



**GARO MEGHRIGIAN EYE INSTITUTE FOR PREVENTIVE OPHTHALMOLOGY
CENTER FOR HEALTH SERVICES RESEARCH AND DEVELOPMENT
THE AMERICAN UNIVERSITY OF ARMENIA**

**Strengthening Regional Ophthalmic Services in Gegharkunik Marz
of Armenia: Needs Assessment**

**Report to
Lions Club International Foundation**

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Prepared by:
**Ovsanna Najaryan, MD, MPH
Program Assistant**

**Naira Khachatryan, MD, MPH
Program Manager**

**with
Michael E. Thompson, MS, DrPH
Director**

**Varduhi Petrosyan, MS, PhD candidate
Lecturer of Public Health**

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Project Goals and Objectives:

The specific aims of the project are:

- **Needs Assessment**
Community needs for cataract intervention in Gegharkunik marz will be assessed using the Rapid Survey of Cataract Surgical Services (RACSS) methodology. The RACSS technique optimizes the use of limited sources for data collection, data entry, and analysis through the use of a simplified but valid survey methodology and a specially developed software package. This approach also establishes baseline measures against which to monitor and evaluate the program's success.
- **Build infrastructure**
A regional ophthalmic unit (ROU) will be established/renovated according to MOH standards and equipped per the WHO standard list. Standardized systems and procedures for the staff and patients will also be developed.
- **Develop human resources**
Key personnel will receive training specifically developed for their needs. Training will consist of international experiences, local academic training, and local practical training covering both treatment and management skills as appropriate for the person's role in the new system of care.
- **Establish Village Examination Centers**
Village Examination Centers (1 per 10 villages) will be established in the selected village ambulatories. These ambulatories will be equipped with minimal necessary equipment for basic eye screening and its staff (nurses) trained.
- **Increase demand for eye care**
ROU's personnel will complete mass screenings of people 50 years and over in Gegharkunik marz (~20,000 people).
- **Provide high quality surgery**
All prevalent cases of bilateral blinding cataract (estimated ~1,000-1,500) in Gegharkunik marz of Armenia will be identified and treated during a 1.5-year period.
- **Evaluate the program and develop policy recommendations**
The project will be evaluated throughout so as to provide timely information for effective monitoring of the project and development of policy recommendations for the Ministry of Health of Armenia and Lions Club International Foundation regarding improvement of the regional ophthalmic services.

Key Project Participants

Michael E. Thompson, MS, DrPH,
*Assistant Professor of Public Health
Associate Director, MPH Program
Director, Center for Health Services Research and Development
Interim Vice President
American University of Armenia*

*40 Marshal Bahamian, Yerevan 375019 ARMENIA
(374 1) 51 25 92 (Office), (374 1) 51 25 66 (fax)*

Dr. Thompson provided consultation and guidance throughout the needs assessment. He was involved in the sample design and development of an appropriate data management and analysis system for the study.

Varduhi Petrosyan, MS, PhD candidate,
*Lecturer of Public Health
American University of Armenia*

*40 Marshal Baghramian, Yerevan 375019 ARMENIA
(374 1) 51 25 64 (Office), (374 1) 51 25 66 (fax)*

Ms. Petrosyan provided consultation and guidance throughout the needs assessment phase of the project. She was responsible for the oversight of the project and development of key quality assurance factors.

Naira Khachatryan, MD, MPH,
*Program Manager, Garo Meghriyan Eye Institute for Preventive Ophthalmology
Center for Health Services Research and Development,
American University of Armenia*

*9 Alex Manoogyan, Yerevan 375070 Armenia
(374 1) 51 20 52 (Office), (374 1) 51 25 66 (fax)*

Dr. Khachatryan was responsible for the design and management of the project, development of detailed study procedures, analysis of the data, and preparing and submission of the final report.

Ovsanna Najaryan, MD, MPH,
*Program Assistant, Garo Meghriyan Eye Institute for Preventive Ophthalmology
Center for Health Services Research and Development,
American University of Armenia*

*9 Alex Manoogyan, Yerevan 375070 Armenia
(374 1) 51 20 27 (Office), (374 1) 51 25 66 (fax)*

Dr. Najaryan was involved in the following project phases: preparatory activities, development of research methods and tools, training of field staff, monitoring of the process, data gathering and data analysis, as well as preparing the final report.

Gohar Navoyan, MD, MPH: Data Analyst

Dr. Navoyan was involved in the preparatory activities and training of the field staff.

The following ophthalmologists were involved in the study:

Karine Taroyan (Ophthalmologist, Martuni polyclinic)

Karine Sinanyan (Ophthalmologist, Gavar polyclinic)

Jasmena Vardanyan (Ophthalmologist, Vardenis polyclinic)

Svetlana Abrahamyan (Ophthalmologist, S. Malayan Ophthalmologic Center)

The following nurses were involved in the study:

Lusine Eghoyan (Martuni polyclinic)

Sergey Ohanyan (Martuni polyclinic)

Sofik Knyazyan (Gavar polyclinic)

Mari Amirkhanyan (Gavar polyclinic)

Margarit Badeyan (Vardenis polyclinic)

Susanna Grigoryan (Vardenis polyclinic)

Magda Grogoryan (8th Eye Clinic)

Heriknaz Margaryan (8th Eye Clinic)

Executive Summary

The Garo Meghrigian Eye Institute for Preventive Ophthalmology (GMEIPO) of the Center for Health Services Research and Development (CHSR) at the American University of Armenia (AUA) in collaboration with the Ararat Lions Club of Armenia (ALC) implemented needs assessment (mass screening of population) as a part of the 3-year project aimed at strengthening ophthalmic services of the remote and underserved regions of Gegharkunik marz, Armenia.

The needs assessment phase started on 10 October 2003. Data collection followed the methodology for a Rapid Assessment of Cataract Surgical Services (RACSS) adapted for Armenia. The instrument contained sections for the following indicators: general information, visual acuity, causes of low vision, lens status, intraocular blood pressure, required current actions, details about cataract operation, reasons for not getting cataract operated, and existence of eye pathologies.

Using stratified multistage systematic cluster sampling technique, 56 clusters were selected covering Gegharkunik marz. Two thousand three hundred sixty five participants (2,365) aged 50 and over were randomly sampled for eye screening. Additional 687 participants were recruited from the neighborhoods of people who were absent or declined to participate.

Four teams were equipped to carry out the survey. Each team consisted of an ophthalmologist, an ophthalmic nurse, an interviewer, and a driver. Each team was responsible for screening one cluster per day.

Data entry and statistical analysis was carried out using SPSS.11.0 software.

The needs assessment study provided population based information on prevalence and main causes of blindness and cataract services. The major findings were:

- Of 2,365 randomly selected people from the lists of residents 1,100 participants were screened (46.5%). Three hundred and sixty people (361) were absent, 598 refused to participate, 284 could not be found and 23 were dead by the time of the survey. The survey teams recruited an additional 687 people to offset those high losses.
- The blindness prevalence among randomly contacted participants (2058) was estimated at 3.7%.
- The main cause of blindness was cataract (69.7% of all cases of blindness).
- The prevalence of cataract, independent of stage was 15.6%.
- The main barriers to cataract surgery were unaffordability and inaccessibility of ophthalmic services.
- Cataract surgical coverage (CSC) rate was low: 8.6% (VA<6/18), 20.3% (VA<6/60), and 36.5% (VA<3/60) for eyes and 14.4% (VA<6/18), 38.1% (VA<6/60), and 63.6% (VA<3/60) for persons (see Table 12).
- Approximately 20% of screened people needed cataract surgery.
- Most of screened people (80.8%) required some current actions, including medication, prescription eyeglasses, or cataract treatment.

The results obtained from the study support the necessity of Establishment a Regional Ophthalmic Unit that would provide specialized eye services in Gegharkunik marz.

1.0 Background

Armenia is one of the republics of former Soviet Union. In 1991, Armenia regained its independence. Immediately, Armenia faced devastating economic and socio-political problems, which strained the health care system and led significant declines in health status [1]. In 1995, the Government of Armenia adopted Program for development and reform of the Armenian health system for 1996–2000. These reforms led to a complete decentralization and reorientation of the health care system. Health care facilities have been reoriented toward strengthening primary health care and optimization/rationalization of hospital care [1-3].

However, those reforms did not tackle eye care. Eye care in Armenia is characterized by excessive physical infrastructure and overcapacity in Yerevan eye clinics, including overstaffing of physicians and nurses. There are two specialized eye hospitals in Yerevan; 5 regional eye departments/units (ROU) in Echmiadzin, Vanadzor, Kapan, Goris and Guimri; and polyclinic eye services in 35 towns. In total, there are 291 ophthalmologists in Armenia [4-6], of which 82% (n=238) work in Yerevan, and 18% (n=53) in the rural areas. Of all ophthalmologists, 25% (n=74) are surgeons, others are mainly involved in providing pre- and post-operative care, ambulatory treatment, and measuring refraction. There are 65 surgeons in the city and only 8 for the rural areas. Thus, the ratio of ophthalmic surgeons is 64 per million population in the city, and 4 per million in the rural areas [4-5].

The striking inequality between eye care in the capital and rural areas can be explained by the following factors:

- *Poor financing of eye care in the rural areas.* Since the Government itself is covering eye care for a very small part of the population and health insurance system is not in place yet, particularly in the rural areas, out-of-pocket payments are the most

important source of funding for eye care. The economic problems impact rural areas of Armenia more than capital city: the average per capita income is significantly higher in the capital than in marzes [3]. Consequently, the higher paying capacity of the population guarantee high volume of work and much higher earnings for ophthalmologists in the capital, than in the rural areas, which contributes to overstaffing of the ophthalmologists in Yerevan.

- *Poor planning/staffing for present Armenian context.* When the old Soviet model of eye care delivery collapsed, eye care providers were not ready for the new market-oriented approach to health care delivery. Most department heads in the marzes lack contemporary managerial training and expertise critical for success in the new reality of service-oriented medicine, contributing to financial crisis of the regional eye care units and low efficiency of regional ophthalmologists.
- *Collapse of supporting health system.* In the Soviet model, village ambulatories were responsible for providing primary eye care. Recently many villages lack not only eye care but primary health care as well. Thus, the first level of care, responsible for appropriate demand generation is missing, which contributes to low utilization of regional eye care facilities and low patient volume.
- *Poor equipment and poor working conditions.* Equipment in the ROUs is mostly obsolete, sometimes 30-40 years old, lacking proper maintenance due to the unavailability of replacement parts. Facilities of the majority of ROUs need upgrading.
- *Low quality services.* ROU ophthalmologists have almost no access to new knowledge, and in the most cases, poor/outdated training. Because of low patient

volume, ROU ophthalmologists are losing skills; lack of regular training for regional ophthalmologists contributes to the low performance as well. In addition, in the regions ophthalmologists make medical decisions with minimal supervision. They are not evaluated on performance or quality of services. The lack of accountability to a higher authority is limited, as performance is rarely, if ever, the basis for reward or penalty.

- *Poor surgical outcomes.* Extra capsular cataract extraction (ECCE) with intra-ocular lens (IOL) implantation is not used in the rural areas. Moreover, due to financial and geographic barriers, patients from rural areas present at later stages of diseases, with worse prognosis and treatment outcomes.

The aforementioned problems pervading the country's eye care delivery system emphasize the pressing need to bring high quality ophthalmologic services to isolated regions. In response to this emerging need, the Ararat Lions Club of Armenia (ALC) in collaboration with the Garo Meghrigian Eye Institute for Preventive Ophthalmology (GMEIPO) of the Center for Health Services Research and Development (CHSR) at the American University of Armenia (AUA) is implementing a 3-year project aimed at strengthening ophthalmic services in the remote and underserved regions of Gegharkunik marz (Appendix I), Armenia. As the first phase of the project, the assessment of community needs for cataract intervention was carried out using WHO developed Rapid Assessment of Cataract Surgical Services (RACSS) methodology [6]. This report presents the results of the needs assessment.

2.0 Specific Aims

The specific aims of the project's needs assessment phase were:

- Estimate the prevalence of blindness, severe visual impairments, and visual impairment in Gegharkunik marz;
- Assess the prevalence of cataract and other major causes of blindness;
- Estimate the prevalence of aphakia and pseudophakia;
- Calculate the cataract surgical coverage rate for the marz;
- Find details of cataract surgery: age at the time of surgery, place of surgery, type of surgery, if Intra-Capsular Cataract Extraction (ICCE) , use of glasses, reasons for not using glasses;
- Evaluate the visual outcomes from cataract surgery and identify the major causes of poor visual outcomes;
- Identify barriers to cataract surgery;
- Estimate the population in need for eye care services in Gegharkunik marz and recommend a scope of work of ROU;
- Allow cataract case finding;
- Facilitate marketing of cataract surgery.

3.0 Methods

3.1 Manual of Operations

GMEIPO staff developed a Manual of Operations, which included training manual (Appendix II), and guidelines for interviewers (Appendix III), ophthalmic nurses (Appendix IV), ophthalmologists (Appendix V), and a survey coordinator (Appendix VI).

3.2 Data Collection Instrument

Data collection followed the methodology for a Rapid Survey of Cataract Surgical Services, which allowed collecting data to develop a plan of action for cataract intervention based on community needs. The methodology was optimal for use given the limited resources for data collection, data entry, and analysis. It did not require complicated ophthalmic equipment. Rapid assessment of cataract surgical services was a simplified but valid methodology, which gathered data not only on cataract prevalence, but also on cataract surgical coverage (CSC) [6]. The latter is particularly important, since the prevalence alone may not be an adequate indicator to monitor achievements (number of cataract operations actually done, visual outcomes of the interventions, availability, accessibility, affordability and quality of cataract operations) over time.

The screening instrument Rapid Assessment of Cataract Surgical Services (RACSS) (Appendix VII) was adapted from Hans Limburg, WHO [6]. New sections were added to the original record form (Intraocular pressure, Additional Examination, Current action needed, Clinical Diagnosis, and Examiner Remarks) to get more detailed information on other eye pathologies. A separate sheet was added to the instrument (Patient information sheet), which was considered a written recommendation for further diagnostics/treatment. This sheet was given to the participant.

