult for this/these problem/s? (n=766)**



**Figure 11: What was the main reason for seeking treatment? (n=766)**

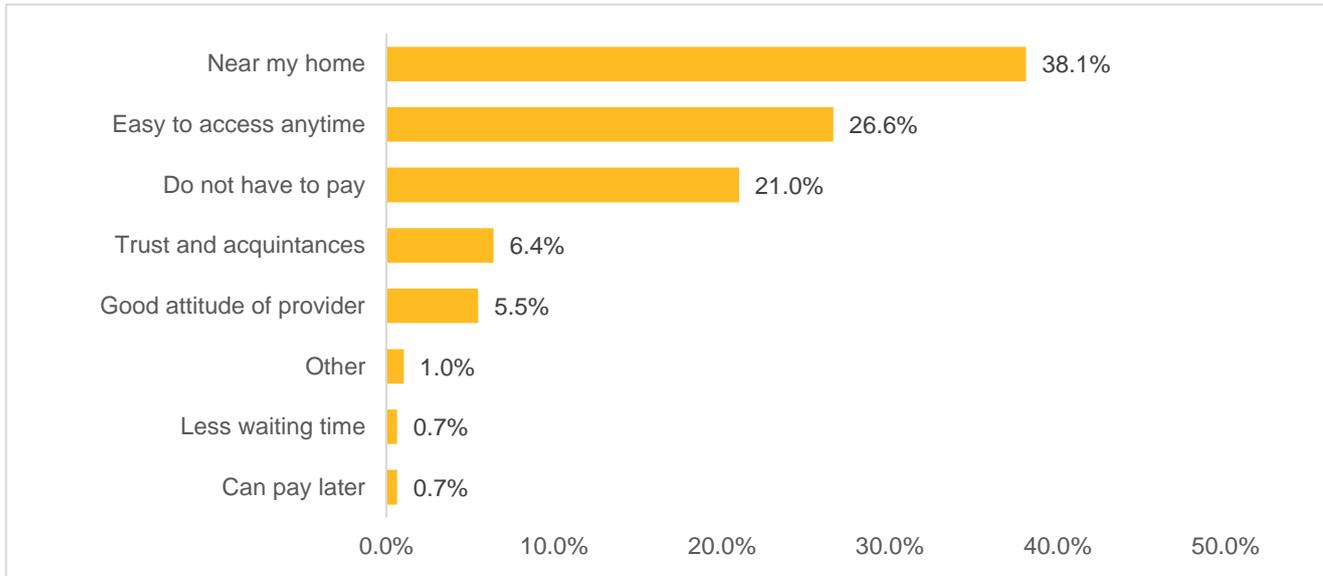


**Figure 12: What was the first place you went to seek treatment? (n=766)**

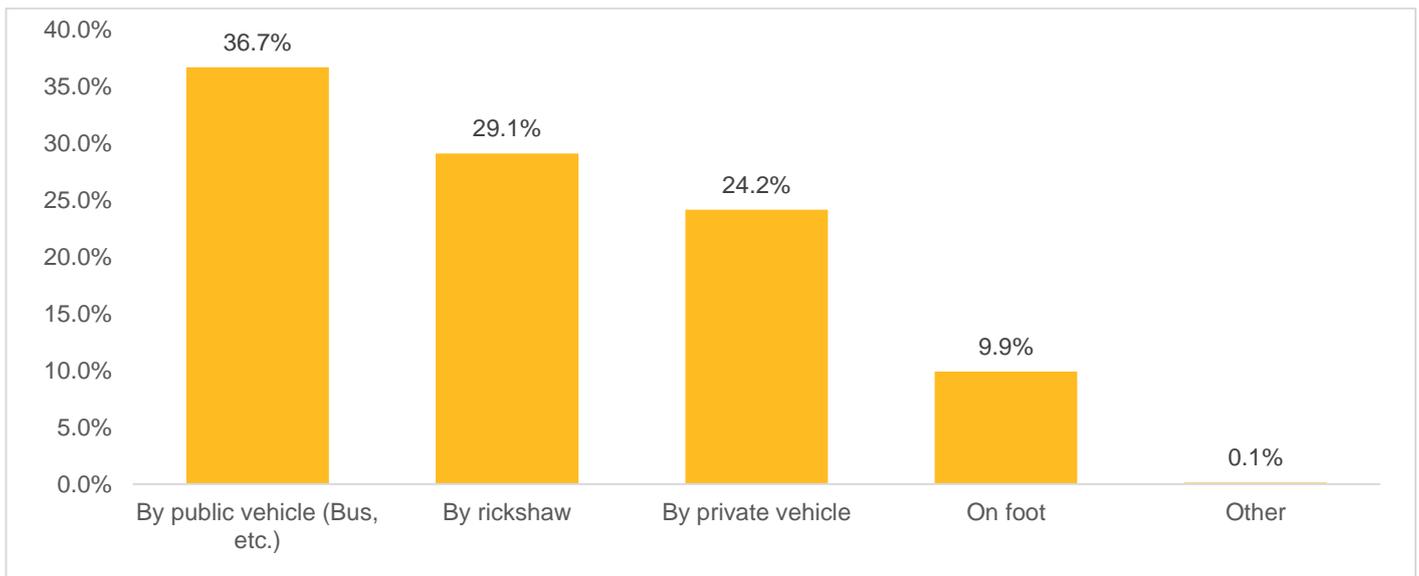


Over 38.1% of the respondents chose their healthcare provider because they were near their home; 26.6% visited the facilities that could be accessed at any time; and 21% chose the provider because they offered free treatment (Figure 13). The type of transport used to access health care providers varied with 36.7% of respondents using public transport; 29.1% using rickshaws; 24.2% using private vehicles; and 9.9% walking on foot (Figure 14).

**Figure 13: What was the main reason for choosing that provider? (n=766)**

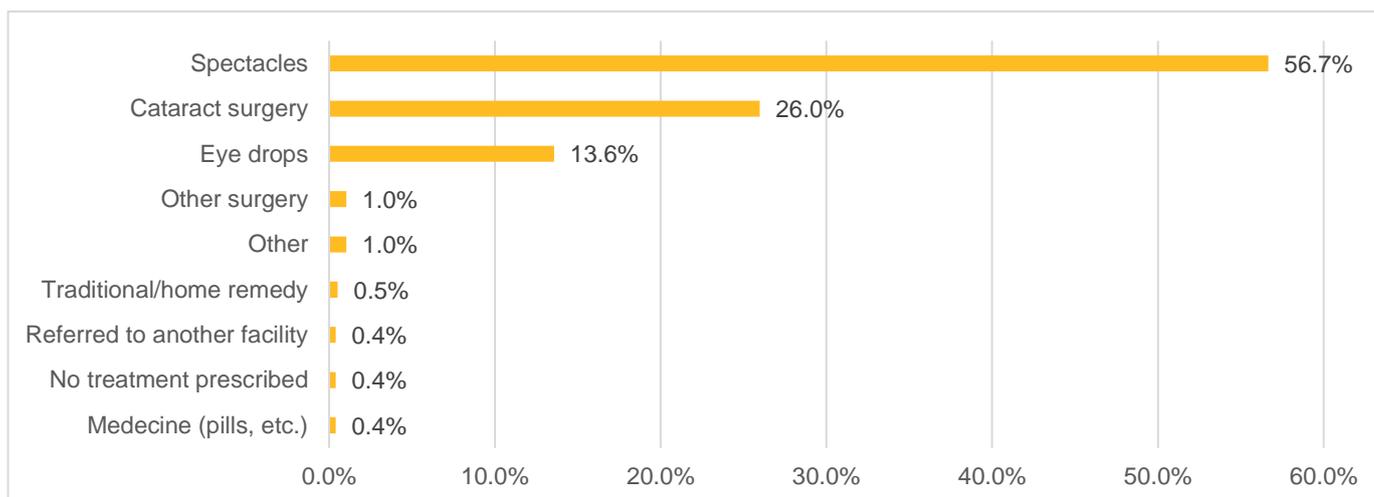


**Figure 14: How did you travel to that facility? (n=766)**



The majority of participants who sought treatment were prescribed spectacles (56.7%), followed by referral to cataract surgery (26%) and prescription of eye drops (13.6%) (Figure 15).

**Figure 15: What treatment was prescribed to you? (n=766)**



Among 763 respondents who had received a treatment prescription, 86.6% complied with it. 92.4% of those who were prescribed spectacles purchased them; the uptake of cataract surgery was 71.4% (Table 5). The main reasons for not taking up surgery were that respondents had other spending priorities (37%), fear of treatment (23%), and lack of money (14%). Among a few people who chose not to buy spectacles, the main reasons were feeling no need and having no money (Table 6).

**Table 5: Compliance by treatment**

Compliance by treatment	Complied	Non-compliance
Cataract surgery	71.4% (142)	28.6% (57)
Spectacles	92.4% (401)	7.6% (33)
Other treatment prescribed	90.8% (118)	9.2% (12)
Total	86.6% (661)	13.4% (102)

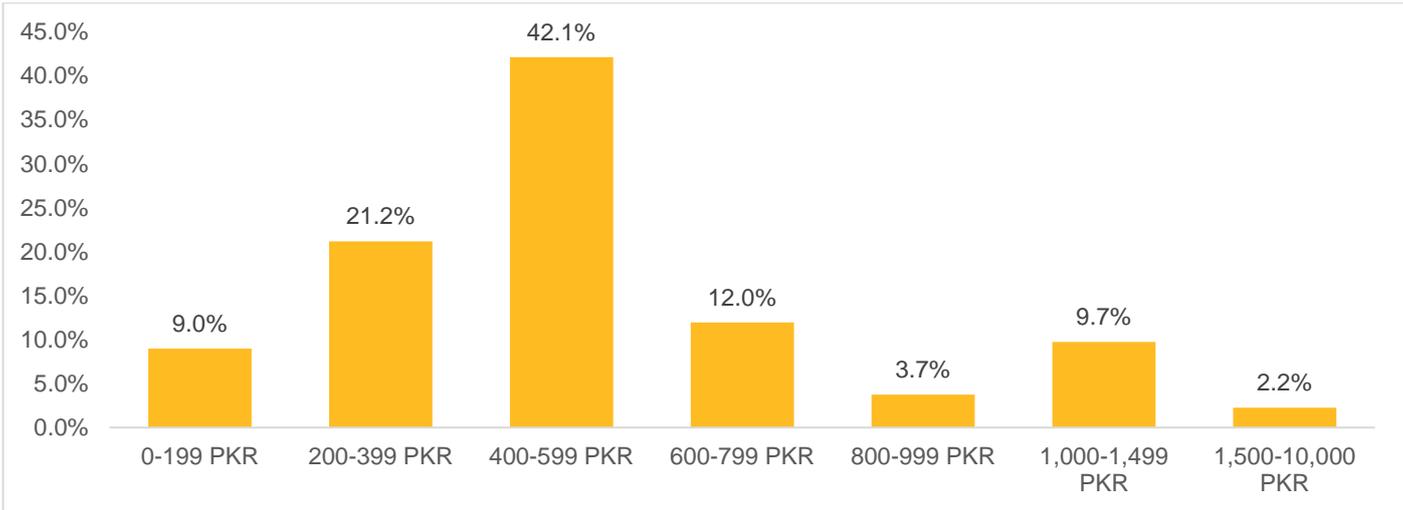
**Table 6: Why did you not comply with the prescribed treatment?**

Non-compliance with treatment	Spectacles non-compliance (n=33)	Cataract surgery non-compliance (n=57)	Other treatment non-compliance (n=12)
Did not trust provider	-	2% (1)	25% (3)
Fear of treatment	-	23% (13)	8% (1)
Need not felt	33% (5)	18% (10)	17% (2)
No money to pay	33% (5)	14% (8)	17% (2)
No person to accompany	-	5% (3)	8% (1)
Other priorities for spending money	27% (4)	37% (21)	25% (3)
Don't know where to go	7% (1)	-	-
Other	-	2% (1)	-

