

# Study on Importance of Eye Care Services among Slum Dwellers in Bangladesh

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## Abstract

The most recent WHO figures on the global magnitude and causes of visual impairments indicate that in 2017 there were 285 million visually impaired people, of which 39 million were blind. It is thought that 80% of all causes of visual impairment are either preventable or curable. In low-income countries, limited awareness, availability, and affordability are often barriers to accessing eye care services. This can result in low uptake of eye care treatment, which is a challenge for many national programmes working to eliminate avoidable blindness in these countries. Specific barriers in each country or region need to be identified and alleviated in order to reach the overarching goal of the WHO global action plan 2014-2019 of providing universal access to comprehensive eye care services. In Bangladesh alone, it is estimated that 650,000 adults are blind predominantly due to cataracts and more than 4.6 million people experience visual impairment due to refractive error. Cataracts and refractive errors continue to be significant public health concerns, despite the fact that cost-effective interventions exist to treat these conditions. Urban health is of growing interest given the rapid pace of urbanization globally. Bangladesh is no exception and projections show that the majority of the population will live in urban areas by 2039. Dhaka is already one of the most densely populated cities in the world and is set to become the world's third largest city by 2019. The Bangladesh National Survey of Blindness and Low Vision (2000) found that Dhaka had a relatively low prevalence of blindness compared to other administrative divisions of Bangladesh. Yet this figure is likely to conceal important variations in terms of the prevalence of visual impairment and access to eye care services in different population sub-groups. Various studies in Bangladesh show important intra-city health between slum and non-slum areas. This is of particular concern given that slum populations have three times overall city population growth rate.

**Keywords:** *Eye Care Services, Slum Dwellers, Eye health, ECSAT, Health system, Bangladesh*

## INTRODUCTION

Bangladesh is a developing country with an area of 147,570 sq. kilometers. The estimated population in 2001 was 123.1 million with an annual growth rate of 1.47% (Statistical Pocketbook 2002, BBS); and 77% of the population live in rural areas. Per capita Gross National Income (GNI) in the year 2002 was US\$ 380, and 36% of the population lived below the poverty line (World Bank, World Development Report 2004; World Development Indicators). Agriculture sector provides employment to 63% of the country's workforce. The literacy rate among adults (15+ years) is 51% (BBS Statistical year Book 2002).

The health status of the people has been steadily improving as evidenced from various indicators. The Life Expectancy at birth was estimated to be 61.71 years in January 2004 (CIA World Fact book). The estimated under-five mortality rate in 2002 was 73 per 1000 live births (UNICEF website). The government is a major provider of health care in the country along with NGO and private providers. Healthcare in government facilities are provided free of cost. The per capita annual government expenditure on health and family planning was about US\$ 3 while the overall health expenditure per capita was US\$ 12 as estimated in 2001 (World Bank, World Development Indicators 2004).

The national health policy was officially adopted in 1998 which is now under the process of revision. The national population policy in its draft form has been approved by the cabinet recently. The national drug policy adopted in 1982 is also under the process of revision. The national nutrition plan has been adopted in 1997 and a national nutrition program is under operations. The national maternal health strategy has been adopted in 2001. In context of

all these policies and strategies, the health system of the country is currently undergoing a process of reform under a sectoral approach of Health, Nutrition and Population Sector Program (HNPS) which was preceded by Health and Population Sector Plan (HPSP) which ran from July 1998 to December 2003.

The Government of Bangladesh has identified blindness as a critical social and health problem and demonstrated its commitment by forming a national apex body entitled Bangladesh National Council for the Blind (BNCB) in 1978 with a mandate to formulate, facilitate and monitor the national plan of action to prevent and control blindness. Besides, the Government of Bangladesh has ratified the Vision 2020 program; and while chairing the 56<sup>th</sup> session of World Health Assembly in May 2003, the honorable Health Minister of Bangladesh reiterated commitment for achieving vision 2020 goals within the stipulated time.

Bangladesh was one of the first few countries to have a national program for prevention of blindness. The Directorate of Health Services in collaboration with BNCB developed and launched first National Program for Prevention of Visual Impairment and Blindness in Bangladesh in the year 1980. This program was based on eye camp strategy in order to work within limited resources available during the time. Consequent to the paradigm shift in early 1990s that discouraged eye camps, and launched Vision 2020 in 2000, eye care program strategies in Bangladesh were changed and directed towards sustainable development approaches.

It is in this context BNCB has taken the initiative in response to the decision taken in BNCB full committee meeting chaired by the Health Minister, to review and update the National Eye Care Plan to incorporate in the ongoing Health Care program of the government. Accordingly a National Eye Care Plan Review Sub-Committee of BNCB was formed with selected members. As a methodology, the sub-committee undertook review and research of the existing plan, programs and literature, sought views of stakeholders, and prepared this draft which was widely shared and consulted with cross section of professionals and people including the clients in all the divisions; and finally all the inputs will be synthesized in the national plan through a national level workshop.

National Plan of Action on Eye Care would be based on the eye care needs of population. Plan would focus on human resource development, infrastructure and technology, strategies for control of major blinding eye diseases. Advocacy, resource mobilization, community participation; and continuous monitoring of the implementation of the plan through a coordinated mechanism would also be key elements of the national plan.

## OBJECTIVES OF THE STUDY

The overall aim of this research is to better understand the demand for and provision of eye care services in urban slum-dwelling communities in Dhaka by answering the following questions:

1. What types of facility are offering eye care services in the targeted areas? What are their characteristics?
2. What is the willingness-to-pay for refractive error services (spectacles)? What are the implications in terms of pricing and sustainability for eye care providers targeting slum-dwellers?
3. What is the community attitude and practice around eye care? What are the main reasons for consulting, where do patients go and why? What is the perceived advantage of each type of facility?
4. What are the main barriers to accessing eye care services in poor urban communities? Do eye care facilities targeting slum-dwelling communities deliver effective services to the poor?

## METHODOLOGY

Based on the study's objectives, several different research approaches were adopted to answer the research questions as summarized in the table below:

### Qualitative study

After completion of the household survey, a qualitative study was conducted to explore in greater depth individual experiences and community perceptions regarding eye illnesses, as well as barriers and enablers in accessing eye care services. The qualitative study used two different techniques: i) in-depth interviews (IDIs), and ii) focus group discussions (FGDs). A total of 43 survey participants were chosen for the in-depth interviews based on their age and gender. These criteria assumed that perception and experience regarding eye problems, as well as health-seeking behavior, may vary between age groups and between men and women. Initially, it was planned to have an equal number of male and female participants from two age groups: (i) 30 years or younger, and (ii) older than 30 years. However, an even spread of male and female survey participants was not possible during the data collection period due to availability issues. Of those participants above 30 years of age, 14 were male and 12 were female. Of those aged 30 years or less, seven were male and 10 were female.

Community members who did not take part in the survey participated in FGDs. Four FGDs were conducted in order to learn about community perception regarding eye illnesses within different age and gender categories, as well as the perceived barriers and enablers in accessing eye care services. The total number of participants in the FGDs was 28 (6 to 8 in each group). Participants were chosen for the FGDs based on their age and gender. For both men and women, one FGD was conducted among those aged 30 years or younger, and one among those aged above 30 years. Qualitative interviews were conducted using specific interview guides for IDIs and FGDs covering different themes, such as perception of eye health and eye care, previous experience of eye care facilities, perceived and experienced barriers and enablers in accessing eye care services, perception of good eye care service.