In general, the record form was divided into three main parts:

- General information
- Eye screening
- Patient information sheet

Eye screening was divided into 10 sections: Vision, Lens Examination, Principal cause of vision <6/18, Additional examination, Intra-ocular pressure, Current action needed, History, if not examined, Why cataract operation has not been done, Details about cataract operation, and Clinical Diagnosis.

The study instrument was pre-tested on 5 people, revised to the final form and subsequently translated to Armenian. The Armenian form was pre-tested on 3 people.

3.3 Sampling

Stratified multi-stage, systematic cluster sampling was used. The calculated sample size, adjusted for the design effect of 1.5, was 2,240 people aged 50 and over. The total number of clusters was 56, each consisting of 40 people aged 50 and over. To reflect the rural and urban population of Gegharkunik 20 clusters were selected from towns and 36 from villages.

Before starting the survey, a representative sampling frame consisting of a list of all villages and towns of Gegharkunik marz and the total number of population within each village/town was obtained from the Department of Statistics of the Ministry of Health, Republic of Armenia.

All 56 clusters were located using the same method (see Table 1).

Table 1. Systematic random sampling of clusters.

Survey design:	56 clusters of 40 people of 50years and older
Total population:	275,525
Sampling interval:	$275,525 / 56 = 4,920$
Random start:	3,395

Regional departments (Martuni, Vardenis, Sevan, Gavar and Chambarak) provided lists of people aged 50 and over within the chosen settlements. Final sampling units (40-45 in each

cluster) were selected from those lists using systematic random method using sampling method similar to that used to select the city.

3.4 Staff training

Job vacancies for ophthalmologists and ophthalmic nurses were announced via the AUA job server list. The announcements were also placed at the ophthalmic clinics of Yerevan. Preference was given to local ophthalmologists and ophthalmic nurses. By this an opportunity was given to develop local capacity essential for establishment of Village Examination Centers (VEC), which when established will have to rely on the local specialists.

Given the sample size and number of clusters, 4 teams of surveyors were recruited to implement the survey. Each team consisted of an ophthalmic nurse-interviewer, an ophthalmic nurse-screening assistant and an ophthalmologist. Each team was equipped with necessary ophthalmic instruments, (ophthalmoscope, lens set and pointer, apparatus Rotte, Maklakov's tonometer) and basic ophthalmic drugs (Homatropin 1.0%, Lidocain 2.0%, Dexametazone 0.1%, Pilocarpin 1.0%, Timolol 0.5%, Gentamicin 0.3%, Ciprofloxacin 0.3%, Analgin 50.0%, Dimedrol 1.0%, spirirtus, sterile bandages and syringes [1 and 3 g]).

The field staff completed one day training at the local policlinics. One of the teams, hired from Yerevan ophthalmic clinics, completed the training at GMEIPO. Training was based on the training manual (Appendix II). Each surveyor was provided with a copy of the training manual.

3.5 Logistics and Duration of the study

Once the cluster location had been determined, a timetable with dates and chosen settlements was prepared for each team. Prior to the fieldwork, the project assistant organized meetings

with heads of regional polyclinics and sent letters to village heads/ mayors explaining the nature of the study, its purpose and objectives, with attached timetables of examinations and lists of participants in the study settlements. Officials of each respective settlement were asked to establish basic examination/screening units in health care units. Official support facilitated the organizational process in the field. Village heads, through village ambulatory nurses, recruited participants. Heads of polyclinics recruited district health personnel to provide support for the study. Continuous collaboration between field staff and administrative units was maintained throughout the survey.

Announcements about the survey were made through local TV channels in cities Sevan and Gavar to increase the response rate. Overall duration of data collection for the needs assessment phase of the project was 2 weeks plus one training day. Every team was responsible for surveying 14 clusters.

3.6 Monitoring and Quality assurance

Each team was observed three times by GMEIPO staff. Attention was given to the process of interviewing of participants and the screening. Monitoring of the fieldwork was done by spot checks and field oversight.

3.7 Ethical Considerations

The questionnaire used during the survey did not include sensitive questions. Data collection instruments did not contain unique identifiers. Names were recorded only on the patient information sheet, which were given to the participants. An informed consent statement was read to all respondents by the interviewer (Appendix III). Apart from general information about the study it also stated participants' right to refuse to answer to any question, stop the interview and the screening itself, and assured confidentiality of the information provided.

The data will be kept for 5 years in a secure place (GMEIPO archives). The research team only has access to these data. After 5 years the hard copies will be destroyed.

3.8 Screening

The general structure of the screening was the following:

- The interviewer obtained participants' consent.
- Then, the interviewer completed general information portion of the questionnaire.
- The participant was referred to an ophthalmic nurse, who measured presented Visual Acuity (VA) by Sivtsev's chart (or Landolt's chart).
- In case of blindness (VA less than 3/60), the ophthalmic nurse checked light perception and pupil reaction with torch in semi dark condition.
- In case of VA less than 6/18, the ophthalmic nurse conducted a pinhole examination.
- After measuring the visual acuity, the ophthalmologist checked the lens status by an ophthalmoscope in a shaded or dark area.
- If the study areas were established in the polyclinics of the towns, the ophthalmologist performed slit lamp examination in persons with VA <6/60.
- In case, the visual acuity of any or both eyes was less than 6/18 the eyes were examined to find the cause of low vision or blindness. An ophthalmologist did this using direct ophthalmoscope.
- If the ophthalmologist suspected glaucoma (the vertical cap-disk ratio was greater than 0.8 or the eye was stone hard on the digital palpation), she performed intraocular measurement using Maklakov's tonometer.

- If there was obvious lens opacity (a pupil that clearly appears grey or white when examined with oblique light in a shaded or darkened area) present in either or both eyes, the patient was referred to the interviewer to complete “Why the operation for cataract was not done” section.
- If the person was operated in one or both eyes, the interviewer completed “Details about cataract operation” section.
- Finally, the ophthalmologist completed Diagnosis and Remarks sections, as well as Patient Information Sheet; the latter was given to the participant.

3.9 Data review, entry, cleaning and analysis

The Survey Coordinator reviewed all data records and made appropriate corrections before starting data entry.

A data entry operator constructed a database using the SPSS statistical software package.

Trained data entry operators performed double entry and cleaning of the data. The statistical analysis was carried out using SPSS 11.0 software.

The program assistant and manager conducted data analysis including descriptive statistics (means, proportions, frequency distributions), associations among variables examining their patterns and strength. Statistical tests of significance were conducted using χ^2 tests.

4.0 Results

4.1 Distribution of Participants

Overall, 3,052 people were contacted, of which 2,365 (77.5%) were selected by a systematic random sampling technique and additional 687 (22.5%) were recruited during the survey by screening people aged 50 and above from neighborhoods of people who were absent or refused to participate. The participant distribution was summarized in Table 2.

Table 2. Distribution of Participants

PARTICIPANTS	N	%
Sampled	2,365	77.5
• Screened	1,100	36.0
• Non-responders	1,265	41.5
Absent	360	11.8
Refused to participate	598	19.6
No information	284	9.3
Dead	23	0.8
Additional List/Screened	687	22.5
Total/Obtained information	2,745	89.9
Total/Contacted	3,052	100.0

Some people from the preliminary sampling list were not available (n=360) or refused to participate (n=598), but information was obtained regarding their age and blindness status from neighbors, relatives or local health personnel. Their blindness status was categorized as “believed.” The main reason of being absent was being out of the country. Several attempts were made to contact those who refused to participate. Overall, information was obtained on 2,058 (87.0%) people from the preliminary sampling list. The main reason for refusal was absence of ophthalmic complaints.

Information about 284 (12.0%) people from the sampling list could not be obtained. Some of them were absent on the screening day and no accurate information could be obtained regarding their age and blindness status; some of them were not recognized by village people and could not be recruited for participation. The lists of residents in the study settlements provided by the regional departments of Gegharkunik marz were 5 months old and included names of 23 (1.0%) people who were dead at the time of the survey.

Additional 687 were recruited during the survey by asking people aged 50 and above from neighborhoods of people who were absent or refused to participate. This was done to assure adequate sample size. However, we could not combine the group of randomly selected people with the one with additionally recruited participants, because the blindness status in the latter group was statistically significantly higher ($p < 0.001$) than in the randomly selected group despite the similarities in socio-demographic characteristics (nationality, gender and age distribution). Combination of two groups would introduce a bias towards higher estimates of prevalence of blindness. Thus, the results are reported separately for each group throughout the report.

Comparison of blindness prevalence between randomly selected responders (examined subjects) and non-responders (refused and absent people) was made. The Chi square test of independence did not find statistically significant difference ($p = 0.06$) in blindness prevalence between responders and non-responders. That is why the data from responders and non-responders with available information in the randomly selected group are presented together.

4.2 General Information

Male/female distribution of the total contacted participants ($n = 2,058$) was the following: 46.4% male and 53.5% female. Information on gender was missing on some record forms (0.1%, $n = 2$).

The mean age of the participants was 67.9 (SD 9.7 years, median 65.0), ranging from 50 to 97 years old. The age distribution is presented in Table 3.

Table 3. Age and Gender Distribution of Participants (N=2,058).

Age groups	Males		Females		Total	
	N	%	N	%	N	%
50-59	348	36.5	340	30.8	689	33.5
60-69	320	33.5	383	34.8	703	34.2
70-79	245	25.7	300	27.2	546	26.5
80-89	36	3.8	65	5.9	101	4.9
≥90	4	0.4	12	1.1	16	0.8
Missing	1	0.1	2	0.2	3	0.1
Total	954	100.0	1102	100.0	2058	100.0

The majority of the participants were Armenians (99.6%, n=2049), 0.1% were Yesidi (n=3), and 0.1% Russian (n=3). No information on nationality was obtained for 3 people (0.1%).

Of all participants, 13.5% were refugees (n=278). This large number could be explained by the fact that several border villages, where refugees were concentrated, were studied. In Vardenis and Chambarak regions the percentage of refugees was higher compared to other regions of Gegharkunik marz (75.4% - in Chambarak region, 30.0% in Vardenis region, 1.0% in Sevan region, 0.6% in Gavar region and no refugees in Martuni region).

4.3 Vision

Grading

The levels of blindness and low vision were defined based on WHO recommended definitions [6]:

VA<6/18: visual impairment

VA<6/60: severe visual impairment

VA<3/60: blindness

Vision corresponding to Visual Acuity of 0.3 (6/18) or better was not examined further, in accordance with the International Classification of Diseases (ICD), 1975.

4.4 Blindness

Prevalence of blindness

The prevalence of blindness was 3.7% with 95% confidence interval (CI) of 3.5% to 3.9% [7] (the total number of cases 76); of the total, 0.5% (95% CI: 0.48%-0.52%) had bilateral blindness, and 3.2% (95% CI: 3.0%-3.4%) unilateral.

Bilateral blindness rate was higher in males than in females: 0.6% (95% CI: 0.57%-0.63%) and 0.4% (95% CI: 0.37%-0.43%), respectively. The same tendency was found in the rates of unilateral blindness. It was more frequent in males (3.8%, 95% CI: 3.5% to 4.1%) than in females (2.5%, 95% CI: 2.3%-2.7%).

The prevalence of unilateral and bilateral blindness increased with age (see Table 4).

Table 4. Rate of unilateral and bilateral blindness by age groups (N=2,058).

Age categories	Bilateral Blindness (N)	Unilateral Blindness (N)	Prevalence bilateral blindness (%)	Prevalence unilateral blindness (%)	Total participants (N)
50-59	0	4	0.0	0.6	689
60-69	3	18	0.4	2.6	703
70-79	6	34	1.1	6.2	546
80-89	2	7	2.0	7.0	100
≥90	0	1	0.0	6.3	16
Missing	0	1	0.0	6.3	3
Total	11	65	0.5 (0.48 to 0.52)*	3.2 (3.0 to 3.4)*	2058

* 95% Confidence interval

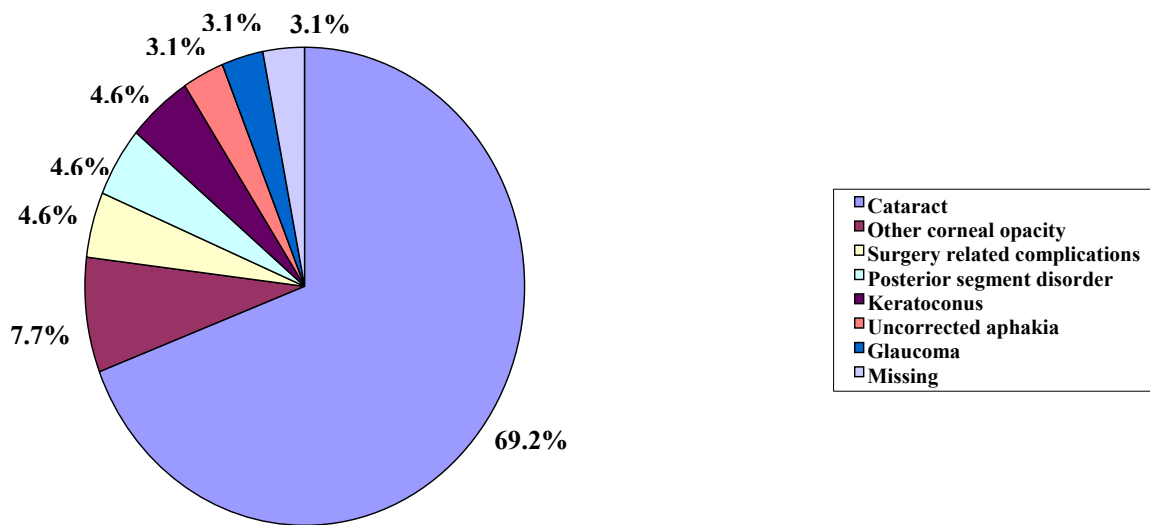
Causes of unilateral and bilateral blindness

The main cause of both unilateral and bilateral blindness was cataract. The prevalence of bilateral cataract blindness was 0.4% (95% CI: 0.38% to 0.42%) and the prevalence of unilateral cataract blindness – 2.2% (95% CI: 2.0 to 2.4). Unilateral cataract was observed in 69.2% of cases with unilateral blindness and in 72.7% of cases with bilateral blindness.

