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Functional low vision in adults from Latin America: findings from population-based surveys in 15 countries

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ABSTRACT

Objective. *To review data on functional low vision (FLV) (low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable) in adults aged 50 years or older from published population-based surveys from 15 countries in Latin America and the Caribbean.*

Methods. *Data from 15 cross-sectional, population-based surveys on blindness and visual impairment (10 national and five subnational) covering 55 643 people ≥ 50 years old in 15 countries from 2003 to 2013 were reanalyzed to extract statistics on FLV. Eleven of the studies used the rapid assessment of avoidable blindness (RAAB) method and four used the rapid assessment of cataract surgical services (RACSS) method. For the 10 national surveys, age- and sex-specific prevalence of FLV was extrapolated against the corresponding population to estimate the total number of people ≥ 50 years old with FLV.*

Results. *Age- and sex-adjusted prevalence of FLV in people ≥ 50 years old ranged from 0.9% (Guatemala, Mexico, and Uruguay) to 2.2% (Brazil and Cuba) and increased by age. The weighted average prevalence for the 10 national surveys was 1.6%: 1.4% in men and 1.8% in women. For all 10 national studies, a total of 509 164 people ≥ 50 years old were estimated to have FLV. Based on the 910 individuals affected, the main causes of FLV were age-related macular degeneration (weighted average prevalence of 26%), glaucoma (23%), diabetic retinopathy (19%), other posterior segment disease (15%), non-trachomatous corneal opacities (7%), and complications after cataract surgery (4%).*

Conclusions. *FLV is expected to rise because of 1) the exponential increase of this condition by age, 2) increased life expectancy, and 3) the increase in people ≥ 50 years old. These data can be helpful in planning and developing low vision services for the region; large countries such as Brazil and Mexico would need more studies. Prevention is a major strategy to reduce FLV, as more than 50% of it is preventable.*

Key words Eye health; vision, low; cross-sectional studies; health planning; Argentina; Brazil; Chile; Cuba; Dominican Republic; Ecuador; El Salvador; Guatemala; Honduras; Mexico; Panama; Paraguay; Peru; Uruguay; Venezuela; Latin America; Caribbean Region.

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Despite major advances in eye care in recent decades, an increasing number of people have functional low vision (FLV) (low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable). There is no medical or surgical treatment and/or refractive correction that can restore their visual acuity to 6/18 or better. Many of these individuals might benefit from low vision services that allow people to live more independently (1). Providing these services to people with FLV to improve their vision-related quality of life is one of the priorities of VISION 2020, the

global initiative of the World Health Organization (WHO) and the International Agency for the Prevention of Blindness (IAPB) (2).

FLV was first described by WHO in 1993 in Bangkok as follows: "A person with low vision is one who has impairment of visual functioning even after treatment and/or standard refractive correction, and has a visual acuity of less than [20/60] to light perception, or a visual field less than 10 degrees from the point of fixation, but who uses, or is potentially able to use, vision for the planning and/or execution of a task" (3). In 2005, WHO further defined FLV as best-corrected visual acuity (BCVA) of less than 6/18 (20/60) but with PL+ in the better eye, that is not due to any treatable or correctable disease or disorder (4). Consequently, the current WHO International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) (version 2015) no longer uses the term "low vision" to describe moderate (category 1) and severe (category 2) visual impairment (presenting VA (PVA) < 6/18 (20/60) to ≥ 3/60 (20/400)) (5).

While the epidemiology of treatable and preventable eye diseases is well documented, epidemiological data on FLV are very scarce. A WHO report on FLV from 1996 estimated that of the 148 million visually impaired—category 1–5: best corrected visual acuity (BCVA) < 20/60 but with light perception in the better eye—in the world, 35 million (25%) were in need of low vision care (4). The report on global estimates for 2010 indicates that of the estimated 285 million people worldwide with VA < 20/60, 43% had uncorrected refractive error (i.e., vision loss correctable with glasses) and 33% had cataract (i.e., vision loss correctable through cataract surgery) (6). The remaining 24% or 68.5 million people—1% of the world's population—are assumed to have irreversible BCVA <20/60 (i.e., FLV). These estimates suggest that the number of people with FLV has doubled since 1996.

The sharp increase in FLV might be explained by the increased life expectancy worldwide and the increased risk for chronic eye diseases with irreversible loss of sight at higher ages.

