

# The webinar, “**Visual Impairment and Eye Care Utilization in the CLSA**” will begin shortly.

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# CLSA Webinar Series



## Visual impairment and eye care utilization in the Canadian Longitudinal Study on Aging

Presented by Dr. Ellen Freeman

12 to 1 p.m. ET | December 12, 2017

In this webinar presentation, Dr. Freeman will share the design and results of her research study, the goal of which was to determine the frequency and determinants of visual impairment and eye care utilization in Canada. Data were used from 30,097 CLSA participants aged 45-85 years old, and visual acuity was measured with both eyes open using a letter chart while participants wore their usual prescription for distance, if any. Visual impairment was defined as visual acuity worse than 20/40.

Dr. Freeman will reveal the risk factors identified in this study and share the preliminary results. She will also explain geographic variations identified in the participant sample and explore considerations around the efforts needed to reduce uncorrected refractive error and to ensure that Canadians have access to appropriate eye care.

Register online at <http://bit.ly/clsawebinars>



Canadian Longitudinal Study on Aging  
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# Visual Impairment and Eye Care Utilization in the CLSA

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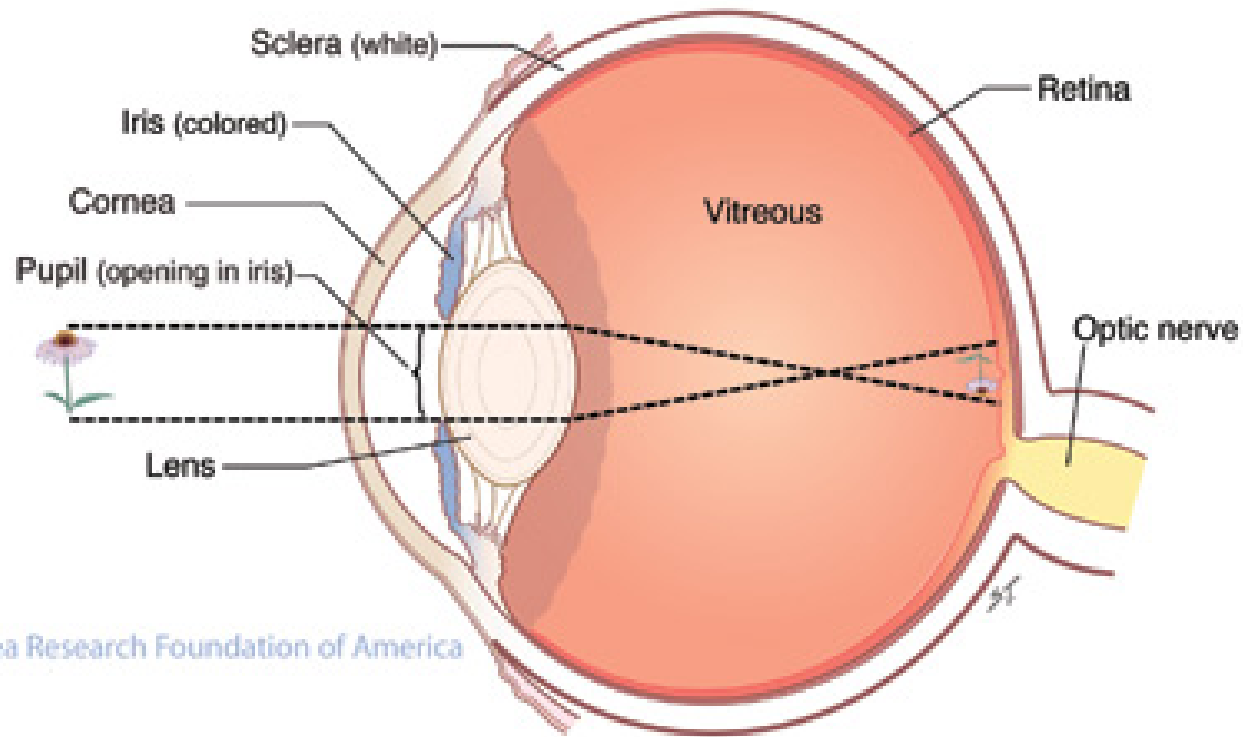
# Research Program Motivation

- Population aging will double the number of Canadians age 65 or older by 2031
- Many eye diseases are age-related
- \$8.6 billion in direct costs per year (CNIB)

# Outline

- Background (what is vision, prior literature)
- Objectives
- Methods
- Results
- Implications

# How Do We See?



# Major Causes of Visual Impairment

1. Refractive error (avoidable)
2. Cataract (avoidable)
3. Age-related macular degeneration
4. Glaucoma
5. Diabetic retinopathy

# Measurement of Vision

- Many measures of visual function are important in everyday life
  - Visual acuity
  - Contrast sensitivity
  - Visual field
  - Motion perception
  - Glare sensitivity