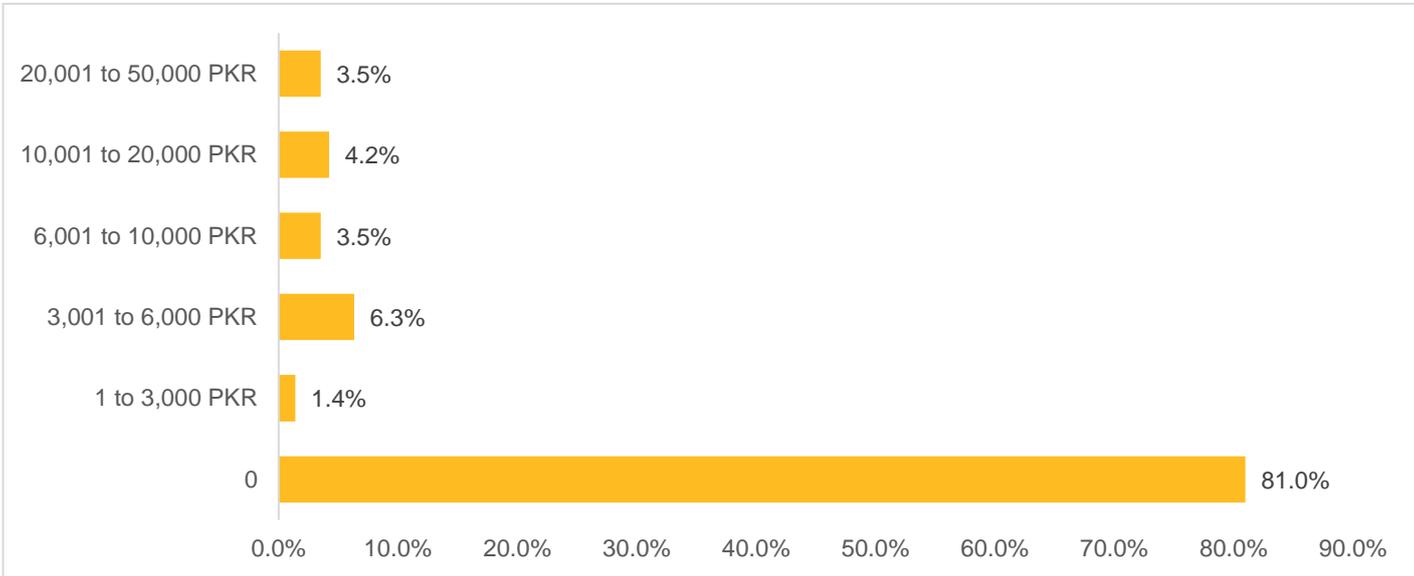
Non-responded	55% (18)	-	-
---------------	----------	---	---

The price paid for spectacles ranged from 0 to 10,000 rupees (USD 0-94.5)<sup>5</sup> with nearly three-quarters of the respondents paying between 200 and 799 rupees (USD 1.9 to 7.6) and 42.1% paying between 400 and 599 rupees (USD 3.8 to 5.7) (Figure 16). The price of cataract surgery ranged from 0 to 50,000 rupees (USD 0 to 472.5) but only a small proportion of respondents paid for surgery (19%), with 81% reporting that their surgery was free (Figure 17).

**Figure 16: How much did the spectacles cost you in rupees? (n=401)**



**Figure 17: How much did the cataract surgery cost you in rupees? (n=142)**



<sup>5</sup> PKR/USD 0.00945 exchange rate for March 2017, OANDA

### 3.2.3. Factors associated with eye health seeking behaviour

A statistically significant association was found between seeking care and respondents' age, education and occupation ( $p < 0.05$ ). Middle-aged participants (30-49 years) and those with housework or work outside their home were less likely to seek care, while those who had secondary and tertiary education were much more likely to seek care compared to those who were uneducated. There was no relationship between health seeking behaviour and gender.

**Table 7: Factors associated with eye care seeking behaviour among respondents with an eye problem within four weeks before the survey (n=1,390)**

Consultation (n=1,390)	Odds ratio
<b>Age group</b>	p.value = 0.0000
15-19	ref.
20-29	1.5454
30-39	0.5966*
40-49	0.451***
50-59	0.6909
60-69	1.053
70+	1.523
<b>Gender</b>	p.value = 0.1546
Male	ref.
Female	0.8565
<b>Wealth Quintiles</b>	p.value = 0.0798
Q1 (poorest)	ref.
Q2	1.3659*
Q3	1.2327
Q4	0.9833
Q5 (wealthiest)	0.8796
<b>Education</b>	p.value=0.0201
No formal education	ref.
Primary	1.0284
Secondary	1.4510**
Tertiary	1.864*
<b>Occupation</b>	p.value = 0.0000
Going to school/studying	ref.
Housework/childcare	0.5742**
Working	0.5233**
Not working	0.9192
Retired	1.3757

Significance level: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### 3.3. Prevalence and type of disability

Data on disability could be collected in a rigorous way among a share of participants aged 50 years old and above, representing 31% of respondents (n=1,508). Among these, 20% had a disability using the Washington Group definition (reporting ‘cannot do at all’ or ‘a lot of difficulty’ in at least one domain). The most common disability was difficulty in walking (10.6%); followed by difficulty in seeing (4.7%); self-care/upper body limitations (6.6%) and remembering/concentrating (1.5%). Very severe functional difficulties (cannot do at all) were identified mainly in two domains, self-care/upper body function (5.2%) and walking (1.5%) (Table 8).

**Table 8: Description of Washington Group variables (n = 2,660)**

	No difficulties (A)	Some difficulties (B)	A lot of difficulties (C)	Cannot do at all (D)
<b>See</b>	77.8% (1,174)	17.24% (260)	4.7% (71)	0.2% (3)
<b>Hear</b>	87.3% (1,317)	12.3% (186)	0.3% (4)	0.1% (1)
<b>Walk</b>	60.9% (918)	27% (407)	10.6% (160)	1.5% (23)
<b>Remember/ concentrate</b>	81% (1,221)	17.4% (263)	1.5% (22)	0.1% (2)
<b>Self-care/upper body</b>	73.8% (1,113)	14.4% (217)	6.6% (99)	5.2% (79)
<b>Communicate</b>	95.7% (1,443)	4.1% (62)	0.2% (3)	0% (0)

More than 7% of the participants had disability in two domains; 1.7% in three domains and 0.1% in four domains. Severe disability in two domains was found in 1.6% of respondents (Table 9).

**Table 9: Number of difficulties experienced (n=2,660)**

Number of difficulties	D level		C or D level		B, C or D level	
	N	Percent	N	Percent	N	Percent
0	1,424	94.4	1,204	79.8	744	49.3
1	60	4	169	11.2	260	17.2
2	24	1.6	108	7.2	189	12.5
3	-	-	26	1.7	134	8.9
4	-	-	1	0.1	104	6.9
5	-	-	-	-	56	3.7
6	-	-	-	-	21	1.4

Disability was associated with age, gender, socio-economic quintile, education and occupation. Women and respondents belonging to the two “wealthiest” quintiles were more likely to report a disability. People aged 80 years or above were 38 times more likely to report disability than those aged 50 to 59 years old. The odds of those who had primary education and secondary education to report disability were, respectively, 3 and 2 times lower than those with no formal education. Those who had no work (house workers, unable to work and retired) were 13 to 16 times more likely to report disability than those with formal work outside their home (Table 10).

**Table 10: Factors associated with disability – participants who responded to socio-demographic, economic and disability components (n=2,575)**

Disability (n=2,575)	Odds ratio
<b>Age</b>	p.value = 0.0000***
50-59	ref.
60-69	7.1004***
70-79	18.8061***
80-89	38.0138***
<b>Gender</b>	p.value = 0.0101**
Male	ref.
Female	1.3923
<b>Wealth Quintiles</b>	p.value = 0.0000***
Q1 (poorest)	ref.
Q2	1.0839
Q3	1.4893*
Q4	2.5033***
Q5 (wealthiest)	2.5325***
<b>Education</b>	p.value = 0.0000***
No formal education	ref.
Primary	0.2906***
Secondary	0.2060***
Tertiary	0.393
<b>Occupation</b>	p.value = 0.0000***
Working	ref.
Going to school/studying	2.09596
Housework/childcare	13.8372***
Not working	16.3636***
Retired	16.6***

Significance level: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

## 3.4. Clinical assessment

### 3.4.1. Clinical assessment: RARE

#### 3.4.1.1. Participant characteristics

3,065 eligible subjects (aged 15-49 years) were enumerated and 3,000 were examined in the RARE survey (response rate 97.9%). 1,217 (40.6%) of the examined subjects were female and the mean age was 26.7 years.

#### 3.4.1.2. Visual acuity status of the sample

223 subjects had presenting vision less than 6/12 in the better eye (Table 11). Prevalence of refractive error was 7.9% (95% CI 6.9% to 8.9%) and higher among women and people under 35 years (Table 12)

**Table 11: Presenting vision by sex and age**

	Sex		Age		Total
	Male	Female	>=35 years	>=35 years	
	n (%)	n (%)	n (%)	n (%)	n (%)
VA < 0.3 (6/12)	127 (7.10%)	96 (7.90%)	179 (7.60%)	44 (6.90%)	<b>223</b> <b>(7.40%)</b>
VA > 0.3 (6/12)	1,656 (92.90%)	1,121 (92.10%)	2,186 (92.40%)	591 (93.10%)	<b>2,777</b> <b>(92.60%)</b>
<b>Total</b>	<b>1,783</b> <b>(100%)</b>	<b>1,217</b> <b>(100%)</b>	<b>2,365</b> <b>(100%)</b>	<b>635</b> <b>(100%)</b>	<b>3,000</b> <b>(100%)</b>

**Table 12: Prevalence of refractive errors by sex and age**

	Sex		Age		Total
	Male	Female	< 35 years	>=35 years	
	n (%)	n (%)	n (%)	n (%)	n (%)
Any refractive error	132 (7.4%)	104 (8.5%)	191 (8.1%)	45 (7.1%)	<b>236</b> <b>(7.9%)</b>
No refractive error	1,651 (92.6%)	1,113 (91.5%)	2,174 (91.9%)	590 (92.9%)	<b>2,764</b> <b>(92.1%)</b>
<b>Total</b>	<b>1,783</b> <b>(100%)</b>	<b>1,217</b> <b>(100%)</b>	<b>2,365</b> <b>(100%)</b>	<b>635</b> <b>(100%)</b>	<b>3,000</b> <b>(100%)</b>

The majority of respondents with refractive error (90.7%) had myopia resulting in the sample prevalence of 7.1%; 17 subjects (7.2% of refractive error cases) had hyperopia (prevalence 0.6%) and five people (2.1% of refractive error cases) had astigmatism (prevalence 0.2%). Myopia was more prevalent among people under 35, while hyperopia and astigmatism were more common among participants aged 35 years and over (Table 13).

**Table 13: Types of refractive error by sex and age**

	Age Group		Sex		Total
	< 35 years	>=35 years	Male	Female	
	n (%)	n (%)	n (%)	n (%)	n (%)
Myopia (<-0.5D)	178 (93.2%)	36 (80%)	121 (91.70%)	93 (89.4%)	<b>214</b> <b>(90.70%)</b>
Hyperopia (=>+2D)	10 (5.20%)	7 (15.60%)	9 (6.80%)	8 (7.70%)	<b>17</b> <b>(7.20%)</b>
Astigmatism (= +/- 0.75D)	3 (1.60%)	2 (4.40%)	2 (1.50%)	3 (2.90%)	<b>5</b> <b>(2.10%)</b>
<b>Total</b>	<b>191</b> <b>(100%)</b>	<b>45</b> <b>(100%)</b>	<b>132</b> <b>(100%)</b>	<b>104</b> <b>(100%)</b>	<b>236</b> <b>(100%)</b>

### 3.4.1.3. Prevalence of presbyopia

Presbyopia was measured in people aged 35-49 years (n=635). 79.5% of these respondents could not read N8 on the near vision LogMAR chart. 63.5% of subjects aged 35-39 years and 93.8% of those aged 40-49 had presbyopia indicating an early onset of presbyopia in this population. There was no difference in the prevalence of presbyopia among males and females (Table 14).

**Table 14: Prevalence of presbyopia by age and sex**

	Age Group		Sex		Total
	35 - 39 years	>=40 years	Male	Female	
	n (%)				
Cannot read N8	190 (63.5%)	315 (93.8%)	299 (79.7%)	206 (79.2%)	<b>505</b> <b>(79.5%)</b>
Can read N8	109 (36.5%)	21 (6.3%)	76 (20.3%)	54 (20.8%)	<b>130</b> <b>(20.5%)</b>
<b>Total</b>	<b>299</b> <b>(100%)</b>	<b>336</b> <b>(100%)</b>	<b>375</b> <b>(100%)</b>	<b>260</b> <b>(100%)</b>	<b>635</b> <b>(100%)</b>

### 3.4.1.4. Spectacle coverage for distant vision

Spectacle coverage for distant vision was low with only 9.7% of subjects with refractive error using spectacles. Spectacle coverage was slightly lower among men (9.1% vs 10.6%) and in the younger age group (8.9% vs 13.3%) (Table 15).

**Table 15: Use of distance spectacles by age and sex**

	Age Group		Sex		Total
	35 - 39 years	>=40 years	Male	Female	
	n (%)	n (%)	n (%)	n (%)	n (%)
Using glasses	17 (8.90%)	6 (13.30%)	12 (9.10%)	11 (10.60%)	<b>23</b> <b>(9.70%)</b>
Not using glasses	174 (91.10%)	39 (86.70%)	120 (90.90%)	93 (89.40%)	<b>213</b> <b>(90.30%)</b>
<b>Total</b>	<b>191</b> <b>(100%)</b>	<b>45</b> <b>(100%)</b>	<b>132</b> <b>(100%)</b>	<b>104</b> <b>(100%)</b>	<b>236</b> <b>(100%)</b>

### 3.4.1.5. Spectacle coverage for near vision

Spectacle coverage for near vision was also very low - 9.7% of respondents aged 35+ years diagnosed with presbyopia had glasses with no difference between males and females (Table 16).

