

# Eye care utilization and its determinants in Canada

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## ABSTRACT •

**Objective:** To provide the frequency and potential determinants of eye care utilization over the last 12 months among Canadians between the ages of 45 and 85 years old.

**Design:** Cross-sectional population-based study.

**Participants:** 30,097 people in the Comprehensive Cohort of the Canadian Longitudinal Study on Aging.

**Methods:** Inclusion criteria included being between the ages of 45 and 85 years old, community-dwelling and living near one of the 11 data collection sites across 7 Canadian provinces. Eye care utilization was defined as the self-report of a visit to an optometrist or ophthalmologist in the past 12 months.

**Results:** In the last year, 57% of 28 728 adults visited an eye care provider although there was heterogeneity between provinces. The highest eye care utilization was found in Ontario at 62%, whereas the lowest was in Newfoundland and Labrador at 50%. Of concern, 25.3% of people with diabetes above the age of 60 years had not seen an eye care provider in the last year. Our novel finding was that current smokers were less likely to use eye care compared to never smokers (odds ratio [OR] = 0.76, 95% confidence interval [CI] 0.67–0.87). Confirming previous research, men compared to women (OR = 0.67, 95% CI 0.62–0.71), people with less than a bachelor's degree compared to more than a bachelor's degree (OR = 0.87, 95% CI 0.79–0.95), and people making less income (linear trend  $p < 0.05$ ) were less likely to use eye care.

**Conclusions:** Disparities exist in eye care utilization in Canada. Efforts should be made to reduce these disparities to reduce avoidable vision loss.

Visual impairment is a substantial economic burden in Canada costing approximately \$15.8 billion per year.<sup>1</sup> The prevalence of visual impairment increases dramatically with age such that approximately 1 in 10 adults above the age of 60 years is affected.<sup>2</sup> The majority of visual impairment is due to uncorrected refractive error.<sup>2</sup> Routine eye examinations are important for the timely detection of refractive error and the early identification and management of eye disease.<sup>3</sup>

The most recent study to examine rates and determinants of eye care utilization in Canada used data that are now more than 10 years old.<sup>4</sup> Jin and Trope used the 2005 Canadian Community Health Survey to examine eye care utilization in individuals aged 12 and older and found that 40% of Canadians in this age group utilized eye care services from an optometrist or an ophthalmologist in a 12-month period.<sup>4</sup> Being male, younger, having lower socioeconomic status, and living in Newfoundland and Labrador were factors associated with less utilization ( $p < 0.05$ ).

The Canadian Longitudinal Study on Aging (CLSA) Comprehensive Cohort, a large, national, population-based epidemiological study of over 30 000 middle-aged and older adults across 7 provinces of Canada, allows us to address the following goals: (i) to provide up-to-date estimates of eye care utilization, and (ii) to identify novel and confirm previously identified determinants of eye care

utilization.<sup>5</sup> Knowing the current patterns and frequency of eye care utilization would help to identify eye care access disparities, which would allow policymakers, researchers, and health care providers to devise ways to close the gaps and improve Canada's vision and eye health.

## METHODS

### Setting

The CLSA is a national prospective cohort study of adult development and aging. A detailed description of the CLSA methodology is reported elsewhere.<sup>5</sup> This analysis used baseline data from the 30 097 participants in the Comprehensive Cohort of the CLSA collected between 2012 and 2015. Participants were community-dwelling adults aged between 45 and 85 years living near one of 11 data collection sites (Victoria, Vancouver, Surrey, Calgary, Winnipeg, Hamilton, Ottawa, Montreal, Sherbrooke, Halifax, and St. John's) across 7 Canadian provinces. People were not eligible if they lived in an institution, were on a First Nations reserve or settlement, were full-time members of the Canadian Armed Forces, did not speak French or English, or had overt cognitive difficulties. Written informed consent was obtained and the project was approved by research ethics boards in 7 different provinces.

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**Design**

The participants in the CLSA Comprehensive Cohort were sampled using both provincial health registries (14%) and random digit dialling (86%). For those recruited using provincial health registries, a letter was sent to the randomly chosen, age-eligible person introducing the study and providing a consent form to be returned to the CLSA. For those recruited through random digit dialling, a random sample of landline telephone numbers was selected for a given geographic area. Stratified sampling was used to ensure adequate representation of various demographic groups. Strata within a province were defined by age group, sex, and distance from the data collection sites.