### Sampling method

We use a combined sample in this study by including both patients and the general population when investigating WTP. Participants were recruited from two different settings as described below:

**General slum population:** We included the WTP module in the population-based survey that we carried out among 1,600 randomly selected households from four slums in Dhaka. The survey included collecting some basic socio-demographic and economic information and a module that included a series of questions to elicit the WTP for eye glasses. One respondent aged 18 years or more was selected in each household to administer the survey and WTP elicitation module. By surveying the general population in slums, we take an ex-ante perspective for eliciting WTP where there is uncertainty about suffering from refractive error and requiring treatment (i.e. eye glasses).

**Patient exit interviews at eye care facilities:** We also surveyed 558 individuals at five different eye care facilities in Dhaka (see Table 2). These individuals were selected randomly among patients who were exiting doctors' chambers with a prescription for eye glasses. We used the same WTP elicitation technique as in the household survey. In this case, respondents were in an intermediate state, where the diagnosis had been confirmed but the treatment had not started and uncertainty remained about the efficacy of treatment. We were interested to see if there were any differences in WTP between the general slum population, where vision problems were hypothetical (ex ante state), and individuals who have been diagnosed with refractive error (intermediate state). For interviews with exiting patients at the eye care facilities, no simulation of refractive error was required as the interviewees had already been diagnosed with refractive error and received full refraction using trial lenses or an auto refractor.

### Data Collection and Analysis

**Quantitative component:** Data collection for the household survey, facility and optic shop exit interviews were conducted in person. Household data was entered through CSPro version 6.0.1 software. Facility and optic shop exit interview data was collected using tablet devices through CSPro Android version 4.1.2. Quantitative data was analyzed using STATA version 12.1. Data was first transported from CSPro to STATA and then analyzed. Quantitative data was first analyzed by descriptive analysis and was presented as mean, standard deviation, frequency and percentage analysis. Chi-square statistical analysis was used to test for significant associations between independent variables (age, gender, socioeconomic status, marital status, etc.) and dependent variables (type of self-reported eye problem, health-seeking behavior, willingness to pay, etc.). Multivariate analysis was done as well.

### Qualitative component:

Qualitative data were collected using the guidelines developed from the study objectives. The qualitative interviews were audio recorded and thorough field notes were taken during data collection. Then the data was transcribed and translated by a team of transcribers. Deductive coding was done using *priori* codes based on study objectives and guidelines. On completion of the coding, a qualitative data matrix was developed and thematic analysis done.

### Challenges experienced:

There were various challenges while conducting the study. Firstly, there have been some difficulties in accessing the survey participants. The households in the slum areas were difficult to identify and the participants with jobs were often very hard to reach. Also, finding survey participants for qualitative interviews was a difficult task due to the high geographic mobility of the slum population in urban settings. Interviewing the randomly selected household participant was also challenging, partly as a result of their availability and/or gaining their consent to be interviewed. Accordingly, enumerators visited households multiple times in order to conduct interviews at the times that best suited the respondent.

Interestingly, the simulation of eye sight impediments with spectacles for the WTP elicitation module was occasionally misinterpreted by the respondents as a "door-to-door eye glass selling business initiative". To overcome this, enumerators had to spend additional time explaining to respondents the purpose of the study.

Conducting interviews of patients exiting from facilities and optic shop customers was difficult and enumerators and field coordinators had to overcome some challenges. As both the patient and the customers were exiting from the



facilities or shops, convincing them to set aside an additional 25 to 30 minutes was difficult. Political unrest and strikes in Bangladesh during the data collection period also hindered the implementation of the study.

Some facilities were closed during the GIS data collection period, making it difficult to collect information from them. Consequently, data collectors had to visit these facilities multiple times. Access to the facilities was also not easy, as permission had to be granted formally. Another difficulty surfaced during the collecting of geographical coordinates due to the proximity of high-rise buildings, as these affected the GPS values. To overcome this, the GIS team used 'Google Earth' images as a background format, which helped to collect accurate coordinate values from the field. Facility mapping was also difficult to interpret due to facilities being clustered in a small geographical area.

## RESULT AND DISCUSSION

### Breakdown of eye care facilities by ward

There are of 371 eye care facilities in DCCN (52%) and 344 facilities located in DCCS (48%). In DCCN, the number of facilities range between 0 and 48 per ward, with an average of 10.3 per ward. Three wards out of 36 (8%) have no eye care facilities and these are highly concentrated in six wards, which total 203 facilities or 55% of all eye care facilities in DCCN. The number of facilities per ward for DCCS varies between 0 and 40 facilities, with fewer facilities per ward compared to DCCN (6.1 facilities on average). Twelve wards have no eye care facilities (22%) while only six wards total up half of the facilities in DCCS (n=173).

### Eye care facility assessment

#### Eye care facility profile

Eye care facilities in DCC were categorized as specialized eye care facilities (3%, n=23), general facilities/ doctors providing eye care services (58%, n=412), and stand-alone optical shops (39%, n=280). The vast majority of facilities providing eye care services in Dhaka city were privately owned (99%). The number of private for-profit facilities was the highest with 685 facilities recorded, including 405 general or specialized health facilities and 280 optic shops compared to non-profit facilities (n=22), and public facilities (n=8). All the stand-alone optic shops identified in this study were operating as private for-profit-facilities.

**Table 1: Profile of eye care facilities in DCC area**

Specialized facilities n (%)	General facilities/doctors (with eye care services) n (%)**	Optical shops (stand- alone) n (%)	Total N (%)
<b>Eye care providers</b>			
Hospital	7 (30.43)	111 (26.94)	-
Clinic/diagnostic centre	16 (69.57)	73 (17.72)	-
Chamber	-	228 (55.34)	-
Optical shop	-	-	280 (100)
Total	23 (3.22)*	412 (57.62)*	280 (39.16)*
<b>Management type</b>			
Public	1 (4.35)	7 (1.70)	-
Private	-	-	-
For profit	14 (60.87)	391 (94.90)	280 (100)
Non-profit	8 (34.78)	14 (3.40)	

\*Percentage calculation based on the total 715 eye care providers, which contain specialized, general facilities and optical shops.

\*\* including optical shops attached to doctors chambers

All specialized and general health facilities that were enumerated were registered and 95% were operating with a medical license.

**Table 2: Operational status of eye care facilities in DCC area (excluding optical shops\*)**

N=435	n (%)
<b>Licensing status</b>	
Licensed	413 (94.94)
Not licensed	18 (4.13)
Missing data	4 (0.92)
<b>Registration status</b>	
Registered	435(100)
Not registered	-

\* Stand-alone optical shops are excluded from calculation, as they require business license, not medical licensing and registration

#### **Services provided by eye care facilities in DCC area**

Outpatient services were available in all specialized eye care facilities and about half of these facilities provided ambulatory surgery (56.5%). Of these facilities, 83% were also equipped to provide eye care surgery requiring the patient to be admitted and remain in hospital (inpatient services, IPD). The number of beds was 53 on average per facility, ranging from 5 to 280 for the largest hospital. In terms of opening times, all specialized facilities operated on a weekly basis: 16 of the 23 facilities opened seven days a week (69.6%). In 83% of the specialized facilities, general service and doctors were available 24 hours a day.