Other causes of bilateral blindness were: glaucoma (9.1% [n=1] of all bilaterally blind cases) and diabetic retinopathy (9.1% of all bilaterally blind cases). In one bilaterally blind patient, the cause of blindness in one eye was cataract while another eye was blind due to glaucoma. Some reasons of blindness were not included in the list of the record form and they were recorded as others (e.g., hypertensive angioretinopathy, keratoconus).

Among other causes of unilateral blindness were other corneal opacity (7.7%, n=5), surgery related complications (4.6%, n=3), other posterior segment disorder (4.6%, n=3), keratoconus (4.6%, n=3), uncorrected aphakia (3.1%, n=2), glaucoma (3.1%, n=2), and two reasons (3.1%) of unilateral blindness were missing (see Figure 1).

Figure 1. Causes of Unilateral Blindness (N=65).



Prevalence of cataract blindness

Cataract is the main cause of low vision and blindness in the world [8]. It accounts for a large proportion of the workload of most ophthalmologists and eye clinics. In many cases, full sight can be restored after a relatively simple operation, even among those who have been blind from cataract for many years [8].

People were classified as having cataract blindness when the visual acuity in one or both eyes was poorer than 3/60 and the impairment was attributable to lens opacity. The cataract was found to be the main cause of blindness in both unilaterally blind (69.2%) and bilaterally blind people (72.7%). The prevalence of unilateral and bilateral cataract blindness was respectively 2.2% and 0.4%. Specific age tendency in the cataract blindness prevalence was not found (see Table 5).

Table 5. Rate of cataract blindness among different age groups of participants (N=2,058).

Age categories	Unilateral Cataract Blindness (N)	Bilateral Cataract Blindness (N)	Prevalence Unilateral Cataract Blindness (%)	Prevalence Bilateral Cataract Blindness (%)	Total Participants (N)
50-59	1	0	0.1	0.0	689
60-69	11	1	1.6	0.1	703
70-79	25	5	4.6	0.9	546
80-89	7	2	7.0	2.0	101
90-97	1	0	6.3	0.0	16
Missing	0	0	0.0	0.0	7
Total	45	8	2.2 (2.0 to 2.4)*	0.4 (0.38 to 0.42)*	2058

* 95 % confidence interval

4.5 Causes of low vision

The study revealed also the reasons of visual impairments (VA<6/18) and severe visual impairment (VA<6/60).

In cases with VA<6/18 the most common cause of both unilateral and bilateral visual impairment was cataract (74.5% and 70.4%, respectively). Other major causes of unilateral visual impairments were: refractive errors (5.1%), other posterior segment disorders (4.1%), other corneal opacities (3.1%) and uncorrected aphakia (2.0%).

In cases with bilateral blindness another major cause was refraction pathology (18.3%).

Cataract was responsible for most cases with both unilateral and bilateral severe visual impairments also. It constituted two-thirds of all cases with unilateral and bilateral severe visual impairments (75.0% and 75.5% respectively). Among other causes of bilateral visual impairments were observed refraction errors (12.5%), macular degeneration (8.6%) and uncorrected aphakia (4.2%).

In cases with unilateral severe visual impairments other common causes were: glaucoma (5.7%), other posterior segment disorders (5.7%), uncorrected aphakia (3.8%), and other corneal opacities (3.8%).

Cataract

Besides being the most common cause of unilateral and bilateral blindness cataract was the most frequent pathology. The prevalence of cataract, independent of stage, was 15.6% (95% CI: 14.0% to 17.2%). It constituted the major part of all eye pathologies (80.3%). The highest rate of cataract was in the age group 80-89 (30.7%) and among females (16.2%) (see Tables 6 and 7).

Table 6. Prevalence rates of cataract (N=2,058).

Age categories	n	Prevalence cataract (%)	Total participants (N)
50-59	18	2.6	689
60-69	114	16.2	703
70-79	157	28.8	546
80-89	31	30.7	101
90-97	1	6.3	16
Missing	0	--	7
Total	321	15.6 (14.0 to 17.2)*	2058

* 95% confidence interval

Table 7. Gender distribution of cataract patients (N=2,058).

Gender	Total cataract (N)	Prevalence cataract (%)	95% CI	Total participants (N)
Male	143	15.0	12.7 to17.3	954
Female	178	16.2	14.0 to18.4	1102
Missing	0	0.0	--	2

4.6 Cataract surgery

Prevalence of (pseudo)aphakia

Aphakia and pseudoaphakia indicate that a person had cataract surgery in one or both eyes. A person is aphakic when the entire lens was removed and pseudoaphakic when an artificial lens was placed inside the eye [8]. Among the participants, 3 had bilateral aphakia and 10 unilateral aphakia. Sixteen people had intraocular lens implanted in eyes, from which in 3 cases IOL implantation was done in both eyes (bilateral pseudoaphakia) and in one eye (unilateral pseudoaphakia) in 13 cases (see Table 8).

Table 8. Prevalence of (pseudo)aphakia (N=2,058).

	N	%	95% CI
No aphakia	2029	98.7	97.60 to 98.80
Bilateral aphakia	3	0.1	0.09 to 0.11
Unilateral aphakia	10	0.5	0.48 to 0.52
Bilateral pseudoaphakia	3	0.1	0.09 to 0.11
Unilateral pseudoaphakia	13	0.6	0.58 to 0.62
Total	2058	100.0	--

Overall, 35 eyes had been operated on among study participants. Of those, 16 (45.7%) had extra capsular cataract extraction (ECCE) without IOL, and 19 eyes (54.3%) ECCE with IOLs. The mean age for cataract surgery was 66.5 year old (± 8.5). No association between age at operation and gender was found (X^2 test, p-value 0.3).

Table 9. Types of cataract surgery by gender.

Gender	IOLs		Non-IOLs		Total eyes	
	Eyes	%	Eyes	%	Eyes	%
Male	14	73.7	11	68.8	25	71.4
Female	5	26.3	5	31.2	10	28.6
Total	19	100.0	16	100.0	35	100.0

In order to assess the quality of cataract services, visual outcomes after cataract surgery were evaluated. WHO recommended definition of acceptable outcomes was used in this analysis [9]. Of all operated eyes, 22.9% (n=8) had poor visual outcomes, almost four times more than accepted WHO standards. The following factors could determine the poor outcomes: preexisting conditions of the eye, poor expertise of the surgeon, inadequate surgical technique used, poor postoperative management, and inadequate correction of the residual error post operatively. In this study, the impact of the surgical technique used was examined. Analysis indicated better outcomes after ECCE with IOL than without IOL, although the difference was not statistically significant (X^2 test, p-value 0.4) (see Table 10).

Table 10. Visual outcomes after cataract surgery with available correction.

Category of Visual Acuity (WHO)	IOLs		Non-IOLs		Total eye	
	Eyes	%	Eyes	%	Eyes	%
Normal vision	13	68.5	7	43.7	20	57.1
Visual impairment	2	10.5	5	31.3	7	20.0
Severe visual impairment	2	10.5	3	18.8	5	14.3
Blindness	2	10.5	1	6.2	3	8.6
Total	19	100.0	16	100.0	35	100.0

The major causes of poor visual outcomes varied significantly depending on the surgical technique used. Surgery related complications only were responsible for poor outcomes after ECCE with IOL , and uncorrected aphakia was responsible for the majority of the problems (70.0%) after ECCE without IOL.

The majority of the participants reported that the regional hospital in province was the most common place for cataract surgery, both for ECCE with IOL (78.9%) and ECCE without IOL (87.5%). Only 14.3 % of the participants had surgery in public hospitals in Yerevan (see Table 11).

Table 11. Place of cataract surgery.

Place of surgery	IOLs		Non-IOLs		Total eye	
	Eyes	%	Eyes	%	Eyes	%
Governmental hospital in Yerevan	3	15.8	2	12.5	5	14.3
Governmental hospital in province	15	78.9	14	87.5	29	82.8
Other country	1	5.3	0	0.0	1	2.9
Total	19	100.0	16	100.0	35	100.0

One of the aims of cataract services is to meet the demand for cataract surgery, so that everyone with ‘operable’ cataract (visual loss justifying surgery) can receive surgery if they wish (100% coverage). Cataract surgical coverage is defined as the proportion of patients or eyes with operable cataract, who have already received surgery. Coverage varies according to the level of visual acuity used to indicate surgery; VA less than 3/60, 6/60 or 6/18 can be used as an indication for surgery [10, 11]. It is important to calculate the cataract surgical coverage for all three levels of visual acuity, because it is not possible to assess whether patients with operated eye were actually blind (VA<3/60), severely visually impaired (VA<6/60) or visually impaired at the time of surgery [11].

In the study the cataract surgical coverage (CSC eyes) was estimated at 36.5% (VA<3/60), higher for males (47.2%), than females (23.3%) (see Table 12). This tendency prevailed for all three levels of VA and are significant. Cataract surgical coverage (CSC persons) was 63.6% (VA<3/60).

Table 12. Cataract surgical coverage by VA in persons and eyes.

	Cataract Surgical Coverage					
	Persons			Eyes		
	Males	Females	Total	Males	Females	Total
VA<6/18	23.2%	7.2%	14.4%	13.2%	4.6%	8.6%
VA<6/60	60.0%	18.2%	38.1%	29.8%	11.4%	20.3%
VA<3/60	76.9%	44.4%	63.6%	47.2%	23.3%	36.5%

These data corresponds with the finding from a recent study in India, which showed that females are less likely to be operated for cataract (adjusted OR 0.71, 95% CI: 0.57 to 0.87) although the cataract blindness burden is higher for females ($p < 0.001$) [12]. There are many gender-related factors which are the major predictors for greater ill-health of women, including longer life expectancy, which increases their risk of exposure to non-fatal age-related health outcomes, such as cataract. Lower status of women in the family and financial dependence on men, especially in rural areas, could possibly contribute to this inequality in Armenia. Achieving equal surgical coverage between sexes could result in considerable reduction in blindness in rural areas of the country.

Surgical coverage surveys from other parts of the world have reported: Malawi < 15%, Paraguay 36%, and Karnataka State, India 40% for bilateral < 6/60 due to cataract [13-14]. Community based surveys conducted in 19 rural districts in the south-west and one urban district in the north-west of India found Cataract Surgical Coverage (VA < 3/60) ranging from 42%-67% for 'persons' and 22%-45% for 'eyes' [11]. The numbers obtained for the Gegharkunik marz are falling in CSC range reported for Indian districts.

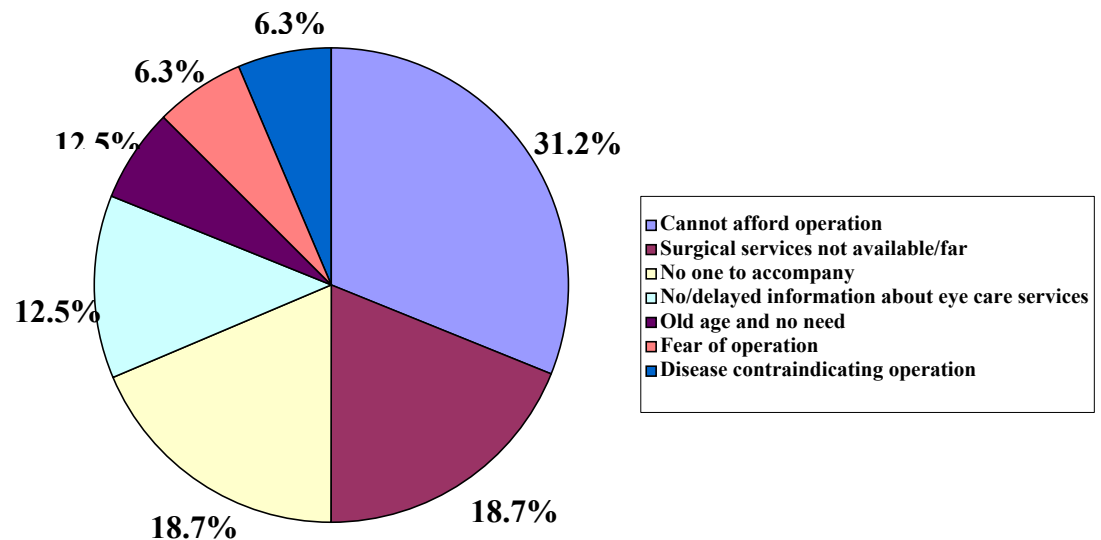
4.7 Barriers to Cataract Surgery

Barriers in people bilaterally blind due to cataract

Not all patients, blind due to cataract, undergo operation. Many of patients with cataract are not operated on because of certain problems. The most frequently mentioned cause (31.2%) was high price. Some participants mentioned that they are aware of the problem but cannot afford such an operation. Other major causes were inaccessibility of surgical services (18.7%) and having no one to accompany them (18.7%). Among other causes of bilateral not operated cataract blindness were mentioned no or delayed information about possible

ophthalmic interventions (12.5%), old age and not feeling the need (6.3%), fear of operation (6.3%), and existence of diseases contraindicating surgery (6.3%) (see Figure 2).

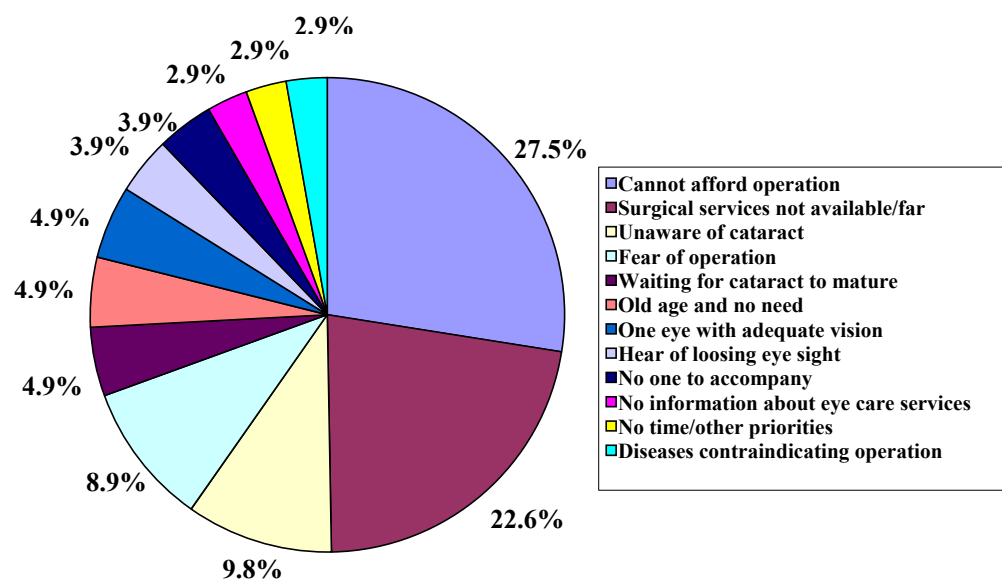
Figure 2. Distribution of reasons for not being operated in bilaterally blind patients.