# Measurement of Vision

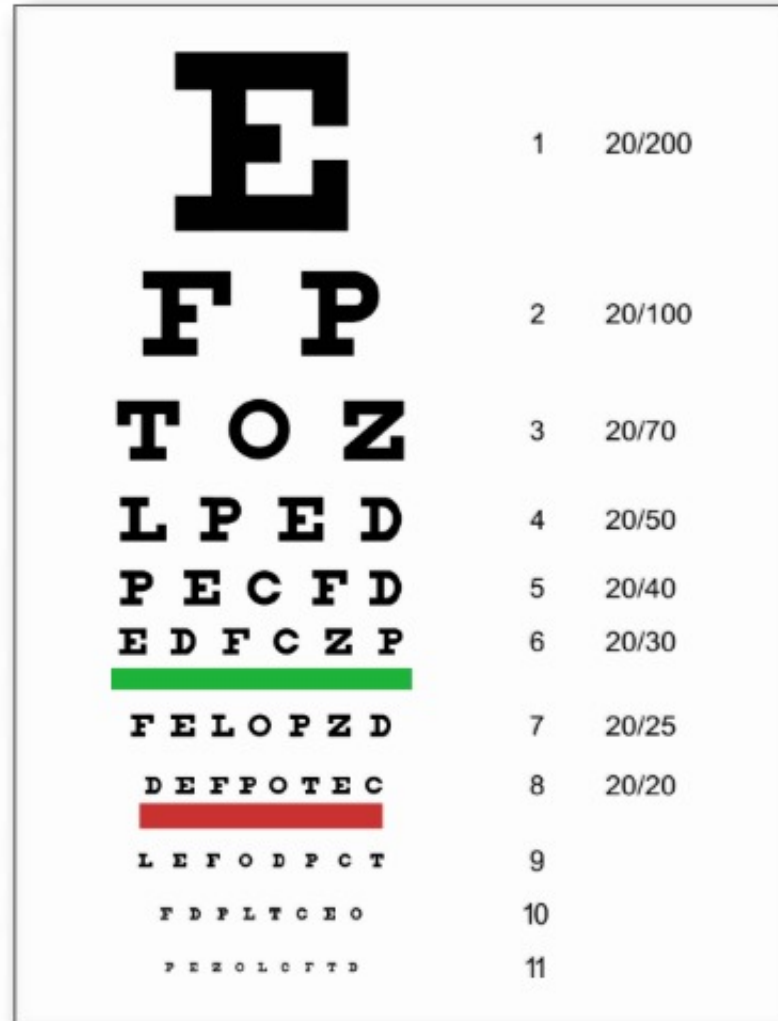
- Visual acuity
  - Measure of the spatial resolving power of the visual system
  - Indicates the angular size of the smallest detail that can be resolved
  - Measured under conditions of high contrast and often expressed in Snellen notation
    - E.g. 20/40: you see at 20 feet what someone with normal vision would see at 40 feet
    - E.g. 6/12: you see at 6 meters what someone with normal vision would see at 12 meters

# Measurement of Vision

- Snellen notation
  - Standard is 20/20 (6/6) but some people can see better than that

# Snellen Chart

- Herman Snellen (1862)



# ETDRS Chart

- Early Treatment of Diabetic Retinopathy study chart (1976)
- More standardized
  - Letters of equal legibility, same # letters per row, uniform spacing to reduce crowding effect
- Better reproducibility
- Logarithmic progression in size



Bailey IL, Lovie JE. New design principles for visual acuity letter charts. *Am J Optom Physiol Opt* 1976;**53**: 740–5.