Among general facilities providing eye care services, 99.5% had an outpatient department and 33.5% provided ambulatory surgery. Fewer facilities offered inpatient services with only 34.5% having an IPD department with surgery, and 1.2% having an IPD service without surgery. Bed numbers at general facilities averaged 130, although no data was available to determine how many of them were reserved for eye patients. Like the specialized facilities, almost all the general facilities worked on a weekly basis. Around 59% of them opened seven days a week and 36% opened for five to six days a week. Twenty-four-hour general service and 24-hour doctor services were both available in 36% of the facilities. None of the specialized eye care facilities in our sample provided outreach services and only one general facility reported to do so.

A total of 278 facilities included in the study (64%) reported having some mechanisms in place to facilitate access to services for low-income patients who were unable to pay. These mechanisms included provision of services or medicines at a discounted price (n=191), free health care (n=64), free care on specific days (n=9) and having a certain number of beds allocated to low-income patients qualifying for free care provision (n=13).

**Table 3: Services provided by eye care facilities in DCC area**

Service type	Specialized facility (N=23) (n, %)	General facility (w/ eye care services) (N=412) (n, %)
<b>Outreach</b>	-	1 (0.24)
<b>Indoor</b>		
With surgery	19 (82.61)	142 (34.47)
Without surgery	-	5 (1.21)
<b>No indoor services</b>	4 (17.39)	265 (64.32)
<b>Outdoor</b>		
With surgery	13 (56.52)	138 (33.50)
Without surgery	10 (43.48)	272 (66.02)
<b>No ambulatory services</b>		2 (0.48)
<b>Number of facilities with bed</b>	19 (82.61)	148 (35.92)
Average bed*	Mean: 53, Max- 280, Min- 5	Mean: 130, Max- 2150, Min- 2
<b>Pattern of service</b>		
Weekly	23 (100)	411 (99.76)
Monthly	-	1 (0.24)
<b>Service availability in a week</b>		
7 days a week	16 (69.57)	243 (58.98)
5-6 days a week	7 (30.43)	149 (36.17)
Less than 5 days a week	-	20 (4.85)
<b>Service availability in a day **</b>		
On call doctor available	1(4.34)	9(2.18)
24hr general service available	19(82.61)	148(35.92)
24hr outdoor service available	5(21.74)	74(17.96)

24hr doctor available	19(82.61)	147(35.68)
<b>Special provisions for targeted population (low-income patients)</b>		
Discounted medicine	-	5 (1.21)
Free beds	-	13 (3.16)
Free clinic day	2 (8.70)	7 (1.70)
Subsidy for services	7 (30.43)	179 (43.45)
Free services	6 (26.09)	58 (14.08)
Health cards	-	1 (0.24)

\*Present average number of beds for all types of facility. \*\*Cumulative percentage is more than 100%, as more than one type of service might be available in one facility.

#### **Human resources of eye care facilities in DCC area**

Staff numbers at eye care facilities in Dhaka City Corporation averaged 98 at 23 specialized eye facilities and 122 at 412 general facilities. There were, on average, 21 physicians in specialized facilities and 29 in general facilities. A total of 985 ophthalmologists were recorded at the facilities included in this study, with the average number of ophthalmologists being higher in specialized facilities (=7) compared to general hospitals (=2), as one could expect.

**Table 4: Average human resources in eye care facilities in DCC area**

Type of staff	Specialized facility (Average)	General facility (Eye care services) (Average)
<b>General staff</b>		
Total staff in facility	98	122
Physicians in facility	21	29
Nurse	18	23
Paramedics	3	1
Midwives	1	1
Pharmacists	1	1
Non physician clinicians	4	9
Other staff (medical)	1	1
Other staff (support)	49	57
<b>Specialized doctors</b>		
Anesthetist	3	5
Ophthalmologist	7	2

#### **Patient exit interviews**

Patient exit interviews were conducted with 1,114 respondents randomly selected from five eye care facilities within Dhaka. Two thirds of respondents were domiciled in the city (66%) while the remaining third lived outside. The main reasons given for seeking consultations at a facility were: poor vision (44%), cataracts (24.5%), symptoms related to allergy, infection or inflammation (13%), lacrimation (10%), ocular trauma (2%) and other symptoms or conditions (9%).

Patients paid BDT 1,663 (USD 21.6) on average for eye care services but this amount varied greatly depending on the eye diagnostic group and treatment prescribed. The difference in patients' costs between those living in the city and those coming from outside Dhaka was significant; BDT 787 (USD 10.2) and BDT 3,356 (USD 43.6) respectively. Higher transport costs were a factor, but they do not fully explain the level of increase observed in overall cost of seeking eye care.

On average, patients required three hours 18 minutes (one way) to travel to the facility but more than half of respondents indicated that they could reach the facility from their home in less than an hour (56%). The average travel time for Dhaka residents was slightly under one hour ( $x = 57\text{min}$ ), while it was nearly seven hours and 50 minutes for those living outside Dhaka ( $x = 470\text{min}$ ). Patients also report increased transport costs as a result of the longer journey time: BDT 104 (USD 1.35) on average for Dhaka residents and BDT 963 (USD 12.5) for patients coming from outside the city.

**Table 5: Information collected during patient exit interviews**

Patient exit interviews (n=1114)	Patients from Dhaka N (%)	Patients from outside Dhaka N (%)	Total N (%)
Origin of patients	734 (65.9)*	380 (34.1)*	1,114 (100%)

Reasons for visiting facility			
Poor vision	353 (48.1)	140 (36.8)	493 (44.25%)
Cataract	135 (18.4)	138 (36.3)	273 (24.5%)
Allergy, infection or inflammation symptoms	112 (15.3)	29 (7.6)	141 (12.7%)
Lacrimation	82 (11.2)	29 (7.6)	111 (10%)
Ocular trauma	13 (1.8)	9 (2.4)	22 (2%)
Other	39 (5.3)	35 (9.2)	74 (6.6%)
Time spent travelling to facility**			
Less than 1 hour	596 (81.2)	27 (7.1)	623 (55.9%)
1-3 hours	122 (16.6)	74 (19.5)	196 (17.6%)
3-6 hours	13 (1.8)	105 (27.6)	118 (10.6%)
6-9 hours	0	54 (14.2)	54 (4.85%)
More than 9 hours	3 (0.4)	120 (31.6)	123 (11.4%)
Patient expenditures (average in BDT)			
All	787	3,356	1,663
Poor vision	309	1,444	631
Cataract	2,729	4,554	3,652
Allergy, infection or inflammation symptoms	270	1,423	507
Lacrimation	255	2,360	805
Ocular trauma	1,426	6,618	3,550
Other	777	7,862	4,128
Source of payment			
Current income	666 (90.7)	282 (74.2)	948 (85.1)
Borrowing from relatives/friends	27 (3.7)	42 (11.0)	69 (6.2)
Savings	25 (3.4)	27 (7.1)	52 (4.7)
Selling household assets	1 (0.1)	4 (1.05)	5 (0.45)
Loan	0	3 (0.8)	3 (0.3)
Reducing expenditures	0	21 (5.5)	1 (0.1)
Others	15 (2.0)	1 (0.3)	36 (3.2)

\*% is calculated based on row total instead of columns as for the rest of the table.

\*\* time required to travel to facility from home (one way), excluding return travel.

\*\*\* total expenditures as reported by respondents, including transport, consultation, medicine, surgery, hospital accommodation and other direct expenditures incurred for seeking care.