**Sources of Data**

All CLSA personnel underwent detailed training in all aspects of data collection. The training was standardized across all data collection sites. The following data were collected as part of a face-to-face, interviewer-administered questionnaire given either in the home or at a data collection site, unless otherwise specified.

**Sociodemographic.** Data on demographic variables such as age, sex, race/cultural group, highest level of education, and urban versus rural residence were obtained. Household income was assessed by asking, “What is your best estimate of the total household income received by all household members, from all sources, before taxes and deductions, in the past 12 months?” Respondents chose from 5 categories of household income: < \$20 000; \$20 000–\$50 000; \$50 000–\$100 000; \$100 000–\$150 000; and \$150 000 or more.

**Lifestyle and Health.** Participants were asked about former and current smoking. Depression was ascertained through the Center for Epidemiologic Studies Depression Scale Revised (CESD-R-10) questionnaire.<sup>6</sup> Participants who scored  $\geq 10$  points were classified as having depression. Memory problems were determined using the following questionnaire item: “Has a doctor ever told you that you have a memory problem?” Participants were classified as having diabetes if they answered “yes” to “Has a doctor ever told you that you have diabetes, borderline diabetes or that your blood sugar is high?” Those who said “yes” were then asked whether they had type 1 or type 2 diabetes.

**Eye Disease, Corrective Lenses, Visual Impairment, and Eye Care Utilization.** Information on eye disease was obtained by asking, “Has a doctor ever told you that you have [glaucoma, cataract, macular degeneration]?” People who said that they had been told that they had cataract were then asked if they currently had a cataract. Those who said no were assumed to have had it removed. Participants were asked if they wore contact lenses or glasses. Participants were also asked to rate their visual health using a 5-item

Likert scale ranging from “Excellent,” “Very good,” “Good,” “Fair,” to “Poor or Nonexistent.” Visual acuity was assessed with both eyes open using the Early Treatment Diabetic Retinopathy Study (ETDRS) letter chart at a 2 m distance, while participants wore their currently prescribed glasses or contact lenses for distance correction.<sup>7</sup> Participants who had a visual acuity of  $\leq 20/40$  were classified as visually impaired, as is standard in North America.<sup>8</sup> Information on eye care utilization was ascertained over the telephone with the question: “During the past 12 months, have you had contact with an ophthalmologist or optometrist about your health?” Previous research indicates that the self-report of eye care use in the previous year has good agreement with eye care use as confirmed in medical records ( $\kappa = 0.64$ ).<sup>9</sup>

**Number of Ophthalmologists and Optometrists by Province.** Data on the number of optometrists per 100 000 people by province were obtained from the Canadian Institute for Health Information.<sup>10</sup> Data on the number of ophthalmologists per province were obtained from the Canadian Medical Association,<sup>11</sup> and data on the number of people per province were taken from Statistics Canada.<sup>12</sup> All data are from the year 2013.

**Statistical Analysis**

The proportion who used eye care by province was plotted on a map using Stata/IC Version 14.2.<sup>13</sup>  $\chi^2$  tests of independence were used to determine the relationship between categorical variables and use of eye care. Variables that had a  $p$  value of 0.1 or lower from the  $\chi^2$  tests were retained for regression analysis to try to ensure that no important variables were missed. Logistic regression was then used for adjustment for the following: age, sex, ethnicity, education, marital status, income, rural residence, province, smoking, diabetes, self-reported eye disease, and visual impairment.<sup>14–16</sup> Only those variables that reached the Bonferroni-adjusted  $p$  value of 0.0014 for the 35 tests in the logistic regression model were considered statistically significant. The complex survey design was accounted for in all analyses by using the primary sampling unit, sample weight, and strata variables within the SVY commands in STATA Version 14.2 (College Station, Tex.). Age standardization of the primary outcome was done by direct age adjustment in which age-stratified rates were applied to a standard population (Alberta).

**RESULTS**

Of the 30 097 CLSA Comprehensive Cohort participants, a total of 28 728 participants completed the eye care utilization question (95%). The mean age of those who did and did not answer the question was the same at 60 years, and there was no difference by sex ( $p > 0.05$ ). However, those with missing data on eye care utilization were more likely to have lower household incomes, were

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