**Table 16: Spectacle coverage among people with presbyopia by age and sex**

	Age Group		Sex		Total
	35 - 39 years	>=40 years	Male	Female	
	n (%)				
Using near glasses	29 (9.2%)	20 (10.5%)	29 (9.7%)	20 (9.7%)	<b>49</b> <b>(9.7%)</b>
Not using glasses	286 (90.8%)	170 (89.5%)	270 (90.3%)	186 (90.3%)	<b>456</b> <b>(90.3%)</b>
<b>Total</b>	<b>315</b> <b>(100%)</b>	<b>190</b> <b>(100%)</b>	<b>299</b> <b>(100%)</b>	<b>206</b> <b>(100%)</b>	<b>505</b> <b>(100%)</b>

## 3.4.2. Clinical assessment: RAAB

### 3.4.2.1. Characteristics of respondents in the RAAB survey

3,050 eligible subjects were enumerated for the RAAB survey, of whom 2,958 were examined (97.0% response). 45.5% of those examined were females.

### 3.4.2.2. Prevalence of blindness and low vision

The unadjusted prevalence of blindness amongst people aged 50 and above was 1.2% (95% CI 0.8-1.6). Severe Visual Impairment was 0.7% (95% CI 0.4-1.1), moderate visual Impairment was 7.5% (95% CI 6.0-9.1) and mild (early) visual impairment was 17.1% (95% CI 15.0-19.1); 1.2% (95% CI 0.7-1.7) of the examined individuals had Functional Low Vision (FLV).

Gender differences in the sample were particularly pronounced in the prevalence of blindness with 2.2% (95% CI 1.3-3.1) of female participants being blind compared to 0.4% (95% CI 0.1-0.7) among males. The differences between men and women were also significant in the early visual impairment but the prevalence for this level of impairment was higher among men (19.7% (95% CI 17.4-22.1)) compared to women (13.9% (11.5-16.3)) (Table 17).

**Table 17: Unadjusted prevalence of blindness, severe (SVI), moderate (MVI) and early (EVI) visual impairment - bilateral PVA**

	Males		Females		Total	
	n	% (95% CI)	N	% (95% CI)	n	% (95% CI)
Blindness	6	0.4 (0.1 - 0.7)	30	2.2 (1.3 - 3.1)	36	1.2 (0.8 - 1.6)
Severe VI	12	0.7 (0.3 - 1.2)	10	0.7 (0.3 - 1.2)	22	0.7 (0.4 - 1.1)
Moderate VI	120	7.4 (5.7 - 9.2)	103	7.7 (5.8 - 9.5)	223	7.5 (6.0 - 9.1)
Early VI	318	19.7 (17.4 - 22.1)	187	13.9 (11.5 - 16.3)	505	17.1 (15.0 - 19.1)
Functional Low Vision	18	1.1 (0.5 - 1.7)	17	1.3 (0.6 - 1.9)	35	1.2 (0.7 - 1.7)

The prevalence of blindness in the sample increased with age, particularly for female respondents where the prevalence among females aged over 80 years reached 7.1% (Table 18). The prevalence of blindness was higher among women in all age groups.

**Table 18: Unadjusted blindness prevalence (PVA<3/60 in better eye) by age group and sex**

	Males		Females		Total	
	n	% (95% CI)	N	% (95% CI)	n	% (95% CI)
50-59 years	0	0.0 (0.0 - 0.0)	7	0.8 (0.2 - 1.4)	7	0.4 (0.1 - 0.7)
60-69 years	0	0.0 (0.0 - 0.0)	12	4.6 (1.2 - 8.0)	12	2.0 (0.6 - 3.4)
70-79 years	5	2.3 (0.4 - 4.1)	8	4.9 (1.3 - 8.5)	13	3.4 (1.5 - 5.2)
80+ years	1	0.8 (0.0 - 2.5)	3	7.1 (0.0 - 14.7)	4	2.5 (0.1 - 4.9)
All 50+ years	6	0.4 (0.1 - 0.7)	30	2.2 (1.3 - 3.1)	36	1.2 (0.8 - 1.6)

### 3.4.2.3. Causes of blindness and low vision

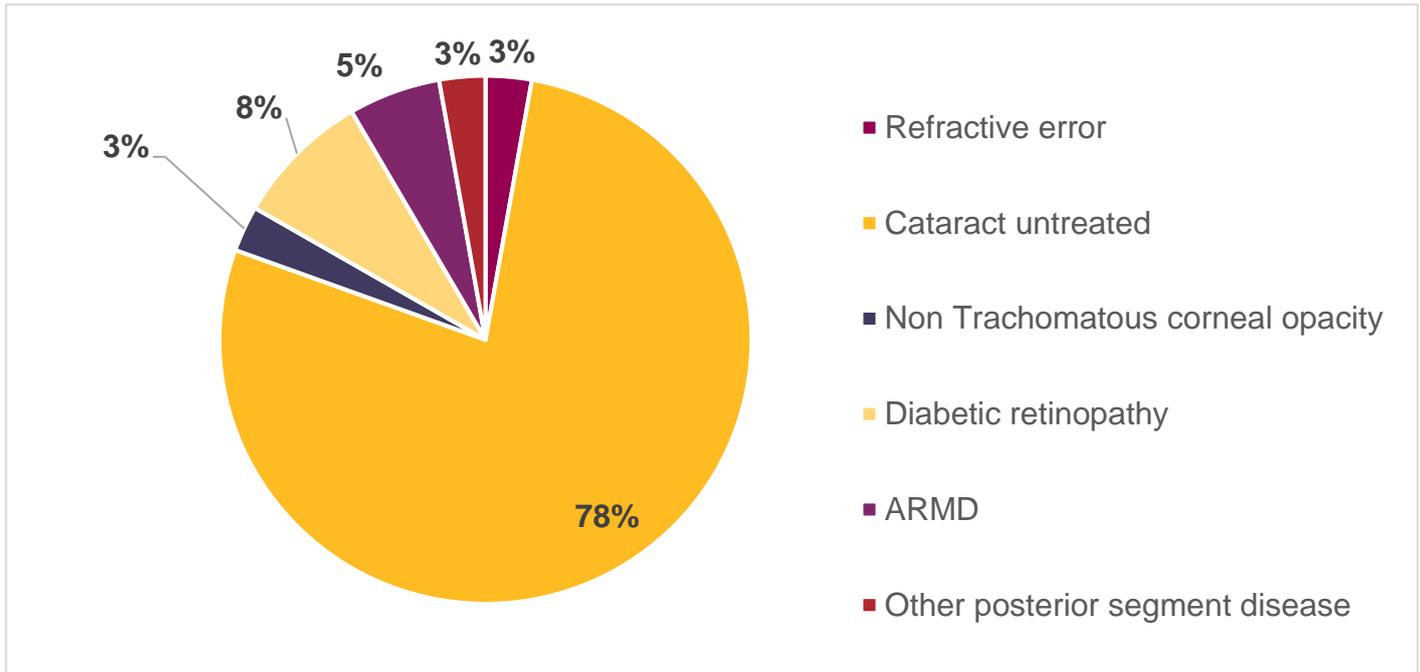
Untreated cataract was the major cause of blindness (77.8%), severe visual impairment (72.7%) and moderate visual impairment (48.0%). Refractive error was the main cause of early visual impairment (57.4%) and the second common cause of moderate visual impairment (38.6%) (Table 19).

Among eight people who were blind from the causes other than cataract, three (8.3%) were blind from diabetic retinopathy; two (5.6%) from age-related macular degeneration (ARMD); and one (2.8%) each from other posterior segment diseases, RE and non-trachomatous corneal opacity (Figure 18). All three cases of blindness from diabetic retinopathy were females (Annex 7.8).

**Table 19: Principal causes of blindness (<3/60), severe (SVI<6/60-3/60), moderate (MVI<6/18-6/60) and early visual impairment (EVI <6/12-1/18) in persons (PVA)**

	Blindness		Severe VI		Moderate VI		Early VI	
	n	%	N	%	n	%	n	%
1. Refractive error	1	2.8%	1	4.5%	86	38.6%	290	57.4%
2. Aphakia uncorrected	0	0.0%	0	0.0%	0	0.0%	0	0.0%
3. Cataract untreated	28	77.8%	16	72.7%	107	48.0%	135	26.7%
4. Cataract surgical complications	0	0.0%	3	13.6%	5	2.2%	23	4.6%
5. Trachomatous corneal opacity	0	0.0%	0	0.0%	0	0.0%	1	0.2%
6. Non Trachomatous corneal opacity	1	2.8%	0	0.0%	4	1.8%	2	0.4%
7. Phthisis	0	0.0%	0	0.0%	0	0.0%	0	0.0%
8. Onchocerciasis	0	0.0%	0	0.0%	1	0.4%	0	0.0%
9. Glaucoma	0	0.0%	0	0.0%	4	1.8%	11	2.2%
10. Diabetic retinopathy	3	8.3%	1	4.5%	15	6.7%	39	7.7%
11. ARMD	2	5.6%	0	0.0%	0	0.0%	1	0.2%
12. Other posterior segment disease	1	2.8%	1	4.5%	1	0.4%	3	0.6%
13. All other globe/CNS abnormalities	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Total</b>	<b>36</b>	<b>100.0%</b>	<b>22</b>	<b>100.0%</b>	<b>223</b>	<b>100.0%</b>	<b>505</b>	<b>100.0%</b>

**Figure 18: Causes of blindness**



**3.4.2.4. Barriers to uptake of cataract surgical services**

Cost of surgery was the major named barrier (40%) for people with un-operated cataract. Other reasons were fear of surgery (25%), not feeling the need (13.3%), being unaware of treatment (13.3%) and refusal of the provider to operate (8.3%). Most reasons were similar for men and women, but more women felt no need for surgery (Table 20).

**Table 20: Barriers to cataract surgery - bilateral VA<6/60 due to cataract**

	Males		Females		Total	
	N	%	n	%	n	%
Cost	5	41.7%	19	39.6%	24	40.0%
Fear	3	25.0%	12	25.0%	15	25.0%
Need not felt	1	8.3%	7	14.6%	8	13.3%
Unaware treatment is possible	2	16.7%	6	12.5%	8	13.3%
Treatment denied by provider	1	8.3%	4	8.3%	5	8.3%
<b>Total</b>	<b>12</b>	<b>100.0%</b>	<b>48</b>	<b>100.0%</b>	<b>60</b>	<b>100.0%</b>

**3.4.2.5. Visual outcomes of cataract surgery**

471 eyes were found to have undergone cataract surgery and 99.7% of patients had Intraocular Cataract Lens (IOL) implanted. 52.9% of the operated respondents had their surgery in a government hospital, 30.1% in an NGO hospital, 5.9% in a private hospital/clinic and 11% in an eye camp (Table 21).

**Table 21: Place of surgery**

	Male		Female		Total	
	n	%	N	%	n	%
Government hospital	151	54.1%	98	51.0%	249	52.9%
NGO/charitable hospital	80	28.7%	62	32.3%	142	30.1%
Eye camp	35	12.5%	17	8.9%	52	11.0%
Private hospital	13	4.7%	15	7.8%	28	5.9%
<b>Total</b>	<b>279</b>	<b>100.0</b>	<b>192</b>	<b>100.0</b>	<b>471</b>	<b>100.0</b>

55.4% of respondents with operated cataract had very good visual outcome (can see 6/12 or better), 25.9% had good visual outcome (can see <6/12 - 6/18), 12.5% had borderline vision (<6/18-6/60) and 6.2% had poor vision (cannot see 6/60) with available correction. There were no significant differences in the outcomes of cataract surgery between men and women (Table 22) or by place of surgery (Table 23).

**Table 22: Outcome after cataract surgery with available correction (eyes)**

	Males		Females		Total	
	n	%	n	%	n	%
Very good: can see 6/12	152	54.5%	109	56.8%	261	55.4%
Good: can see 6/18	74	26.5%	48	25.0%	122	25.9%
Borderline: can see 6/60	37	13.3%	22	11.5%	59	12.5%
Poor: cannot see 6/60	16	5.7%	13	6.8%	29	6.2%
<b>Total</b>	<b>279</b>	<b>100.0%</b>	<b>192</b>	<b>100.0%</b>	<b>471</b>	<b>100.0%</b>

**Table 23: Post-operative VA with available correction by place of surgery**

	Gov. Hospital		NGO. Hospital		Private Hospital		Eye camp		Total	
	Eyes	%	Eyes	%	Eyes	%	Eyes	%	Eyes	%
Very good: can see 6/12	141	56.6%	73	51.4%	19	67.9%	28	53.8%	261	55.4%
Good: can see 6/18	67	26.9%	32	22.5%	7	25.0%	16	30.8%	122	25.9%
Borderline: can see 6/60	32	12.9%	21	14.8%	2	7.1%	4	7.7%	59	12.5%
Poor: cannot see 6/60	9	3.6%	16	11.3%	0	0.0%	4	7.7%	29	6.2%
<b>Total</b>	<b>249</b>	<b>100</b>	<b>142</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>52</b>	<b>100</b>	<b>471</b>	<b>100</b>

### 3.4.2.1. Cataract surgical coverage (CSC) and effective surgical coverage (eCSC)

Cataract surgical coverage (CSC) for persons was 93% at VA<3/60; 86% at VA<6/60; and 64% at VA<6/18. CSC was higher among males in all categories of vision (Table 24).

