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National surveys of avoidable blindness and visual impairment in Argentina, El Salvador, Honduras, Panama, Peru, and Uruguay

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ABSTRACT

Objective. *Describe the rationale and methodology of the Rapid Assessment of Avoidable Blindness carried out at the national level in 2011–2013 in Argentina, El Salvador, Honduras, Panama, Peru, and Uruguay.*

Methods. *The survey includes individuals aged 50 years and older, minimizing required sample sizes, which vary from 2 000 to 5 000 people. It uses straightforward sampling and examination techniques, and data analysis is automatic and does not require a statistician. It is relatively inexpensive, as it does not take a long time, does not require expensive ophthalmic equipment, and can be carried out by local staff. Reports are generated by the assessment software package.*

Results. *Indicators measured are prevalence of blindness and of moderate and severe visual impairment (broken down into avoidable causes and cataracts); prevalence of aphakia or pseudophakia; cataract surgical coverage; visual outcome of cataract surgeries; causes of poor outcomes; access barriers to cataract surgery; and cataract surgery service indicators. Results of each assessment will be published sequentially in successive issues of the Journal, and a final summary article will analyze results as a whole and in comparison with the other surveys in this group and with those previously published, which will provide a current picture of the situation in this group of countries.*

Conclusions. *The Rapid Assessment of Avoidable Blindness is a robust, simple, and inexpensive methodology to determine prevalence of blindness and visual impairment as well as eye health service coverage and quality. It is a very valuable tool for measuring progress by blindness prevention programs and their impact on the population.*

Key words Eye health; blindness; cataract; refraction errors; glaucoma; retinopatía diabética; persons with visual impairments; Argentina; El Salvador, Honduras, Panama, Peru; Uruguay.

Planning ocular health programs requires data on prevalence and causes of blindness and visual impairment, and on coverage and quality of ophthalmological services to ensure they serve the needs of the population. Data are also necessary for monitoring and evaluating existing programs. During the 49th Directing Council of the Pan American Health Organization (PAHO) (1) and in 2009, the ministries of health of the Region of the Americas pledged to measure prevalence of blindness and visual impairment.

In 2001 (2), the blindness prevention program of the World Health Organization (WHO) developed a methodology called Rapid Assessment of Cataract Surgical Services, which then became the Rapid Assessment of Avoidable Blindness (RAAB), a simple, rapid assessment methodology that can provide data

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on prevalence and causes of avoidable blindness (3, 4). Some 80% of all blindness is avoidable and is caused by cataracts, refractive defects, glaucoma, and diabetic retinopathy.

RAAB is rapid because it only includes the group of people 50 years and older, where prevalence is highest and which accounts for some 80% of cases of blindness. This minimizes sample size requirements, which range from 2 000 to 5 000 people. RAAB uses straightforward sampling and examination techniques, and data analysis is automatic and does not require a statistician. It is relatively inexpensive, as it does not take a long time, does not require expensive ophthalmic equipment, and can be carried out by local staff (3, 4).

Reports generated by the RAAB software package contain the following indicators for people aged ≥ 50 years:

1. Prevalence of blindness and severe and moderate visual impairment.
2. Prevalence of avoidable blindness and severe and moderate visual impairment.
3. Prevalence of blindness and severe and moderate visual impairment from cataracts.
4. Leading causes of blindness and severe and moderate visual impairment.
5. Prevalence of aphakia (absence of lens) or pseudophakia (presence of an intraocular lens).
6. Cataract surgical coverage.
7. Visual outcome of cataract surgery.
8. Causes of poor outcomes.
9. Access barriers to cataract surgery.
10. Cataract surgical service indicators, such as location, cost, and type of surgery.

In Latin America, subnational RAABs have been carried out and published in Argentina (5), Brazil (6), Chile (7), Colombia (8), Cuba (9), Guatemala (10), Mexico (11), and Peru (12). National surveys have been carried out in the Dominican Republic (13), Ecuador (14), Venezuela (15), and Paraguay (16). Regional reviews (17, 18) have demonstrated that blindness due to cataracts was adequately controlled only in urban areas with good socioeconomic development in Brazil and Argentina.