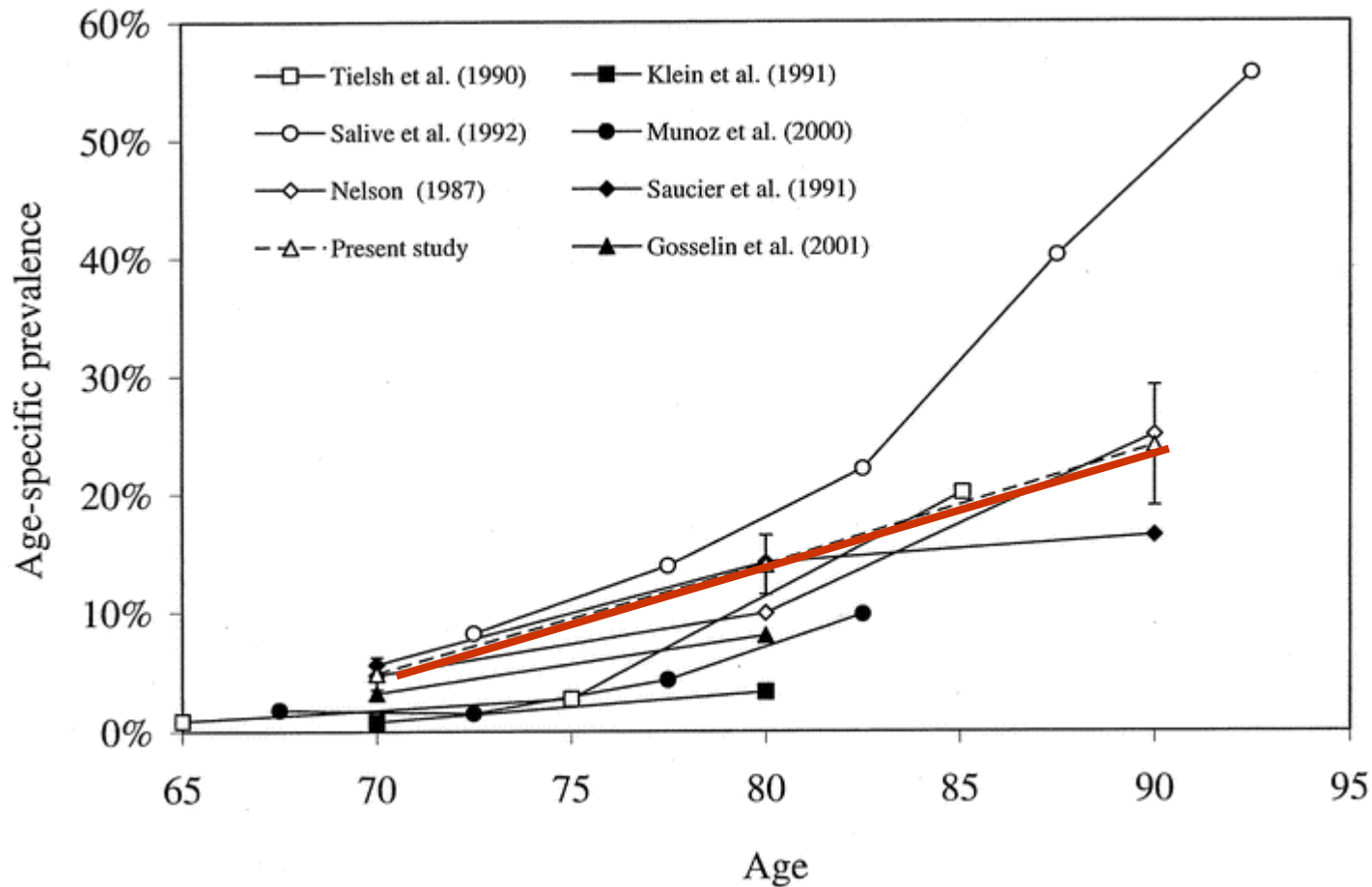
# Measurement of Vision

- Best-corrected visual acuity
  - After refraction
  - Once refractive error is removed, is there still reduced acuity likely due to disease?
- Presenting (habitual) visual acuity
  - Under usual distance correction, if any
  - What level of vision does this person have in his or her daily life?
- Can measure binocularly or each eye separately

# Canada Needs Data on Vision

- It's important for eye care planning purposes to have high quality data on the prevalence of visual impairment
- Canada has rather limited data on visual impairment
  - Studies have relied on self-report of vision
  - One small study from a single city (Brantford, ON)
  - One study extrapolated U.S. rates to Canada

# Prevalence of Visual Impairment by Age in the Community



J. Gresset et al., *Optom Vis Sci* 2002; 79(7): 416-423.

# How Often Do Canadians Use Eye Care?

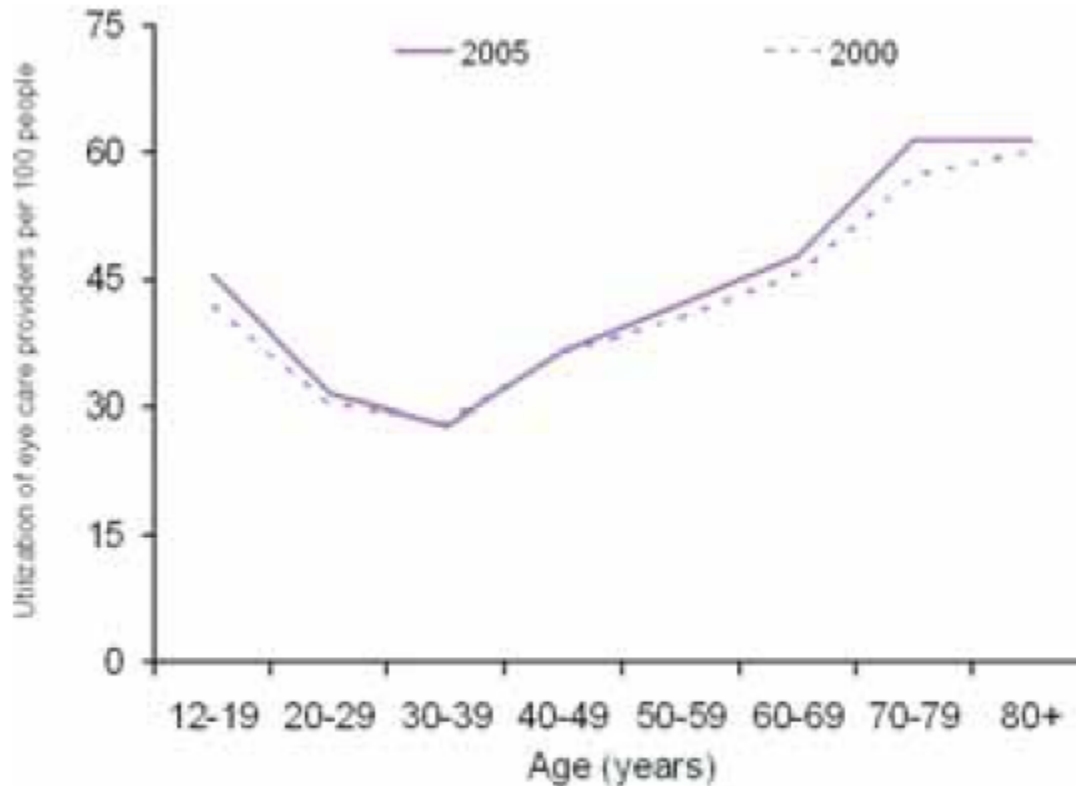


Fig. 1—Utilization\* (%) of eye care providers (ophthalmologists or optometrists), by age group, among Canadians aged 12 years or older in a 12-month period in 2000 and 2005. (\*At least 1 visit or telephone talk with an ophthalmologist or optometrist.)

Jin and Trope. Eye care utilization in Canada, CJO, 46(2), 2011.



# Eye Care Guidelines

## RECOMMENDATIONS

### 1. *Screening intervals in the asymptomatic low-risk patient*

- Age 19–40 years: at least every 10 years [*Consensus*]
- Age 41–55 years: at least every 5 years [*Consensus*]
- Age 56–65 years: at least every 3 years [*Consensus*]
- Age > 65 years: at least every 2 years [*Level 1<sup>o</sup>*]

### 2. *Screening in symptomatic patients*

Any patient noting changes in visual acuity, visual field, colour vision, or physical changes to the eye should be assessed as soon as possible [*Consensus*].

### 3. *Screening intervals in high-risk patients*

Patients at higher risk of visual impairment (e.g., those with diabetes, cataract, macular degeneration, or glaucoma [and glaucoma suspects], and patients with a family history of these conditions) should be assessed more frequently and thoroughly.