The Andhra Pradesh Eye Disease Study (APEDS), a population-based survey in India covering 10 293 people of all ages, analyzed data using the WHO definition of FLV. The study reported a prevalence of FLV for all ages of 1.05% (95% confidence interval (CI): 0.82–1.28), no significant difference between men (1.06%) and women (1.04%), and an increase in prevalence with decreasing socioeconomic status from 0.3% (in the very rich) to 1.8% (in the very poor). Prevalence increased considerably by age, from 0.3% (in the 0–15 year age group) to 6.2% (in people aged 70 years and older) (7). A population-based study from Pakistan in 2008 reported a prevalence of FLV in people aged 30 years and older of 1.7% (8). Another study from Nigeria conducted in 2011 reported a prevalence of FLV in people aged 40 years and older of 3.5% (9).

The Pan American Health Organization (PAHO) estimated in 1999 that 6 million people or 1.2% of the population in Latin America and the Caribbean (LAC) had FLV, defined as BCVA < 6/18 after treatment and/or standard refractive correction (10, 11). These estimates have been used to assess the need (and guide planning) for low vision services in the region.

With advances in treatment options, the proportion of people with avoidable blindness and visual impairment is decreasing in a number of countries (12). At the same time, both life expectancy and the number of elderly people is increasing rapidly worldwide, resulting in increased prevalence of permanent (incurable and/or unpreventable) blindness and visual impairment from causes such as age-related macular degeneration (ARMD), glaucoma, myopic degeneration, diabetic retinopathy, etc. Given these trends, the number of people with FLV is expected to increase in the coming decades.

This study reviewed data on FLV in persons ≥ 50 years old from 15 published population-based surveys from LAC (10 national and five subnational). To the best of the authors' knowledge, this is the first population-based analysis of country-level data on the prevalence of FLV in people aged ≥ 50 years in LAC. The results of this analysis could be used to facilitate adequate planning to meet the increasing need for low vision services in the region.

MATERIALS AND METHODS

Data from 15 population-based surveys on blindness and visual impairment conducted in LAC from 2003 to 2013 (11 using the rapid assessment of avoidable blindness (RAAB) method and four using the rapid assessment of cataract surgical services (RACSS) method) were analyzed. Both RAAB and RACSS use a multistage random cluster sampling methodology in which, in the first stage, small population units (usually census enumeration areas (CEAs)) are selected from a sampling frame through systematic sampling. This ensures a random selection with a probability proportional to the size of the population unit (13, 14). For the second stage of sampling RACSS was applied (until 2005) to select eligible individuals within the CEA through the "random walk" method, a standard survey method at the time for assessing immunization coverage. With new insights, from 2005 onward, this method was modified to the compact segment sampling used in the RAAB method (15). Because the definition of FLV, data collection, and data analysis were identical in both survey methods, the findings of the 15 surveys are fully comparable.

The results of all 15 studies were published in peer-reviewed journals but findings on FLV were not included because (until 2013) the coding w as not available. For this review, the original data from all 15 surveys were reanalyzed and the relevant data extracted after consent from the principal investigators. For the 10 countries where a national survey was carried out, the age- and sex-specific prevalence of FLV was extrapolated against the corresponding population for the year of the survey to estimate the total number of people aged ≥ 50 years with FLV. The population data were obtained at the time of the survey from the national bureau of statistics of the country where the survey was conducted and are part of the data files from that survey.

In the surveys reviewed in this study, FLV is defined as BCVA (measured via pinhole) < 6/18 t o PL+ in the better eye that is not due to cataract, refractive error, uncorrected aphakia, or posterior capsular opacification after cataract surgery. In people identified as having FLV, the main causes, plus age- and sex-specific prevalence, and VA, were extracted.

Precise national estimation of low vision care needs based on VA requires data from national population-based surveys. Therefore, the studies selected for this review included 10 national,

population-based surveys. Individual needs for low vision care are more difficult to assess because they depend on education, level of visual disability, etc.

Ethical approval for this study was provided by the Instituto Mexicana de Oftalmología (IMO) (Querétaro, Mexico). Data from the original databases were reanalyzed and no patients were examined. Each individual study adhered to the provisions of the Declaration of Helsinki. RAAB and RACSS databases do not store any personal data and anonymity is preserved. The principal investigators and the agencies that funded each of the 15 studies granted the authors written permission to analyze their data for this study.