Barriers in people unilaterally blind due to cataract

As in case of unilateral blindness, the main reason of not getting operated in people unilaterally blind due to cataract was unaffordability (27.4%). Another major cause of not getting operated was inaccessibility of ophthalmic services (22.5%). Among other causes mentioned were being unaware of cataract (9.8%), fear of surgery (8.8%), waiting for cataract to mature (4.9%), old age and not feeling the need (4.9%), one eye adequate vision and not feeling the need (4.9%), fear of losing eye-sight (3.9%), having no one to accompany them (3.9%), existence of diseases contraindicating operation (2.9%), not having time or having other priorities (2.9%), and no or delayed information about possible ophthalmic interventions (2.9%) (see Figure 3).

Figure 3. Distribution of reasons for not being operated in unilaterally blind patients.



4.8 Clinical Diagnosis and Required Actions

Prevalence of eye pathologies independent of blindness status

Among new sections added to the original record form was the Clinical Diagnosis section.

The main intention of adding this section was to find eye pathologies independent of blindness status in people aged 50 and over. Overall 562 persons (27.3%) of all participants had eye problems.

Besides cataract, refractive errors and glaucoma were among the most frequent eye pathologies and main causes of bilateral and unilateral blindness in study participants, with prevalence of 4.1% (95% CI: 3.9% to 4.3%), and 0.7% (95% CI: 0.68% to 0.72%), respectively.

Prevalence of the diseases is presented in Table 13.

Table 13. Distribution of major eye pathologies among participants.

Pathology	Number of patients	Percent among eye pathologies	Percent among screened N=1100	Percent among contacted N=2058	95% CI for contacted
Cataract	321	57.1	29.2	15.6	14.0 to 17.2
Refraction pathology	85	15.1	7.7	4.1	3.90 to 4.30
Conjunctivitis	29	5.2	2.6	1.4	1.30 to 1.50
Dacryocystitis	16	2.8	1.5	0.8	0.78 to 0.82
Glaucoma	14	2.5	1.3	0.7	0.68 to 0.72
Other corneal opacity	12	2.1	1.1	0.6	0.58 to 0.62
Pterigium	12	2.1	1.1	0.6	0.58 to 0.62
Macular degeneration	12	2.1	1.1	0.6	0.58 to 0.62
Other retinal pathologies	10	1.8	0.9	0.5	0.48 to 0.52
Nerve atrophy	9	1.6	0.8	0.4	0.38 to 0.42
Diabetic retinopathy	8	1.4	0.7	0.4	0.38 to 0.42
Uncorrected aphakia	8	1.4	0.7	0.4	0.38 to 0.42
Hypertensive angiopathy	6	1.1	0.5	0.3	0.28 to 0.32
Retinal vein occlusion	6	1.1	0.5	0.3	0.28 to 0.32
Atrophy/Absent globe	4	0.7	0.4	0.2	0.18 to 0.22
Strabismus	3	0.5	0.3	0.1	0.09 to 0.11
Anterior uveitis	2	0.4	0.2	0.1	0.09 to 0.11
Keratoconus	2	0.4	0.2	0.1	0.09 to 0.11
Ectropion	2	0.4	0.2	0.1	0.09 to 0.11
Surgery related complications	2	0.4	0.2	0.1	0.09 to 0.11

Refraction pathologies

Refraction pathology is considered the most common eye disease in adults. It is found in approximately 25% of the adult population of the US [15]. Refraction is the phenomenon in which parallel rays of light entering the eye at rest are brought to focus on the retina (nerve layer of the bottom of eye). This makes image formation possible for eye. If the image of a distant object cannot be focused exactly on the retina, refraction pathology occurs [16].

Examination indicated that it was the second most common eye pathology in the study area. It was observed in 7.7% of screened cases (n=85). The prevalence of refractive errors was 4.1% (95% CI: 3.9% to 4.3%). Presbiopia was considered not as pathology but as a

phenomenon of aging. Only cases of hypermetropia and myopia were recorded as refraction pathologies. The highest rate of refractive pathologies was in females and in age group 50 - 59 (see Tables 14 and 15).

Table 14. Rate of refractive pathologies by age group (N=2,058).

Age categories	Total refractive errors (N)	Prevalence refractive errors (%)	Total participants (N)
50-59	36	5.2	689
60-69	32	4.6	701
70-79	16	2.9	545
80-89	1	1.0	100
90-97	0	0.0	16
Missing	0	0.0	7
Total	85	4.1 (3.9 to 4.3)*	2058

95% Confidence interval

Table 15. Gender distribution of patients with refractive errors (N=2,058).

Gender	Total refractive errors (N)	Total participants (N)	Refractive errors % (95% CI)
Male	30	954	3.1 (2.8 to 3.4)
Female	55	1102	5.0 (4.7 to 5.3)
Missing	0	2	--

Glaucoma

Glaucoma is a group of diseases that can damage the eye's optic nerve and result in blindness. It is one of the leading causes of preventable blindness in high-income countries. There are no early warning signs for this dangerous disease that is sometimes called the "sneak thief of sight." Early diagnosis and ongoing treatment can help slow or stop further vision loss [8, 17 - 19].

A total of 14 patients (1.3% of contacted people) were diagnosed with glaucoma. The rate was higher in males than in females (1.0% versus 0.4%), and in the age group 80 – 89 (5.5%).

There were patients who had two different eye pathologies. Glaucoma was also diagnosed with other groups of diseases. For instance, in 2 cases it was combined with other corneal opacities, in 2 cases with optic nerve atrophy, and one with diabetic retinopathy.

Cataract was combined with refraction pathology in 6 cases, with conjunctivitis in 6 cases, with glaucoma in 5 cases, with diabetic retinopathy in 5 cases, with optic nerve atrophy in 3 cases, with uncorrected aphakia in 3 cases, with pterigium in 2 cases, with strabismus in 2 cases, and in one case it was combined with other corneal opacity.

Required Actions¹

Majority of the participants required some eye care. Only 17.1% of the 1100 examined participants did not need any immediate actions. Cataract surgery was recommended to 211 patients (19.3% of screened patients), medications were prescribed to 227 patients (20.6%). Half of the screened participants needed eyeglasses either for close or for far distances (54.7%). Among other required actions mentioned were eyelid surgery (0.5%), ultrasound eye exam (0.2%), keratoplastics (0.2%), laser coagulation (0.2%), and surgical removal of pterigium (0.1%).

The required actions along with recommendations were recorded on the patient information sheet, which was given to the participant. The sheet will help the regional ophthalmologists

¹ We reported the numbers for Required Actions for 1100 people from the randomly selected group, because they went through detailed eye examination. For the other 950 we had only “believed” information about their age and blindness status.

to follow the pool of patients identified during the study. Also, it will be considered as a referral document after the ROU is established in Sevan.

5.0 Additionally recruited participants

As a result of high rates of absenteeism and refusals, a decision was taken to recruit additional people aged 50 and over residing in the chosen settlement. Overall, 687 additional people were recruited and screened. Most of them were recruited from the neighborhood of people who were absent or refused to participate. However, the data obtained from this group could not be combined with the one from the group of randomly selected people, because statistically significant difference in blindness prevalence was found between the groups despite similarities in the socio-demographic characteristics.

Race, age and sex composition of additionally recruited people did not differ from the composition of randomly selected people. The vast majority were Armenians (99.1%). Most of additionally recruited participants were females (54.8% vs. 45.2%). Number of participants aged 50 to 59 prevailed on other age groups. Only three participants aged 90 and over. Among the participants 12.8% were refugees. Number of refugees was higher in border villages when compared to other settlements.

The analysis showed that the opportunity of free of charge eye examinations mostly attracted people having eye complaints and pathologies. This factor resulted in statistically significant differences between rates of visual impairment, severe visual impairment, and blindness between two groups of participants (randomly selected vs. additionally recruited).

The rates of visual impairment (VA<6/18) were almost two times higher in additionally recruited people compared to the randomly selected group. The rate of severe visual impairment (VA<6/60) was more than three times higher. The highest difference was in

blindness. The rates were more than five times higher for both eyes in additionally recruited people when compared to sampled participants (see Table 16).

Table 16. Comparison of blindness status between additionally recruited participants and participants selected using systematic random cluster sampling technique.

Participants	Visual impairment VA <6/18		Severe visual impairment VA <6/60		Blindness VA <3/60	
	Right eye	Left eye	Right eye	Left eye	Right eye	Left eye
	Main list (N)	171	157	45	56	40
Additional list (N)	109	108	50	63	69	82
Main list (%)	8.3	7.6	2.2	2.7	1.9	2.3
Additional list (%)	15.9	15.7	7.3	9.2	10.0	11.9

The prevalence of unilateral cataract blindness was 10.8% (almost five times higher than in randomly sampled people), and the prevalence of bilateral cataract blindness, 1.7% (almost four times higher).

The main cause of blindness was attributable to cataract. In cases with unilateral and bilateral blindness, cataract was responsible for 66.1% (n=74) and 63.1% (n=12) of cases, respectively. Among other causes glaucoma can be mentioned as another frequent cause of unilateral blindness (11.5% of all unilateral blind cases).

Cataract surgical coverage rate for eyes was 44.3% and 74.5% for persons (vs. 36.5% and 63.6% in the randomly selected group) (see Table 17). The higher coverage among people from additional list could be explained by the fact that people who experienced cataract surgery before, in one or both eyes, were interested to come for additional check up. The rate of aphakia among participants (5.6% in additional list vs. 0.6% in the main list) supports this conclusion.

Table 17. Cataract surgical coverage by VA for persons and eyes (additionally recruited people).

	Cataract Surgical Coverage					
	Persons			Eyes		
	Males	Females	Total	Males	Females	Total
VA<6/18	49.2%	29.0%	39.7%	22.4%	14.7%	19.2%
VA<6/60	60.5%	40.6%	52.6%	32.9%	25.0%	30.0%
VA<3/60	75.0%	71.4%	74.5%	42.9%	45.2%	44.3%

CSC (eyes) for females was slightly higher than males (45.2% vs. 42.9%). However, CSC (persons) was higher for males than females (75.0% vs. 71.4%), which corresponds with the results from the main list.

The main barriers for not getting operated were unaffordability (39.3% of all cases with cataract) and unavailability of eye care services (26.3%).

Overall, 79.6% of additionally recruited patients (n=547) had eye pathologies, while this number was only 27.3% for the group of randomly selected people. More than one-third of people who came for the examination were diagnosed as having cataract (37.3%). Refraction pathologies (11.9%), glaucoma (5.7%), conjunctivitis (4.6%), diabetic retinopathy (3.2%), pterigium (2.5%), hypertensive angioretinopathy (1.9%), nerve atrophy (1.9%), and uncorrected aphakia (1.9%) were also observed in this group. Combinations of two different pathologies were not rare. Most frequently cataract was combined with diabetes (9 cases) and with refraction pathologies (7 cases). Two patients had three combined pathologies. One of them had cataract, glaucoma and refraction error, while another had cataract, conjunctivitis and optic nerve atrophy.

Almost half of the additionally recruited participants needed eyeglasses. Cataract surgery was recommended to almost one-third of additionally recruited participants (27.9%). Of all

256 unilateral and bilateral cataract cases, 75.0% required cataract surgery at the time of examination. In general, medications were prescribed to 169 patients and glaucoma treatment was recommended to 33 patients.

6.0 Conclusions/ Limitations/Recommendations

6.1 Conclusions

The study was a valuable and an important first step in implementing “Strengthening Regional Ophthalmic Services in Gegharkunik Marz” project. Firstly, it provided service and thorough eye examination to 1787 inhabitants of Gegharkunik marz. Secondly, it provided population-based information on prevalence and main causes of blindness, as well as cataract services, which could be generalizable for the country.

Detailed information about cataract surgical services was obtained, such as barriers to cataract surgery, technique used, and place of surgery. The cataract surgical coverage rate was computed, the low rate of which proves once more the necessity of having specialized eye care in the marz. The data can be used for ongoing monitoring of the program as well as for other cataract intervention programs in the marz.

The findings can be generalized to the population of Gegharkunik Marz aged 50 and over since the sample was selected using stratified multi-stage, systematic cluster sampling, and design effect of the cluster sampling was taken into account while computing the sample size.

The results of the screening indicate that low vision and blindness are important public health problems for the population of Gegharkunik marz. The 3.7% of blindness estimated in the marz exceeds the numbers reported for European countries [20] (see Table 18).

Table 18. Prevalence of blindness in Europe.

Country	Survey Date	Population covered	Age range	Number examined	Blindness prevalence	Leading causes of blindness
Italy	1992	Casteldaccia, Sicily	≥40 y	1,068	0.47*	20% Cataract, 20% Glaucoma, 20% Refractive, 20% Optic Atrophy, 20% Macular degeneration
France	1990	Bouche du Rhone Department	Not listed	69,356	0.2	Not listed
Ireland	1990	Roscommon	> 50 y	2,186	0.5*	Not listed
Bulgaria	1993	Sofia district, urban and rural	≥40 y	6,275	0.49*	27% Cataract **, 18% Glaucoma, 18% Macular degeneration

* Restricted age group

** Cataract alone or in combination

The Needs Assessment phase of the project revealed that cataract constituted the major cause of bilateral and unilateral blindness (69.7% of all cases of blindness) and was responsible for majority cases of low vision and visual impairments (76.1%).