### Health-seeking behavior

As mentioned earlier, health-seeking behaviors of urban slum-dwellers were assessed using a mixed method approach including: i) a household survey, and ii) qualitative interviews and FGDs.

### Household survey results

#### Respondents' demographic profile

A total of 1,600 participants aged 18 years and above were included in this study. The average age of the participants was 35 years (SD + 13 years). Those aged between 18 and 29 years represented the greatest number of participants (39%), while those aged 60 years and above represented the lowest number (7%). Female participants (59%) outnumbered male participants (41%). Most of the participants were married (85%); with the remainder unmarried (7%) or belonging to other categories including separated, widowed or divorced (8%). Almost all participants (98%) were Muslim. The greater number of participants had no formal education (40%). Other participants had undertaken primary education (31%), secondary education or higher (17%), SSC/HSC equivalent education (9%) and the rest had studied at or above graduate level (2%). The majority of the respondents were homemakers (35%), followed by salaried workers (19%); service holders were the least in number (8%).



**Table 6: Demographic information on participants:**

Variables (N=1,600)	Percentage (%) (Frequency=n)
<b>Age (Mean: 34.94 years, SD: + 13.10)</b>	
18 to 29 years	39.38 (630)
30 to 39 years	26.69 (427)
40 to 49 years	18.13 (290)
50 to 59 years	9.00 (144)
60 years and above	6.81 (109)
<b>Gender</b>	
Male	40.63 (650)
Female	59.38 (950)
<b>Marital status</b>	
Married	84.63 (1354)
Unmarried	7.56 (121)
Widowed/separated/divorced	7.81 (125)
<b>Religion</b>	
Islam	98.06 (1569)
Hindu	1.88 (30)
Christian	0.06 (1)
<b>Educational status</b>	
No formal education	40.44 (647)
Primary education	30.56 (489)
Secondary education	17.50 (280)
SSC/HSC equivalent	9.06 (145)
Graduation and above	2.44 (39)
<b>Occupational status</b>	
Salaried worker	19.00 (304)
Self-employed	9.19 (147)
Garment worker	10.25 (164)
Service	7.88 (126)
Homemaker	34.50 (552)
Other (student, retired, unemployed, etc.)	19.19 (307)

**Respondents' Economic Profile**

Average monthly family income among respondents was BDT 14,626 (USD 188) with the majority of family incomes (48%) ranging between BDT 10,000 and BDT 20,000 (USD 129 and USD 257). The average monthly individual income of respondents was much lower compared to family income (BDT 5,244 or USD 67). A significant number of participants (58%) earned less than BDT 5,000 (USD 64) per month. Survey respondents were generally wealthier when compared to the general population in Bangladesh using the equity measurement tool developed by UCSF. According to the wealth index, based on dwelling characteristics and ownership of durable assets, the majority of survey respondents (61%) belonged to the wealthiest quintile of the population, with only 0.31% of survey respondents in the poorest wealth quintile. The most common source of drinking water was piped water into the dwellings (43%), followed by public tap or stand pipe (24%). Toilets that flush into the sewer system were found to be the most common type of toilet used by the respondents (59%). Toilets flushing into septic tanks and pit latrines were both seen in the same percentage (19%). Almost 89% respondents shared toilets with other households. A high percentage of participants owned mobile phones (82%) and televisions (72%). Around a fifth of participants were landowners (19%), owning 0.11 acres of land on average.

**Table 7: Economic information on participants**

Variables (N=1600)	Percentage (%) (Frequency=n)
<b>Monthly family income (Mean: 14625.61, SD: + 10522.25)/ (Mean: USD* 188.08, SD: + 135.31)</b>	
10,000tk and below (USD 128.60 and below)	37.44 (599)
10,001tk to 20,000tk (USD 128.60 to USD 257.20)	48.19 (771)
20,001tk to 30,000tk (USD 257.20 to USD 385.79)	9.25 (148)
More than 30,000tk (More than USD 385.79)	5.13 (82)



<b>Monthly individual income ( Mean: 5243.73, SD: + 6973.95)/(Mean: USD* 67.43, SD: + 89.68)</b>	
5,000tk and below (USD 64.30 and below)	57.69 (923)
5,001tk to 10,000tk (USD 64.30 to USD 128.60)	28.75 (460)
10,001tk to 15,000tk (USD 128.60 to USD 192.90)	9.31 (149)
More than 15,000tk (more than USD 192.90)	4.25 (68)
<b>Wealth quintile</b>	
Quintile 1 (poorest)	0.31 (5)
Quintile 2	1.00 (16)
Quintile 3	3.06 (49)
Quintile 4	35.13 (562)
Quintile 5 (wealthiest)	60.50 (968)
<b>Source of drinking water</b>	
Piped into dwelling	42.50 (680)
Piped to yard/plot	16.69 (267)
Public tap/stand pipe	23.66 (369)
Tube well/protected well or spring/other	17.75 (284)
<b>Type of toilet</b>	
Flush to piped sewer system	59.44 (951)
Flush to septic tank	19.19 (307)
Any type of pit latrine	18.89 (302)
Flush to pit latrine/elsewhere/unknown	1.06 (17)
Hanging toilet	1.44 (23)
<b>Toilet shared with other household/s</b>	88.94 (1423)
<b>Mobile phone owner</b>	81.81 (1309)
<b>Television owner</b>	72.38 (1158)
<b>Landowner</b>	19.25 (308)
Mean: 0.11 acre	SD: + 0.51

\*1 BDT= 0.013 USD

### **Health care-seeking behavior of respondents**

Self-reported eye illness at the time of survey

Out of 1,600 participants, responses from 1,587 participants were taken into account; 13 participants were excluded due to recorded errors. Of the 1,587 respondents, 773 (49%) complained of at least one eye problem that they were suffering from at the time of the survey. Most commonly reported current eye problems were blurred vision (33.38%) followed by lacrimation (27.04%), itching/irritation (18.89%), poor near vision (15.65%), eye ache (13.32%), poor distance vision (8.67%) and burning sensation (5.43%).

Sixty one out of the 1,587 participants reported suffering from eye illnesses during the 30 days prior to their interview, for which symptoms were no longer present. Given the small number (4% of the total sample), a detailed analysis was conducted only on the data for current self-reported eye illness.

For the purpose of analysis, the self-reported problems were separated into five categories: (i) lacrimation, (ii) symptoms generally representing allergy, infection or inflammation (e.g. discharge, itching/irritation, burning sensation, eye ache and conjunctivitis), (iii) poor vision (e.g. blurred vision, poor distance vision, poor near vision, night blindness and complete blindness excluding cataract), (iv) cataract, and (v) other (e.g. trauma, squint and photophobia). After categorization, the most prevalent self-reported eye problem was found to be poor vision (61%) followed by symptoms of allergy, infection or inflammation (44%) and lacrimation (28%).

**Table 8: Prevalence of self-reported current eye problems**

<b>Variables (N=773)</b>	<b>Percentage (%) (Frequency=n)</b>
Lacrimation	27.55 (213)
Allergy/infection/inflammation	43.73 (338)
Poor vision (excluding cataract)	61.45 (475)
Cataract	2.59 (20)
Other	6.60 (51)

\* Cumulative percentage may not be 100%, as multiple problems were reported.