RESULTS

A total of 55 643 persons aged ≥ 50 years were examined across the 15 surveys. In 2013, the total population 50 years and older for the 15 countries where the surveys were conducted was 105 million or 86.3% of the 121 million people in that age group for the entire LAC region (16).

Ten of the surveys covered the entire country while the remaining five surveys covered cities or states. Table 1 shows the total and sex-specific prevalence of FLV for each country sample. The sample prevalence varied from 0.9% (in the mainly urban state of Nuevo Léon in Mexico) to 2.6% (in the urban populations of Campinas (Brazil) and Havana (Cuba)). Prevalence differed significantly between men and women. Women were more affected more than men in Venezuela ($P = 0.023$), and men were more affected more than women in Mexico ($P = 0.046$), Paraguay ($P = 0.007$).

Table 2 shows the sex- and age-specific prevalence of FLV (by 10-year age groups) for each country sample. As shown in the table, prevalence increased with age. Figure 1 illustrates the increase with age as well as the considerable variation in prevalence across countries. Based on the sex- and age-specific sample prevalence for the 10 countries where representative national surveys were carried out, Table 3 shows the estimated number of people aged ≥ 50 affected and the weighted average prevalence from the 10 countries where a representative national survey was done.

Across the 15 surveys, 910 individuals who were ≥ 50 years old and had FLV were identified and the principal causes of FLV extracted. Table 4 shows the principal causes of FLV for the 910 individuals expressed as proportions of the total affected. ARMD was the most frequent cause (with a weighted average prevalence of 26%), followed by glaucoma (23%), diabetic retinopathy (19%), other posterior segment disease (15%), non-trachomatous corneal opacities (7%), and complications after cataract surgery (4%). However, there was considerable variation across countries. The bottom half of Table 4 shows the percentage of main causes of FLV that are preventable. Of all cases of FLV in people aged ≥ 50 years across all 15 surveys, 37% (in Peru) to 79% (in Paraguay) are potentially preventable (2%–10% through primary health care (PHC) or primary eye care (PEC) services and 46% through improved specialized ophthalmic services for cataract, glaucoma, and diabetic retinopathy).

Table 5 shows the level of VA in the better eye of the 910 individuals ≥ 50 years old identified as having FLV, expressed as a proportion of the total affected. The majority (53.6%) had BCVA < 20/60–20/200, 16.6% had BCVA < 20/60–20/200, and 29.7% had BCVA < 20/400–PL+. The severity of visual impairment may have implications for the type of services required (i.e., low vision services vary from optical to non-optical services and rehabilitation and must be tailored to individual needs).

Earlier estimates of FLV in Latin America assumed that the prevalence of FLV was twice the prevalence of blindness (11). Table 6 compares the overall (age- and sex-adjusted) prevalence of all blindness (PVA < 20/400) and the overall adjusted prevalence of visual impairment (PVA < 20/60) with the overall adjusted prevalence of FLV in each of the 15 surveys. There was considerable variation across countries in the FLV/blindness ratio (prevalence of FLV divided by prevalence of all blindness),

TABLE 1. Total and sex-specific prevalence of FLV[a] in people ≥ 50 years old in 15 studies, by country, Latin America, 2003–2013