CSC (persons) was low among study population, with VA<3/60, estimated at 63.6%. There is a significant gender difference in CSC: 44.4% among females vs. 76.9% among males.

CSC (eyes) for VA<3.60 was much lower (36.5%). The same gender difference was noticed for CSC eyes (47.2% for male vs. 23.3% for female). Such contributing factors as high rate of unemployment among women, which creates financial dependence on men, as well as lower status of women in the family in the rural areas, could possibly play a role in this phenomenon.

Barriers to cataract surgery were determined. The main reasons were unaffordability of ophthalmic services (more than one-third of all causes of not being operated in people having either unilateral or bilateral cataract) in terms of high costs and unavailability (about one-fifth

of all reasons of not being operated in patients having cataract) of those services. The latter is especially important, since specialized eye care is not available in the marz [5].

Absence of high quality eye care led to increased rates of eye diseases. Cataract prevalence independent of the stage was 15.6% among contacted participants, of which (65.7%) required surgical intervention. Refractive pathologies were also frequently diagnosed (in 4.1% of screened people), as well as conjunctivitis (1.4%) and glaucoma (0.7%). Most required and recommended actions for the study participants, including cataract surgery, laser coagulation, eye ultrasound examination, and keratoplasty, were unavailable in Gegharkunik marz. Two hundred eleven people from the randomly selected group were referred for cataract surgery. This number along with low cataract surgical coverage rate (8.6% (VA<6/18), 20.3% (VA<6/60), and 36.5% (VA<3/60) for eyes and 14.4% (VA<6/18), 38.1% (VA<6/60), and 63.6% (VA<3/60) for persons) justifies the need for a modern ROU in the marz. In addition, achieving equal surgical coverage between genders could be one of the main foci of the project, which could result in substantial reduction in blindness in the area.

6.2 Limitations

As with all field projects, this study was subject to a number of limitations that might influence the generalizability of the findings.

- Stratified multi-stage, systematic cluster sampling was used. The final lists of the population of the selected settlements were obtained from the 5 regional departments of Gegharkunik marz. The lists were not perfect. They were 5 months old, which resulted in selecting some people who were dead at the time of the survey. Moreover, city/village people did not recognize some of the people mentioned in these lists, indicating false/outdate information indicating inaccurate and outdated information.

- Absenteeism and refusals were higher in cities. The probability of not finding a person in the settlements with large population was higher compared to villages where people knew each other and village ambulatory nurses had records on all villagers. It was less likely that a blind person, especially with bilateral blindness, could come for an examination. On the other hand, people without apparent health problems frequently refused to come for a screening explaining their refusal by having no complaints.
- The percentage of people from the sampling list who were absent and no accurate information was available on their age and blindness status was high.
- Information on people who were absent or refused to participate were categorized as “believed” blind or not based on the answers of relatives, neighbors, or local health personnel. This may have resulted in false negative and false positive answers. Moreover, taking into account the fact that some absent people were absent from the country for a long time, neighbors, relatives, or health personnel could be unaware of their current blindness status.
- In the towns Sevan, Gavar, and Martuni, some patients with Visual Acuity less than 3/60 were also examined by a slit lamp for diagnosis confirmation. This could lead to over-detecting eye pathologies in these towns compared to other settlements where a slit lamp was not used.
- In the section “Causes of vision less than 6/18” of the record form some causes were not mentioned, and there was no “Other” option; this resulted in missing some causes. Sometimes absence of the option “Do not know” in the section “History if not examined” might have biased some answers towards either blind or not blind.

6.3 Recommendations

The needs assessment in Gegharkunik marz was the first step of the 3 year program aimed at improving ophthalmic services in remote and underserved regions of Gegharkunik marz. As a result of this phase the following recommendations are made:

- High rates of all cause blindness as well as cataract blindness and low CSC justify the need for the ROU in Gegharkunik marz. Another justification is unaccessability of ophthalmic services mentioned by the vast majority of the participants with low vision.
- The majority of people with mature cataract mentioned unaffordability of ophthalmic surgical services. Thus, appropriate financial planning should be developed for the work of the ROU to be able to serve vulnerable layers of the population who otherwise cannot afford it.
- The study found statistically significant gender differences in cataract surgical coverage (CSC), which could be attributed to lower status of Armenian women, especially in rural areas. Another reason for this difference could be women's financial dependence on men. The study is directed towards vulnerable populations, this issue can be taken into account in selecting patients for cataract interventions. These gender differences should be taken into account, when developing appropriate mechanisms for targeting and treating vulnerable populations.
- Establishment of the village examination centers will support the work of ophthalmic departments of regional polyclinics, especially, in the remote villages which during winter months are isolated from the regional centers and in Chambarak region, which does not have an ophthalmologist.

- Ophthalmic departments of regional polyclinics lack basic ophthalmic examination equipment, as well as essential ophthalmic drugs. This should be taken into account when establishing village examination centers.
- Increasing the awareness of general population on prophylactic eye check-ups through eye health education is necessary, for early diagnosis and treatment of the main blinding conditions, especially cataract and glaucoma.
- Mass screenings are necessary to reveal eye pathologies in early stages.
- Additional analysis is needed to calculate age, and gender - adjusted prevalence of blindness and low vision. Furthermore, more detailed comparison of responders vs. non-responders, and sampling list vs. additional participants should be done, in order to extract more and precise information from the collected data.

7.0 Plans for future actions

Over the course of one year, a series of interrelated tasks aimed at infrastructure building and human resources development in Gegharkunik marz will be completed. GMEIPO/CHSR staff will serve as the technical leadership for the project, with the oversight and support of the ALC and MOH.

An overview of each task is presented below.

7.1 Renovation of the facilities

The Sevan Regional Polyclinic (SRP) has been selected and approved by the LCIF as the optimal site for the ROU in Gegharkunik marz.

In February 2004, the consortium partners will gather to approve a detailed plan for renovating the facility for its new role as a regional ophthalmic unit. The facility will be

renovated in accordance with MOH and international standards and licensed by the MOH and Sanitary Epidemiology Commission [21 -23].

Lead GMEIPO/CHSR staff along with CHSR expatriate faculty will:

- Provide detailed description of the existing facilities
- Present to the Sight First Committee a detailed plan of the building, prepared by the project architect and approved by the participating parties
- Conduct competitive bidding process to assure the proposal representing the best value (quality for cost) is selected.
- Organize and monitor renovation process
- Evaluate the renovation process and provide a thorough report to the SightFirst Project and Advisory Committees and the MOH.

The MOH and NIH partners will monitor the facilities' renovation process. The local authorities will organize installation and maintenance of water, sewage, and electric connections. The NIH consultant will provide technical guidance and assess the conformity of the facilities to the stated standards. The MOH consultant will oversee the licensing of the facility. ALC representatives will regularly monitor the progress of this phase of the project and provide report to LCIF on the capacity building process.

The renovated regional ophthalmic unit (ROU) will be equipped per the WHO standard list [24]. The equipment will include diagnostic and surgical equipment, sterilizing system, furniture and computers. GMEIPO will be responsible for the overall process of equipment procurement that involves choosing, buying, ordering and coordinate shipping.

In parallel with the facilities renovation and obtaining equipment, standardized working procedures for the staff will be developed using MOH and WHO standards. GMEIPO/CHSR staff will work closely with consultants from the MOH and NIH. As part of the process, a formal quality assurance system that will monitor clinical parameters such as intra-operative complications and clinical outcomes will be established. The data will be routinely reviewed and analyzed to provide formative, process and outcome performance assessments and guidance for continuous quality improvement. Increased quality and clinical effectiveness will be the main expected outcomes of this component of the project.

7.2 Training

Key personnel will receive training specifically developed for their needs. Training will consist of international experiences, local academic training, and local practical training covering both treatment and management skills as appropriate for the person's role in the new system of care.

Starting in the spring quarter, GMEIPO/CHSR, AUA faculty, NIH, SHCMA, and Ophthalmic Society of Armenia (OSA) members will develop a detailed curriculum for training the ophthalmologic staff and training of trainers. Staff of the Ophthalmic Department at NIH will provide guidance in the conceptual design of the training materials and provide critical review of work plans and draft materials. Assigned personnel of the Republican Eye Clinic will be responsible for the surgical part of the training. SHCMA staff will prepare appropriate materials in health organization, financing and delivery.

Fellowship for regional ophthalmologist (4-months) will include extensive surgical training with emphasis on cataract surgery.

A companion program for ophthalmic nurses will be developed for a 4-6 week course and will include joint periods of training with ophthalmologists (public health ophthalmology and management classes). During the course, regional ophthalmic nurses will be trained on patient processing, reception/registration, pre-operative procedures, operating theater procedures, sterilization procedures, medical records maintenance and outreach activities.

Village Examination Center Nurses will be training in basic screening and assessment procedures and briefed on the services and procedures for accessing the ROU.

Field Staff will be trained for survey/assessment/monitoring work as appropriate to their assigned tasks.

In the framework of training of trainers, the Program Manager will spend two weeks in a management training course at the Aravind [25] to acquire new skills for setting up community eye health programs in keeping with the precepts of the this project as well as for future projects of GMEIPO.

In addition, it is planned to organize a two-month fellowship in LAICO for one ophthalmologist [26] and three months fellowship for two nurses [27] working in ROU to perfection their surgical skills and theoretical knowledge. Both courses are recommended to conduct simultaneously for the whole staff following completion of their fellowship training in Armenia.

The quality of personnel training will be monitored and assured by GMEIPO. GMEIPO staff will track of the trained personnel's work and assess surgical outcomes.

To make eye care affordable and accessible to the majority of the population of Gegharkunik marz and neighboring regions, a detailed economic analysis and calculation of minimum possible per unit surgical cost will be conducted by GMEIPO/CHSR.

During the fall months of 2004 of the project, GMEIPO/CHSR staff, guided by AUA faculty consultants and experts from the MOH and the School for Health Care Management and Administration (SHCMA), will develop alternate payment scenarios, each with its own pricing, patient volume per pricing category, and costs assumptions. All plans will ensure that the most vulnerable populations (disabled, refugees, nursing home residents, etc.) will be provided free services and those near-vulnerable (low-income) groups will be partially subsidized.

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9.1 APPENDIX I.

MAP OF GEGHARKUNIK MARZ



9.2 APPENDIX II.



TRAINING MANUAL

RAPID ASSESSMENT OF CATARACT SURGICAL SERVICES

CATARACT SURGICAL SERVICES SURVEY RECORD

The **Cataract Surgical Services Survey Record** (adapted version)* is developed to facilitate the collection of data in population based Rapid Assessments for Cataract Surgical Services (RACSS).

The purpose of the **Cataract Surgical Services Survey Record** is to collect essential information that will:

- Estimate the prevalence of blindness, severe visual impairments, and visual impairment in Gegharkunik marz;
- Assess the prevalence of cataract and other major causes of blindness;
- Estimate the prevalence of aphakia and pseudophakia;
- Calculate the cataract surgical coverage rate for the province;
- Find details of cataract surgery: age at time of surgery, place of surgery, use of glasses, reasons for not using glasses and type of surgery;
- Evaluate the visual outcomes from cataract surgery and identify the major causes of poor visual outcomes;
- Identify barriers to cataract surgery;
- Estimate the population in need for eye care services in Gegharkunik marz and recommend the scope of work of ROU;
- Allow cataract case finding;
- Facilitate marketing of cataract surgery.

All indicators are subdivided by sex and in many cases also by age group. The indicators thus obtained can be used as baseline information for the formulation of eye care programs and for regular monitoring and/or evaluation of ongoing cataract intervention programs.

STRUCTURE OF THE CATARACT SURGICAL SERVICES SURVEY RECORD

The **Cataract Surgical Services Survey Record** (adapted version) comprises following parts and sections:

- a. General Information
- b. Screening
 - I Vision and Pinhole Examination
 - II Lens Examination
 - III Principle cause of vision < 6/18
 - IV Additional examination
 - V Intraocular pressure
 - VI Current action needed
 - VII History, if not examined
 - VIII Why cataract operation has not been done
 - IX Details about cataract operation
 - X Clinical diagnosis
 - XI Examiner remarks
- c. Patient Information Sheet

The original **Cataract Surgical Services Survey Record** has been designed for use by ophthalmologists and experienced paramedical ophthalmic staff.

The **Cataract Surgical Services Survey Record** is adapted in a way that it should be completed by a team of surveyors, which comprises an interviewer, an ophthalmologist and an ophthalmic nurse.

The Cataract Surgical Services Survey Record (adapted version) is meant for surveys that focus on cataract blindness with some additional information on other major causes of visual loss.

These coding instructions will be used to train field staff in the use of the **Cataract Surgical Services Survey Record** prior to commencing data collection and will serve as a permanent reference throughout the survey.

TRAINING INSTRUCTIONS

(These instructions assume that the subject is a person of 50 years or older, the area of the survey is marz, a cluster random sampling procedure is applied with 56 clusters of 40 people age 50+ each and the **Cataract Surgical Services Survey Record** is used).

1. This study is conducted by the Garo Meghriyan Eye Institute for Preventive Ophthalmology (GMEIPO) of the Center for Health Services Research and Development (CHSR) at the American University of Armenia (AUA) and is sponsored by Lions Club International Foundation. It aims to determine visual impairments and low vision among population of Gegharkunik marz. The study will be carried out by preliminary organized teams.
2. Four teams will be arranged to conduct the survey. Each team comprises from an interviewer, an ophthalmic nurse and an ophthalmologist. In order to achieve reliable and comparable results, it is important that each investigator understands and follows the instructions and uses the tools given meticulously for every subject under investigation. A set of instructions is given below for your reference and use.
3. The study lasts from 5 to 45 minutes and includes the following steps: informed consent acquisition, an interview and eye screening.
4. Before starting the survey, a representative sampling frame consisting of the list of all villages and towns of Gegharkunik marz and the total number of population within each village/town is obtained from the Department of Statistics of the Ministry of Health, Republic of Armenia. This information is entered into a spreadsheet program (MsExcel). The first column contains the names of the settlements, the second column the total population of each settlement. In the

third column the cumulative population is calculated as follows: the cumulative population of the first settlement is equal to the total population of the first settlement. The cumulative population of the second settlement is equal to the population of the first settlement plus the population of the second settlement. The cumulative of the third settlement is equal to the cumulative population of the second settlement plus the total population of the third settlement, etc (see table 1).

