Association of Vision Loss and Work Status in the United States

Cheryl E. Sherrod, MD, MPH; Susan Vitale, PhD, MHS; Kevin D. Frick, PhD; Pradeep Y. Ramulu, MD, MHS, PhD

Methods

We analyzed participants aged 16 to 74 years from the National Health and Nutrition Examination Survey 1999-2008 cycles. Participants were stratified using a multistage probability design to represent the noninstitutionalized US civilian population. All procedures were approved by the National Center for Health Statistics review board and all participants provided written informed consent prior to data collection.

Distance visual acuity was first measured with presenting correction (if any) and again after autorefraction in eyes with visual acuities of 20/30 or worse. Visual acuity was categorized as normal when 20/40 or better in the better-seeing eye on presentation, uncorrected refractive error (URE) if worse than 20/40 on presentation but improving to 20/40 or better with autorefraction, or visual impairment (VI) if worse than 20/40 in the better-seeing eye after autorefraction. Acuity was not measured in participants who answered no to the question “With both eyes open, can you see light?” and these individuals were not included in our analyses.

Distance visual acuity was first measured with presenting correction (if any) and again after autorefraction in eyes with visual acuities of 20/30 or worse. Visual acuity was categorized as normal when 20/40 or better in the better-seeing eye on presentation, uncorrected refractive error (URE) if worse than 20/40 on presentation but improving to 20/40 or better with autorefraction, or visual impairment (VI) if worse than 20/40 in the better-seeing eye after autorefraction. Acuity was not measured in participants who answered no to the question “With both eyes open, can you see light?” and these individuals were not included in our analyses.

Participants were categorized as working or not working at an outside job or business based on responses to the National Health and Nutrition Examination Survey occupational questionnaire. Working participants were further categorized as full time or part time (<35 h/wk). Nonworking participants were further categorized as unemployed if look-
ing for work or on layoff or as not in the labor force if neither seeking work nor on layoff.

Multivariable models using sample weights to account for the complex sampling design were used to assess the association of VI and URE with work status after adjusting for age, race/ethnicity, and the presence of self-reported comorbid disease. Multivariable models using sample weights to account for the complex sampling design were used to assess the association of VI and URE with work status after adjusting for age, race/ethnicity, and the presence of self-reported comorbid disease.4 Separate models predicted the association of vision with not working, part-time work (among those working), and unemployment (among those in the labor force, ie, either working or unemployed).

Results

We estimated that 58.7% (95% CI, 46.9-70.6) and 66.5% (95% CI, 62.3-70.7) of adult American men with VI and URE, respectively, were working compared with 76.2% (95% CI, 75.1-77.4) of American men with normal vision. We estimated that 24.5% (95% CI, 13.5-35.6) and 56.0% (95% CI, 51.2-60.8) of adult American women with VI and URE, respectively, were working compared with 62.9% (95% CI, 61.3-64.5) of American women with normal vision.

Table 1. Work Status in Men and Women With Normal Vision, VI, and URE: NHANES 1999-2008

<table>
<thead>
<tr>
<th>Group</th>
<th>Workingb</th>
<th>Unemployedb</th>
<th>Not in the Labor Forceb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (95% CI)</td>
<td>No. in Millions</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>All adults</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal vision</td>
<td>69.5 (68.4-70.6)</td>
<td>126.7</td>
<td>3.1 (2.8-3.4)</td>
</tr>
<tr>
<td>VI</td>
<td>42.2 (32.6-51.8)</td>
<td>0.6</td>
<td>2.6 (0.5-7)</td>
</tr>
<tr>
<td>URE</td>
<td>61.4 (58.4-64.4)</td>
<td>6.00</td>
<td>3.8 (2.7-4.8)</td>
</tr>
<tr>
<td>Totald</td>
<td>133.3</td>
<td>6.03</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal vision</td>
<td>76.2 (75.1-77.4)</td>
<td>68.43</td>
<td>3.6 (3.1-4.0)</td>
</tr>
<tr>
<td>VI</td>
<td>58.7 (46.9-70.6)</td>
<td>0.43</td>
<td>2.8 (0-7.8)</td>
</tr>
<tr>
<td>URE</td>
<td>66.5 (62.3-70.7)</td>
<td>3.26</td>
<td>4.5 (3.0-6.1)</td>
</tr>
<tr>
<td>Totald</td>
<td>72.12</td>
<td>3.47</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal vision</td>
<td>62.9 (61.3-64.5)</td>
<td>58.66</td>
<td>2.6 (2.3-3.0)</td>
</tr>
<tr>
<td>VI</td>
<td>24.5 (13.5-35.6)</td>
<td>0.20</td>
<td>2.2 (0-5.5)</td>
</tr>
<tr>
<td>URE</td>
<td>56.0 (51.2-60.8)</td>
<td>2.69</td>
<td>3.0 (1.6-4.4)</td>
</tr>
<tr>
<td>Totald</td>
<td>61.55</td>
<td>2.58</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: NHANES, National Health and Nutrition Examination Survey; URE, uncorrected refractive error; VI, visual impairment.