	Men		Women		Total	
Country (city/state, year) (reference)	No. (%)	*n*	No. (%)	*n*	No. (%)	*n*
Brazil (Campinas, 2003) (17)	28 (3.0)	935	29 (2.2)	1 289	57 (2.6)	2 224
Venezuela (national, 2004) (18)	21 (1.4)	1 545	42 (2.4)	1 772	63 (1.9[b])	3 317
Guatemala (four states, 2004) (19)	21 (1.2)	1 808	35 (1.2)	2 998	56 (1.2)	4 806
Cuba (Havana, 2005) (20)	22 (2.4)	900	49 (2.7)	1 816	71 (2.6)	2 716
Mexico (Nuevo Léon State, 2005) (21)	20 (1.2)	1 624	14 (0.7)	2 140	34 (0.9[b])	3 764
Chile (Bio Bio State, 2006) (22)	24 (2.0)	1 218	34 (2.0)	1 697	58 (2.0)	2 915
Dominican Republic (national, 2008) (21)	39 (2.1)	1 879	43 (2.2)	1 994	82 (2.1)	3 873
Ecuador (national, 2009) (21)	44 (2.4)	1 840	43 (2.0)	2 172	87 (2.2)	4 012
Paraguay (national, 2011) (23)	39 (2.9)	1 343	23 (1.5)	1 519	62 (2.2[b])	2 862
Uruguay (national, 2011) (24)	16 (1.0)	1 571	20 (0.9)	2 158	36 (1.0)	3 729
Peru (national, 2011) (25)	43 (2.1)	2 015	65 (2.3)	2 837	108 (2.2)	4 852
El Salvador (national, 2011) (26)	28 (2.0)	1 378	38 (1.9)	2 021	66 (1.9)	3 399
Honduras (national, 2013) (27)	20 (1.6)	1 219	36 (2.0)	1 780	56 (1.9)	2 999
Panama (national, 2013) (28)	37 (2.0)	1 875	37 (1.8)	2 250	74 (1.8)	4 125
Argentina (national, 2013) (29)	17 (1.0)	1 691	29 (1.4)	2 079	46 (1.2)	3 770
Total[c]	419	22 841	537	30 522	956	55 643

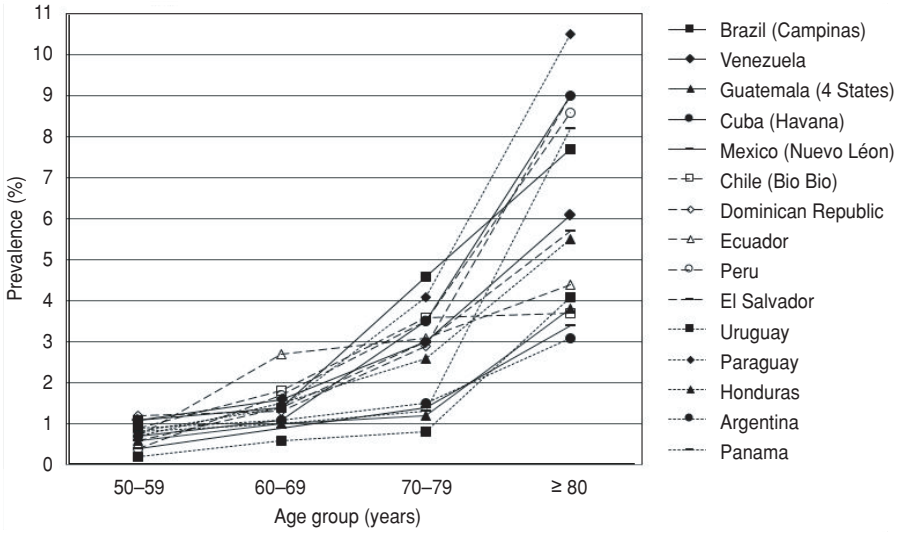
[a] FLV: functional low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.
[b] Significant difference in prevalence between men and women: $P < 0.05$.
[c] Weight average percentages could not be calculated because five studies were subnational.

TABLE 2. Proportion (%) of people ≥ 50 years old with FLV[a] in 15 studies, by country, sex, and age group, Latin America, 2003–2013