Table 1. Example of list of all settlements in Gegharkunik marz

Settlement	Population	Cumulative population
Tchambarak settlement	6600	6600
Aghberk village	638	7238
Aigut village	1364	8602
Antaramej village	262	8864
Artanish village	1241	10105
Etc.		

Then 56 clusters are selected from the list of settlements in a systematic random method.

First, the total population of the entire survey area (275,525) is divided by 56 to obtain the sampling interval, which is $275,525/56 = 4,920$. Then a random number between 0 and 1 was generated with the spreadsheet program (MsExcel). The random number is 0.69. This number is multiplied by the sampling interval (4,920). The result is $0.69 \times 4,920 = 3394.8$ (3,395). It is marked on the cumulative list. The settlement in which this number falls is the first settlement where the first cluster is located. To identify the settlement for the second cluster, add the sampling interval 4,920 to the number identified the first cluster (3,395). The number in which this number lies is taken as the second cluster ($3,395 + 4,920 = 8315$). Add again 4,920 to find the settlement for the third cluster, etc, until all 56 clusters will be located (see table 2).

Table 2. Systematic random sampling of clusters

Survey design:	56 clusters of 40 people of 50+
Total population:	275,525
Sampling interval:	$275,525 / 56 = 4,920$
Random number 0-1:	0.69
First cluster:	$0.69 \times 4,920 = 3394.8$ (3,395)
Second cluster:	$3395 + 4,920 = 8315$
Third cluster:	$8315 + 4,920 = 13,235$
Etc.	

Regional departments of all 5 regions (Martuni, Vardenis, Sevan, Gavar and Chambarak) of Gegharkunik marz provided lists of people aged 50 and over of chosen settlements. Final sampling units (40 in each cluster) were selected from that lists in a systematic random method using sampling interval (total population of the

chosen settlement divided by the cluster size) and a random number between 0 and 1. Finally, Survey coordinator prepares a list of eligible participants per each cluster.

5. The visit to a particular cluster should be announced to the village head/ mayor 2-5 days in advance. Instructions should be given to local health personnel to recruit all persons of age 50 and above selected during sampling procedure, explain them objectives of the study and ask them to come to an examination center located in a village ambulatory or local polyclinic. Local health workers should accompany the survey team.
6. Local health authorities should be responsible for publicity of the survey, which can be achieved by local mass media. **Good publicity is essential to achieve a high coverage.** Poor publicity will result in many people being absent and a lot of extra work and time spent on recruiting the absentees.
7. Transport should be arranged so as to reach the selected village/town area as early as possible, say by 8:00 a.m. on the day of survey. This will help in contacting most of the persons eligible for examination.
8. Two rooms should be prepared beforehand in the village ambulatory/regional polyclinic. One of them should be 5 meter in length, with electrical supply source. Other one should be semi-dark.
9. Each team will be provided by the following:
 - a list of population per each cluster,
 - a time table with list of clusters to be surveyed,
 - the map of the Gegharkunik marz,
 - a booklet containing 40 copies of 3 page Cataract Surgical Services Survey Records.
Each booklet shall be used for one cluster only. For every new cluster, the supervisor will provide a new booklet.
 - a pencil, eraser, sharpener, a stapler, blank papers and other necessary office supplies,
 - a 5 meter tape with 2 marks, corresponding to 1 and 2.5 meters,
 - Sivtcev's and Landolt's charts, pointers and an apparatus Rota,
 - an occluder with and without pinhole,
 - a trial lens set with a frame,
 - a direct ophthalmoscope,
 - a torch with spare cells,
 - Maklakov's tonometer and ruler,
 - Necessary medication.

10. Read the **Cataract Surgical Services Survey Record** and its coding instructions carefully before starting the survey work. Make sure you understand all the sections and the method to complete the record.

- a. General Information
- b. Screening
 - I Vision and Pinhole Examination
 - II Lens Examination
 - III Principle cause of vision < 6/18
 - IV Additional examination
 - V Intraocular pressure
 - VI Current action needed
 - VII History, if not examined
 - VIII Why cataract operation has not been done
 - IX Details about cataract operation
 - X Clinical diagnosis
 - XI Examiner remarks
- c. Patient Information Sheet

General Information part must be filled for all persons** above 50 years of age eligible for participation (see sampling procedure described in the point 1). Sections of the **screening part** (except **SECTION VII** “History, if not examined”) are for all persons above 50 years who are in attendance and have agreed for eye examination at the time of visit. **SECTION III** “Principal cause of vision <6/18” should be completed only for those patients with visual acuity less than 0.3 (6/18) without pinhole in either or both eyes (see **SECTION I** “Vision” any option under “Low vision” part).

SECTION VII “History, if not examined” is for eligible persons who are known to be above 50 years and not available at the time of visit or refused examination.

SECTION VIII “Why cataract operation has not been done” is for examined persons, who have a visual acuity level less than 0.1 (<6/60), not improving with pinhole (see **SECTION I** “Vision; Pinhole examination; Cannot see 6/60 with pinhole” answer), as well as an obvious opacity in the lens of one or both eyes (see **SECTION II** “Lens examination; Obvious lens opacity” option).

SECTION IX “Details about cataract operation” is for all persons with (pseudo)aphakia in one or both eyes (see **SECTION II**. “Lens examination; Lens absent (aphakia)”, “Pseudophakia without PCO” or “Pseudophakia with PCO” options).

** You will be provided by the lists of participants.

11. For each eligible person **one Cataract Surgical Services Survey Record** has to be completed, whether the person is examined, is absent or refused examination. In the case of absence or refusal, check with neighbors his/her visual status and complete only "**General Information Part**" and **SECTION VII** ("History, if not examined") of the "**Screening Part**".
12. In a survey like this, there are always some subjects who are not available or refuse to co-operate. Two or three attempts to contact them again are desirable. If still not available or refusing examination, you may interview a neighbor a relative regarding the subject's blindness status. In this case the eye examination can not be done and the actual visual acuity level will not be known. The subject can only be categorized as "believed" blind or not blind depending upon the response of the neighbor or relative. Other information such as age and sex can also be obtained from the neighbor or a relative. The number of "absentees" or "refusals" should be kept as low as possible and be less than 10% of the subjects in the cluster (4 or less in cluster of 40).
13. Fill the cells with a pencil. If you make a mistake or respondent changes his/her mind, erase completely and fill the correct cell. Please make all notes carefully.
14. Some boxes need to be filled either with a number or a tick (✓) mark as appropriate. In case of circles you can make the circle black or put a tick (✓) mark across the circle. Follow the instructions behind the circles where you will mark. Enter a tick-mark (✓) against each correct response in the circle provided. All other boxes should be left blank.
15. Do not tear, waste or discard any record in your book of questionnaires.
16. Check whether you have filled up all the relevant sections in the **Record** before going to the next individual. Each form must be completely filled up.
17. Once the entire procedure, including filling of the **Record** is complete, go to the next individual and repeat the same procedure.
18. You may come across persons with eye problems who do not qualify to be part of the survey (younger than 50 years; visitors, not residing in the household) but do need medical attention. You can examine, advise and even treat such patients, but do not include them in the survey data. Do not fill a Record for such persons.
19. Continue the survey with a systematic route till you complete all the required subjects in that area.
20. Once a week the Survey Coordinator should make a field trip for monitoring of the screening process, collecting and checking completed record forms.
21. Contact the team leader or the Survey Coordinator for any clarifications regarding the record, the methodology of the eye examination or any other aspect of the survey. He/she will be available during field trips and anytime by phone [52 20 27 (w); 52 20 54 (w); 22 87 26 (h); 09 48 18 40 (cel)].

9.3 APPENDIX III.

Guidelines for conducting interviews

General instructions

- Fill the cells with a pencil. If you make a mistake or respondent changes mind, erase completely and fill the correct cell. Please make all notes carefully.
- Do not tear, waste or discard any record in your book of questionnaires.
- Some boxes need to be filled either with a number or a tick (✓) mark as appropriate. In case of circles you can make the circle black or put a tick (✓) mark across the circle. Follow the instructions behind the circles where you will mark. Enter a tick-mark (✓) against each correct response in the circle provided. All other boxes should be left blank.
- Once a week the Survey Coordinator will make a field trip for monitoring of the screening process, collecting and checking completed record forms.
- Contact the Survey Coordinator for any clarifications regarding the record, the methodology of the eye examination or any other aspect of the survey. He/she will be available during field trips and anytime by phone [52 20 27 (w); 52 20 54 (w); 22 87 26 (h); 09 48 18 40 (cel)].

Follow the instructions provided below.

1. Read this form to the participant, explaining the nature of the interview and screening as appropriate, including all items below.

“Good morning / Good afternoon. My name is _____. I work for the project, which is conducted by the Garo Meghriyan Eye Institute for Preventive Ophthalmology (GMEIPO) of the Center for Health Services Research and Development (CHSR) at the American University of Armenia (AUA). This project is sponsored by Lions Club International Foundation. It aims to determine visual impairments and low vision among population of Gegharkunik marz.

Today, we will conduct a 5-45 min interview and eye screening, which will not include any apparent or implied risks.

Please be reminded that the results of your screening and the responses during the interview will remain confidential and used for research purposes only. Your participation is completely voluntary. You can refuse to answer any question or end the screening and withdraw from the study at any time without penalty. If you wish a copy of the results they will be made available for you. If you have any questions about this project, please call us at 51 20 54.

If you don't mind, let's start the interview."

2. For each eligible person **one Cataract Surgical Services Survey Record** has to be completed, whether the person is examined, is absent or refused examination.

In the case of absence or refusal, check with neighbors and/or with available local medical personnel his/her visual status and complete only **“General Information Part”** and **SECTION VII** (“History, if not examined”) of the **“Screening Part”**. If no satisfactory assessment of age is available, the subject has to be excluded.

3. For each person, try to get the most accurate estimate of age of the individual. Only those individuals aged 50+ should be examined and included in the survey.
4. The following instructions will help to complete **General Information** part.

General Information	
Item	Instructions
Day + Month + Year	Day, month and Year of the date of examination to be entered. Example: September 15, 2003 would be 150903
Survey area	A defined geographical or administrative area, such as a district, from where the clusters are selected. Write the name of the area.
Cluster No.	This may be a village or part of a village or town. Clusters will be identified and numbered at the design stage. You will be provide by the list of clusters. Then, the cluster number should be written from that list of the selected units. The number should be printed in respective boxes. It should have 2 digits. For example, the cluster number 9 should be entered as 09.
Individual No.	Sequential number of eligible persons in a cluster. The individual number should be selected from the book of survey records. The number should be printed in respective boxes. It should have 2 digits. For example, the individual number 5 should be entered as 05.
Name	Person name, to be written only on the Patient Information Sheet, as appropriate. This item will not be included in the data processing.
Sex	Mark the appropriate box, where 1 = male; 2 = female.
Age	In years; estimated if no official certificate available. Every person in the sample must be assigned an age, even if only an approximation. 50 to 98 = age in years 99 = age 99 and above
Ethnicity	This field is used for collection of information about ethnicity. Ethnicity should have a predefined code. Select it from the following list, where 1= Armenian, 2= Russian, 3= Other Slavic, 4= Yezidi, 5= Georgian, 7= Other. Print the answer.
Refugee	Mark the appropriate box, where 1 = Yes; 2 = No.
Examination Status	1 = Examined; 2 = Absent; 3 = Refused. Code 1 (Examined) refers to either complete or partial examination, which at least includes visual acuity. Code 2 (Absent) refers to residents not present during the entire survey period. Code 3 (Refused) is for residents refusing to be examined. This item should be filled in after all attempts to examine the patient have been made (in the case of “Absent / Refused”), or after the examination process has been completed.

5. In a survey like this, there are always some subjects who are not available or refuse to co-operate. Two or three attempts to contact them again are desirable. If the person is still not available for examination or refused to participate, try to get the correct estimate of age by interviewing a near relative, a neighbor and/or local medical personnel. If they are sure that the missing person's age is 50+, you can complete the appropriate columns in **General information part** (see above) and **SECTION VII** "History, if not examined" (see the table below) by interviewing a neighbor, a relative or local medical personnel regarding the subject's blindness status. In this case the eye examination can not be done and the actual visual acuity level will not be known. The subject can only be categorized as "believed" blind or not blind depending upon the response of the neighbor, relative and/or local medical personnel. Other information such as age and sex can also be obtained from the neighbor or a relative. The number of "absentees" or "refusals" should be kept as low as possible and be less than 10% of the subjects in the cluster (4 or less in cluster of 40).

Section VII: history, if not examined

Section VII – History, if not examined	
Item	Instructions
Believed not blind	Vision in either eye allows subject to move around freely and participate in social life.
Believed blind due to cataract	Visual impairment inhibits social interaction. Blindness is attributed to cataract. (Use the local name for cataract)
Believed blind due to other causes	Visual impairment inhibits social interaction. Blindness is not attributed to cataract (use local name).
Believed operated for cataract	Visual impairment inhibited social interaction in the past. Subject was operated reportedly for cataract.

6. If there is obvious lens opacity present in either or both eye ($VA < 6/60$, not improving with pinhole), ask why the operation for cataract has not been done. There are many barriers to not getting operated. These can be poor accessibility, costs, fear of operation, etc. Knowing these barriers makes it possible to address them effectively and thereby increase the utilization of cataract surgical services. **SECTION VIII** "Why cataract operation has not been done" shows a list of the barriers most commonly brought forward by patients. Read this list carefully before you start the fieldwork. This should be an open-end question. The reasons mentioned by the person should be compared with the barriers listed under **SECTION VIII**. Mark those barriers that come closest to the reasons for non-operation mentioned by the patient. In no case a possible answer should be prompted. At least one and a maximum of four barriers can be marked.

7. If the person is operated in one or both eyes, all details given under **SECTION IX** “Details about cataract operation” of the form must be entered. If a person is blind due to cataract in one eye, while the other eye is aphakic, **SECTION VIII** “Why cataract operation has not been done” has to be completed for the cataract blind eye and **SECTION IX** “Details about cataract operation” has to be completed for the operated eye. Detailed instructions for completing **SECTION IX** is presented below.