- Age > 40 years: at least every 3 years [*Consensus*]
- Age > 50 years: at least every 2 years [*Consensus*]
- Age > 60 years: at least annually [*Consensus*]

# Objectives

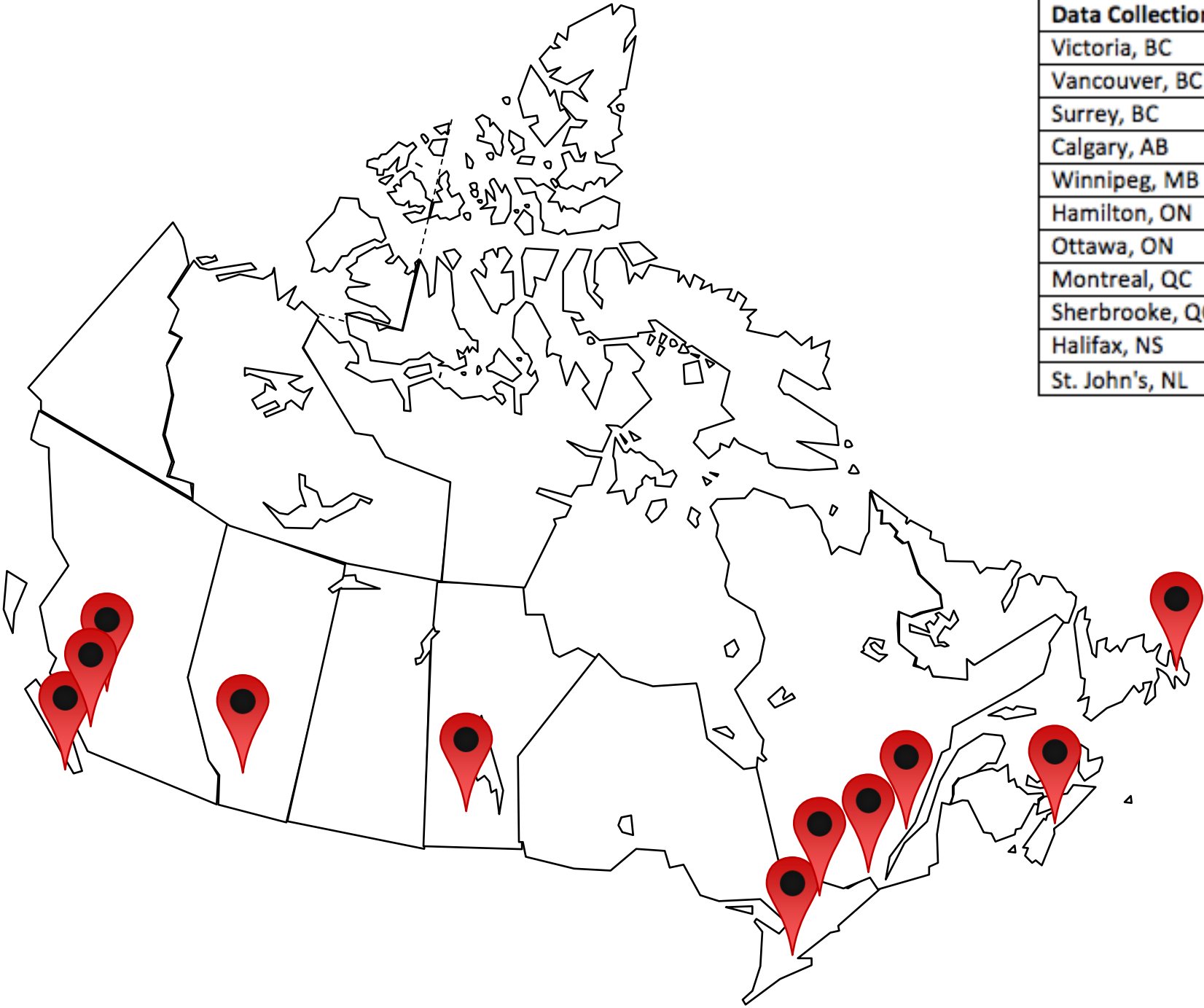
1. What is the prevalence of visual impairment and its determinants in Canada?
2. How frequently are people using eye care every year? What are the determinants of using eye care?



# Methods

- CLSA Comprehensive Cohort included 30,097 adults ages 45-85 from 11 sites in 7 provinces
  - Visual acuity was measured in the Comprehensive Cohort
  - Data were collected between 2012-2015
- People were excluded from the CLSA if they were in an institution, living on a First Nations reserve or settlement, were a full-time member of the Canadian Armed Forces, did not speak French or English, or had obvious cognitive impairment

Data Collection Sites
Victoria, BC
Vancouver, BC
Surrey, BC
Calgary, AB
Winnipeg, MB
Hamilton, ON
Ottawa, ON
Montreal, QC
Sherbrooke, QC
Halifax, NS
St. John's, NL



# Methods

- People were sampled using provincial health registries and random digit dialing
- Stratified sampling was used to ensure adequate representation of various demographic groups

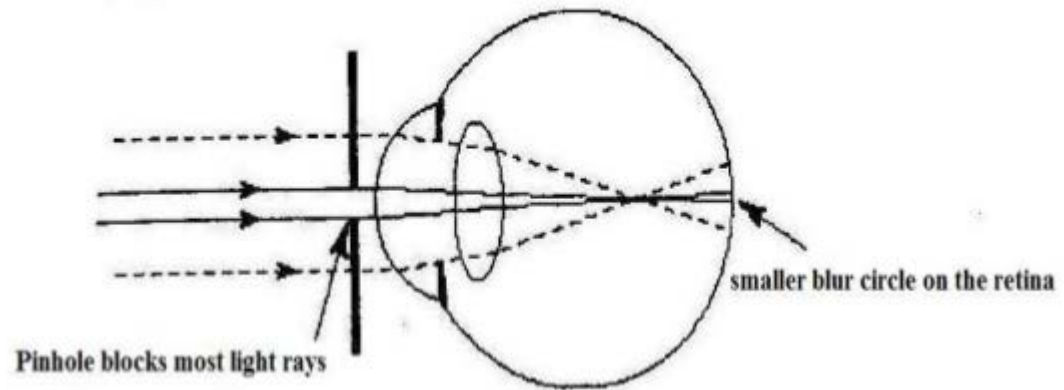
# Methods

- Visual acuity was measured using the ETDRS letter chart at 2 meters
- Primary outcome: acuity measured with both eyes open (binocular) wearing usual prescription for distance correction
- Visual impairment (VI) was defined as acuity worse than 20/40