#### Delays in seeking treatment

Average duration of self-reported eye problems was around three years at the time of the survey. Respondents, who sought care from some kind of Health Care Provider (HCP) for any eye problem, took more than a year on average to seek care counting from the time their symptoms began. This delay in seeking treatment was found to extend as long as 18 years in some cases. In most of the cases (69.42%), participants with eye problems waited at least 3 months before seeking any kind of treatment.

**Table 9: Delay in treatment seeking for current eye problems**

Mean: 428.01 days (1 year 2 months)	
Maximum: 6,570 days (18 years)	Minimum: 1 day
<b>Duration of delay (N=773)</b>	<b>Percentage (%) (Frequency=n)</b>
7 days or less	8.24 (38)
7 to 30 days	10.85 (50)
1 to 3 months	11.50 (53)
3 months to 1 year	42.52 (196)
More than 1 year	26.90 (124)

#### Treatment-seeking behavior

In the majority of cases (76%), people did nothing to resolve the eye problems they were experiencing, whereas 60% subsequently went to some kind of health care provider (formal/informal). Very few used home remedies (2%).

**Table 10: Treatment choice for current eye problems**

<b>Variables (N=773)</b>	<b>Percentage (%) (Frequency=n)</b>
Did nothing	75.94 (587)
Used home remedy	2.46 (19)
Went to a health care provider	59.64 (461)

\*Cumulative percentage might not be 100%, as treatment seeking behavior for multiple illnesses was recorded. One interesting finding was that facility-based qualified eye care providers like MBBS doctors, government/ NGO/private hospitals were found to be the most commonly stated first choice for eye care services (78%). They were also the most common second and third choices. Community health workers were the least used eye care service providers (0%-1%).

**Table 11: Choice of health care provider for current eye problems**

<b>Providers</b>	<b>First choice % (Frequency)</b>	<b>Second choice % (Frequency)</b>	<b>Third choice % (Frequency)</b>
Qualified/specialist HcP (facility based)	77.81 (298)	69.39 (68)	76 (19)
Qualified/specialist HcP (outreach activities)	8.36 (32)	13.26 (13)	4 (1)
Community Health Workers	0.78 (3)	1.02 (1)	0 (0)
Informal providers	13.05 (50)	16.33 (16)	20 (5)
<b>Total</b>	100 (383)	100 (98)	100 (25)

For purposes of analysis, eye care service providers were divided into two groups: (i) formal providers (including MBBS doctors, NGO/private/public hospitals and eye camps), and (ii) informal providers (including non-MBBS doctors, health workers, traditional healers and others). After categorization, it was found that 86% of respondents first consulted a formal health care provider for their current eye problem.

#### Type of treatment and mode of payment

There were 417 cases where participants attending a health care provider were given some form of treatment. The most commonly given treatment was eye drops (60%), followed by spectacles (38%). Participants mostly paid for their treatment from their current income (78%). In around 15% of cases, participants received free treatment while only 7% of cases incurred catastrophic expenditures forcing them to sell assets or borrow money to bear the treatment cost.

**Table 12: Treatment provided by a health care provider for current eye problems**

Type of treatment received (N=417 incidences)	Percentage (%) Frequency (n)
Eye drops	59.95 (250)
Medicine	32.61 (136)
Spectacles	38.13 (159)
Surgery	5.04 (21)
Other (ointment, traditional treatment, advice, etc.)	6.47 (27)

\*Cumulative percentage may not be 100%, as multiple treatment record for each reported eye problem was taken.

### Compliance to eye treatment

Among participants who received treatment from a health care provider for their current eye problem, 81% fully complied with the treatment advice and 13% did not comply at all. Approximately 6% of participants partially followed the full treatment regime. The most common reason for non-compliance or partial compliance was financial constraint (50%). Only 3% did not comply because symptoms ceased without treatment.

**Table 13: Reason for non-compliance to given treatment for current eye problems**

Reason for non-compliance to treatment	Percentage (%) (Frequency=n)
Financial constraints	50 (33)
Problem resolved without treatment	3.03 (2)
Did not want to take the treatment	13.64 (9)
Other (fear of treatment, losing medication/glasses, shyness, etc.)	33.33 (22)
<b>Total (N)</b>	100 (66 responses)

### Reason for not seeking eye care services

In total, 606 participants did not seek care from any kind of health care provider for their eye illnesses and 526 provided explanations for their choice. The most common reason was financial constraint (45%), followed by not taking the problem seriously (31%) and lack of time to go to a health care provider (16%).

**Table 14: Reason for not seeking treatment for current eye problems**

Reason for not seeking treatment	Percentage (%) Frequency (n)
Financial constraints	45.06 (237)
Did not feel important	30.80 (162)
Time constraints	15.78 (83)
Other (didn't know where to go, no one to accompany, fear, etc.)	8.36 (44)
<b>Total (N)</b>	100 (526 responses)

### Sources of eye health and eye care service information

Out of 1,587 participants, 456 (29%) had received information concerning eye illness or eye care during the three months prior to the survey. Of them, 63% received the information from eye care promotional activities, 13% from friends, relatives or neighbors, 7% from television, 13% from camps and health care providers and the rest from health facilities, radio and newspapers.

### Factors associated with eye care-seeking behavior

A statistically significant association was found between treatment-seeking behavior and respondents' gender and education ( $p < 0.05$ ). Female participants and participants with at least some formal education were found to seek treatment from health care providers more than male and uneducated participants. Although occupation was initially found to be a significant factor ( $p < 0.05$ ) in vicariate analysis, it was later found to be insignificant after controlling for other factors. No association was demonstrated between the type of ailment and the treatment-seeking behavior.



**Table 15: Factors associated with treatment-seeking behavior for current eye illness**

Variables	Odds ratio	z	P >  z
<b>Age</b>			
<30 years		1	
>30 years	1.248012	1.55	0.122
<b>Gender</b>			
Male		1	
Female	1.382438	2.05	0.041*
<b>Education</b>			
No formal education		1	
Some formal education	1.424387	2.67	0.008*
<b>Occupation</b>			
Non-income generating		1	
Income generating	0.821531	-1.31	0.192
<b>Family income</b>			
BDT<15,000/ USD 193		1	
BDT>15,000/ USD 193	1.147079	1	0.315
<b>Eye problem</b>			
Other problem		1	
Vision impairment	0.858557	-1.19	0.235
<b>Constant</b>	0.237814	-2.42	0.015

\*p value significant, i.e.  $p < 0.05$

It was also found that age, gender and education significantly influenced choice of health care provider. Among the participants, women, individuals aged 30 years or older and those with some formal education were more likely to visit formal eye care providers than those who were under 30 years of age, male or uneducated.