RAAB-based ocular health surveys were conducted in 2011–2013 in Argentina, El Salvador, Honduras, Panama, Peru, and Uruguay with support from Orbis and the International Agency for the Prevention of Blindness. They will be published in this six-article Eye Health Series of the *Pan American Journal of Public Health*, beginning in this issue, and will provide updated national data for South American and Central American countries. This information will be useful for planning or follow-up of the national blindness and visual impairment prevention programs and surgical programs for cataracts and other visual disorders, and will enable identifying problems, such as poor cataract surgery outcomes or significant access barriers to surgery. Data will also serve as a baseline to monitor the outputs and impact of the PAHO Plan of Action for the Prevention of Blindness and Visual Impairment 2014–2019 approved by the ministers of health during the 53rd PAHO Directing Council in 2014 (19).

This article presents the methodology of the Rapid Assessment of Avoidable Blindness, common to the six articles in the Eye Health Series.

MATERIALS AND METHODS

After explaining the nature and purpose of the study to national health authorities and national committees for the prevention of blindness in Argentina, El Salvador, Honduras, Panama, Peru, and Uruguay, these countries decided to carry out the national assessment of avoidable blindness in people aged ≥ 50 years under the auspices of the respective ministries of health and with technical assistance from Hans Limburg, a world expert on the subject, and from the PAHO Regional Eye Health Program. Support and funding were provided by Orbis and the International Agency for the Prevention of Blindness.

The data needed for the study design were:

1. Total population of the study area, stratified by 5-year age groups and by sex, for the year in which the RAAB was carried out (Excel table, Microsoft Corporation, Seattle, Washington, United States).
2. List of the smallest population units used by the census office (Excel table), also called census enumeration blocks. Lists were provided by national statistics and censes institutes. This list was the sampling framework from which the clusters to be surveyed were selected. The sample was randomly selected, with probability proportionate to population size.
3. Detailed maps of census tracts, essential for locating the area and the individual houses where RAAB was carried out.

These data were obtained before beginning design of the studies and training of fieldwork teams.

Sample size

RAAB requires a sample size ranging from 2 000 to 5 000 people. The RAAB software package version 5 (4) was used to calculate sample size, based on estimated prevalence for each country, along with confidence and precision levels. For most studies, the confidence level was set at 95%, and relative precision at 25%. Prevalence was estimated using previous studies in the same region with similar populations.

First stage of sampling: selection of population units

RAAB was conducted in clusters selected randomly at the national level. Population segments or clusters were selected using the list of all population units at the national level (sampling framework) and a probability determined by population size. It has been established that this procedure is self-weighting and ensures that selected clusters are distributed uniformly in the entire population. It is also done rapidly and reliably using the sampling framework and the RAAB software package.

Second stage of sampling: selection of eligible people

In most cases, there were more than 50 people aged ≥ 50 years in the selected population unit, and accordingly it was necessary to sample a portion of the population unit. In these cases, households were selected through compact segment sampling (20).

Standardized data capture and automatic data analysis were done with the RAAB software package.

Human resource requirements

It was recommended to do field work with four to five groups. Each group

consisted of an ophthalmologist or a final-year ophthalmology resident, one or two paramedics trained in visual acuity measurement (ophthalmic technician, ophthalmic nurse), and a local guide to facilitate interaction with the community (local health center representative, social worker, community leader, etc.).

Fieldwork equipment

Each group was equipped with a flashlight, a direct ophthalmoscope, a portable slit lamp (optional), Snellen charts, pinhole occluders, and data collection forms.