# Methods

- Secondary outcome: acuity measured in each eye with and without pinhole correction
- Pinhole correction removes refractive error
- Visual impairment (VI) was defined as acuity worse than 20/40



# Methods

- “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 ( $\kappa=0.64$ )

MacLennan PA, McGwin G, Jr., Searcey K, Owsley C. Medical record validation of self-reported eye diseases and eye care utilization among older adults. *Curr Eye Res.* 2013;38(1):1-8.



# Methods

- Data on the number of optometrists per 100,000 people by province were obtained from the Canadian Institute for Health Information
- Data on the number of ophthalmologists per province were obtained from the Canadian Medical Association
- Data on the number of people per province was taken from Statistics Canada
- All data are from the year 2013

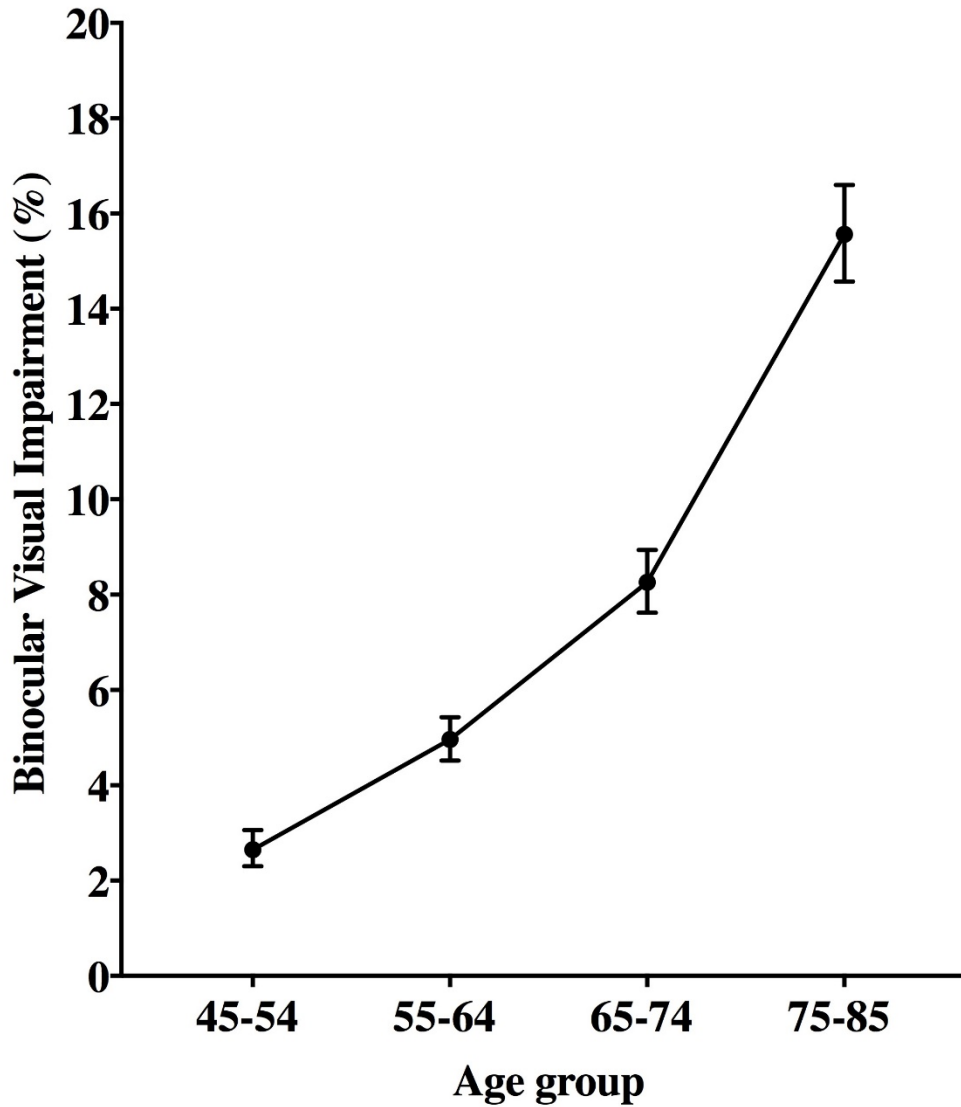
# Methods

- Logistic regression was used
- The complex study design was accounted for in all analyses using SVY commands in Stata Version 14.2

# Who Is Missing Data on VA?

	VA Data n=29,666	No VA Data n=431 (1.5%)
Age	59.4	62.4
Household Income		
>\$100K	42.4	30.7
\$50-100K	31.4	30.2
\$20-50K	16.7	25.1
<\$20K	3.9	8.7
Smoking		
None	49.9	43.5
Former	41.2	43.2
Current	8.9	13.3

# Visual Impairment by Age Group



## Prevalence of VI by Province

Province	VI % (95% CI)
Alberta (n=2,923)	7.8 (6.8-8.9)
British Columbia (n=6,212)	8.6 (7.9-9.3)
Manitoba (n=3,095)	2.4 (2.0-3.0)
N & L (n=2,203)	10.9 (9.6-12.3)
Nova Scotia (n=3,046)	6.9 (6.0-7.9)
Ontario (n=6,304)	3.5 (3.1-4.0)
Quebec (n=5,883)	3.2 (2.8-3.7)
Canada (n=29,666)	5.7 (5.4-6.0)