	Men Age group (years)					Women Age group (years)					Total Age group (years)				
Country (city / state) (reference)	50–59 %	60–69 %	70–79 %	≥ 80 %	All (≥ 50) %	50–59 %	60–69 %	70–79 %	≥ 80 %	All (≥ 50) %	50–59 %	60–69 %	70–79 %	≥ 80 %	All (≥ 50) %
Brazil (Campinas) (17)	1.1	1.9	6.0	8.6	2.5	1.0	1.0	3.7	7.1	1.9	1.1	1.4	4.6	7.7	2.2
Venezuela (national) (18)	0.9	0.9	2.4	3.9	0.8	1.3	2.2	3.5	7.9	2.3	1.1	1.6	3.0	6.1	1.6
Guatemala (four states) (19)	1.0	0.7	0.6	3.9	0.9	0.5	1.2	1.6	3.6	0.9	0.6	1.0	1.2	3.8	0.9
Cuba (Havana) (20)	0.4	0.3	4.5	8.3	1.8	0.8	1.5	2.9	9.3	2.5	0.7	1.1	3.5	9.0	2.2
Mexico (Nuevo Léon State) (21)	0.4	1.5	1.9	3.4	1.1	0.4	0.5	0.9	3.4	0.7	0.4	0.9	1.4	3.4	0.9
Chile (Bio Bio State) (22)	0.2	2.0	4.5	3.3	1.6	1.4	1.6	2.9	4.0	1.8	0.9	1.8	3.6	3.7	1.8
Dominican Republic (national) (21)	1.3	1.1	3.0	7.9	1.9	1.1	1.6	2.9	10.0	2.2	1.2	1.3	2.9	9.0	2.1
Ecuador (national) (21)	0.6	3.4	2.3	5.4	1.9	0.7	2.0	3.8	3.6	1.8	0.7	2.7	3.1	4.4	1.8
Paraguay (national) (23)	0.9	2.2	5.2	14.0	2.6	0.6	0.7	3.0	7.3	1.4	0.8	1.4	4.1	10.5	2.0
Uruguay (national) (24)	0.2	0.8	1.3	3.2	0.9	0.1	0.5	0.4	4.6	0.9	0.2	0.6	0.8	4.1	0.9
Peru (national) (25)	0.7	2.0	2.1	7.8	1.7	0.3	1.4	4.5	9.3	2.0	0.4	1.7	3.5	8.6	1.8
El Salvador (national) (26)	0.2	2.0	2.9	5.9	1.7	0.8	1.1	3.1	5.6	1.6	0.6	1.4	3.0	5.7	1.6
Honduras (national) (27)	0.9	1.1	1.1	6.0	1.3	0.6	1.7	3.9	5.0	1.8	0.7	1.5	2.6	5.5	1.6
Panama (national) (28)	0.9	1.2	1.8	7.5	1.7	0.8	0.9	0.9	8.8	1.6	0.8	1.0	1.3	8.2	1.7
Argentina (national) (29)	0.6	1.0	1.3	2.9	1.0	1.1	1.2	1.6	3.2	1.5	0.9	1.1	1.5	3.1	1.3

[a] FLV: functional low vision—visual acuity (VA) < 6/18 (< 20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.

FIGURE 1. Prevalence of FLV[a] in people ≥ 50 years old in 15 surveys, by country and age group, Latin America and the Caribbean, 2003–2013



[a] FLV: functional low vision—visual acuity (VA) < 6/18 (< 20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.

which ranged from 0.2 (in Guatemala) to 1.9 (in Argentina).

DISCUSSION

Based on the 10 national surveys, across all 10 countries, an estimated 509 000 people aged ≥ 50 years have FLV. Assuming that the 10 countries were representative of the entire LAC region, the adjusted and weighted prevalence of FLV from Table 3 could be extrapolated to the regional population aged ≥ 50 years in 2013 (16). The estimated number of people aged ≥ 50 years with FLV region-wide would be 1.98 million (812 000 males and 1 171 000 females), considerably less than PAHO's 1996 estimate of FLV prevalence (6 million, for all age groups).

Data on prevalence of FLV in people less than 50 years old are very limited in LAC and elsewhere in the world. One study from Santiago, Chile, reports a prevalence of 0.21% for FLV in children aged 5–15 years (22). Data from India, Nigeria, and Pakistan suggest that the prevalence of FLV in younger age groups in those countries is low (9–11) (Figure 2). While there were no comparable data for LAC for those age groups, as shown in the figure, weighted age- and sex-specific FLV prevalence in people ≥ 50 years old is lower in the region versus those three countries.

One important finding in this study was the fact that 56.7% of all cases of FLV in people 50+ years old could have been

TABLE 3. Estimated total and sex-specific prevalence of FLV[a] in people ≥ 50 years old, based on age- and sex-specific prevalence in 10 national studies, by country, Latin America and the Caribbean, 2003–2013

	Men		Women		Total	
Country (reference)	No.	%	No.	%	No.	%
Venezuela (18)	30 269	1.3	63 795	2.3	94 064	1.8
Dominican Republic (21)	17 875	1.9	21 994	2.2	39 869	2.1
Ecuador (21)	28 217	2.1	26 465	1.8	54 682	1.9
Paraguay (23)	15 981	2.7	9 866	1.6	25 847	2.2
Uruguay (24)	3 799	0.9	5 371	1.0	9 170	0.9
Peru (25)	45 631	1.7	54 697	1.9	100 328	1.8
El Salvador (26)	7 640	1.6	9 993	1.7	17 633	1.7
Honduras (27)	5 808	1.3	9 246	1.7	5 054	1.5
Panama (28)	5 392	1.6	5 655	1.6	11 047	1.6
Argentina (29)	51 364	1.0	90 107	1.5	141 470	1.3
Total and weighted average	211 974	1.4	297 190	1.8	509 164	1.6

[a] FLV: functional low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.