**Table 24: Cataract surgical coverage (persons) – percentage**

	Males	Females	Total
VA < 3/60	98.1%	86.8%	93.4%
VA < 6/60	95.0%	75.8%	86.3%
VA < 6/18	72.0%	55.4%	64.4%

The effective cataract surgical coverage, i.e. proportion of operated cataract with good outcome among operable and operated cataract, reached 88% for male respondents and 66% for females respondents, for a total effective CSC of 78% (Table 25) [17]. The ratio of good outcome cataract operation among operated cataract is lower among women (0.87) compared to male respondents' ratio (0.93). As whole, a relatively high proportion of good visual outcome was observed (0.91).

**Table 25: Effective cataract surgical coverage (persons) – percentage**

	Males	Females	Total
eCSC persons <6/60	88.1%	66.3%	78.1%
eCSC/CSC ratio	0.93	0.87	0.91

### 3.4.2.2. Causes of poor visual outcomes after cataract surgery

The major causes of poor post-surgery outcomes were surgical complications (44.8%), long-term sequelae (i.e. posterior capsular opacification) (31%), selection of patients or "Ocular comorbidity" (20.7%) and spectacles (i.e. biometry technique before surgery) (3.4%) (Table 26).

**Table 26: Cause of PVA<6/12 (good, borderline and poor outcome) after cataract surgery**

	Selection		Surgical complications		Spectacles		Sequelae		Can see 6/12		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Very good: can see 6/12	0	0.0%	0	0.0%	0	0.0%	0	0.0%	261	100%	261	100%
Good: can see 6/18	10	8.2%	31	25.4%	43	35.2%	38	31.1%	0	0.0%	122	100%
Borderline: can see 6/60	8	13.6%	11	18.6%	14	23.7%	26	44.1%	0	0.0%	59	100%
Poor: cannot see 6/60	6	20.7%	13	44.8%	1	3.4%	9	31.0%	0	0.0%	29	100%
<b>Total</b>	<b>24</b>	<b>5.1%</b>	<b>55</b>	<b>11.7%</b>	<b>58</b>	<b>12.3%</b>	<b>73</b>	<b>15.5%</b>	<b>261</b>	<b>55.4%</b>	<b>471</b>	<b>100%</b>

### 3.4.2.3. Functional low vision

Functional low vision was defined as VA <6/18 in the better eye with best correction not due to refractive error, cataract or uncorrected aphakia. The overall prevalence of FLV was 1.2% with little difference between women (1.3%) and men (1.1%) (Table 27). Most of FLV was found in the age group 70-79 years. Around 48.6% of cases were caused by diabetic retinopathy, followed by cataract surgical complications (17.1%), non-trachomatous corneal opacity (11.4%), glaucoma (11.4%), ARMD (5.7%) and other posterior segment conditions (5.7%). Women were more affected by diabetic retinopathy, while men had more corneal opacity and glaucoma (Table 28).

**Table 27: Persons with Functional Low Vision: BCVA<6/18 - PL+ in the better eye; incurable**

	Males		Females		Total	
	n	%	N	%	n	%
50-59	1	0.1	3	0.3	4	0.2
60-69	4	1.2	6	2.3	10	1.7
70-79	9	4.1	6	3.7	15	3.9
80+	4	3.4	2	4.8	6	3.7
<b>Total</b>	<b>18</b>	<b>1.1</b>	<b>17</b>	<b>1.3</b>	<b>35</b>	<b>1.2</b>

**Table 28: Principal cause of functional low vision in persons: BCVA<6/18 - PL+ in better eye, incurable**

	Males		Females		Total	
	N	%	n	%	n	%
1. Diabetic retinopathy	8	44.4%	9	52.9%	17	48.6%
2. Cataract surgical complications	3	16.7%	3	17.6%	6	17.1%
3. Non-trachomatous corneal opacity	4	22.2%	0	0.0%	4	11.4%
4. Glaucoma	3	16.7%	1	5.9%	4	11.4%
5. ARMD	0	0.0%	2	11.8%	2	5.7%
6. Other posterior segment disease	0	0.0%	2	11.8%	2	5.7%
<b>Total</b>	<b>18</b>	<b>100.0%</b>	<b>17</b>	<b>100.0%</b>	<b>35</b>	<b>100.0%</b>

### 3.4.2.4. Refractive errors and spectacle coverage

The prevalence of refractive errors among people aged 50+ years was 27.3%, while prevalence of uncorrected refractive errors was 12.8% and higher in men compared to women (14.6% vs 10.6%). The prevalence of uncorrected presbyopia was 66.5%, again slightly higher among men (67.9%) than women (64.9%) (Table 29).

**Table 29: Uncorrected refractive error and uncorrected presbyopia**

	Males		Females		Total	
	n	%	n	%	n	%
<b>Total refractive errors</b>	484	30.0%	322	23.9%	<b>806</b>	<b>27.3%</b>
<b>Uncorrected refractive errors</b>	235	14.6%	143	10.6%	<b>378</b>	<b>12.8%</b>
<b>Uncorrected presbyopia</b>	1,094	67.9%	874	64.9%	<b>1,968</b>	<b>66.5%</b>

### 3.4.2.5. Prevalence of avoidable visual impairment

80.6% of blindness, 77.3% of severe visual impairment, 86.6% of moderate visual impairment and 84.2% of early visual impairment in this survey was due to treatable causes. 91.7% of blindness and 95.5% of severe visual impairment was avoidable and could be addressed by eye care interventions (Table 30).

**Table 30: Avoidable Blindness, SVI, MVI and EVI in persons by intervention category**

	Blindness		SVI		MVI		EVI	
	n	%	n	%	n	%	n	%
A. Treatable (1,2,3)	29	80.6%	17	77.3%	193	86.6%	425	84.2%
B. Preventable (PHC/PEC services)	1	2.8%	0	0.0%	5	2.2%	3	0.6%
C. Preventable (Ophthalmic services)	3	8.3%	4	18.2%	24	10.8%	73	14.5%
D. Avoidable (A+B+C)	33	91.7%	21	95.5%	222	99.6%	501	99.2%
E. Posterior segment causes	6	16.7%	2	9.1%	21	9.4%	54	10.7%

## 3.5. Willingness to pay

### 3.5.1. Willingness to pay for cataract surgery

Among 1,033 respondents aged 50+ for whom cataract was simulated using cataract simulation glasses 90.4% were willing to take up cataract surgery, but only 46.3% were willing to pay for it. For those who were willing to pay (n=478), the most common price intervals were PKR 4,000-4,999 (USD 38- 48) (13.0 %) and PKR 2,000-2,999 (USD 19-29) (8.7%). 30% of the respondents were prepared to pay 4,999 rupees (USD 48) or more and another quarter would not pay more than PKR 1,999 (USD 19). Only one in ten participants were willing to pay PKR 6,999 (USD 67) or more for cataract surgery (Table 31). The average WTP for cataract surgery amounted to PKR 2,082 (USD 19.7).

**Table 31: Willingness to pay for cataract surgery (n=932)**

Variables	Percentage (frequency)
<b>Pay</b>	N= 932
No	48.7% (454)
Yes	51.3% (478)
<b>Willingness to pay for cataract surgery</b>	N=932
0	48.76% (454)
1-999 PKR	1.1% (10)
1,000-1,999PKR	4.2% (39)
2,000-2,999 PKR	8.7% (81)
3,000-3,999 PKR	6.7% (62)
4,000-4,999 PKR	13.0% (121)
5,000-5,999 PKR	8.3% (77)
6,000-6,999 PKR	3.7% (34)
7,000-7,999 PKR	1.6% (15)
8,000-8,999 PKR	0.9% (8)
9,000-9,999 PKR	1.6% (15)
10,000-10,999 PKR	1.1% (10)
>11,000 PKR	0.6% (6)

### 3.5.1.1. Ability to pay and strategy to afford cataract surgery

Bearing in mind their current income, about 52.7% of the respondents reported they would find it easy or somewhat easy to pay for surgery, while 45.2% would find it difficult. The majority suggested they would use their income or savings, while one in ten would have to reduce their day-to-day consumption and one in nine would have to borrow money (Table 32).

**Table 32: Ability and strategy to pay for cataract surgery**

Variables	Percentage (frequency)
<b>How difficult/easy would it be for you to pay that amount based on your income?</b>	n=932
Very easy	1.7% (6)
Somewhat easy	52.7% (252)
Somewhat difficult	45.2% (216)
Very difficult	0.8% (4)
Impossible	0% (0)
No WTP	N/A (454)
<b>Strategy how to pay*</b>	n=932
Income from this month	50.2% (422)
Savings	29.6% (250)
Reduce consumption (food, etc.)	10.1% (85)
Borrow from relative/friends	6.5% (55)
Borrow from lenders	2.4% (20)
Sell household assets	0% (0)
Don't know	1.2% (10)
No WTP	N/A (454)

\* Multiple answers per respondent

### 3.5.1.2. Factors associated with willingness to pay for cataract surgery

There were no associations between willingness to pay for cataract surgery and either age or sex. However, significant statistical associations between willingness to pay for cataract surgery and wealth, education and occupation were observed (Table 33). Thus, the WTP for surgery among the respondents from the wealthiest quintile was on average 1,042 PKR (USD 9.8) higher than for those from the poorest quintile (p.value=0.006). Participants with secondary and higher education had higher WTP than those with no formal education (p.value=0.000). Those who could not work also had lower WTP compared to those with work outside their home (p.value=0.016).

**Table 33: Factors associated with willingness to pay for cataract surgery for participants who answered WTP and socio-economic components (n=708)**

Willingness to pay for cataract surgery (0 to >11,000 PKR) (n=708)	Coefficients
<b>Age group</b>	p.value = 0.9217
50-59	ref.
60-69	69.9
70-79	-240
80-89	-61.3
<b>Gender</b>	p.value = 0.2841
Male	ref.
Female	-210.2
<b>Wealth Quintiles</b>	p.value = 0.0119
Q1 (poorest)	ref.
Q2	546.7*
Q3	895.2***
Q4	382.8
Q5 (wealthiest)	1042***
<b>Education</b>	p.value=0.0002
No formal education	ref.
Primary	287.8
Secondary	494.7*
Tertiary	3823.5***
<b>Occupation</b>	p.value = 0.076
Working	ref.
Going to school/studying	405
Housework/childcare	-247.2
Not working	-917.2**
Retired	444.9

Significance level: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

### 3.5.1. Willingness to pay for spectacles

Among 887 respondents aged 15-49 years for whom refractive error was simulated, 490 (55.2%) were willing to wear spectacles and 445 of them (90.8%) were willing to pay for spectacles. A fifth of the willing to pay for spectacles respondents (21.8%) selected the price range of PKR 500-599 (USD 4.7- 5.7) and another 14.3% selected PKR 1,000-1,099 (USD 9.5- 10.4) (Table 34). More than half of the respondents were willing to pay at least PKR 500 (USD 4.7) and 80% of the respondents were willing to pay at least PKR 400 (USD 3.8). The average WTP for spectacles stated was PKR 592 (USD 5.6).

**Table 34: Willingness to wear and pay for spectacles (simulation of refractive error)**

Variables	Simulated refractive error
<b>Pay</b>	<b>n=490</b>
No	9.2% (45)
Yes	90.8% (445)
<b>Elicited WTP for spectacles</b>	<b>n=490</b>
0 PKR	9.2% (45)
1-99 PKR	0% (0)
100-199 PKR	1.4% (7)
200-299 PKR	4.1% (20)
300-399 PKR	4.7% (23)
400-499 PKR	14.9% (73)
500-599 PKR	21.8% (107)
600-699 PKR	8.8% (43)
700-799 PKR	14.3% (70)
800-899 PKR	6.3% (31)
900-999 PKR	7.4% (36)
1,000-1,099 PKR	4.9% (24)
>1,100 PKR	2.2% (11)

### 3.5.1.1. Ability and strategy to pay for spectacles

People who were willing to wear spectacles (n=490) were asked how easy or difficult they would find to pay for spectacles bearing in mind their current income. Over 62% of the respondents would find it easy or somewhat easy to pay for spectacles, while 38% would find it somewhat difficult or very difficult. None of the respondents said that it would be impossible. The majority would use their income or savings to cover the costs (75.3%) (Table 35).