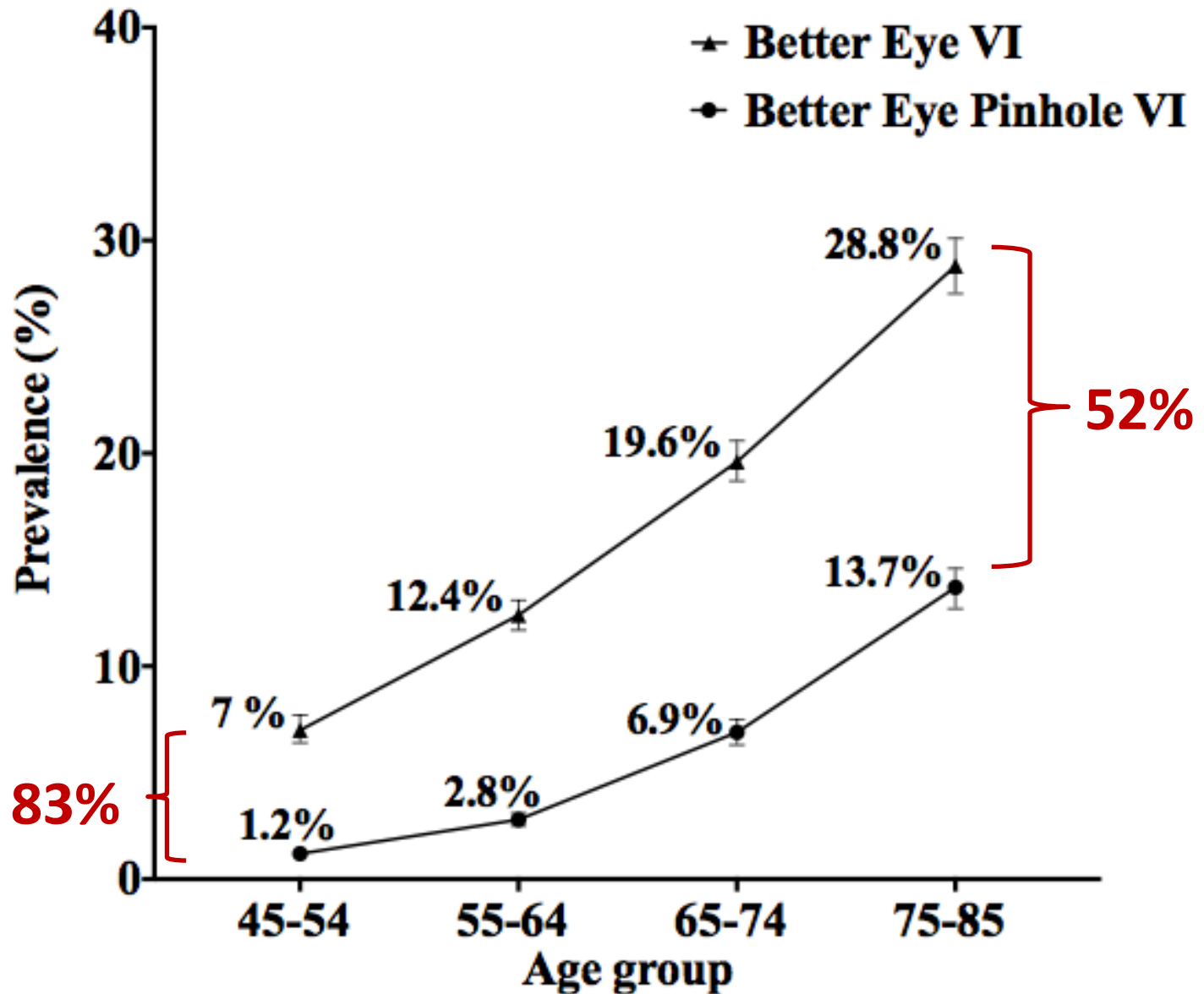
# Estimated No. With VI in Age Range

Province	No. With VI
Alberta	116,396
British Columbia	175,142
Manitoba	11,570
N & L	27,575
Nova Scotia	31,297
Ontario	191,094
Quebec	109,207
Canada	662,281

	Visual Impairment Odds Ratio	95% CI
Age, per 1 year	1.07	1.06, 1.08
Household Income		
>\$100K	1.00	
\$50-100K	1.14	0.98, 1.32
\$20-50K	1.33	1.13, 1.57
<\$20K	2.09	1.67, 2.63
Smoking		
Never	1.00	
Former	1.04	0.93, 1.17
Current	1.52	1.25, 1.85
Diabetes		
None	1.00	
Type 1	1.57	0.84, 2.97
Type 2	1.21	1.04, 1.42
Memory problems	1.44	1.04, 2.01

Logistic regression model also included sex, education, urban/rural residence, high blood pressure, and province