TABLE 4. Main causes of FLV[a] in people ≥ 50 years old as a proportion of total prevalence (weighted average) in 15 studies, by country,[b] Latin America and the Caribbean, 2003–2013

Main causes of FLV	BR %	VE %	GT %	CU %	MX %	CL %	DO %	EC %	PY %	UY %	PE %	SV %	HN %	PA %	AR %
1. Cataract surgery complications	5	7	0	1	7	5	3	5	0	3	2	13	4	12	4
2. Non-trachomatous corneal opacity	0	0	0	0	0	0	1	0	0	0	2	3	0	1	0
3. Other corneal opacity	2	11	16	4	4	7	1	4	8	3	8	11	4	7	7
4. Phthisis	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0
5. Onchocerciasis	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
6. Glaucoma	14	40	0	43	25	16	43	23	32	25	24	2	38	24	11
7. Diabetic retinopathy	29	11	0	14	14	30	16	27	39	6	1	16	9	9	33
8. ARMD[c]	7	20	0	4	0	9	14	33	11	28	55	28	20	14	17
9. Other posterior segment disease	43	9	84	33	46	30	22	10	8	16	7	23	14	27	15
10. All globe/CNS[d] abnormalities	0	0	0	0	4	0	0	0	2	19	1	3	11	5	13
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Proportion of main causes of FLV that are preventable															
A. Through PHC/PEC[e] services (main causes # 2, 3, 4, 5)	2	13	16	4	4	9	3	4	8	3	10	15	5	8	7
B. Through specialized ophthalmic services (main causes # 1, 6, 7)	48	58	0	59	46	52	61	54	71	34	27	31	50	46	48
Total proportion of main causes that are preventable (A+B)	50	71	16	63	50	61	64	58	79	38	37	46	55	54	54

[a] FLV: functional low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.
[b] AR: Argentina; BR: Brazil (Campinas); CL: Chile (Bio Bio State); CU: Cuba (Havana); DO: Dominican Republic; EC: Ecuador; GT: Guatemala (four states); HN: Honduras; MX: Mexico (Nuevo Léon State); PA: Panama; PE: Peru; PY: Paraguay; SV: El Salvador; UY: Uruguay; VE: Venezuela.
[c] ARMD: age-related macular degeneration.
[d] CNS: central nervous system.
[e] PHC / PEC: primary health care / primary eye care.

TABLE 5. Proportion (%) of people ≥ 50 years old with FLV[a] in 15 studies, by severity and by country,[b] Latin America and the Caribbean, 2003–2013

Severity of FLV	BR %	VE %	GT %	CU %	MX %	CL %	DO %	EC %	PY %	UY %	PE %	SV %	HN %	PA %	AR %
< 20/400–PL+	43	20	29	37	29	29	26	14	19	38	33	33	39	43	15
< 20/200–20/400	20	27	16	13	21	7	17	18	18	13	12	21	14	12	17
< 20/60–20/200	38	53	55	50	50	64	57	67	63	50	55	46	46	45	67
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

