Public Health and Eye Care

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Prevalence of Visual Impairment
(BCVA ≤ 20/40-Better Eye)

Prevalence of Blindness
(BCVA ≤ 20/200-Better Eye)
Comparison of Age-Specific Prevalence (%) of Visual Impairment in Latinos with African-Americans and Caucasians

Prevalence of All Lens Changes
Prevalence of Any Age-Related Macular Degeneration

Prevalence of Open-Angle Glaucoma
Comparison of prevalence of Glaucoma in LALES Latinos and African-Americans and Whites in the Baltimore Eye Study

Prevalence of Any Diabetic Retinopathy
Uncorrected refractive error and unmet refractive need in Latinos

Additional LALES findings

LALES found that..

• Only 57% of the participants reported ever visiting an eye doctor.
• Only 21% visited an eye doctor annually.
Additional LALES findings

*LALES found that...*

- One in five participants with diabetes was newly diagnosed during the LALES examination, and 25% of these participants were found to have diabetic retinopathy.

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LALES 2
4-year Incidence and Progression
Summary Results
Eligible Participants

- Of 6357 participants examined at Baseline,
- 6100 (257 deceased) were living eligible for the 4-year follow-up examination,
- 4658 (76%) completed the 4-year follow-up clinical examination.

Four-Year Incidence of Presenting Binocular Visual Impairment *

*Incidence reported using United States criteria for visual impairment and blindness.
Four-Year Incidence of Best-Corrected Visual Impairment and Blindness*

* Incidence reported using United States criteria for visual impairment and blindness

Four-Year Incidence of Any Cortical Opacities

* Incidence reported using United States criteria for visual impairment and blindness
Four-Year Incidence of Any Nuclear Opacities

Age group at baseline (years)

Four-Year Incidence of Any PSC Opacities

Age group at baseline (years)
### Four-Year Incidence of Any Diabetic Retinopathy

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-49</td>
<td>36.5</td>
</tr>
<tr>
<td>50-59</td>
<td>45.5</td>
</tr>
<tr>
<td>60-69</td>
<td>64.2</td>
</tr>
<tr>
<td>70+</td>
<td>39.2</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
</tr>
</tbody>
</table>

### Four-Year Incidence of Early Age-Related Macular Degeneration

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-49</td>
<td>3.6</td>
</tr>
<tr>
<td>50-59</td>
<td>6.4</td>
</tr>
<tr>
<td>60-69</td>
<td>7.4</td>
</tr>
<tr>
<td>70-79</td>
<td>12.3</td>
</tr>
<tr>
<td>80+</td>
<td>13.1</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
</tr>
</tbody>
</table>
Four-Year Incidence of Advanced Age-Related Macular Degeneration (either eye)

Four-Year Incidence of AMD by Specific Lesions
Prevalence of Undetected Eye Disease

Projected # of Latinos with Any Undetected Eye Disease

Any Undetected Eye Disease

# of people

0 5,000,000 10,000,000 15,000,000 20,000,000 25,000,000 30,000,000

Year

2000 2020 2030 2040 2050

Detected
Undetected
Total costs of visual impairment in 2005 were estimated as $173 billion.

$69.6 billion Financial costs

$103 billion - Value of the healthy life lost
Risk factors for undetected eye disease

• Older age (≥80) (5 fold higher risk than 40 year olds)
• Having diabetes mellitus (3 fold higher risk)
• Never having had an eye examination (2 times)
• Being uninsured (60% higher risk)
• Less than high school education (30% higher risk)
• Low acculturation (30% higher risk)

Uncorrected Refractive Error, Unmet Refractive Need, and Undetected Eye Diseases
Table 1. Age-Specific Prevalence of Uncorrected Refractive Error in CHES

<table>
<thead>
<tr>
<th>Age Group (yrs)</th>
<th>Uncorrected Refractive Error*</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>n</td>
<td>% (95% CI)</td>
<td>N</td>
</tr>
<tr>
<td>50–59</td>
<td>2180</td>
<td>368</td>
<td>16.9 (15.3-18.5)</td>
<td></td>
</tr>
<tr>
<td>60–69</td>
<td>1547</td>
<td>299</td>
<td>19.3 (17.4-21.3)</td>
<td></td>
</tr>
<tr>
<td>70–79</td>
<td>549</td>
<td>93</td>
<td>16.9 (13.8-20.1)</td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>306</td>
<td>59</td>
<td>19.3 (14.9-23.7)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4582</td>
<td>819</td>
<td>17.9 (16.8-19.0)</td>
<td></td>
</tr>
<tr>
<td>P for trend test</td>
<td></td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Age-Specific Prevalence of Unmet Refractive Need in CHES