**Table 35: Ability and strategy to pay for spectacles**

Variables	Simulated refractive error
<b>How difficult/easy would it be for you to pay that amount based on your income?</b>	n=490
Very easy	8.8% (39)
Somewhat easy	53.5% (238)
Somewhat difficult	33% (147)
Very difficult	4.7% (21)
Impossible	0% (0)
No WTP	N/A (45)
<b>Which strategy would you use to cope with such expenditure if you had to pay that amount today?</b>	n=490*
Income from this month	44.2% (266)
Savings	31.1% (187)
Reduce consumption (food, etc.)	3% (18)
Borrow from relative/friends	19.3% (116)
Borrow from lenders	2.2% (13)
Sell household assets	0% (0)
Don't know	0.3% (2)
No WTP	N/A (45)

\*Multiple answers per respondent

### 3.5.1.2. Factors associated with willingness to pay for spectacles

Table 36 shows the relationship between willingness to pay for spectacles and socio-demographic characteristics of participants. Three variables were statistically associated with the WTP. Female respondents had lower WTP than males (p.value=0.0483), whereas respondents with higher levels of education (primary and above) and those in the wealthier quintiles (quintile three and above) had higher WTP than uneducated or poorer participants.

**Table 36: Factors associated with willingness to pay for spectacles for participants who answered WTP and socio-economic components (n=432)**

Willingness to pay for spectacles (0 to >1,100 PKR) (n=432)	Coefficients
<b>Age group</b>	p.value = 0.4814
15-19	Ref.
20-29	28.1
30-39	-6.6
40-49	-71.3
<b>Gender</b>	p.value = 0.0483
Male	ref.
Female	-72.7**
<b>Education</b>	p.value = 0.0000
No formal education	ref.
Primary	95.4*
Secondary	121.9***
Tertiary	301***
<b>Wealth Quintiles</b>	p.value = 0.0012
Q1 (poorest)	ref.
Q2	31.8
Q3	165**
Q4	204.8***
Q5 (wealthiest)	128*
<b>Occupation</b>	p.value = 0.0732
Working	ref.
Going to school/studying	-31
Housework/childcare	-93.4**
Not working	-128**
Retired	-288.4

Significance level: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

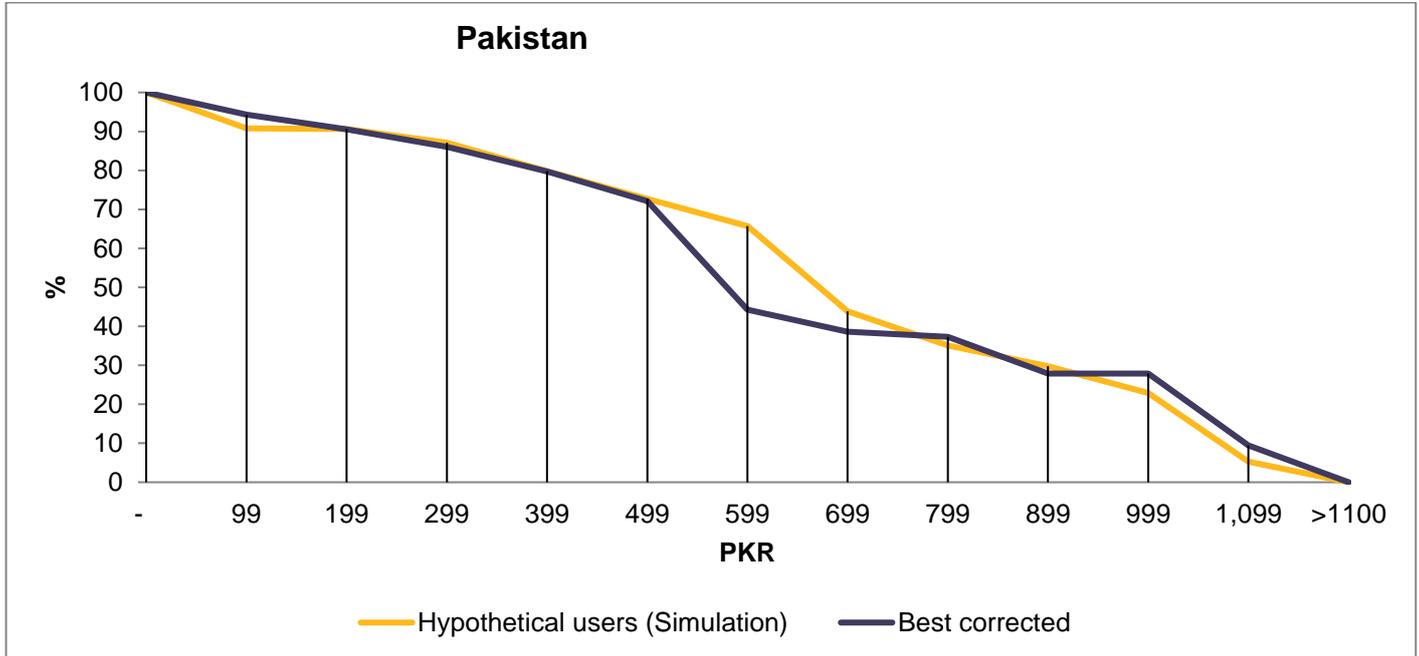
## 3.5.2. Willingness to pay – theoretical validation

### 3.5.2.1. Spectacles demand curve – theoretical validation

In order to test the theoretical validity of the WTP for spectacles, as mentioned in methodology section, respondents diagnosed with uncorrected refractive error and provided with best possible correction were asked about their willingness to pay for this correction. A total of 158 respondents with uncorrected refractive error were asked for their WTP for spectacles after having their vision corrected. On average, “Best corrected” respondents stated a willingness to pay for spectacles of PKR 639 (USD 6) against PKR 592 (USD 5.6) for respondents with simulated refractive error (Annex 7.9).

Figure 19 shows the demand curves for spectacles from the respondents diagnosed with refractive error and those for whom refractive error was simulated. The curves were similar and both followed the same downward trend as the price of spectacles increased, suggesting no difference between hypothetical users and those actually suffering from refractive error. The results show that the demand decreased slowly up to the price of PKR 499 (USD 4.7) but dropped significantly from 75% to 45% as the price increased to PKR 799 (USD 7.6) and further to around 30% as the price increased to PKR 999 (USD 8.5).

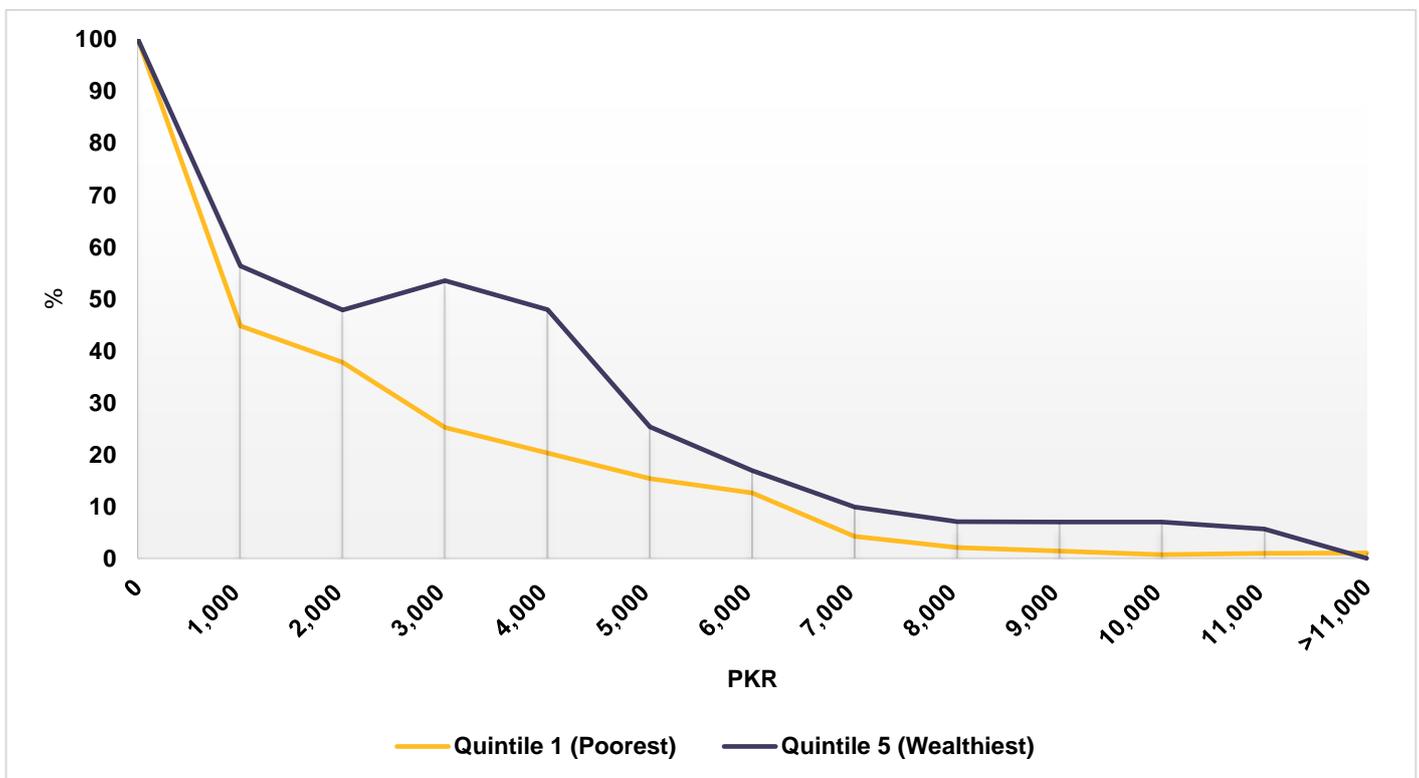
**Figure 19: Demand curves for spectacles for hypothetical users (no visual impairment) and respondents diagnosed with Refractive Error**



### 3.5.2.2. Cataract surgery demand curve – theoretical validation

Figure 20 shows WTP for cataract surgery disaggregated by relative wealth, using the Equity Tool quintiles. The graph shows the demand curves for cataract surgery of the respondents belonging to the first (poorest) and fifth (wealthiest) quintiles. Both curves follow the same downward trend as the price of cataract surgery increases. However, the respondents belonging to the wealthiest quintile had, on average, a higher willingness to pay and their demand dropped slower than for those in the poorest quintile. For example, while half of the respondents in the wealthiest quintile were willing to pay for cataract surgery PKR 4,000 (USD 34.7), only one in five participants in the poorest quintile were willing to pay this price.

**Figure 20: Demand curves for cataract surgery for hypothetical users by relative wealth quintile**



## 3.6. In-depth interviews

Twenty-six respondents selected across seven clusters took part in the in-depth interviews; 13 of them (50%) were female; and the mean age was 50.7 years.

A number of themes were identified during the analysis. These were grouped under two themes: i) perception of eye health and decisions about eye care; and ii) perception and experiences of eye health services.

### 3.6.1. Perception of eye health and decisions about eye care

---

Many respondents stated that they were often negligent and careless about their eye health and only consulted doctors when it was inevitable. Men were more likely to describe such behaviour than women. For men, it was the degree of severity of their illness that mattered, only those conditions that prevented them from working were the ones that forced them to seek medical care.