Course in RAAB and initiation of field work

Once the data was obtained and the availability of staff and equipment was confirmed, a five-day workshop-training course in RAAB was organized with the national groups. They were taught the basics of RAAB and its software package, calculation of sample size, cluster selection, use of data collection forms, patient examination, and how to carry out field work. An observer variation test was done with 50 patients from an ophthalmology service to ensure standardization of ophthalmological examination. This included measurement of visual acuity with the correction used by each participant or presenting visual acuity (PVA) and examination of the lens to determine the primary cause of PVA of less than 20/60. All teams achieved a kappa index ≥ 0.60 in the six countries, which indicated good agreement among the different teams. A practical exercise was also carried out in one of the selected clusters. The last day of the training, the RAAB software package was installed and data entry staff was trained. A visit was also made to the ministry of health and the ophthalmology society of the respective countries to introduce RAAB.

Field work

The survey field work in the six countries was carried out in 2011–2013. A standard cluster contained 50 people aged ≥ 50 years and could be completed in one day by the group. When a group could not finish examining all participants, it returned another day to examine the remaining participants, to achieve optimal coverage during the study.

Two to five days before the survey, the local health worker visited the population unit in which the cluster was located to inform residents about the survey. Maps were requested from local leaders or maps were sketched with identifiable reference points and the approximate distribution of neighborhoods and households. Clusters were surveyed sequentially, door to door, including all households in the segment with residents aged ≥ 50 years. In cases where there were fewer than 50 people aged ≥ 50 years in a given segment, all eligible individuals in that segment were examined and then sampling was continued in a second segment (randomly selected) until reaching person number 50 in the cluster.

Verbal informed consent was obtained from individuals who agreed to participate. The studies were conducted according to the Declaration of Helsinki and consent was obtained from ethics committees at the national level. Individuals who needed medical care received treatment or were referred to the closest medical unit for treatment.

All eligible people were interviewed using the standard RAAB survey. Visual acuity was measured with a Snellen tumbling E chart, with optotype size 20/200 on one side and 20/60 on the other side, at a distance of 20 feet (6 meters). In cases in which the 20/200 chart was not recognized at 20 feet, visual acuity was measured with the same chart at a distance of 10 feet (3 meters). Visual acuity was measured using daylight, outside the house of the person being examined. PVA was measured for each eye; when the optotype of 20/200 was seen correctly, that of 20/60 was shown. When visual acuity was less than 20/60, it was measured with a pinhole occluder to detect whether visual impairment was caused by refractive error. Direct ophthalmoscopy was performed on all participants in a dark room to assess lens status (normal, moderate opacity, obvious opacity, aphakia [lens absent], pseudophakia [presence of intraocular lens] with posterior capsule opacification [PCO] or pseudophakia without PCO). When necessary, direct ophthalmoscopy was performed with dilation of the pupil using tropicamide collyrium 1% and phenylephrine 10%. Principal cause of PVA < 20/60 per eye and per person was classified using the following categories: refractive error, uncorrected aphakia, untreated cataract, surgical complication, trachomatous corneal opacity, non-trachomatous corneal opacity, phthisis bulbi (subatrophy of the eye), glaucoma, diabetic retinopathy, age-related macular degeneration, and other posterior pole, eyeball, and nervous system disorders.

Moderate visual impairment was defined as visual acuity (VA) < 20/60 to 20/200 in the better eye, severe visual impairment as VA < 20/200 to 20/400 in the better eye, and blindness as VA < 20/400 in the better eye, all assessed with presenting visual acuity (PVA). Cause of primary blindness or visual impairment was identified in each eye and in each person. In cases with two or more causes of visual loss, when it was not possible to determine the primary disorder, the convention established by WHO was followed (i.e., recording the cause that is easier to treat or prevent).

Cataract surgical coverage was defined as the percentage of eyes (or people) treated with cataract surgery divided by the number of eyes (or people) with pseudophakia, aphakia, or operable cataract (21).

Visual outcome of cataract surgery was described as good (PVA ≥ 20/60), marginal (PVA < 20/60 to 20/200), or poor (PVA < 20/200). Causes of poor visual outcomes were classified as selection (patients with another visual disorder, in addition to cataract), surgical (e.g., vitreous loss), optical (e.g., postoperative astigmatism), and late surgical complications (retinal detachment or posterior capsule opacification). In patients with corrected AV of < 20/200 and operable cataract, barriers that hinder access to cataract services were identified, which were classified into six categories: "need not felt"; "fear of surgery or its outcome"; "cannot pay for surgery"; "treatment denied by provider"; "unaware that treatment is possible"; and "no access to treatment."