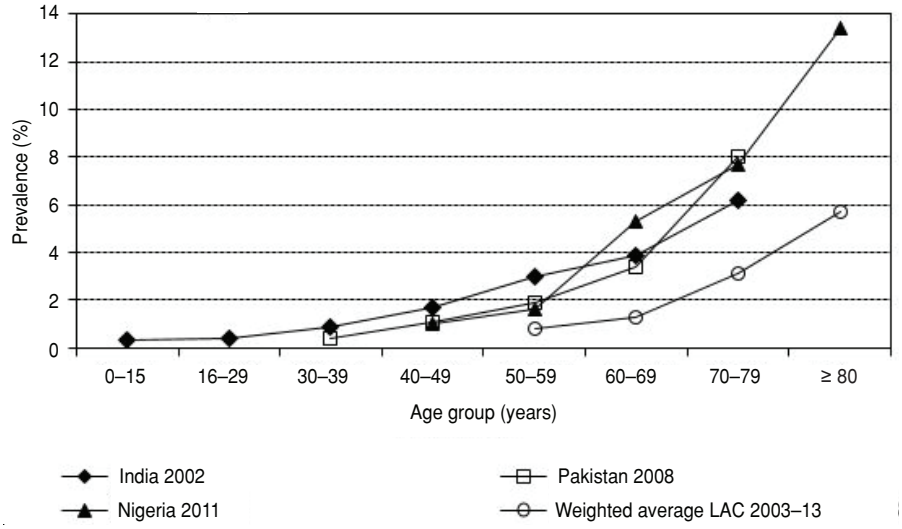
[a] FLV: functional low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.
[b] AR: Argentina; BR: Brazil (Campinas); CL: Chile (Bio Bio State); CU: Cuba (Havana); DO: Dominican Republic; EC: Ecuador; GT: Guatemala (four states); HN: Honduras; MX: Mexico (Nuevo Léon State); PA: Panama; PE: Peru; PY: Paraguay; SV: El Salvador; UY: Uruguay; VE: Venezuela.

TABLE 6. Age- and sex-adjusted prevalence of blindness, visual impairment, and FLV[a] in people ≥ 50 years old in 15 studies, by country,[b] Latin America and the Caribbean, 2003–2013

Prevalence	BR	VE	GT	CU	MX	CL	DO	EC	PY	UY	PE	SV	HN	PA	AR
Blindness (PVA[c] < 20/400) (%)	1.6	2.3	3.7	1.9	1.5	1.4	2.2	1.4	1.1	0.9	2.1	2.6	1.9	3.0	0.7
Visual impairment (PVA < 20/60) (%)	9.4	12.3	18.1	16.2	10.3	10.3	14.3	15.1	13.0	10.2	15.7	19.2	13.0	16.0	12.9
FLV (BCVA[d] < 20/60–PL+) (%)	2.2	1.6	0.9	2.2	0.9	1.8	2.1	1.8	2.0	0.9	1.8	1.6	1.6	1.7	1.3
FLV / PVA < 20/400	1.4	0.7	0.2	1.2	0.6	1.3	1.0	1.3	1.8	1.0	0.9	0.6	0.8	0.6	1.9

[a] FLV: functional low vision—visual acuity (VA) < 6/18 (<20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.
[b] AR: Argentina; BR: Brazil (Campinas); CL: Chile (Bio Bio State); CU: Cuba (Havana); DO: Dominican Republic; EC: Ecuador; GT: Guatemala (four states); HN: Honduras; MX: Mexico (Nuevo Léon State); PA: Panama; PE: Peru; PY: Paraguay; SV: El Salvador; UY: Uruguay; VE: Venezuela.
[c] PVA: presenting visual acuity.
[d] BCVA: best-corrected visual acuity (measured by pinhole).

FIGURE 2. Prevalence of FLV[a] in India, Pakistan, and Nigeria versus weighted avarage for selected countries in Latin America and the Caribbean (LAC), by age group, 2003–2013



[a] FLV: functional low vision—visual acuity (VA) < 6/18 (< 20/60) to ≥ perception of light (PL+) in the better eye—that is untreatable and uncorrectable.

prevented (49.3% though specialized ophthalmic services and 7.4% through PHC/PEC services). This finding provides a strong argument for blindness prevention as a major strategy to reduce FLV. Another interesting finding was that prevalence of FLV varied by sex in some countries. For example, prevalence was significantly higher in men versus women in Mexico ($P = 0.046$) and Paraguay ($P = 0.007$) and significantly higher in women versus men in Venezuela ($P = 0.023$). These differences in prevalence by sex should be investigated further.