# What is the Main Cause of VI?





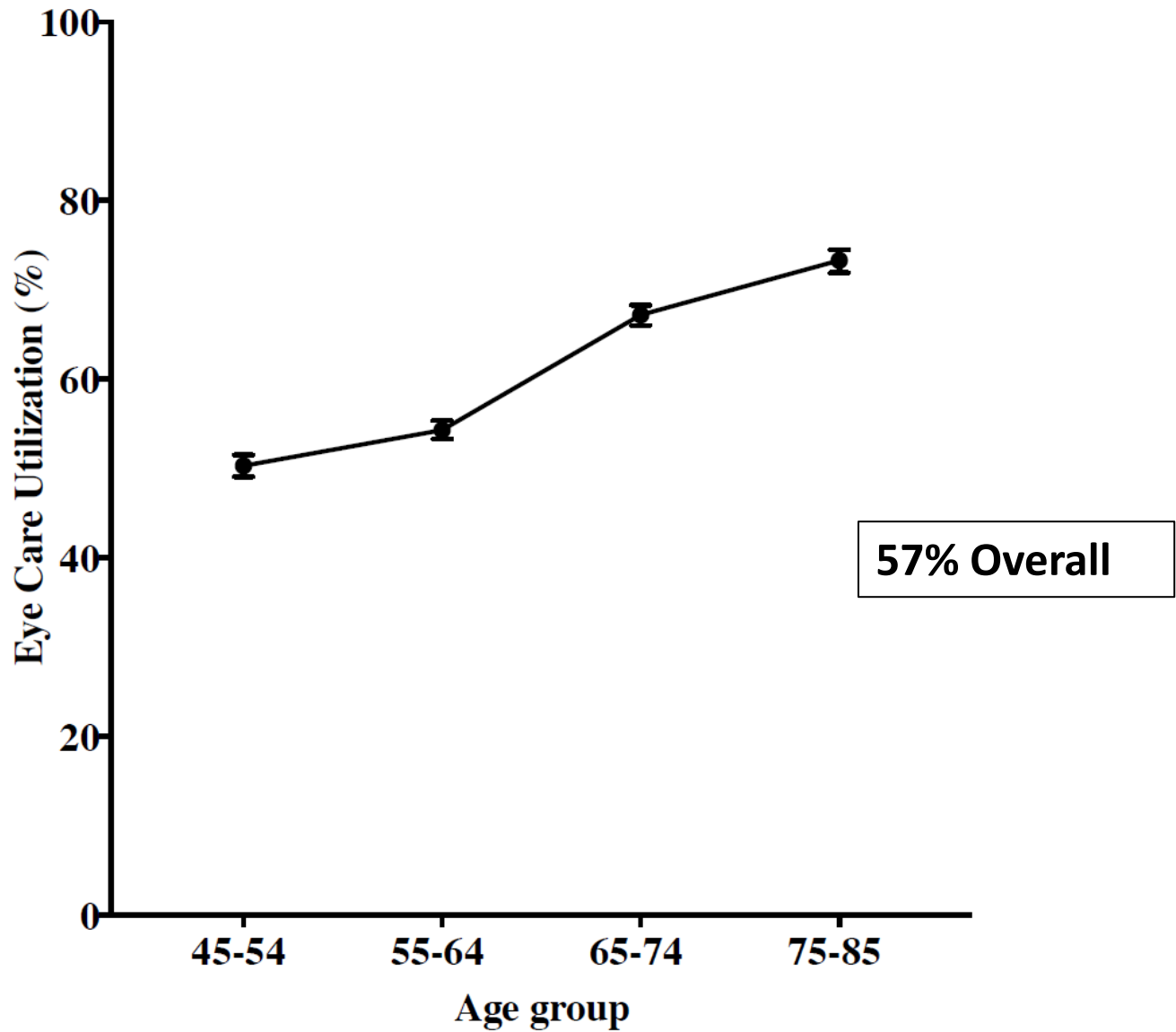
# Other Possible Causes of VI

- 13% with VI reported a cataract in the eye
- 10% with VI reported AMD
- 8% with VI reported glaucoma

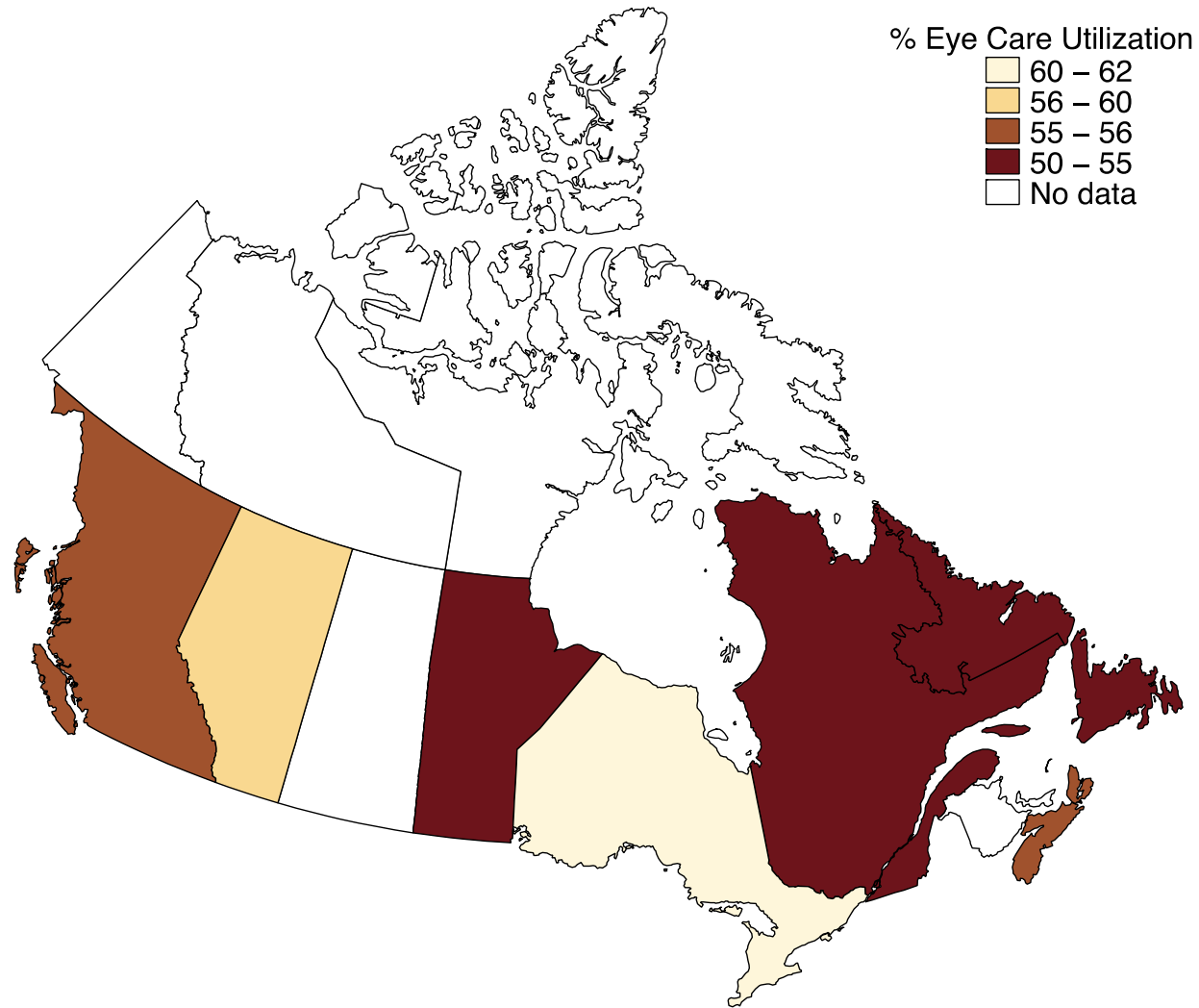
# Who Is Missing Data on ECU?

