Association of Vision Loss and Work Status in the United States

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Individually who do not work have poorer physical and mental health, are less socially integrated, and experience a lower sense of worth and self-confidence.1 Several previous studies have demonstrated it is unlikely that visually impaired individuals are employed.2-9 However, the estimates for workforce participation presented in these studies were subject to bias because data were not population based,3,5,6 relied on self-reported visual impairment (as opposed to measured visual acuity),2,4,5 did not adhere to a clearly defined definition of visual impairment,3,5 and/or analyzed individuals receiving vocational services.6,8,9 Here, we assess employment rates by vision status in a nationally representative sample of working-age American individuals analyzed as part of the National Health and Nutrition Examination Survey.

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.3 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.3 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.

Results

A total of 19 849 participants from the 1999-2008 National Health and Nutrition Examination Survey completed a vision examination and employment/demographic questionnaires. Employment rates for men with visual impairment, uncorrected refractive error, and normal vision were 58.7%, 66.5%, and 76.2%, respectively; employment rates for women with visual impairment, uncorrected refractive error, and normal vision were 24.5%, 56.0%, and 62.9%, respectively. In multivariable models adjusting for age, sex, race/ethnicity, and chronic disease status, both uncorrected refractive error (odds ratio [OR], 1.36; 95% CI, 1.15-1.60) and visual impairment (OR, 3.04; 95% CI, 1.93-4.79) were associated with a higher likelihood of not working. Subgroups in which visual impairment was associated with even higher odds of not working included women (OR, 4.9; 95% CI, 2.5-9.6), participants younger than 55 years (OR, 4.3; 95% CI, 2.9-6.5), and diabetic individuals (OR, 14.8; 95% CI, 5.8-37.3).

Conclusions and Relevance

Decreased vision is associated with a significantly higher likelihood of not working. Visually impaired diabetic individuals, women, and those younger than 55 years have a particularly high risk of not working. Further investigation is warranted to understand barriers for employment in individuals with decreased 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>Working(^b) % (95% CI)(^c)</th>
<th>No. in Millions</th>
<th>Unemployed(^b) % (95% CI)(^c)</th>
<th>No. in Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>All adults</td>
<td></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>
<td>5.6</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>
<td>0.03</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>
<td>0.4</td>
</tr>
<tr>
<td>Total(^d)</td>
<td>133.3</td>
<td>6.03</td>
<td></td>
<td>55.1</td>
</tr>
<tr>
<td>Men</td>
<td></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>
<td>3.23</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>
<td>0.02</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>
<td>0.22</td>
</tr>
<tr>
<td>Total(^d)</td>
<td>72.12</td>
<td>3.47</td>
<td></td>
<td>19.84</td>
</tr>
<tr>
<td>Women</td>
<td></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>
<td>2.42</td>
</tr>
<tr>
<td>VI</td>
<td>24.5 (13.5-35.6)</td>
<td>0.20</td>
<td>2.2 (0-5.1)</td>
<td>0.018</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>
<td>0.14</td>
</tr>
<tr>
<td>Total(^d)</td>
<td>61.55</td>
<td>2.58</td>
<td></td>
<td>34.75</td>
</tr>
</tbody>
</table>

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

\(^a\) 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.

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, 61.6-64.5) of American women with...
normal vision (Table 1, Figure). In multivariable logistic re-
gression 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 work-
ing associated with VI were particularly high in women (OR, 
4.9; 95% CI, 2.5-9.6 vs OR, 1.9; 95% CI, 0.9-3.7 for men), par-
ticipants younger than 55 years (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\(^9\) while only 
18% of a sample of Americans seeking visual rehabilitative 
services were employed.\(^9\) 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 un-
clear 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 di-
rectly, 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 classi-
ced 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 
ods 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 sim-
ply reflect that more older individuals stop working for rea-
sons other than vision loss, thus lowering the odds of not 
working associated with VI. Finally, visually impaired dia-
abetic 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\(^10,11\) and when VI is com-
bined 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-

### Table 2. Multivariable Logistic Regression Analyses Predicting Odds of Not Working, Working Part Time, and Being Unemployed

<table>
<thead>
<tr>
<th>Variable</th>
<th>Interval</th>
<th>Not Working vs Working</th>
<th>Part Time vs Full Time</th>
<th>Unemployed vs Working</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Odds Ratio</td>
<td>(P) Value</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>Vision status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>URE</td>
<td>Vs normal vision</td>
<td>1.36</td>
<td>&lt;.001</td>
<td>1.25</td>
</tr>
<tr>
<td>VI</td>
<td>Vs normal vision</td>
<td>3.04</td>
<td>&lt;.001</td>
<td>1.38</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>Vs white</td>
<td>1.46</td>
<td>&lt;.001</td>
<td>0.80</td>
</tr>
<tr>
<td>Mexican American</td>
<td>Vs white</td>
<td>1.37</td>
<td>&lt;.001</td>
<td>0.74</td>
</tr>
<tr>
<td>Age, y(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-25</td>
<td>5 y</td>
<td>0.42</td>
<td>&lt;.001</td>
<td>0.19</td>
</tr>
<tr>
<td>26-55</td>
<td>5 y</td>
<td>1.02</td>
<td>&lt;.001</td>
<td>0.96</td>
</tr>
<tr>
<td>56-74</td>
<td>5 y</td>
<td>2.47</td>
<td>&lt;.001</td>
<td>2.41</td>
</tr>
<tr>
<td>Women</td>
<td>Vs men</td>
<td>2.25</td>
<td>&lt;.001</td>
<td>3.7</td>
</tr>
<tr>
<td>Comorbid illness(^b)</td>
<td>Vs no comorbid illness</td>
<td>1.62</td>
<td>&lt;.001</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Abbreviations: URE, uncorrected refractive error; VI, visual impairment.

\(^a\) Age expressed in years was incorporated into regression models as a spline term because its relationship with the outcome variable does not have the same linear relationship across all age groups but differs from ages 16 to 25 years, ages 26 to 55 years, and ages 56 to 74 years.

\(^b\) Comorbid illness was present if the patient self-reported 1 or more of the following: asthma, arthritis, congestive heart failure, coronary heart disease, angina pectoris, heart attack, stroke, emphysema, or diabetes mellitus.
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.