**Table 16: Factors associated with choice of health care provider for current eye illness**

Variables	Odds ratio	z	P >  z
<b>Age</b>			
<30 years		1	
>30 years	3.089572	3.2	0.001*
<b>Gender</b>			
Male		1	
Female	2.24048	2.09	0.037*
<b>Education</b>			
Non-formal education		1	
Some formal education	3.220436	3.42	0.001*
<b>Occupation</b>			
Non-income generating		1	
Income generating	0.846788	-0.44	0.657
<b>Family income</b>			
BDT<15,000/USD 193		1	
BDT>15,000/USD 193	1.241846	0.61	0.542
<b>Eye problem</b>			
Other problem		1	
Vision impairment	1.216817	0.58	0.559
<b>Constant</b>	0.031051	-2.36	0.018

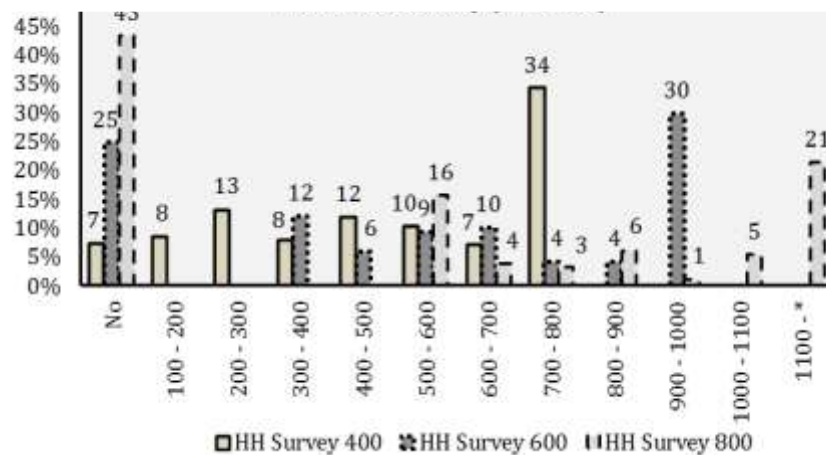
\*p value significant, i.e.  $p < 0.05$

### Estimating demand curve for spectacles

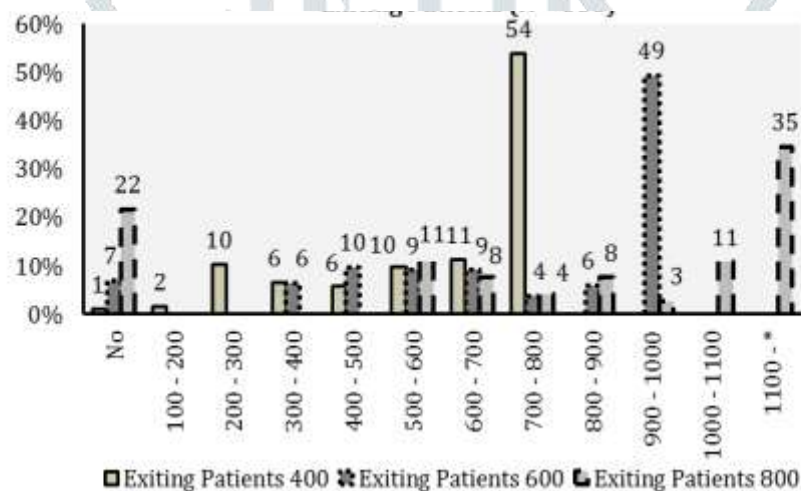
Based on the number of accepted bids for different price intervals, histograms were constructed to show the extent to which respondents' WTP varies depending on the starting bid amount. Figure 2 depicts the percentage of accepted

bids at different price intervals for the 1,560 respondents of the household survey, and figure 3 shows the results for the 558 patients prescribed with eye glasses by their doctors.

**Figure 1: Frequency Distribution of WTP on Different Intervals Household Survey (N = 1560)**

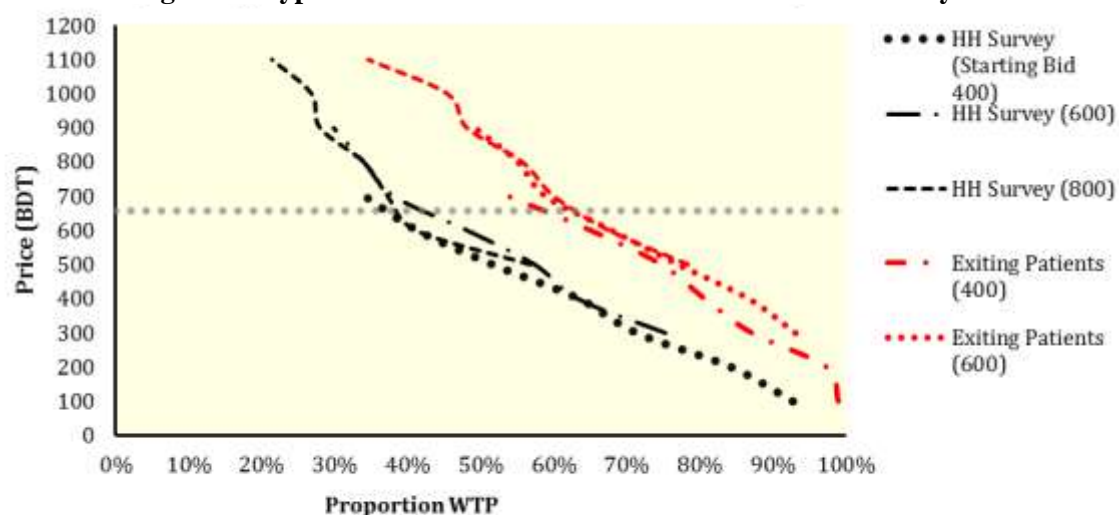


**Figure 2: Frequency Distribution of WTP on Different Intervals Exiting Patients (N = 558)**



The results from the two experiments can be summarized by drawing two demand curves using WTP data for each of the three starting bids. Figure 3 shows the suggested demand curves for each sub-group (i.e. household survey and facility patients with prescribed glasses). We assumed that respondents would agree to pay any amount less than their stated maximum WTP. Since the exact WTP amount for each individual is not available, we used the percentage of respondents who would accept the offer against the lower bound of each price interval to draw the demand curves.

**Figure 3: Hypothetical Demand Curves Derived from WTP analysis**



The suggested or hypothetical demand curves that we obtain have the appearance of a demand curve that is frequently encountered for normal goods (showing a decrease in demand associated with an increase in price), providing reassurance that WTP demand curves for eye glasses are not particularly unusual. At BDT 100 (USD 1.27), 93% of respondents in the household survey would be willing to pay that price for spectacles, while about 99% of patients with a prescription would be willing to pay that amount. The probability of buying eye glasses was the lowest (21.4%) when the offered price was BDT 1,100 for survey participants, compared to refractive error patients (34.6%).

The difference between the hypothetical demand curves of the general population (household survey) and the actual refractive error patients (exit interviews) is substantive. A shift in demand can be assumed between respondents, eliciting WTP before and after being diagnosed with refractive error (and receiving a prescription for spectacles). Three demand curves overlap at the prices of BDT 300 to BDT 700 (with 75.2 % to 38.1% acceptance) for household respondents and BDT 500 to BDT 900 (78.4% to 49.2% acceptance) for exiting patients. Figure 4 also shows the average price of BDT 657.43 (USD 8.35), at which 356 randomly selected customers actually purchased their eye glasses (see details below). Comparing the WTP with the average price of BDT 657.43 (USD 8.35) that we obtain, shows what the equilibrium points may be at current market prices.

### Actual transaction prices for eye glasses

Table 23 shows the actual transaction prices for spectacles, collected from 356 randomly selected customers exiting optic shops. It shows that 80% of customers who were interviewed paid between BDT 300 (USD 3.81) and BDT 900 (USD 11.43) for eye glasses. Among them, 138 customers (39%) paid between BDT 500 (USD 6.35) and BDT 700 (USD 8.89) and 83 customers (23%) paid between BDT 700 and BDT 900 (USD 8.89 – 11.43). Few subjects (5.3%) paid more than BDT 900 (USD 11.43), with a maximum amount recorded of BDT 2,200 (USD 27.95).