Section IX. Details about cataract operation

Operated patients are asked about their age at the time of cataract surgery. “Mobile Eye Clinic” should be marked if the surgery was performed by qualified ophthalmic staff in an improvised operation theatre. If conducted in a well-equipped designated operating theatre, one of the three hospitals should be marked. Mark “Other country” if the operation was done out of Armenia.

Services are totally free if the patient did not pay anything in cash or kind towards the surgery or for boarding. Ask how much did the patient pay for cataract surgery. There are two categories: “Less than 40,000 AMD” and “More than 40,000 AMD”. Mark the respective category and specify amount paid not matter for what kind of services (surgery, boarding, kinds, etc).

Under “Spectacles”, mark whether the operated patient is using spectacles or not. If not, one of the “Reasons for not using glasses” should be marked.

Mark “Non IOL” if an ophthalmologist revealed aphakia (see an answer “Lens absent (aphakia)” in the **SECTION II**, which means that the patient did not get an IOL* implanted at the time of surgery. Mark “IOL implant” if an ophthalmologist revealed pseudophakia (see answers “Pseudophakia without PCO**” and “Pseudophakia with PCO”).

8. At the end of the interview thank the participant for participation.

*IOL – Intra-ocular lens

**PCO – Posterior Capsule Opacification

9.4 APPENDIX IV.

Guidelines for an ophthalmic screening assistant

General instructions

- Fill the cells with a pencil. If you make a mistake or respondent changes mind, erase completely and fill the correct cell. Please make all notes carefully.
- Do not tear, waste or discard any record in your book of questionnaires.
- Follow the instructions behind the circles where you will mark. Enter a tick-mark (✓) against each correct response in the circle provided or you can make the circle black. All other circles should be left blank.
- Once a week the Survey Coordinator will make a field trip for monitoring of the screening process, collecting and checking completed record forms.
- Contact the Survey Coordinator for any clarifications regarding the record, the methodology of the eye examination or any other aspect of the survey. He/she will be available during field trips and anytime by phone [52 20 27 (w); 52 20 54 (w); 22 87 26 (h); 09 42 67 34 (cel)].

The Ophthalmic Screening Assistant is responsible for completing SECTION I of the Cataract Surgical Services Record and assisting Ophthalmologist during the ophthalmic examination of the participants.

Follow the instructions provided below.

1. Introduce yourself and the nature of the screening, including all items below:

“Good morning / Good afternoon. My name is _____. I am an Ophthalmic Screening Assistant of the project, which is conducted by the Garo Meghriyan Eye Institute for Preventive Ophthalmology (GMEIPO) of the Center for Health Services Research and Development (CHSR) at the American University of Armenia (AUA). The Lions Club International Foundation sponsors this project. It aims to determine visual impairments and low vision among population of Gegharkunik marz and provide an appropriate ophthalmic care for those in need.

Today, we will conduct an eye screening to you that will last 15-45 min

Please be reminded that the results of your screening will remain confidential and used for research purposes only. Your participation is completely voluntary. You can refuse to participate in the screening and withdraw from the study at any time without penalty. If you wish a copy of the results they will be made available for you. If you have any questions about this project, please call us at 51 20 27.

Don't hesitate to ask us questions. If you don't mind, let's start.

2. If the participant doesn't mind to be examined, verify that s/he is registered in the registration book. Be sure that the questionnaire on general information is complete.

3. The following general instructions will help you properly complete **SECTION I**.

Section I – Vision	
Item	Instructions
Unaided or With Glasses	Mark the appropriate circle for each eye.
Vision in right and left eye	Mark the appropriate circle for each eye.
Pinhole examination	In all cases of low vision or blindness, vision should be further tested with pinhole. If vision was tested with glasses, these should be used here as well. Mark the vision with pinhole.

4. Visual acuity should be measured in a special room of the village ambulatory/regional polyclinic, at least 5-meter in length, with electrical supply source.

5. Visual acuity is measured with a Sivtsev’s chart. In case if patient is illiterate, use Landolt C chart. Apparatus Rotta is used for lightening the chart. Distance is measured with a special tape of 5-metre length, with marks in the 2,5 meter distance, and in 1 meter distance.

6. Vision should be tested separately for each eye with the patient’s own glasses if normally worn for seeing at distance. Measure the visual acuity beginning with the right eye, while the left eye is covered with the palm of a hand, either by the examinee, or by a helper. The examinee is standing in the shade or with the back to the sun, while the chart is kept up in switched lightening of apparatus Rotta. Begin with the first line of the chart and go down if they can see it. Encourage the subject to try and read the letters if they give up, even guess if they have to.

7. If the patient cannot see letters (or Landolt’s C), ask patient to count examiner’s fingers (finger count technique) at distance 2.5 meters (VA = 0.05), if cannot see, try at distance 1 meter (VA = 0.01).

8. Visual acuity will be defined as the lowest line on which the majority of letters were read correctly. If the person can read letters from **the third line from bottom** of the chart (or even 2nd or first), his/her vision is considered as normal (VA=1.0).

If the person can read letters from **the third line** of the chart, record his/her vision as VA =0.3 (6/18). Vision corresponding to visual acuity of 0.3 (6/18) or better is not dealt with further, in accordance with the International Classification of Diseases (ICD), 1975.

“Low Vision” refers to the ICD categories of visual impairment 1 and 2, with visual acuity less than 0.3 (6/18), but at least 0.1 (6/60) (can read letters from **the first line** of the chart), and less than 0.1 (6/60) but at least 0.05 (3/60) (**finger count at 2.5 meter**).

“Blind” refers to ICD categories of visual impairment 3, 4 and 5, implying visual acuity less than 0.05 (3/60).

9. If patient cannot count fingers at 1 meter distance, check with a penlight in semi-dark

condition whether the person has perception of light (PL+) or not (PL-), and whether the pupil constricts on light (PR+ = Pupil Reaction) or not (PR-).

10. An eye with VA better than 0.3 (6/18) does not have to be examined with pinhole. In this case mark "Pinhole examination; Can see 6/18 without pinhole" option of the **SECTION I**. Any eye with a VA < 0.3 (6/18) has to be examined for acuity with a pinhole as well. If the vision improves with the pinhole to 0.3 (6/18) or better, mark "Pinhole examination; Can see 6/18 with pinhole" option in the **SECTION I**. Otherwise, mark the VA obtained with the pinhole.

11. The test system and distance must be uniform throughout the study.

12. At the end of the screening thank the participant for participation.

9.5 APPENDIX V.

Guidelines for ophthalmologists

General instructions

- Fill the cells with a pencil. If you make a mistake or respondent changes mind, erase completely and fill the correct cell. Please make all notes carefully.
- Do not tear, waste or discard any record in your book of questionnaires.
- Some boxes need to be filled either with a number or a tick (✓) mark as appropriate. In case of circles you can make the circle black or put a tick (✓) mark across the circle. Follow the instructions behind the circles where you will mark. Enter a tick-mark (✓) against each correct response in the circle provided. All other boxes should be left blank.
- Once a week the Survey Coordinator will make a field trip for monitoring of the screening process, collecting and checking completed record forms.
- Contact the Survey Coordinator for any clarifications regarding the record, the methodology of the eye examination or any other aspect of the survey. He/she will be available during field trips and anytime by phone [52 20 27 (w); 52 20 54 (w); 22 87 26 (h); 09 48 18 40 (cel)].

The Ophthalmologist is responsible for conducting a detailed eye examination to the study participants and completing SECTIONS II, III, IV, V, VI, X and XI of the Cataract Surgical Services Record, and Patient Information Sheet.

Follow the instructions provided below.

1. Introduce yourself and the nature of the screening, including all items below:

“Good morning / Good afternoon. My name is _____. I am an Ophthalmologist of the project. I am going to conduct an examination of your eyes that will last 15 – 45 minutes. Don't hesitate to ask me questions. If you don't mind, let's start.

2. If the participant doesn't mind to be examined, verify that her/his visual acuity is measured, and s/he is registered in the registration book. Be sure that the questionnaire on general information and **SECTION I** are complete.
3. The following general instructions for **SECTIONS II, III, IV, V, VI, X and XI, and for Patient Information Sheet** will help you properly complete respective parts.

SECTION II. Lens examination.

After measuring the visual acuity, the examinee is taken inside the second room, which should be dark. There, the lens status is assessed by binocular loupe and by direct ophthalmoscopy in semi-dark condition, without dilatation of the pupil. Examine the lens in each eye and mark your observations in **Section II**: normal lens, obvious lens opacity present, lens absent (aphakia), IOL implanted without posterior capsule opacification or IOL implanted and posterior capsule opacification present. If you cannot see the lens because of corneal scarring, phthisis bulbi or other causes, mark “No view of lens”.

a) Standard lens examination

In this Section, only one circle must be marked for each eye. If the lens in both eyes is normal, circle (1) of each eye must be marked, and the examination is then complete. No other sections need to be filled.

Section II- Standard Lens Examination	
Item	Instructions
Normal lens	Crystal clear lens, clear red reflex.
Obvious lens opacity	A pupil that clearly appears grey or whites when examined with oblique light in a shaded or darkened area. With distant direct ophthalmoscopy an obvious dark shading of the red reflex is visible. Note: This item refers to a major opacification of the lens, leading to low vision or blindness. SECTION VIII to be filled in when appropriate.
Lens absent (aphakia)	Absence of lens from the central pupil. May be judged to be present when there is a reliable history of cataract extraction and/or if other evidence of absence of the lens from the central pupillary area, such as iris tremulousness. A dislocated lens, as occurs with couching or trauma, should also be recorded here.
Pseudophakia without PCO	As aphakia, but with Intra-Ocular Lens (IOL) inserted. No Posterior Capsule Opacification (PCO) to be seen with the unaided eye.
Pseudophakia with PCO	As aphakia, but with Intra-Ocular Lens (IOL) inserted. Obvious Posterior Capsule Opacification (PCO) to be seen with the unaided eye.
No view of lens	Mark if the lens cannot be seen because of dense corneal opacity or for other reasons.

b) Detailed lens examination

This manual provides a simplified procedure with minimal equipment for the examination of eyes, particularly for the presence or absence of cataract. Whenever/wherever additional equipment can be made available, an additional examination could be carried out. This is particularly important in detecting Posterior Capsule Opacification (PCO) and fundus diseases.

Equipment needed: Direct ophthalmoscope

Additional equipment: Hand-held slit lamp and Goldman’s perimeter

Method: When the examined eye does not improve to 0.3 (6/18) or better with pinhole examination, the pupil is dilated with a short-acting mydriatic (Homatropine 1%) eye drop. Two drops ten minutes apart should be applied. In the following conditions, the pupils should not be dilated:

- (a) Very shallow anterior chamber, where an angle-closure glaucoma attack could be precipitated.
- (b) Presence of obvious white cataract where the fundus would not be visible even after dilatation.
- (c) Presence of large corneal opacity, or oclusio pupillae.

Once dilated, the lens (intraocular lens if present), the posterior capsule and the anterior vitreous are examined with the slit lamp in a semi-dark room. The record form is filled in as follows:

Section II- Detailed Lens Examination	
Item	Instructions
Normal lens	Clear lens without obvious opacity
Obvious opaque lens	Lens with cortical/nuclear/posterior subcapsular opacity (opacities). When not fully opaque during direct ophthalmoscopy, a faint red glow is present.
Aphakia	Lens not present in the pupillary area. Dislocated or couched lens also to be recorded here.
Pseudophakia without PCO	Presence of intraocular lens but no opacification of posterior capsule, which could lead to visual impairment.
Pseudophakia with PCO	Presence of intraocular lens with significant PCO which has led to visual impairment/blindness.
No view of the lens	Lens not visible because of dense corneal opacity, oclusio pupillae or any other reason.

SECTION III. Principal cause of vision <6/18.

This section is to be completed only in the case of visual loss, i.e., vision less than 0.3 (6/18) in either eye. The abnormality causing low vision or blindness should be marked. Examination with direct ophthalmoscope should be conducted.

The completion of this section can be divided into two activities: (1) for each eye, assess and mark one principal disorder that is responsible for visual loss in that eye; (2) mark one principal disorder responsible for or contributing to visual loss in the person.