*Vision was categorized as normal when measured visual acuity was 20/40 or better in the better-seeing eye on presentation, VI if worse than 20/40 in the better-seeing eye after autorefraction, or URE if worse than 20/40 on presentation but improving to 20/40 or better with autorefraction.

b Working is defined as working at an outside job or business within the last week. Unemployed is defined as looking for work or being on layoff. Not in the labor force is defined as neither working nor looking for work nor on layoff.

c Percentage values are weighted according to the 2000 US Census.

d Numbers do not sum to group total owing to rounding.
normal vision (Table 1, Figure). In multivariable logistic regression models including all participants, individuals with either URE (odds ratio [OR], 1.4; 95% CI, 1.1-1.6; P < .001) or VI (OR, 3.0; 95% CI, 1.9-4.8; P < .001) had higher odds of not working than participants with normal vision. Neither URE nor VI were associated with higher odds of unemployment (among individuals in the labor force) or part-time work (among those working) (Table 2). In stratified analyses, the odds of not working associated with VI were particularly high in women (OR, 4.3; 95% CI, 2.9-6.5 vs OR, 2.8; 95% CI, 1.6-4.9 for participants older than 55 years), and diabetic individuals (OR = 14.8; 95% CI, 5.8-37.3 vs OR = 3.0; 95% CI, 1.8-5.1 for nondiabetic individuals) (Figure).

Discussion

Visually impaired Americans are less likely to be working but not more likely to be unemployed (seeking work or laid off), suggesting they either never enter or drop out of the labor force. Visual impairment is particularly likely to be associated with not working in diabetic individuals, women, and individuals younger than 55 years. To our knowledge, the current study is the first to describe work patterns in a population-based sample of individuals in whom defined objective (ie, measured visual acuity) criteria were used to define VI.

Our work corroborates previous studies that suggest poor vision is strongly associated with not working. Data from the US Bureau of Labor Statistics suggest that only 22% of the 4 million Americans with vision loss are employed only 18% of a sample of Americans seeking visual rehabilitative services were employed. In both studies, fewer individuals were working than the current study, in which roughly one-quarter of women and nearly 60% of men were employed full time. The US Bureau of Labor Statistics evaluates vision loss through self-reporting to generate statistics, such that it is unclear whether these individuals are truly visually impaired or whether their impairment is owing to refractive error or other causes. Furthermore, neither study measured visual acuity directly, so the level of vision loss is not known. It is possible that both populations had a significant number of individuals with severe vision loss, which would explain differences with the current study where visual acuity worse than 20/40 was classified as VI.

Our data indicated that VI was particularly associated with not working in specific subgroups. Visual impairment was associated with greater odds of not working in women compared with men, possibly because women may be more likely to choose social roles other than employment and less likely to seek the vocational training necessary to facilitate employment. Visual impairment was associated with higher odds of not working in the subgroup of Americans younger than the age of 55 compared with those older than 55 years. Individuals with early-onset vision loss may be likely to never enter the labor force while others experiencing vision loss early in their career may be less able to adapt to vision loss compared with older and more established workers. Alternately, it is possible that the observed differences simply reflect that more older individuals stop working for reasons other than vision loss, thus lowering the odds of not working associated with VI. Finally, visually impaired diabetic participants were significantly less likely to be working than VI individuals without diabetes mellitus. Previous work has indicated that diabetic participants are likely to experience employment difficulties and when VI is combined with other health concerns (eg, neuropathy or kidney disease), employment may be particularly unlikely.

The cross-sectional nature of our study makes it difficult to conclude that poor vision was causative with regards to work status. Indeed, it is quite possible that URE is the result of lim-
ited income from not working. Additionally, very few individuals (13.3%) in the VI group had a visual acuity of 20/200 or worse, leaving us unable to accurately estimate the impact of severe VI on work status. Finally, participants who responded having no light perception in both eyes did not have their visual acuity formally examined. Moreover, participants’ responses to this question were only recorded during a portion of the study period and a decision was made to not include these individuals in our analyses, which may have led us to underestimate the impact of VI on employment status.

Conclusions

The low frequency of employment among visually impaired individuals highlights the need for job training and employment promotion strategies in this at-risk population. Specific consideration should be given to populations at particularly higher risk of not working including women, individuals with diabetes mellitus, and those younger than 55 years. Additional studies should focus on why current strategies are ineffective and/or underused.

ARTICLE INFORMATION

Submitted for Publication: October 7, 2013; final revision received January 28, 2014; accepted January 31, 2014.

Published Online: July 17, 2014. doi:10.1001/jamaophthalmol.2014.2213.

Author Contributions: Drs Sherrod and Ramulu had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Sherrod, Frick, Ramulu. Acquisition, analysis, or interpretation of data: Sherrod, Vitale, Ramulu. Drafting of the manuscript: Sherrod. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: Sherrod. Administrative, technical, or material support: Sherrod, Vitale. Study supervision: Vitale, Ramulu.

Conflict of Interest Disclosures: None reported.

Funding/Support: This work was supported by grant EY018595 from the National Institutes of Health and Research to Prevent Blindness.

Role of the Sponsor: The funders had no role in the design and conduct of the study; collection, management, analysis, or interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

REFERENCES