**Table 17: Actual transaction prices for spectacles (n=356)**

Purchased prices of frame and lenses (BDT)	Frequency	Percentage	Max	Min
Less than or equal to 300	31	8.71	300	150
Above 300 to 500	67	18.82	500	330
Above 500 to 700	138	38.76	700	550
Above 700 to 900	83	23.31	900	750
Above 900 to 1,100	19	5.34	1,050	950
Above 1,100	18	5.06	2,200	1150

### Sources of payment

The source of payment reported by all three participant groups is presented in Table 24. For household survey participants and those interviewed at facilities, reported sources of payment are hypothetical, whereas for the customers of optical shops actual sources of payment are recorded. The majority of respondents intended or managed to use their income from the current month to cover the costs related to purchasing spectacles.

**Table 18: Reported payment sources for spectacles**

Source of payment (%)	Household survey (N = 1560)	Interview of exiting patients (N = 558)	Interview of optical shop customers (N = 356)
Income	64	87	86
Savings	18	4	8
Borrowing from relatives	16	8	6
Reducing expenditure	2	1	–

### SUMMARY

This study provides a valuable insight into demand and provision of eye care services among slum-dwellers in Dhaka. The study shows that there are a high proportion of ocular morbidities in Dhaka's slum population, and many slum-dwellers would benefit from accessible eye care services. The demand for services however is low and constrained by both individual and community factors, including knowledge and education, direct and indirect costs of services and perception of treatment in the light of other competing needs. Although issues on the supply side in Dhaka may be less problematic than in rural areas of Bangladesh, the unequal distribution of services and the high number of private for profit providers have an impact on access to eye care services for the poorest or most vulnerable populations by increasing the distance and costs of access. It is also clear that the lack of awareness and low priority given to eye care are important factors influencing health seeking behavior of slum-dwellers. More emphasis should be given to awareness campaigns and changing behavior/attitudes in order to increase service uptake. Our study also shows that slum-dwellers are not a homogeneous community. Our study on WTP for spectacles indicates that slum-dwellers are



willing to pay for spectacles, although this amount varies depending on respondent characteristics. Slum-dwellers in Dhaka are not necessarily the poorest individuals when compared to the rest of the population of Bangladesh. A market-based approach to delivering spectacles to slum-dwellers seems to be a viable option that needs to be explored further. However, mechanisms for identifying the poorest individuals and enabling them to access eye care services remains crucial. The WTP approach used in this study prove to be a useful tool to accurately estimate communities WTP for a health commodity; despite certain reservations in the literature about the use of such approach in lower socio-economic groups. We recommend replicating this approach in other studies of health seeking behavior and demand for eye care services. The findings of this study should be used as the evidence base for future policies and programmes to increase the uptake of eye care services by urban slum-dwellers, particularly the poorest among them.

## RECOMMENDATIONS

The findings from this study provide a comprehensive picture of the demand and provision of eye care services for urban slum-dwelling communities in Dhaka. On the supply side, we looked specifically at the number, location and characteristics of eye care facilities. On the demand side, we explored eye health-seeking behavior, barriers to accessing services, and WTP for spectacles. The main findings from the study are discussed below with regard to what we already know about provision.

### Eye care facilities mapping and assessment

A total of 715 facilities providing eye care services were identified within Dhaka City Corporation boundaries, including 23 specialized eye care facilities (3%), 412 general facilities or practitioners offering eye care services (58%) and 280 stand-alone optical shops (39%). The vast majority of these eye care facilities were operating as private for-profit entities (96%), with few private non-profit (3%) or public facilities (1%). Respectively, 21% and 22.5% of eye care facilities are providing outpatient and inpatient surgical services. It is however difficult to assess whether the number of facilities and eye care services are adequate to address the need of the population as it requires more detailed information on facility activity (outputs), human resources for eye health (including mid-level ophthalmic personnel) and sub-specialties services and quality of care offered in each facility. When looking at national eye health statistics, Dhaka division performs relatively well compared to others. It has the lowest prevalence of blindness (Dineen et al., 2003) and the second highest cataract surgical rate (CSR) after Sylhet division, with respectively 1,052 and 1,302 surgeries performed per year and per million populations. It is also above the national CSR of 957. Yet, this number is still below the CSR estimate of 1,500-2,000 required to address the incidence of cataracts, and the estimated 2,000-3,000 CSR needed to eliminate the backlog of unoperated cataracts (MHFW & BNCB, 2000). These figures may also hide intra-urban health differences between slum and non-slum dwellers as suggested by other studies conducted in Bangladesh (NIPORT, 2013).

In terms of location and access, the map shows an uneven distribution of eye care facilities across the city, with a concentration of facilities in a certain areas/wards. Nearly half of all eye care facilities in Dhaka City Corporation (47%) are concentrated in 10 wards out of 91. The wards with a high density of eye care facilities are also those with the lowest proportion of slum-dwellers. The distribution may have an impact in terms of access to eye care services for the poorest or most vulnerable population by increasing the distance and cost to access services. An inverse relationship between distance or travel time to health facilities and use of health services has been demonstrated to be an important barrier to access (Peters et al, 2008; Black et al, 2004). Although most of the slum areas identified in Dhaka would be within a 1.5-mile radius of a ward with a high concentration of eye care facilities, respondents in the survey still indicated that long distances between residence and facility, time required to travel to a facility and long waiting times were barriers to accessing services during IDIs and FGDs. Interviews with 1,114 patients exiting five selected eye care facilities in Dhaka show that the travel time required to reach these facilities was three hours and 18 minutes on average; journey times for city residents averaged 57 minutes compared with seven hours and 50 minutes for patients travelling from outside Dhaka. Transport expenditure was an important component of patient costs, amounting on average to BDT 104 (USD 1.35) for city residents and BDT 963 (USD 12.5) for patients coming from outside Dhaka.

In terms of access to eye care services for the poorest section of the population, 64% of facilities providing eye care services (including optical shops) reported having some mechanisms in place to facilitate their access, mainly by offering free or subsidized service to low-income patients.

However, no data was available on the proportion of low-income patients actually benefiting from these mechanisms. Financial constraint was the main reason given by survey respondents for not seeking care services or not complying with the recommended treatments. Only 15% of respondents reported having received eye care for free; 79% paid fees using their monthly income and 7% had to sell assets or borrow money to obtain eye care services. Patients exiting facilities reported paying BDT 1,663 (USD 21.6) on average to receive eye care services, including medical and non-medical expenditures, but this amount varies based on the patient's diagnostic, treatment procedure and whether they come from inside/outside Dhaka.

Survey respondents who expressed dissatisfaction with care complained about the attitude of health care providers and long waiting times.

### Eye care-seeking behavior

Eye care morbidities are common among slum-dwellers, with nearly half of respondents self-reporting an eye problem at the time of the survey. The most prevalent conditions were poor vision (61.5%), lacrimation (27.5%) and allergy/infection or inflammation of the eye (43.7%). This is in line with findings from the baseline study conducted for the Dhaka Urban Comprehensive Eye Care (DUCEC) project, where the two most prevalent eye problems were visual impairment (52%) and lacrimation (12%), (Ali et al, 2009). Studies from other low- or middle-income countries show also that these conditions are the most commonly reported eye problems, in addition to symptoms associated with allergy, infection or inflammation of the eye: itching of eye, red eye, eye ache, burning sensation, etc. (Senyonjo et al, 2014; Ocansey et al, 2014).