Data entry and analysis

A program was developed in Visual FoxPro version 7.0 (Microsoft Corporation, Seattle, Washington, United States) for data entry and automatic standardized data analysis for RAAB. Data were captured using double entry and reviewed for inconsistencies and potential data entry errors. Prevalence of blindness and visual impairment in the sam-

ple were calculated and adjusted for age and sex, with their respective confidence intervals for cluster sampling. Results were reported in tables for men and women separately and together.

Cost

The cost of each survey depends on the sample size, since this determines the number of clusters and the number of fieldwork days. Long distances between clusters, particularly in large countries, account for a considerable increase in transportation and lodging costs.

Limitations

Since RAAB examinations are conducted door to door using portable instruments, diagnostic capacity is limited and it is not always possible to make an accurate diagnosis of causes of diseases of the posterior segment of the eye (retina). RAAB only assesses people aged ≥ 50 years, and therefore does not make it possible to estimate prevalence of blindness in people aged < 50 years.

RESULTS AND CONCLUSIONS

The results of each survey conducted in 2011–2013 in Argentina, El Salvador, Honduras, Panama, Peru, and Uruguay will be published sequentially in successive issues of the Journal, and a final summary article will analyze results as a whole and in comparison with the other surveys in this group and with those previously published, which will provide a current picture of the situation in this group of countries.

The RAAB is a robust, simple, and inexpensive methodology for determining blindness and visual impairment as well as service coverage and quality, which makes it a very valuable tool for measuring progress by blindness prevention programs and their impact on the population. Countries that have still not carried out RAAB should do so to establish their baseline, and ones that have already implemented it should repeat it every five to seven years.

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Conflict of interest. None declared by the authors.

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Encuestas nacionales de ceguera y deficiencia visual evitables en Argentina, El Salvador, Honduras, Panamá, Perú y Uruguay

RESUMEN

Objetivo. Describir la justificación y metodología usadas en la Evaluación Rápida de Ceguera Evitable empleada para efectuar encuestas a nivel nacional entre 2011 y 2013 en Argentina, El Salvador, Honduras, Panamá, Perú y Uruguay.

Métodos. La encuesta se dirige a personas de 50 años o más, lo que reduce al mínimo los requisitos de tamaño de la muestra, que oscila entre 2 000 y 5 000 personas. Se emplean sistemas simples de muestreo y técnicas de examen; el análisis de datos es automático y no requiere de un experto en estadística. Es relativamente económica, ya que no toma mucho tiempo, no requiere equipos oftalmológicos costosos y puede ser llevada a cabo por el personal local. Los informes son generados mediante el propio programa informático de la evaluación.

Resultados. Los indicadores generados son la prevalencia de la ceguera y la deficiencia visual severa y moderada (discriminadas por causas evitables y cataratas); la prevalencia de afaquia o pseudofaquia; la cobertura de la cirugía de cataratas; el resultado visual de las cirugías de cataratas; las causas de resultados malos; las barreras de acceso a la cirugía de cataratas; y los indicadores de servicio de la cirugía de cataratas. Los resultados de cada una de las encuestas serán publicados de manera secuencial en números sucesivos de la revista, y en un artículo final de resumen se hará un análisis de los resultados en su conjunto y comparativo entre las encuestas y con aquellas publicadas anteriormente, que aportará un estado de la situación actual en ese grupo de países.

Conclusiones. La Evaluación Rápida de Ceguera Evitable es una metodología sólida, sencilla y económica para determinar la prevalencia de ceguera y deficiencia visual y la cobertura y calidad de los servicios de salud ocular, y representa una herramienta muy valiosa para medir el progreso de los programas de prevención de la ceguera y su impacto en la población.

Palabras clave Salud ocular; ceguera; catarata; errores de refracción; glaucoma; retinopatía diabética; personas con daño visual; Argentina; El Salvador, Honduras, Panamá, Perú; Uruguay.