Women were more likely to say that they were dependent on their husbands or other men in the household. It was explained that the head of the household (usually male) was the decision maker for the entire family, and particularly for women. These men were often the breadwinners, they were busy at work and did not have time to take women to the doctor. In addition, it was not customary in slums to 'bother' a husband or a son with requests when they returned home tired from work. Furthermore, women themselves had too many household chores and childcare responsibilities and did not have time to go to hospital:

*"...men are out for their jobs all day and they can't take us to the hospital once they are back from ... work. These domestic issues restrained me from visiting any doctor ... despite suffering ... for 6 months."* (45-year-old female)

*"... my son is working at a factory, his job timing doesn't match with hospital OPD timing, this is why I didn't visit."* (72-year-old female)

Women, especially those who observed "parda" or kept their faces covered, preferred to visit female doctors. A number of women also mentioned that they were not comfortable wearing glasses either because glasses were seen as a sign of ageing or because they thought they looked funny:

*"...I feel hesitant and ashamed to wear glasses at this age, it seems funny."* (72-year-old female)

Eye problems in children were often noticed first by teachers, who then flagged them up to the parents. Many participants said that they relied on teachers to identify vision problems in children in schools:

*"His teachers told us: 'Your child faces difficulty in reading and recognising whenever asked to read.'"* (40-year-old female)

Many people believed that poorer eyesight was part of the natural ageing process and considered vision problems acceptable. There were also many myths pertaining to eyesight. Some respondents believed that the left side of the body is generally weaker, therefore problems occurring in the left eye were thought to be natural:

*“My left eye sight started weakening but I didn’t care. I had a belief that just like left hand and foot, the left eye was meant to be weaker... naturally. This is why I never went to any doctor for a check-up, I kept on driving rickshaw and my eye sight kept on getting weaker and weaker.”*  
(60-year-old male)

Self-medication was often used, as it was easy, convenient and often perceived to be more effective than doctors:

*“...whenever there is severe pain, I have been taking self-medication for almost three years.”*  
(52-year-old female)

### 3.6.2. Perception and experiences of eye health services

---

A number of factors influenced people’s decisions when they were choosing where to seek eye care. The majority of respondents said that they preferred facilities that were nearby and easy to get to, irrespective of how big or small the facility was and which services it provided. Many said that free care was a very important factor. Some said that they wanted services that were attentive and respectful. Many asked around and checked references for the facilities available:

*“...because it’s near and accessible, just five minutes’ walk from my house, plus it’s free, they don’t charge any fee.”* (55-year-old female)

*“It was near my house and it was free. So I thought to visit and get myself examined.”* (60-year-old male)

*“...another famous hospital is Rahmat hospital in Town Ship, our whole mohalla recommends that hospital for eye diseases.”* (72-year-old female)

Costs of care coupled with the costs of transportation and time were an important deterring factor for many patients. A number of respondents said that they would not mind paying a small fee (no more than 250 rupees (USD 2.2)) but the prices in many private facilities were much higher and often unaffordable, as the following two participants explained:

*“They charged me 17,000 rupees [USD 147] besides the post operation medicine, overall it costed me about 25,000 [USD216].”* (60-year-old male)

*“...injection prescribed by the doctor was going to cost me 20,000 rupees [USD 173], that was a big amount for me, that is why I quit the treatment.”* (60-year-old male)

Quality of care and the reputation of the healthcare provider was also important for study respondents. Facilities where the examination, diagnosis and treatment were easy and smooth were thought to be well-managed and of good quality. A number of respondents said that small eye care providers, such as trust hospitals or dispensaries, were often more reliable and

satisfactory. Large public hospitals were sometimes perceived as overcrowded, disrespectful and corrupt:

*“...rush, disappointment, wastage of time... I am tired of public sector hospitals, there wasn't any place to sit, no sympathy for senior citizens. Corrupt system is strengthening its roots and this isn't acceptable...” (55-year-old male)*

## 4. Discussion

### Key characteristics of eye health services available to slum communities

The study identified a large number and a wide spectrum of facilities around selected slums, ranging from small optical shops and pharmacies to large secondary and tertiary hospitals. Similarly to many other settings, eye care services were not equally distributed across the city with a higher concentration of facilities in central parts and around major roads and some outskirt areas having no eye care facilities at all. The vast majority of the facilities available were private for-profit and had user fees as their major source of funding, although provisions for poor and vulnerable populations, including slum dwellers, were available in most public and private non-for-profit facilities and the majority of study participants reported that they could access eye care services free at the point of use.

### Health seeking behaviour and barriers to available eye care services

The socio-demographic and economic characteristics of the survey respondents showed a heterogeneous slum population. But overall, this population had very low education levels with almost half of the sample having no formal education and one in three being illiterate. However, the population was economically active with one in three participants being engaged in work outside their home, primarily in service and manufacturing industries. The majority of those with work were men, while women were primarily involved in household activities and childcare. The economic status of households despite them being slum dwellers was only marginally lower than the rest of the urban population in Pakistan. However, it should be noted that Punjab is one of the wealthiest provinces of Pakistan, and it is possible that the study participants were not poor compared to other urban centres of Pakistan but poor relative to the rest of the population of Lahore [20].

The prevalence of self-reported ocular morbidity (both visually impairing and non-impairing conditions) was similar to other settings with about a third of study respondents reporting an eye problem in the four weeks preceding the study, the main issues being poor near and distance vision and red and itchy eyes. Health seeking behaviour was also similar to other urban settings with only half of those experiencing eye problems seeking care outside their home. In line with other studies, our findings suggest that people seek eye care when they experience symptoms, such as severe pain or sudden change in vision. In other cases, when the condition is asymptomatic or gradual and does not affect functioning and quality of life, they prefer to wait until the issue resolves on its own. Consequently, similarly to other settings [21-23], the main reason for those who did not seek eye care for their problem was feeling no need. Other main reasons were having no money or having other spending priorities. For men, the condition was worth checking only if it affected their ability to work. For women, seeking care often depended on the availability and willingness of the head of the household or another male in the family; many women did not feel comfortable to ask busy working men to take them to the doctor. In addition, women were also busy with their own household chores and child care and had no time to go to hospital. Older people perceived vision problems to be a natural sign of aging and did not see any need for treatment. Self-medication was also common in this population.

In terms of awareness of eye care services, the overwhelming majority of respondents knew where to seek eye care, although only just over a third had heard eye health messages in the 12 months preceding the study. The main source of information about eye health was word of mouth, relatives

and friends, with whom people checked about the treatment available and the reputation of different facilities. A third of those who had heard about eye health in the past 12 months received information from the media - mainly television and newspapers/magazines. Very few participants received information from the radio and a relatively small proportion received information from healthcare providers, including health facilities, community workers and outreach camps.

The decision where to seek treatment depended primarily on the distance to the facility followed by convenient opening hours and whether the services were free. Many respondents also noted that the quality of care was important, i.e. whether the service was well organised, attentive and respectful, particularly towards older people. Some people said that they preferred smaller private facilities to large public hospitals but in practice the majority of respondents sought treatment from governmental facilities, primarily because they were free. The main treatments prescribed to those who consulted eye care providers were spectacles, cataract surgery and eye drops. The compliance with the treatment was relatively high, but over a quarter of those referred to surgery opted out, largely due to other spending priorities, fear of treatment and feeling no need.

The regression analysis showed that the uptake of eye health services was associated with higher levels of education. However, those who were busy with work or house duties were less likely to take up treatment. The survey findings were corroborated by the data from the in-depth interviews, where working respondents mentioned the lack of time as a barrier to the uptake of eye health services.

The prevalence of disability among those for whom disability data was available was 20%, which is in line with other studies that used the Washington Group Short Set. The survey, using Washington Group Short Set of questions in three rural districts of India (Kalahandi, Jhabua and Sitapur) found the prevalence of disability in the population aged 50 years old and above to be 22%, 13%, and 29% respectively. Moreover, a survey in Sunderbans, India conducted in 2018 found the prevalence of disability at 14.7% among people over 40 years old.

### **Magnitude and causes of visual impairment**

The clinical examination showed that the prevalence of blindness in this population was low (1.2% in the age group 50 years and above) but there were significant differences by gender, with women being significantly worse off. The coverage with cataract surgery was very high (over 93% at VA 3/60 and over 86% at VA < 6/60), which explains the low prevalence of blindness in this population. Over 99% of patients had an IOL implanted and over 80% had good visual outcomes. The finding suggests that despite being slum dwellers this population has access to quality cataract services, with over half of surgeries provided by government facilities (nearly 53%) and another third by NGOs (30%) with the majority of cases (over 80%) operated for free. There was no difference in the quality of visual outcomes by gender, but the cataract surgical coverage was significantly lower among women, resulting in the high prevalence of cataract related blindness and visual impairment in the female population.

Diabetic retinopathy is a growing problem in this population, causing over 8% of blindness and over 48% of functional low vision. Women seemed to be more affected, but the numbers were too small to make any more definitive conclusions.

Similarly to other settings, uncorrected refractive error was the leading cause of early visual impairment and second leading cause of moderate visual impairment among people aged 50+

years. Overall, 27.3% of respondents aged 50+ years had refractive error and 12.8% had uncorrected refractive error. The prevalence of uncorrected presbyopia was over 66%. In the younger population group (15-49 years), the prevalence of refractive error (VA<6/12) was 7.9%. The prevalence of presbyopia in those aged 35-49 years was 79.5% indicating an early onset of presbyopia in this population. The coverage with spectacles for both distance and near vision was low, around 9.7%.

### **Willingness to pay for cataract surgery and spectacles among slum dwellers**

The majority of those participating in the WTP for cataract surgery study were willing to take up surgery but only 46% were willing to pay with the median WTP of PKR 4,000 to 5,000 (USD 37.8 to 47.3). One reason may be that free cataract surgery is available in this community and over 80% of patients receive it for free. As expected, the higher WTP was associated with higher socio-economic status with those in the wealthiest economic quintile willing to pay on average 1,042PKR (USD 9.85) more than those in the poorest quintile. The study confirms the theoretical validity of the willingness to pay technique as a method to support the development of co-payment strategies of financing cataract services, including differential pricing, targeted exemptions and subsidies, in private facilities, in order to reach out to those unable to access free public facilities (due to too long distances, cost of transportation or inconvenient opening hours etc.).

The results of the WTP for spectacles showed a lower willingness to comply with treatment for hypothetical spectacle users. Indeed, only 55% of the respondents were willing to wear spectacles; those who were willing to wear spectacles stated an average WTP of PKR 592 (USD 5.6) which is higher than the average price of a pair of spectacles reported in Pakistan PKR 300-350 (USD 2.8-3.3). It appears that the price of spectacles is not the main reason for low spectacle coverage in this population. Our findings suggest that the majority of those with eye care problems which do not affect day to day functioning, which would include mild refractive errors and presbyopia, choose not to go for a check-up and diagnosis in the first place. The reasons are likely to be other life priorities and costs of time. Stigma associated with wearing spectacles also appears to be a major barrier in this population. Therefore, eye health marketing strategies need to focus on providing an easy effortless access to screening and diagnostic services located close to the communities or places of work, and on de-medicalising spectacles and their use.

### **Limitations**

It is important to note that this study has several limitations. First, the consolidation of the various survey components was not fully successful due to problems with assigning the unique ID and subsequent loss of observations, which had an impact on opportunities for regression analysis. Also, the data on disability was available only for 50% of study participants, as two enumerators were unable to correctly apply the Washington Group Short Set. The participants aged 50-59 years seemed to be over-represented among those for whom disability data was available, which may overestimate the prevalence of disability in this population.

## 5. Conclusion

In conclusion, the surveyed slum population in Lahore has a variety of eye care facilities available to them. The prevalence of blindness in this population is relatively low, but women are significantly more disadvantaged and need to be prioritised and specifically targeted using culturally sensitive approaches. Opportunities for free cataract services for this population are available and need to be maintained but better promoted as a proportion of the surveyed population is still not accessing treatment.

Introducing market-based strategies in the provision of affordable spectacles is possible and needs to be further developed. Market-based approaches should focus on the provision of easily accessible screening and diagnostic services close to the communities and places of work and on the de-medicalising of spectacles and their use. A better understanding of what can make spectacles attractive to these communities beyond their health benefits should be an essential part of the marketing strategy. Moreover, the heterogeneous slum population calls for targeted eye health policies reaching out to the ones from the poorest households as they tend to be the least informed on available health services. The gathered evidence could be used by policy makers to improve the delivery of eye care services in order to reduce the burden of avoidable blindness and refractive error in urban slum areas of Lahore.

## 6. References

1. World Health Organisation, *Universal Eye Health, A Global Action Plan 2014-2019*. 2013, World Health Organisation: Geneva.
2. Jadoon, M.Z., B. Dineen, R.R. Bourne, S.P. Shah, M.A. Khan, G.J. Johnson, C.E. Gilbert, and M.D. Khan, *Prevalence of blindness and visual impairment in Pakistan: the Pakistan National Blindness and Visual Impairment Survey*. Invest Ophthalmol Vis Sci, 2006. **47**(11): p. 4749-55.
3. A.A. Khan, N.U.K., K.M. Bile and H. Awan, *Creating synergies for health systems strengthening through partnerships in Pakistan - a case study of the national eye health programme*. Eastern Mediterranean Health Journal, 2010.
4. Chaudhry, K.A.B., M. Nawaz, A., *A Study on the Lives of Slum Dwellers of Urban Lahore*. Research Front, 2014. **2**(1).
5. Gilbert, C.E., S.P. Shah, M.Z. Jadoon, R. Bourne, B. Dineen, M.A. Khan, G.J. Johnson, and M.D. Khan, *Poverty and blindness in Pakistan: results from the Pakistan national blindness and visual impairment survey*. BMJ, 2008. **336**(7634): p. 29-32.
6. United Nations, *World Urbanization Prospects*. 2014: <https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.Pdf>.
7. Alliance, C. *World Statistics Day: A Look at Urbanization*. 2010 05 June 2017]; Available from: <http://www.citiesalliance.org/node/2195>.
8. The World Bank. *Leveraging Urbanization in South Asia*. 05 June 2017]; Available from: <http://www.worldbank.org/en/region/sar/publication/urbanization-south-asia-cities>.
9. The World Bank, *International Comparison Program Database*, W. Bank, Editor. 2016.
10. Pakistan Bureau of Statistics, *Pakistan Statistical Pocket Book 2006*. 2006, Pakistan Bureau of Statistics, : Islamabad, Pakistan.
11. Kugelman, M., *Pakistan's Runaway Urbanization: What Can Be Done?* 2014, The Wilson Center.
12. ADB, *Basic 2018 Statistics*, . 2018, Economic Research and Regional Cooperation Department, Development Economics and Indicators Division.
13. Ellis, P. and M. Roberts, *Leveraging Urbanization in South Asia*. 2016, World Bank Group.
14. Demographia, *Demographia World Urban Areas (Built-Up Urban Areas or World Agglomerations)*. 2014: Illinois.
15. EquityTool. *Pakistan*. 2015 20.06.2018]; Available from: <http://www.equitytool.org/pakistan/>.
16. Centers for Disease Control and Prevention. *Short Set of Questions on Disability*. 2010 20.06.2018]; Available from: [https://www.cdc.gov/nchs/washington\\_group/wg\\_questions.htm](https://www.cdc.gov/nchs/washington_group/wg_questions.htm).
17. Ramke, J., C.E. Gilbert, A.C. Lee, P. Ackland, H. Limburg, and A. Foster, *Effective cataract surgical coverage: An indicator for measuring quality-of-care in the context of Universal Health Coverage*. PLOS ONE, 2017. **12**(3): p. e0172342.
18. Foreit, J.R. and K.G. Foreit, *The reliability and validity of willingness to pay surveys for reproductive health pricing decisions in developing countries*. Health Policy, 2003. **63**(1): p. 37-47.