Yet, 76% of respondents with self-reported eye problems had not sought any treatment at the time of the survey. Reasons for not seeking treatment included financial constraints, not considering the problem to be important, lack of time, not knowing where to go for treatment, fear of treatment/surgery/complication and having no one to accompany (especially in the case of women). A study conducted in rural Andhra Pradesh, South India, among the visually impaired population, found similar reasons for not accessing treatment for eye problems (Kovai et al., 2007). Although the eye is considered to be a vital organ because of its relation to vision, which is generally considered as the most important sense, people do not necessarily seek prompt treatment for eye problems (Hayden, 2012). Delaying treatment for eye conditions was found to be a strategy commonly used among survey respondents. From the qualitative study, we found that people tend to ignore eye problems for as long as they can. Lack of information about eye diseases was reported as one of the reasons for delaying treatment since eye care is given a low priority among competing health and non-health needs. From the qualitative study, it was evident also that previous experience in health care facilities and behavior of the staff and doctors played an important role in the utilization of eye care facilities.

In terms of factors associated with eye care-seeking behaviors, we found that gender and education were significantly associated with seeking treatment for eye conditions. Women were more likely to seek treatment compared to men (OR=1.38, P-val. = 0.041), and the same was observed for respondents with formal education compared to those without (OR=1.42, P-val. = 0.008). Generally, it is assumed that health care-seeking behavior is related to the type or severity of illness, but no statistically significant association was found in our study. Also, respondents engaged in income-generating activities were also less likely to seek treatment in univariate analysis ( $p < 0.05$ ), but this association is no longer significant after controlling for other factors. This may be explained by the strong association between gender and occupation (99% of homemakers were female). Among survey respondents who sought treatment for their eye condition, 86% visited a qualified or specialist health care provider at a fixed facility or outreach camp as their first choice. We found that about 1 in 8 respondents (13%) visited an informal care provider as a first point of contact. These findings differ from other research conducted in Bangladesh on health-seeking behavior and choice of health care provider for different diseases such as diarrhoea, tuberculosis, and maternal morbidity. Almost all these studies show that informal health care providers are more commonly chosen over the formal ones (Larson et al., 2006; Ahmed et al., 2009; Hossain et al., 2014). Another study on the use of health care services in Dhaka's urban slums and adjacent rural areas (Khan et al., 2012) shows that pharmacies or drug stores are the most popular choice for treatment seeking in both urban and rural areas in Bangladesh. Indeed, we find that when respondents sought eye care services from informal providers, pharmacy attendants (drug sellers) were the most common source of care.

Over 80% of respondents reported that they complied with the treatment recommendation, and the most frequent reason given for non-compliance was financial constraint (50%). Compliance with a prescribed treatment changed according to the type of treatment. During IDIs, participants indicated that they preferred medicine over surgery and spectacles, and this is reflected in compliance rates. During qualitative interviews, some respondents mentioned that there was some stigma associated with wearing spectacles. Participants reported that one could be mocked and discriminated against for using glasses. These findings are remarkably similar to studies in India. A study on low uptake of eye care service in rural India reported a high level of compliance for medication and less for surgery and glasses. They found that fear of surgery was a major barrier even among people whose eye problem did not require surgery but whose perception of possible treatment recommendations included this outcome (Fletcher et al, 1999). In another study (Balasubramaniam et al., 2013), parents expressed their reluctance to make their children wear glasses, especially if the child is a girl, as it is considered to be cosmetically unappealing. In our study, no gender component was found regarding the stigma associated with wearing eye glasses, but age came out as an important factor in this matter. Use of spectacles by old patients seemed to be more acceptable in the community, whereas it was not considered normal for young people to be wearing them.

When participants in IDIs and FGDs were asked to identify factors that would enable patients to seek eye care treatment, they mentioned: the opportunity to get appointments at convenient times, accessing free or subsidized

services (including spectacles), and having facilities closer to their home. Other suggestions made by community members included establishing good quality eye care services, arranging health camps close to peoples' homes, arranging awareness campaigns, providing free treatment and disseminating eye care information.

### Willingness-to-pay (WTP) Study

In this study we focused on eliciting the WTP for refractive error correction (spectacles) targeting urban slum communities. WTP and contingent valuation methods have been used successfully in developing countries to assess the demand for specific health services and the potential for cost-recovery (Foreit and Foreit, 2003; Yeung and Smith, 2005; Prata et al. 2013; Tamiru et al., 2014). Refractive error correction (using spectacles) is a cost-effective intervention which can lead to substantial improvement in quality of life (World Health Organization, 2007). This type of analysis is very relevant as spectacles are often seen as a private good, and hence have been considered a low priority by governments. As a consequence, spectacles are often provided by private organizations (for-profit and NGOs) and the question of pricing or cost recovery is very important for the sustainability of these services.

Our findings suggest that individuals living in the urban slums of Dhaka are willing to pay for spectacles, and the average WTP amount is BDT 597 (USD 7.76), representing 11.3% and 4% of average individual and household income respectively. To put this into context, it represents about one and half times the daily wage rate for a low- to semi-skilled worker in Dhaka (HIES, 2010). The WTP increased for individuals who had actually been diagnosed with refractive errors, with an average value of 847 BDT (USD 11). This difference remained even after using statistical matching techniques based on a set of respondents' characteristics. Other factors determining WTP for spectacles were age, gender, family income, and education. Female respondents were willing to spend BDT 134 (USD 1.70) less on average compared to males ( $P\text{-val.}=0.00$ ); individuals with primary/higher education were willing to pay BDT 155 (USD 1.97) more compared to those without formal education ( $P\text{-val.}=0.00$ ). Respondents' WTP also increased by an average of BDT 134 (USD 1.70) based on a monthly income tranche of BDT 10,000; but it decreased for older respondents by BDT 36 (USD 0.05) on average for every additional year ( $P\text{-val.}=0.00$ ).

It is important to note that respondents in our household survey were found to be poorer than the average urban population, but this is not necessarily the case when considering the entire population of Bangladesh. This is in line with findings from the 2006 Bangladesh Health Survey, where women and men in the slums were found to be poorer than their counterparts in non-slums or district municipalities. Yet, when compared to the general population in Bangladesh, 60% of survey respondents belonged to the richest quintile (20%) of the population. This finding may seem counter-intuitive initially, but is plausible when considering that, nationwide, more than half of the population (55%) residing in urban areas is in the highest wealth quintile, compared with 9% in rural areas. Among the administrative divisions in Bangladesh, people living in Dhaka are more likely to fall within the highest wealth quintile than people living in other divisions (DHS Bangladesh, 2011).

Our findings indicate that there is a potential to use cost recovery and market-based approaches for providing spectacles to slum-dwellers in Dhaka.. The approach that we used in this study (i.e. contingent valuation with simulation of refractive error) appears to produce reliable and valid WTP estimates and can be used by development practitioners and other stakeholders to make pricing decisions for spectacles. WTP varies according to individuals' characteristics and adjustment in prices could potentially lead to an increase in uptake of services. The capacity to pay for spectacles also varies greatly among slum-dwellers and financial access to eye care services continues to be an issue, as evidenced in the household survey and qualitative study. This means that there is still a need for offering spectacles at no fees or at a subsidized price, and better mechanisms for identifying those who cannot afford to pay are required to enable the poorest to access eye care services.

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