Mark the principal disorder responsible for visual loss in each eye as well as in the individual after considering disorders in either eye, which are most amenable to treatment or prevention. When there are two disorders, one of which is secondary to the other, the primary is to be selected as the principal disorder. For example, if the patient has cataract secondary to glaucoma, glaucoma is the principal disorder. When there are co-existing primary disorders in the same or different eyes, mark as the principal disorder that which is most readily curable or, if not curable, that which is most easily preventable. The following is a recommended ranking of the disorders with respect to these criteria:

1. Cataract
2. Surgery related complications

3. Preventable corneal opacities and phthisis
4. (Primary) glaucoma
5. Posterior segment disorders

Section III – Principal Cause of Vision	
Item	Instructions
Cataract	Do not mark in cases of minor opacities, unlikely to affect vision.
Refractive error	VA <6/18, improving with pinhole.
Uncorrected aphakia	This condition is defined as aphakia (absence of lens from the central pupil) which, with proper correction, improves vision to satisfactory visual acuity (6/18 or better). For aphakia where VA does not improve with proper correction, other causes of visual loss should be determined and recorded appropriately, while uncorrected aphakia should <u>not</u> be marked. If there is clear evidence that a surgical procedure has led to a blinding condition, e.g. secondary glaucoma, then “surgery related complication” should be marked as an underlying cause.
Surgery related complications	If there is clear evidence that a surgical procedure has led to a blinding condition, e.g., secondary glaucoma, then this box should be marked. Uncorrected aphakia must be recorded as above.
Phthisis or absent globe	Refers to partial or complete phthisis bulbi, staphyloma, and disorganized globe after severe trauma, or enucleated eye.
Trachomatous corneal opacity	Central corneal scarring in the presence of at least one of the following signs of trachoma: (1) trichiasis / entropion, (2) conjunctival scarring, (3) pannus, or (4) Herbert’s pits.
Other corneal opacity	Easily visible corneal opacity present over the pupil. The corneal opacity is so dense that at least part of the pupil margin is blurred when seen through the opacity.
Glaucoma	Mark if any of the following suggested criteria apply: 1. the vertical cup-disk ratio is greater than 0.8; 2. the eye is stone hard on digital palpation. This is <u>not</u> a complete diagnosis for glaucoma, but only used for the purpose of this survey, since tonometry and testing of visual fields is not practical under field conditions and glaucoma is not the focus of this survey.
Diabetic retinopathy	Applies only for persons with retinal findings attributable to confirmed diabetes. Check only if the condition is a likely cause of visual loss and there is obvious involvement of the posterior pole. Refers essentially to proliferative retinopathy (growth of new blood vessels with or without haemorrhages) or diabetic macular oedema (extensive swelling of the central retina)
Macular degeneration	The macula is defined as the area of increased brownish-black pigmentation surrounding the fixation point. It is slightly larger than one disc diameter in size. It is also slightly larger than the vascular free zone off the posterior fundus. Macular degeneration refers to all obvious or severe pigment

	<p>disturbances or any other deviations from what is considered a “normal” aspect of the macula area, as defined above, in the absence of diabetes or other diseases which may cause these lesions.</p> <p>Check if any of the following suggested criteria apply:</p> <ol style="list-style-type: none"> 1. the regularity of the pigment epithelium is disturbed either by atrophy, proliferation, migration, deposits, haemorrhage, mottling, scarring, clumping. 2. Existence of elevation/swelling or oedema of the central retina. 3. Presence of drusen (small yellow colloid-like dots, sometimes larger lesions) or hard exudates. <p>Presence of circinate exudates. Presence of holes.</p>
Other posterior segment disorders	<p>Check only if the condition is a likely cause of visual loss and there is obvious involvement of the posterior pole in a non-diabetic patient.</p> <p>Refers to any easily visible lesions in:</p> <ul style="list-style-type: none"> • the vitreous (hemorrhages,...) • the optic disk (except horizontal cup-disk ratio >0.5 to be checked under the “Glaucoma” section) or • the retina (except any lesion of the macula area to be checked under the “Macular Degeneration” section).
Not examined	<p>Mark if the patient has vision < 6/18 in this eye and was not examined.</p>

Once the disorders and underlying causes have been marked for each eye, an assessment is made of the principal cause of low vision in the person.

SECTION IV. Additional examination.

In case if an additional examination is performed the type of the examination is printed. For example, visual field testing with Goldamn’s perimeter. If there is no need for additional examinations, then “Not examined” should be marked.

SECTION V. Intraocular pressure.

In case of glaucoma suspicion (c/d ration ≥ 0.6), measure intraocular pressure using Maklakov’s tonometer. For anesthesia, please, use Lidocain 2%. Print results in exam form. Define the eye pressure using Maklakov’s ruler. Record the results. If intraocular pressure is not measured, mark “Not examined”.

SECTION VI. Current action needed.

Define is there a need for current actions or not. If yes, print respective action. In case if there will be need for an action which is not mentioned in the list, then print in “**Other**” defining type of action.

SECTION X. Clinical diagnosis.

If an examinee has an eye disorder, choose an appropriate option from the list of eye pathologies provided under **SECTION X**.

SECTION XI. Examiner remarks.

You could have some comments, which you would like to mention. Print them in the provided section.

PATIENT INFORMATION SHEET.

After all, complete the patient information form. This sheet is required to be completed for all participants.

Patient Information Sheet comprises general information, diagnosis, recommendations and comments. Print the patient's name. If examinee has an eye disorder, write the full diagnosis under Diagnosis subsection. In the Recommendation subsection mention which kind of actions and/or treatment are needed currently and in the future, what kind of further examinations are required, etc. Besides recommendations you could have some comments, which you would like to mention. Print this in Comments subsection. Please, carefully fill in this page, since it will be considered a written recommendation for further diagnostics/treatment. Put your signature at the end of the Patient Information sheet.

Instructions for a survey coordinator

*(These instructions assume that the subject is a person of 50 years or older, the area of the survey is marz, a cluster random sampling procedure is applied with 56 clusters of 40 people age 50+ each and the **Cataract Surgical Services Survey Record*** is used).*

You are a coordinator of the survey teams that will survey the population to estimate the number of people blind due to cataract. Two teams will be arranged to conduct the survey. Each team comprises from a nurse-interviewer, an ophthalmic nurse and an ophthalmologist. This survey is scientifically designed and tested for its methodology and validity. In order to achieve reliable and comparable results, it is important that each investigator understands and follows the instructions and uses the tools given meticulously for every subject under investigation. A set of instructions is given below for your reference and use.

1. Before starting the survey, a representative sampling frame consisting of the list of all villages and towns of Gegharkunik marz and the total number of population within each village/town is obtained from the Department of Statistics of the Ministry of Health, Republic of Armenia. This information is entered into a spreadsheet program (MsExcel). The first column contains the names of the settlements, the second column the total population of each settlement. In the third column the cumulative population is calculated. Then 56 clusters are selected from the list of settlements in a systematic random method. A list of names and addresses of the eligible population 50+ in the cluster is obtained from the local medical units of each selected cluster. Systematic random sampling is used to select final sampling units from each cluster. Finally, Survey coordinator prepares a list of eligible participants per each cluster.
2. The visit to a particular cluster should be announced to the village head/ mayor 2-5 days in advance. Instructions should be given to local health personnel to recruit all persons of age 50 and above selected during sampling procedure, explain them objectives of the study and ask them to come to an examination center located in a village ambulatory or local policlinic. Local health workers should accompany the survey team. Local health authorities should be responsible for publicity of the survey, which can be achieved by local mass media. **Good publicity is essential to achieve a high coverage.** Poor publicity will result in many people being absent and a lot of extra work and time spent on recruiting the absentees.
3. The survey coordinator is responsible for training the members of each team, for accommodating their work, making travel arrangements and providing transport.

Adapted from Hans Limburg, WHO. Rapid Assessment of Cataract Surgical Services. A package for data entry and analysis from population based rapid assessment. Version 2.02 for Windows® - December 2001

4. Transport should be arranged so as to reach the selected village/town area as early as possible, say by 8:00 a.m. on the day of survey. This will help in contacting most of the persons eligible for examination.
5. Two rooms should be prepared beforehand in the village ambulatory/regional polyclinic. One of them should be 5 meter in length, with electrical supply source. Other one should be semi-dark.
6. The survey coordinator is responsible for providing each team with:
 - a list of population per each cluster,
 - the map of the Gegharkunik marz,
 - a time table with list of clusters to be surveyed,
 - a booklet containing 40 copies of 3 page **Cataract Surgical Services Survey Records**. Each booklet shall be used for one cluster only. For every new cluster, the supervisor will provide a new booklet.
 - a pencil, eraser, sharpener, stapler, blank papers and other necessary office supplies,
 - a 5 meter tape with 2 marks, corresponding to 1 and 2.5 meters,
 - Sivtcev's and Landolt's charts, pointers and an apparatus Rotta,
 - an occluder with and without pinhole,
 - a trial lens set with a frame,
 - a direct ophthalmoscope,
 - a torch with spare cells,
 - Maklakov's tonometer and ruler,
 - Necessary medication.
7. Once a week the Survey Coordinator should make a field trip for monitoring of the screening process, collecting and checking completed record forms.
8. The Survey Coordinator must check all entries on all **Cataract Surgical Services Survey Records**, and corrections must be made before passing on the records for data entry.
9. Data entry process should be monitored and supervised by the Survey Coordinator.
10. The Survey Coordinator is responsible for any clarifications regarding the record, the methodology of the eye examination or any other aspect of the survey. He/she will be available during field trips and anytime by phone.

CATARACT SURGICAL SERVICES RECORD

VII. History, if not examined <i>(From relative or neighbor)</i>		<u>Right eye</u>	<u>Left eye</u>			<u>Right eye</u>	<u>Left eye</u>
<u>Believed</u>							
Not blind		<input type="radio"/> (1)	<input type="radio"/> (1)				
Blind due to cataract		<input type="radio"/> (2)	<input type="radio"/> (2)				
Blind due to other causes		<input type="radio"/> (3)	<input type="radio"/> (3)				
Operated for cataract		<input type="radio"/> (4)	<input type="radio"/> (4)				
VIII. Why cataract operation has not been done <i>(mark not more than four responses)</i>							
Unaware of cataract			<input type="radio"/> (1)				
Believes it to be a curse			<input type="radio"/> (2)				
Waiting for cataract to mature			<input type="radio"/> (3)				
Surgical services not available/very far			<input type="radio"/> (4)				
No /delayed information about eye camp			<input type="radio"/> (5)				
Cannot afford operation			<input type="radio"/> (6)				
No one to accompany			<input type="radio"/> (7)				
No time available/other priorities			<input type="radio"/> (8)				
Old age and need not felt			<input type="radio"/> (9)				
One eye adequate vision/need not felt			<input type="radio"/> (10)				
Fear of operation			<input type="radio"/> (11)				
Fear of losing eye sight			<input type="radio"/> (12)				
Disease contra-indicating operation			<input type="radio"/> (13)				
X. Clinical Diagnosis <i>(Mark all that apply)</i>							
Preliminary stage of atrophy			<input type="radio"/> (1)				
/changes/absent globe			<input type="radio"/> (2)				
Strabismus			<input type="radio"/> (3)				
Refraction pathology			<input type="radio"/> (4)				
Cataract			<input type="radio"/> (5)				
Uncorrected aphakia			<input type="radio"/> (6)				
Conjunctivities			<input type="radio"/> (7)				
Corneal Opacity			<input type="radio"/> (8)				
Anterior Uveitis			<input type="radio"/> (9)				
Glaucoma			<input type="radio"/> (10)				
Optic atrophy			<input type="radio"/> (11)				
Diabetic retinopathy			<input type="radio"/> (12)				
Other retinal pathology _____							
Other group (Please, specify) _____							
				IX. Details about cataract operation			
				Age at operation (years)			
						□□	□□
				<u>Place of operation</u>			
				Mobile Eye Clinic		<input type="radio"/> (1)	<input type="radio"/> (1)
				Government hospital in Yerevan		<input type="radio"/> (2)	<input type="radio"/> (2)
				Government hospital in provinces		<input type="radio"/> (3)	<input type="radio"/> (3)
				Private hospital		<input type="radio"/> (4)	<input type="radio"/> (4)
				In other country		<input type="radio"/> (5)	<input type="radio"/> (5)
				<u>Costs of surgery</u>			
				Totally free		<input type="radio"/> (1)	<input type="radio"/> (1)
				Less than 40,000 AMD		<input type="radio"/> (2)	<input type="radio"/> (2)
				More than 40,000 AMD		<input type="radio"/> (3)	<input type="radio"/> (3)
				<i>(Please, specify)</i> _____			
				<u>Use of spectacles</u>			
				Using glasses		<input type="radio"/> (1)	<input type="radio"/> (1)
				Not using glasses		<input type="radio"/> (2)	<input type="radio"/> (2)
				<u>Reason for not using glasses</u>			
				Never provided		<input type="radio"/> (1)	<input type="radio"/> (1)
				Lost		<input type="radio"/> (2)	<input type="radio"/> (2)
				Damaged		<input type="radio"/> (3)	<input type="radio"/> (3)
				Don't need (IOL implanted)		<input type="radio"/> (4)	<input type="radio"/> (4)
				Don't need (VA other eye OK)		<input type="radio"/> (5)	<input type="radio"/> (5)
				<u>Type of surgery</u>			
				Non IOL		<input type="radio"/> (1)	<input type="radio"/> (1)
				IOL implant		<input type="radio"/> (2)	<input type="radio"/> (2)

Examiner Remarks

CATARACT SURGICAL SERVICES RECORD



Day/Month /Year: **Team no.**

Survey-area _____ **Cluster no.** **Individual no.**

Name _____

Diagnosis

Recommendations

Examiner remarks

Signature of the ophthalmologist _____

9.8 APPENDIX VIII.

LIST OF SELECTED CLUSTERS

CODING OF THE CLUSTERS

CLUSTER #	SETTLEMENT	REGION
01	Chambarak town	Chambarak
02	Aigut village	Chambarak
03	Drakhtik village	Chambarak
04	Zil village	Chambarak
05	Sevan town	Sevan
06	Sevan town	Sevan
07	Sevan town	Sevan
08	Sevan town	Sevan
09	Sevan town	Sevan
10	Sevan town	Sevan
11	Tsovagiugh village	Sevan
12	Ddmashen village	Sevan
13	Lchashen village	Sevan
14	Khachaghbiur village	Vardenis
15	Sodk village	Vardenis
16	Gavar town	Gavar
17	Gavar town	Gavar
18	Gavar town	Gavar
19	Gavar town	Gavar
20	Gavar town	Gavar
21	Gavar town	Gavar
22	Gavar town	Gavar
23	Gandzak village	Gavar
24	Lanjaghbiur village	Gavar
25	Karmirgiugh village	Gavar
26	Karmirgiugh village	Gavar
27	Noratus village	Gavar
28	Sarukhan village	Gavar

CLUSTER #	SETTLEMENT	REGION
29	Sarukhan village	Gavar
30	Martuni town	Martuni
31	Martuni town	Martuni
32	Martuni town	Martuni
33	Tsovinar village	Martuni
34	Geghhovit village	Martuni
36	Vakhashen village	Martuni
37	Verin Getashen village	Martuni
38	Litchk village	Martuni
39	Tsakqar village	Martuni
35	Yeranos village	Martuni
40	Vardadzor village	Martuni
41	Madina village	Martuni
42	Nerkin Getashen village	Martuni
43	Zolaqar village	Martuni
44	Zolaqar village	Martuni
45	Vardenik village	Martuni
46	Artsvanist village	Martuni
47	Vardenis town	Vardenis
48	Vardenis town	Vardenis
49	Vardenis town	Vardenis
50	Vardenis town	Vardenis
51	Akunk village	Vardenis
52	Geghamasar village	Vardenis
53	Tsovak village	Vardenis
54	Kutakan village	Vardenis
55	Norakert village	Vardenis
56	Pambak village	Vardenis