Association between visual impairment and health-related outcomes in California

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Background

- **Visual impairment** is a term encompassing conditions of low vision such as partial vision loss and blurry vision not improved with refractive correction, as well as complete blindness.
- In 2017, visual impairment affected **3.9 million older adults** (≥45 years), with an additional half a million new cases emerging within this population annually[1].
- The high prevalence and increasing incidence of visual impairment presents a pressing public health concern due to its associations with potential poor health outcomes such as **increased mortality**[2] and **depression and anxiety**[3].

Objectives

- To examine associations between visual impairment and health-related variables in California, USA

Methods

- **Data Source**
  - 2015-2019 **American Community Survey (ACS)** 5-year estimate
    - Continuous nationwide survey by the U.S. Census Bureau to collect social, economic, housing, and demographic data about individuals living in the U.S.
- **Exposure**
  - **Visual impairment**: blindness or serious difficulty seeing even when wearing glasses
- **Outcome**
  - **Hearing difficulty**: deafness or serious difficulty hearing
  - **Cognitive difficulty**: serious difficulty concentrating, remembering, or making decisions
  - **Ambulatory difficulty**: difficulty walking or climbing stairs
  - **Self-care difficulty**: difficulty dressing or bathing
  - **Independent living difficulty**: difficulty doing errands alone (e.g. shopping, visiting doctor's office)

Methods (cont.)

- **Statistical Analysis**
  - Included all participants ≥18 years and sub-analysis of participants ≥65 years
    - Prevalence of each health-related variable in 542 Medical Service Study Area (MSSAs) in California
    - Linear regression models at the MSSA level between prevalence of visual impairment and other health-related variables (unadjusted and adjusting for covariates)
- **Covariates**
  - Ethnicity, gender, age, poverty status, urbanity of residence location, access to health insurance

Results

- **Study population**: 30,231,767 participants from the 2015-2019 ACS
- **Visual impairment prevalence**: 709,353 participants (2.3%)

Table 1. Prevalence of Health-Related Outcomes in Study Population

Characteristics	Age (years)	Number	Percentage
Total Population	≥ 18	30,231,767	100.0%
	≥ 65	5,478,957	100.0%
Visual Impairment	≥ 18	709,353	2.3%
	≥ 65	336,948	6.1%
Hearing difficulty	≥ 18	1,095,238	3.6%
	≥ 65	736,212	13.4%
Cognitive difficulty	≥ 18	1,358,181	4.5%
	≥ 65	520,434	9.5%
Ambulatory difficulty	≥ 18	2,085,111	6.9%
	≥ 65	1,199,556	21.9%
Self-care difficulty	≥ 18	887,059	2.9%
	≥ 65	516,062	9.4%
Independent living difficulty	≥ 18	1,625,465	5.4%
	≥ 65	892,100	16.3%

Table 2. Associations between Visual Impairment and Health-Related Outcomes*

	Age 18 and Older		Age 65 and Older	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Health-Related Outcome	Slope Estimate (±SE)		Slope Estimate (±SE)	
Hearing difficulty	0.89 ± 0.071	0.67 ± 0.057	0.67 ± 0.057	0.45 ± 0.062
Cognitive difficulty	1.06 ± 0.061	0.79 ± 0.066	0.76 ± 0.065	0.54 ± 0.051
Ambulatory difficulty	1.57 ± 0.090	1.00 ± 0.082	0.98 ± 0.081	1.08 ± 0.080
Self-care difficulty	0.63 ± 0.042	0.48 ± 0.047	0.47 ± 0.050	0.66 ± 0.052
Independent living difficulty	1.16 ± 0.069	0.84 ± 0.071	0.82 ± 0.070	0.90 ± 0.070

*all p-values <0.001

Results (cont.)

- Linear regression models showed **statistically significant positive association between visual impairment and each health-related outcome**, for age groups ≥18 years as well as ≥65 years.
- The slope estimates here describe the % change in prevalence of each health-related outcome that would accompany a 1% rise in visual impairment
  - Ex: A 1% rise in visual impairment would be associated with a 1.57% rise in ambulatory difficulty (in the unadjusted, ≥18 years model)
- **Ambulatory difficulty** and **independent living difficulty** showed the strongest associations with visual impairment.

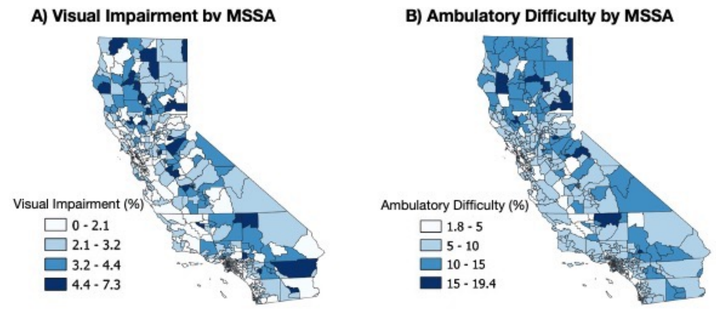

Figure 1a) Prevalence of visual impairment in California by MSSA. **Figure 1b)** Prevalence of ambulatory difficulty in California by MSSA. The gray scales of the maps were determined by the default Jenks natural breaks classification method in the GIS software (QGIS 3.16).

Discussion & Conclusion

- Our findings are consistent with existing literature, showing that visual impairment is associated with increased mobility limitations[4]. These limitations may in turn pose increased fall and subsequent injury risk[5,6].
- Additionally, visual impairment is associated with independent living difficulties. This is supported by studies showing that difficulty seeing impairs ability to perform daily activities such as driving[7,8].
- Public health efforts should focus on addressing visual impairment and its health-related outcomes.

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