<table>
<thead>
<tr>
<th>Age Group (yrs)</th>
<th>Definition 1†</th>
<th></th>
<th></th>
<th></th>
<th>Definition 2‡</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>n</td>
<td>% (95% CI)</td>
<td>N</td>
<td>n</td>
<td>% (95% CI)</td>
<td>N</td>
<td>n</td>
</tr>
<tr>
<td>50–59</td>
<td>819</td>
<td>62</td>
<td>7.6 (5.8-9.4)</td>
<td>774</td>
<td>61</td>
<td>7.9 (6.0-9.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60–69</td>
<td>759</td>
<td>63</td>
<td>8.3 (6.3-10.3)</td>
<td>696</td>
<td>63</td>
<td>9.1 (6.9-11.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70–79</td>
<td>308</td>
<td>37</td>
<td>12.0 (8.4-15.6)</td>
<td>291</td>
<td>36</td>
<td>12.4 (8.6-16.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>155</td>
<td>29</td>
<td>18.7 (12.6-24.8)</td>
<td>146</td>
<td>30</td>
<td>20.5 (14.0-27.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2041</td>
<td>191</td>
<td>9.4 (8.1-10.6)</td>
<td>1907</td>
<td>190</td>
<td>10.0 (8.6-11.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P for trend test</td>
<td>&lt;.0001</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summary:
- The age-specific prevalence of unmet refractive need increased with older age using either definition.
- There were no significant gender-related differences in the prevalence of unmet refractive need.
Table 3. Age-Specific Prevalence of Undetected/detected Eye Diseases in CHES (n=4,145*)

<table>
<thead>
<tr>
<th>Age Group (yrs)</th>
<th>All Participants with Eye Disease N=2622</th>
<th>Undetected Eye Disease N=1686</th>
</tr>
</thead>
<tbody>
<tr>
<td>50–59</td>
<td>1139</td>
<td>700 (61.4%)</td>
</tr>
<tr>
<td>60–69</td>
<td>992</td>
<td>641 (64.6%)</td>
</tr>
<tr>
<td>70–79</td>
<td>347</td>
<td>231 (66.6%)</td>
</tr>
<tr>
<td>≥80</td>
<td>144</td>
<td>114 (79.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>2622</td>
<td>1686 (64.3%)</td>
</tr>
</tbody>
</table>

P for trend test P<0.001

Summary:
- Undetected eye disease: age-related macular degeneration (67.2%), glaucoma (61.2%), cataract (38.3%), refractive error (25.3%), and diabetic retinopathy (8.3%).
- 64% of all participants with eye disease including refractive error was previously undetected.
- The proportion of undetected eye disease increased with older age.

Table 4. Predictors of Undetected Eye Disease in CHES

Summary:
Major risk factors for undetected eye disease included:
- Speaking Chinese only at home (OR=1.7, 1.3-2.5)
- Having diabetes mellitus (OR=2.4, 1.8-3.1)
- Never having had an physical examination (OR=1.7, 1.2-2.4)
- Male gender (OR=1.4, 1.1-1.7)
- Less educational attainment (OR=1.6, 1.0-2.6)
- Without having a regular place for care (OR=1.4, 1.1-1.7)
- Older age (OR=2.7, 1.8-4.3)
- Never having had a complete eye examination (OR=1.6, 1.2-1.9)
Self-Reported Utilization of Eye Care

Table 1. Age-Specific Prevalence of Utilization of Eye Care in CHES

<table>
<thead>
<tr>
<th>Age Group (yrs)</th>
<th>N</th>
<th>Self-Reported Utilization of Eye Care</th>
<th>≥ 1 Eye Care Visits in Past 12 Months</th>
<th>Ever Had a Dilated Eye Exam</th>
<th>≥ 1 Dilated Eye Exams in Past 12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>50–59</td>
<td>2164</td>
<td>14%</td>
<td>34%</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>60–69</td>
<td>1533</td>
<td>23%</td>
<td>51%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>70–79</td>
<td>546</td>
<td>44%</td>
<td>73%</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>302</td>
<td>42%</td>
<td>83%</td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4545</td>
<td>22%</td>
<td>48%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>P for trend test</td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

Summary:
- Overall, 22% of participants reported an eye care visit and 21% reported having a dilated examination in the past year.
- Forty eight percent reported ever having had a dilated eye examination.
- Utilization of eye care increased with older age (p<0.001)
Table 2. Comparison of Self-Reported Utilization of Eye Care between CHES and LALES