19. Oxford Poverty and Human Development Initiative, U.N.D.P., *Multidimensional Poverty in Pakistan*. 2017, Oxford Poverty and Human Development Initiative, United Nations Development Programme,.
20. National Institute of Population Studies - NIPS/Pakistan and ICF International, *Pakistan Demographic and Health Survey 2012-13*. 2013, NIPS/Pakistan and ICF International: Islamabad, Pakistan.
21. du Toit, R., H.B. Faal, D. Etya'ale, B. Wiafe, I. Mason, R. Graham, S. Bush, W. Mathenge, and P. Courtright, *Evidence for integrating eye health into primary health care in Africa: a health systems strengthening approach*. BMC Health Services Research, 2013. **13**(1): p. 102.
22. Stephen, O.S., Kyei. Bismark, Nyark, Gyedu. Agnes, Awuah., *Eye care seeking behaviour: a study of the people of Cape Coast metropolis of Ghana*. Journal of Behavioral Health, 2014.
23. Senyonjo, L., R. Lindfield, A. Mahmoud, K. Kimani, S. Sanda, and E. Schmidt, *Ocular Morbidity and Health Seeking Behaviour in Kwara State, Nigeria: Implications for Delivery of Eye Care Services*. PLOS ONE, 2014. **9**(8): p. e104128.

## 7. Annexes

### 7.1. Annex – Study objectives, methods and tools

Objectives	Methods Employed	Outcomes
To identify the magnitude and causes of avoidable blindness and visual impairment among slum-dwellers	Household survey	<ul style="list-style-type: none"> <li>Demographic profile of the population</li> <li>Economic profile of the population</li> <li>Health seeking behaviour</li> </ul>
To identify spectacle and cataract surgical coverage among slum-dwellers and quality of services delivered (outcome)		<ul style="list-style-type: none"> <li>Spectacle and cataract surgical coverage</li> <li>Quality of visual outcomes</li> </ul>
To explore health seeking behaviour and identify barriers to slum-dwellers' effective engagement with available eye care services	In-depth interviews	<ul style="list-style-type: none"> <li>Perceptions of services</li> <li>Health seeking behaviour</li> </ul>
To identify slum-dwellers' willingness to pay (WTP) and demand for cataract surgery and spectacles	Household survey	<ul style="list-style-type: none"> <li>Participants' average willingness to pay for spectacles and cataract surgery</li> <li>Disability prevalence</li> <li>Participants' relative wealth</li> </ul>
To measure socio-economic status and disability status among slum dwellers		
To describe eye health services available to slum communities – in particular noting location, costs, physical access, health information systems and quality monitoring processes, equipment, staffing	GIS mapping and facility-based data collection	<ul style="list-style-type: none"> <li>Maps of slums</li> <li>Locations of “clusters” in the city</li> <li>Number and basic characteristics of major and minor health facilities within a 1km radius of each cluster</li> <li>Number and basic characteristics of eye health facilities within 1km radius of each cluster</li> </ul>

## 7.2. Annex – Results of slum mapping

Slum Identification	Estimated population	Estimated households	Slum area (m)
Malikpur Road - Slum1	60	15	1,002.9
Malikpur Road - Slum2	80	20	1,316.9
Kamahan Road	150	40	5,370.5
Bandianwala Niazu Chowk	40	180	1,421.3
Defence Road	150	30	3,479.1
Chanrawan Pind Jamiya Stop	650	100	3,541.0
Township Minhaj-ul-Quran uni - Slum1	1500	200	8,785.8
Township Minhaj-ul-Quran uni - Slum2	3000	800	15,401.6
Suleman Nadvi Road Johar Town	850	170	37,368.2
Samsani Road Johar Town - Slum1	400	100	17,229.9
Samsani Road Johar Town - Slum4	180	40	3,392.9
Samsani Road Johar Town - Slum2	20	5	267.3
Samsani Road Johar Town - Slum3	20	5	240.2
Shah Alam Road R Block Johar Town - Slum2	50	10	532.6
Shah Alam Road R Block Johar Town - Slum3	50	10	458.1
Shah Alam Road R Block Johar Town - Slum4	50	10	319.6
Shah Alam Road R Block Johar Town - Slum1	850	160	14,322.0
Nazaria-e-Pakistan Road Bureau of stat Punjab	300	55	2,179.4
Shan Bhatti Road Ali Town	275	55	8,537.7
Block P2 Wapda Town Phase 2	200	40	6,118.6
Ahmad Block Mustafa Town - Slum1	170	30	3,857.0
Ahmad Block Mustafa Town - Slum2	25	5	189.5
Ahmad Block Mustafa Town - Slum3	60	7	807.5
Ahmad Block Mustafa Town - Slum4	40	8	725.7
<b>Baag Wala Dera Pico Road</b>	490	70	5,496.4
Tally Waly Khoon Sardar Street	1200	200	13,837.4
Jutt Chowk Margazar	840	120	6,722.5
Bajri Plot	1500	250	34,431.1
Block H1 Sabzazar - Slum1	130	30	9,016.4
Block P Sabzazar	80	20	1,321.3
Block H1 Sabzazar - Slum2	60	15	3,729.4
Block H1 Sabzazar - Slum3	210	40	6,283.5
Block H1 Sabzazar - Slum14	65	10	1,312.9
Block p+g Sabzazar - Slum1	120	30	2,287.5
Block p+g Sabzazar - Slum2	55	10	1,626.0

Block G Sabzazar - Slum1	60	15	2,207.8
Block G Sabzazar - Slum2	100	20	8,577.1
Block C Sabzazar	140	30	6,984.3
Block D Sabzazar - Slum1	80	20	3,077.6
Block D Sabzazar - Slum2	180	40	12,441.9
Band Road Bakr Mandi	160	35	3,798.1
Bhadru	90	20	1,757.2
Bhadru	90	20	4,432.4
Main Bulevard Gulsha-e-Ravi	200	50	651.9
Sagian Wala Bypass Road	100	25	3,683.1
Qasoor Pura Ravi Chowk Lahore Ring Road - Slum1	120	35	866.6
Qasoor Pura Ravi Chowk Lahore Ring Road - Slum2	80	15	593.2
Niazi Chowk Interchange Ring Road Lhr	300	60	9,267.7
Lhr Ring Road	1200	200	20,912.7
Lhr Ring Road Bhogiwal Road	200	45	8,745.7
Bhogiwal Road - Slum1	150	30	1,516.4
Bhogiwal Road - Slum2	35	10	396.4
Farooq Even - Slum1	150	80	4,634.3
Farooq Even - Slum2	70	30	3,917.3
Ch Rehmat Road	20	5	5,560.5
Township Minhaj-ul-Quran uni - Slum3	150	60	5,009.2

## 7.3. Annex – Facility assessment

Facility Details	
Name of the facility:	
Postal address of the facility:	
House/plot#:	Road#:
Name:	Area
Union Council#:	
GPS coordinate:	
Latitude N ____ ° ____ . ____ ,	
Longitude E ____ ° ____ . ____ ,	
Accuracy ____	
Type of facility: <input type="checkbox"/> Doctors' chambers <input type="checkbox"/> Stand-alone pharmacy <input type="checkbox"/> Pharmacy with doctors' chambers <input type="checkbox"/> Stand-alone optic shop <input type="checkbox"/> Optic shop with doctors' chambers <input type="checkbox"/> General clinic or hospital with eye health dpt. <input type="checkbox"/> Specialised clinic or hospital (eye health) <input type="checkbox"/> Medical College or teaching hospital/tertiary care <input type="checkbox"/> Traditional/alternative medicine (ayurveda, homeopathy, unani, etc.)	Ownership: <input type="checkbox"/> Public <input type="checkbox"/> Private (not-for-profit) <input type="checkbox"/> Private (for profit) <input type="checkbox"/> Other (specify) _____
Service pattern: <input type="checkbox"/> Daily                      Other (specify): _____ <input type="checkbox"/> Weekly (number of days ____ )	Operating hours (approx.)*: The timing may be approximated but aligned with the options <input type="checkbox"/> 24 hours

<input type="checkbox"/> Monthly (number of days ____)	<input type="checkbox"/> Morning (7am-1pm) <input type="checkbox"/> Afternoon (1pm-7pm) <input type="checkbox"/> Evening (7pm-12am) <input type="checkbox"/> Night (12am-7am) <input type="checkbox"/> Not applicable
Operating days:* <input type="checkbox"/> All week <input type="checkbox"/> Mon <input type="checkbox"/> Tue <input type="checkbox"/> Wed <input type="checkbox"/> Thu <input type="checkbox"/> Fri <input type="checkbox"/> Sat <input type="checkbox"/> Sun <input type="checkbox"/> Variable	
Service provision*:	
<input type="checkbox"/> Outpatient services (OPD) <input type="checkbox"/> Inpatient services (IPD) <input type="checkbox"/> Surgery (OT) services	<input type="checkbox"/> Pharmacy services <input type="checkbox"/> Laboratory services <input type="checkbox"/> Screening and outreach services
Facility specialties*:	
<input type="checkbox"/> Eye health (ophthalmic examinations, refraction & glass dispensing, eye surgery, etc.) <b>[if selected please also complete section 2 &amp; 3]</b> <input type="checkbox"/> General health <input type="checkbox"/> Emergency and critical care (ambulance services, trauma, burn, etc.) <input type="checkbox"/> Maternal, newborn & child health (ANC, EMOC, PNC, nutrition, vit. A suppl., etc.) <input type="checkbox"/> Immunisation services <input type="checkbox"/> Infectious disease (HIV/AIDS, TB & Leprosy DOTS, etc.) <input type="checkbox"/> Sexual/reproductive health and family planning (STI, infertility, safe abortion, etc.) <input type="checkbox"/> Non-communicable diseases (cancer, diabetes, cerebro-vascular diseases, IUD, tubectomy/vasectomy, etc.) <input type="checkbox"/> Health education (support group, BCC, counselling, outreach awareness programs, etc.) <input type="checkbox"/> Others (please specify) _____	
<b>Facility income sources (to be completed for eye care facilities only)</b>	
What is your main source of facility income?*	
<input type="checkbox"/> Patient fees (out of pocket expenditures)	

<input type="checkbox"/> Government grants (central/state/district) <input type="checkbox"/> Donations (NGO, private foundations, etc.) <input type="checkbox"/> Health insurance schemes (public & private) <input type="checkbox"/> Others (please specify) _____
Are you providing services under any government healthcare plans?
<input type="checkbox"/> No <input type="checkbox"/> Yes (please specify) _____
Are you working with any private health insurance or community health insurance schemes?
<input type="checkbox"/> Yes    No <input type="checkbox"/>
If yes, please list companies/schemes here below:
<b>Provision for poor patients (to be completed for eye care facilities only)</b>
Do you have any specific provisions for individuals who cannot afford to pay?*
<input type="checkbox"/> No specific provision <input type="checkbox"/> Free services (for all patients) <input type="checkbox"/> Free services (for indigent patients only) <input type="checkbox"/> Reduced fees (third party sponsored, specify: _____) <input type="checkbox"/> Reduced fees (cross-subsidies) <input type="checkbox"/> Specific payment agreement (differed payment, by instalments, etc.) <input type="checkbox"/> Micro-credit or loan facilities <input type="checkbox"/> Others (please specify) _____