Strengths and limitations

One strength of this analysis was the fact that all 15 included studies used the same survey methodology, protocols, definitions, age groups, and methods of data analysis. Ten of the studies were national surveys, with a sample representative of the entire country, and seven of them were conducted in the last four years. This study also had some limitations. First, in five of the countries, the survey area was limited to a state, province, district, or city, and therefore the data might not be representative of the entire country. This was especially important for countries with large populations like Brazil and Mexico. The authors hope that by including these data, other researchers may conduct similar surveys in other parts of these countries to get more representative data on blindness, visual impairment and FLV. Second, some of the surveys were conducted about a decade ago, so the findings may not be the same as today. Because both life expectancy and the proportion/number of people ≥ 50 years old have increased considerably in all 15 countries studied, and risk of FLV increases with age, it is likely that the data from the older surveys underrepresent the current situation. Finally, this study may have underestimated the number/percentage of individuals with a visual field radius < 10 degrees around the center of fixation because the RACSS and RAAB method do not include visual field assessment (it is too difficult and time-consuming in a field situation). This could have affected the accuracy of the survey measurements of FLV from glaucoma—a major cause of FLV in LAC—as central vision remains intact until a very late stage of the disease (whereas based on visual field assessment patients might have qualified as having FLV). Because glaucoma is a major cause of FLV in LAC, it is likely that the data from the surveys presented here underestimated the prevalence of FLV and, consequently, the number of people who may benefit from low vision services.

Conclusions

The authors hope that these findings on FLV will be helpful in planning for

the provision and development of adequate low vision services at the country level in the LAC region. FLV is expected to rise because of the exponential increase of this condition by age, increased life expectancy, and the increase in the number and proportion of people ≥ 50 years old. More studies are required for the more highly populated countries such as Brazil and Mexico, for which only subnational RAAB/RACSS data were available, to obtain more representative data. Finally, prevention should be a major strategy to reduce FLV, as more than 50% of it is preventable.

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Conflicts of interest. None.

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Baja visión funcional en adultos de América Latina: resultados de las encuestas poblacionales realizadas en 15 países

RESUMEN

Objetivo. Analizar los datos de las encuestas poblacionales publicadas provenientes de 15 países de América Latina y el Caribe sobre baja visión funcional (BVF) (baja visión, desde una agudeza visual [AV] inferior a 6/18 [20/60] hasta ≥ percepción de luz (PL+), en el mejor ojo, no tratable ni corregible) en adultos de 50 años de edad o mayores.

Métodos. Con objeto de extraer información estadística en materia de BVF, se volvieron a analizar los datos de 15 encuestas transversales poblacionales sobre ceguera y deficiencia visual realizadas del 2003 al 2013 (10 a escala nacional y cinco subnacionales) que abarcaron a 55 643 personas de ≥ 50 años de edad en 15 países. Once de los estudios emplearon el método de Evaluación Rápida de la Ceguera Evitable y cuatro utilizaron el método de Evaluación Rápida de de Catarata y Servicios Quirúrgicos. Al analizar las 10 encuestas nacionales, se extrapoló la prevalencia específica por edad y sexo de la BVF frente a la población correspondiente, con objeto de calcular el número total de personas de ≥ 50 años de edad con BVF.

Resultados. La prevalencia de la BVF ajustada por edad y sexo en personas de ≥ 50 años de edad varió desde 0,9% (en Guatemala, México y Uruguay) a 2,2% (en Brasil y Cuba) y aumentó con la edad. La prevalencia promedio ponderada en las 10 encuestas nacionales fue de 1,6%: 1,4% en hombres y 1,8% en mujeres. Al considerar los 10 estudios nacionales en su conjunto, se calcularon un total de 509 164 personas de ≥ 50 años de edad con BVF. Con base en las 910 personas afectadas, las principales causas de BVF fueron la degeneración macular relacionada con la edad (prevalencia promedio ponderada de 26%), el glaucoma (23%), la retinopatía diabética (19%), otras enfermedades del segmento posterior del ojo (15%), las opacidades corneales no tracomatosas (7%) y las complicaciones posteriores a la cirugía de la catarata (4%).

Conclusiones. Se prevé que la BVF aumente como consecuencia de 1) el aumento exponencial de esta afección con la edad, 2) la mayor esperanza de vida, y 3) el aumento de personas de ≥ 50 años de edad. Estos datos pueden ser útiles para planificar y extender los servicios de atención a la disminución de la agudeza visual en la Región; países extensos, como Brasil y México, requerirían nuevos estudios. La prevención constituye una estrategia muy importante para reducir la BVF, ya que más de 50% de los casos se pueden prevenir.

Palabras clave Salud ocular; baja visión; estudios transversales; planificación en salud; Argentina; Brasil; Chile; Cuba; Ecuador; El Salvador; Guatemala; Honduras; México; Panamá; Paraguay; Perú; República Dominicana; Uruguay; Venezuela; América Latina; Región del Caribe.