<table>
<thead>
<tr>
<th>Study (Ethnic Group)</th>
<th>sample size</th>
<th>age categories</th>
<th>overall prevalence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1 Eye Care Visits in Past 12 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHES (urban Chinese American)</td>
<td>4545</td>
<td>14%</td>
<td>23%</td>
</tr>
<tr>
<td>LALES (urban Latino American)</td>
<td>3350</td>
<td>36%</td>
<td>43%</td>
</tr>
<tr>
<td>Ever Had a Dilated Eye Exam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHES (urban Chinese American)</td>
<td>4490</td>
<td>34%</td>
<td>51%</td>
</tr>
<tr>
<td>LALES (urban Latino American)</td>
<td>3274</td>
<td>56%</td>
<td>69%</td>
</tr>
<tr>
<td>≥ 1 Dilated Eye Exams in Past 12 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHES (urban Chinese American)</td>
<td>4490</td>
<td>11%</td>
<td>23%</td>
</tr>
<tr>
<td>LALES (urban Latino American)</td>
<td>3274</td>
<td>17%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Table 3. Predisposing, Enabling and Need Variables Associated with Utilization of Eye Care in CHES

Summary:
- Greater eye care utilization was associated with
  - older age
  - having health insurance
  - lower vision-specific quality of life scores
  - female gender
  - greater number of co-morbidities
  - currently driving
  - having a usual place for care
  - bilingual language proficiency (English and Asian), and
  - more education.
- Similar predictors as LALES
Multi-Ethnic Pediatric Eye Disease Study

• MEPEDS data found the prevalence of myopia (spherical equivalent of -1 diopter or greater) to be highest in African American children (6.6%) compared to Asian (4.0%) and Hispanic (3.7%) children.
• Non-Hispanic White children (1.2%) had the lowest prevalence of myopia. Prevalence of myopia in Asian children varied with age.
• Prevalence of myopia decreased with increasing age in African American children as well as in Hispanic children from 12 to 72 months of age. No trend in myopia with age was observed in Non-Hispanic white children.
• Prevalence of hyperopia (spherical equivalent of +2 diopters or greater) was highest in Hispanic (26.9%) and Non-Hispanic White children (25.7%), but lower in African American (20.8%) and Asian children (13.5%).

• Astigmatism also varied with ethnicity. Hispanic children had the highest prevalence of astigmatism (1.5 diopter or greater) (16.8%) and Non-Hispanic White children had the lowest prevalence (6.3%).
• Prevalence of any strabismus was greatest in Asian children (3.6%) compared to Non-Hispanic White (3.3%), African American (2.6%), and Hispanic (2.4%) children.

• Prevalence of amblyopia was greatest for Hispanic children (2.6%) compared to Non-Hispanic White (1.8%), African American (1.6%) and Asian (1.8%) children.
Undetected Eye Disease

87% of all Eye Disease in Children was previously undetected

Over 90% of Amblyopia was undetected

Risk Factors Associated with Childhood Strabismus: The Multi-Ethnic Pediatric Eye Disease Study and the Baltimore Pediatric Eye Disease Study

The Joint Writing Committee for the Multi-Ethnic Pediatric Eye Disease Study and
Baltimore Pediatric Eye Disease Study Groups

Ophthalmology 2011: Accepted for Publication on June 3, 2011

Ophthalmology
Definition:

- Strabismus was defined as constant or intermittent heterotropia of any magnitude at distance and/or near fixation.
In Conclusion:

- This study established a strong dose-dependent link between refractive errors and strabismus and
- confirmed the role of other risk factors, such as premature birth and gestational exposure to maternal smoking.
- Because refractive errors may be targeted for early intervention, our data provide valuable information to help guide providers and patient families in making informed decisions regarding management of early refractive error.
- However, longitudinal study is needed both to confirm the predictive value of uncorrected refractive error, and to evaluate the potential impact of early treatment.
Risk Factors for Decreased Visual Acuity in Preschool Children: the Multi-Ethnic Pediatric Eye Disease Study and the Baltimore Pediatric Eye Disease Study

The Joint Writing Committee for the Multi-Ethnic Pediatric Eye Disease Study and Baltimore Pediatric Eye Disease Study Groups

Ophthalmology 2011: Accepted for Publication on June 3, 2011

Figure 3a

Prevalence of Hyperopic VA Difference >= 2 lines (%) vs SE Myopia (Diopters)
Risk Factors for Decreased Visual Acuity in Preschool Children

In Conclusion:

• Our data support the strong association of anisometropic and bilateral refractive errors with unilateral and bilateral decreased best-corrected VA, respectively.

• We suggest an expanded range of refractive errors that should be considered as potentially contributing to amblyopia.

• We have confirmed the high risk of unilateral VA deficits associated with esotropia and the low risk associated with exotropia.

Lessons from LALES, CHES and MEPEDS

• Extremely high rates of undetected eye disease in children and Adults

• The single most important strategy would be screening for eye disease or visual impairment
Lessons from LALES, CHES and MEPEDS

• Once persons have been screened important to get care

• The single most important intervention would be addressing refractive error both in adults and children

Lessons from LALES, CHES and MEPEDS

• In the US for screening to be covered by insurance, evidence needs to be provided that screening for vision loss and eye disease is beneficial.

• For us, it would be important to conduct screening trials to demonstrate the benefit of screening
Thank you