\* Multiple responses allowed

## 7.4. Annex – List of selected clusters

Cluster Code	Settlement	Population
1	Badar Colony	1659
2	Chaudhry Colony	1736
3	Ghausia Colony	518
4	Abu-Bakar Block	273
5	Amer Sidhu	273
6	Baba Beri Wala No.III	351
7	Dhana Singh Wala	910
8	Gopal Nagar Old (Mustafabad)	2853
9	Bhabra Purana	910
10	Qazi Mohallah	966
11	Plot No.32,36- Shah Jamal	487
12	Shadman Colony no 3	526
13	Plot No. 6,7 - Shah Jamal	336
14	Shadman Colony no 2	567
15	Theh Zaildaran	6083
16	Ahata Dittu Shah	1710
17	Qazi Abad, Gulshan Ravi	370
18	Ahata Mool Chand	3906
19	F.C. College	1498
20	Shah Noor Colony	455
21	Karamat Colony, Thokar Niaz Baig	2054
22	Tokar Niaz Baig	602
23	Shora Koth	1022
24	Ittehad Colony, 7-Up Factory	526
25	Wireless Colony	793
26	Guru Dat Bhawan	754
27	Maryam Colony	2678
28	Chamba House	364
29	Mailk Pura	567
30	Basti Saidan Shah	343
31	Tibba Baba Farid	325

32	Mujahid Colony	924
33	Ahata No.52, Mohni Road	505
34	Farukh Abad	4387
35	Millat Colony (Millit Factory)	644
36	Iqbal Park, Badami Bagh	4777
37	Jamil Abad No.1 & 2	1176
38	Shuja Colony	2795
39	Qazi Mohallah	966
40	Milad Street Near Schazoo Lab.	617
41	Umar Colony	357
42	Christian Colony (Bilawal Colony) Township	234
43	Nala B-2, Township	396.5
44	Nusrat Colony	1436
45	Mian Mir Colony	6741
46	Basti Saidan Shah	343
47	Nabi Pura No.3	1316
48	Shamas Pura No.2	819
49	Tariq Abad, Bhutto Colony	975
50	Muft Pura (Abbas Nagar)	468
51	Mujahid Abad (Mujahid Colony)	579
52	Mandir Bhagat Ram	2877
53	Nabi Pura, Bangali Bagh	931
54	Gandi Jhallar	338
55	Takkia Pir Yaqoob Shah	294
56	Kucha Masoom Shah	338
57	Sikandaria Colony	2380
58	Qalandar Pura	6048
59	Daras Baray Mian	7791
60	Goshat Market	2023
61	Usmania Colony	2000

## 7.5. Annex – Equity Tool

Part I, Section 2.a Equity Tool					
No	Question	Coding categories	No	Question	Coding categories
201	Does your household have, for example ... a refrigerator/freezer?	Yes ... 1 No ... 0	211	What kind of toilet facility do members of your household usually use?	Flush or pour flush toilet to piped sewer system 1 Flush connected to pit/septic tank or open drain 3 Other 2
202	... a washing machine?	Yes ... 1 No ... 0	212	What type of fuel does your household mainly use for cooking?	Natural gas 1 Other 2
203	... a sofa?	Yes ... 1 No ... 0	213	What is the main material of the roof in your household?	Cement/RCC roof 1 Other 2
204	... an almirah/cabinet?	Yes ... 1 No ... 0	214	What is the main material of the floor in your household?	Earth/Sand/Mud 1 Other 2
205	... a chair?	Yes ... 1 No ... 0			
206	... an internet connection?	Yes ... 1 No ... 0			
207	... a computer?	Yes ... 1 No ... 0			
208	... an airconditioner?	Yes ... 1 No ... 0			
209	... a landline telephone?	Yes ... 1 No ... 0			
210	Does any member of this household have a bank account?	Yes ... 1 No ... 2			

## 7.6. Annex – Washington Group questions on disability

### Census questions on disability endorsed by the Washington Group

Introductory phrase: the next questions ask about difficulties you may have doing certain activities because of a HEALTH PROBLEM.

1. Do you have difficulty seeing, even if wearing glasses?
  - a. No - no difficulty
  - b. Yes - some difficulty
  - c. Yes - a lot of difficulty
  - d. Cannot do at all
2. Do you have difficulty hearing, even if using a hearing aid?
  - a. No - no difficulty
  - b. Yes - some difficulty
  - c. Yes - a lot of difficulty
  - d. Cannot do at all
3. Do you have difficulty walking or climbing steps?
  - a. No - no difficulty
  - b. Yes - some difficulty
  - c. Yes - a lot of difficulty
  - d. Cannot do at all
4. Do you have difficulty remembering or concentrating?
  - a. No - no difficulty
  - b. Yes - some difficulty
  - c. Yes - a lot of difficulty
  - d. Cannot do at all
5. Do you have difficulty (with self-care) such as washing all over or dressing?
  - a. No - no difficulty
  - b. Yes - some difficulty
  - c. Yes - a lot of difficulty
  - d. Cannot do at all
6. Using your usual (customary) language, do you have difficulty communicating, for example understanding or being understood?
  - a. No - no difficulty
  - b. Yes - some difficulty
  - c. Yes - a lot of difficulty
  - d. Cannot do at all

## 7.7. Annex – In-depth interview guide

### INFORMED CONSENT FORM

#### In-depth Interview

#### Accessibility of eye care service in an urban setting in Pakistan

Greetings, I am \_\_\_\_\_ and this is \_\_\_\_\_ (if there are two interviewers). I am/we are working in a research project under HEED consulting.

We are conducting a study on eye care facilities and patients' experience around them in Lahore city. In this study, we wish to determine the common eye care services provided by and received from different service providers and facilities, and look into the quality of these services. We also want to know about your experience, perception and opinion about eye problems as well as eye care services and facilities that you have used previously or been using currently.

We invite you to participate in this study. The interview will take approximately 15-20 minutes. Your responses will be kept confidential and will not be used for any other purpose other than this study. You can ask for clarification of any question and can withdraw from the study anytime you want.

Do you have any further questions about this study? (If "Yes" please answer to any other inquiry of the parent/guardian)

Do you agree to participate in this study?  Yes  No

#### Community People - In-depth interview guideline

Age:	Sex:
Union Council name:	Area:
Living in registered slum:	Address:
Date of interview:	Interviewer name:
Time interview started:	Time interview ended:

#### General Background

1. Tell me a little more about yourself and your family (background, family status, occupation, life condition in slum, etc.)
2. What kind of eye problem are you suffering from or did you suffer from in the past four weeks? Probe for how long, signs and symptoms

#### Healthcare seeking behaviour

3. Did you seek eye care services?

- a) If yes, can you explain how and when you or someone else in your family or community decided that you needed to seek services?
- b) Where did you go for this problem? Probe: Please explain, step by step, the process.
  - 1. How did you reach the eye health facility?
  - 2. Did you visit different types of healthcare provider/facility?
  - 3. What kind of services have they provided?
  - 4. How much did it cost?
  - 5. Were you referred elsewhere?
- c) Did you comply with the treatment that was prescribed (probe why/why not?)
- d) How was the overall experience?

If no, can you please explain?

- a) Why haven't you sought eye care services? Probe: family/community perception cost of services, distance to the facility, reputation of the facility, lack of information.
- b) What would help you to seek services when you have an eye care problem (probe for enablers/potential solutions from respondent perspective)?

#### **Perceptions of facilities if participant sought eye care services**

- 4. Do you know of health facilities where eye care services are available?

Probe: name, where did you hear about these facilities, have you visited them?

- 5. What was your experience about the facility/healthcare provider where you received eye treatment?

Probe: Wait time, staff and doctor behaviour, available medicines and diagnostic equipment, satisfaction with services, costs, bribes.

Why did you choose this facility? Probe: quality of care, cost and who referred

According to you, what is "good quality care" in a facility/healthcare provider which gives eye care?

- 6. Did you have to face any challenges in terms of seeking treatment?
- 7. Is there anything else about your experience that you think we should know about?

#### **Closing questions**

- 8. Do you feel there is something important we should have asked that we did not address?

*[Thank you very much for your time]*

## 7.8. Annex – Causes of visual impairment by gender

Principal cause of blindness in persons: VA<3/60 in better eye with available correction

	Males		Females		Total	
	n	%	n	%	n	%
1. Refractive error	0	0.0%	1	3.3%	1	2.8%
2. Aphakia uncorrected	0	0.0%	0	0.0%	0	0.0%
3. Cataract untreated	5	83.3%	23	76.7%	28	77.8%
4. Cataract surgical complications	0	0.0%	0	0.0%	0	0.0%
5. Trachomatous corneal opacity	0	0.0%	0	0.0%	0	0.0%
6. Non Trachomatous corneal opacity	1	16.7%	0	0.0%	1	2.8%
7. Phthisis	0	0.0%	0	0.0%	0	0.0%
8. Onchocerciasis	0	0.0%	0	0.0%	0	0.0%
9. Glaucoma	0	0.0%	0	0.0%	0	0.0%
10. Diabetic retinopathy	0	0.0%	3	10.0%	3	8.3%
11. ARMD	0	0.0%	2	6.7%	2	5.6%
12. Other posterior segment disease	0	0.0%	1	3.3%	1	2.8%
13. All other globe/CNS abnormalities	0	0.0%	0	0.0%	0	0.0%
<b>Total</b>	<b>6</b>	<b>100.0%</b>	<b>30</b>	<b>100.0%</b>	<b>36</b>	<b>100.0%</b>

Principal cause of severe visual impairment in persons: VA<6/60 - 3/60 with available correction

	Males		Females		Total	
	n	%	n	%	n	%
1. Refractive error	1	8.3%	0	0.0%	1	4.5%
2. Aphakia uncorrected	0	0.0%	0	0.0%	0	0.0%
3. Cataract untreated	9	75.0%	7	70.0%	16	72.7%
4. Cataract surgical complications	1	8.3%	2	20.0%	3	13.6%
5. Trachomatous corneal opacity	0	0.0%	0	0.0%	0	0.0%
6. Non Trachomatous corneal opacity	0	0.0%	0	0.0%	0	0.0%
7. Phthisis	0	0.0%	0	0.0%	0	0.0%
8. Onchocerciasis	0	0.0%	0	0.0%	0	0.0%
9. Glaucoma	0	0.0%	0	0.0%	0	0.0%
10. Diabetic retinopathy	1	8.3%	0	0.0%	1	4.5%
11. ARMD	0	0.0%	0	0.0%	0	0.0%
12. Other posterior segment disease	0	0.0%	1	10.0%	1	4.5%
13. All other globe/CNS abnormalities	0	0.0%	0	0.0%	0	0.0%
<b>Total</b>	<b>12</b>	<b>100.0%</b>	<b>10</b>	<b>100.0%</b>	<b>22</b>	<b>100.0%</b>

Principal cause of moderate visual impairment in persons: VA<6/18 - 6/60 with available correction

	Males		Females		Total	
	n	%	n	%	n	%
1. Refractive error	49	40.8%	37	35.9%	86	38.6%
2. Aphakia uncorrected	0	0.0%	0	0.0%	0	0.0%
3. Cataract untreated	53	44.2%	54	52.4%	107	48.0%
4. Cataract surgical complications	3	2.5%	2	1.9%	5	2.2%
5. Trachomatous corneal opacity	0	0.0%	0	0.0%	0	0.0%
6. Non Trachomatous corneal opacity	4	3.3%	0	0.0%	4	1.8%
7. Phthisis	0	0.0%	0	0.0%	0	0.0%

8. Onchocerciasis	1	0.8%	0	0.0%	1	0.4%
9. Glaucoma	3	2.5%	1	1.0%	4	1.8%
10. Diabetic retinopathy	7	5.8%	8	7.8%	15	6.7%
11. ARMD	0	0.0%	0	0.0%	0	0.0%
12. Other posterior segment disease	0	0.0%	1	1.0%	1	0.4%
13. All other globe/CNS abnormalities	0	0.0%	0	0.0%	0	0.0%
<b>Total</b>	<b>120</b>	<b>100.0%</b>	<b>103</b>	<b>100.0%</b>	<b>223</b>	<b>100.0%</b>

## 7.9. Annex – Willingness to pay for spectacles of respondents with refractive error

Variables	Simulated refractive error
<b>Pay</b>	N=158
No	5.7% (9)
Yes	94.3% (149)
<b>Elicited WTP for spectacles</b>	N=158
0 PKR	5.7% (9)
1 -99 PKR	0% (0)
100-199 PKR	3.8% (6)
200-299 PKR	4.43% (7)
300-399 PKR	6.33% (10)
400-499 PKR	7.59% (12)
500-599 PKR	27.85% (44)
600-699 PKR	5.7% (9)
700-799 PKR	1.27% (2)
800-899 PKR	9.49% (15)
900-999 PKR	0% (0)
1,000-1,099 PKR	18.35% (29)
>1,100 PKR	9.49% (15)

We work with partners in  
low and middle income countries  
to eliminate avoidable blindness  
and promote equal opportunities  
for people with disabilities

[www.sightsavers.org](http://www.sightsavers.org)

Visit our research centre:

[www.research.sightsavers.org](http://www.research.sightsavers.org)

 Share **SightsaversUK**

 Follow **@Sightsavers @Sightsavers\_Pol**

 Watch **SightsaversTV**

Bumpers Way  
Bumpers Farm  
Chippenham  
SN14 6NG  
UK

+44 (0)1444 446 600

[info@sightsavers.org](mailto:info@sightsavers.org)