	<b>ECU Data n=28,728</b>	<b>No ECU Data n=1,369 (5%)</b>
Age	59.5	59.6
Household Income		
>\$100K	42.7	32.8
\$50-100K	31.6	27.2
\$20-50K	16.5	22.7
<\$20K	3.7	10.1
Smoking		
None	50.1	44.1
Former	41.3	39.1
Current	8.6	16.9

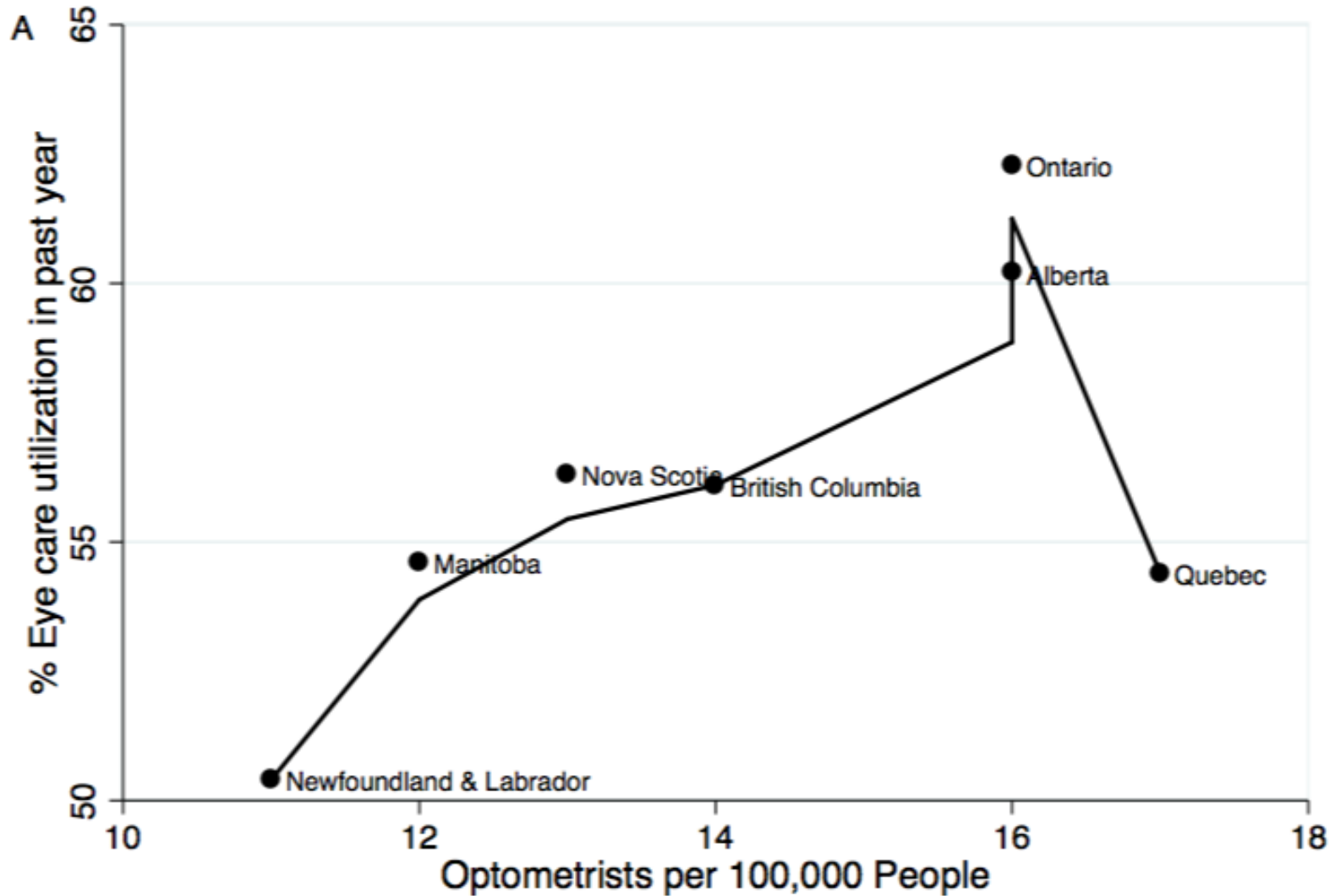
# Eye Care Utilization by Age



# Eye Care Use by Province

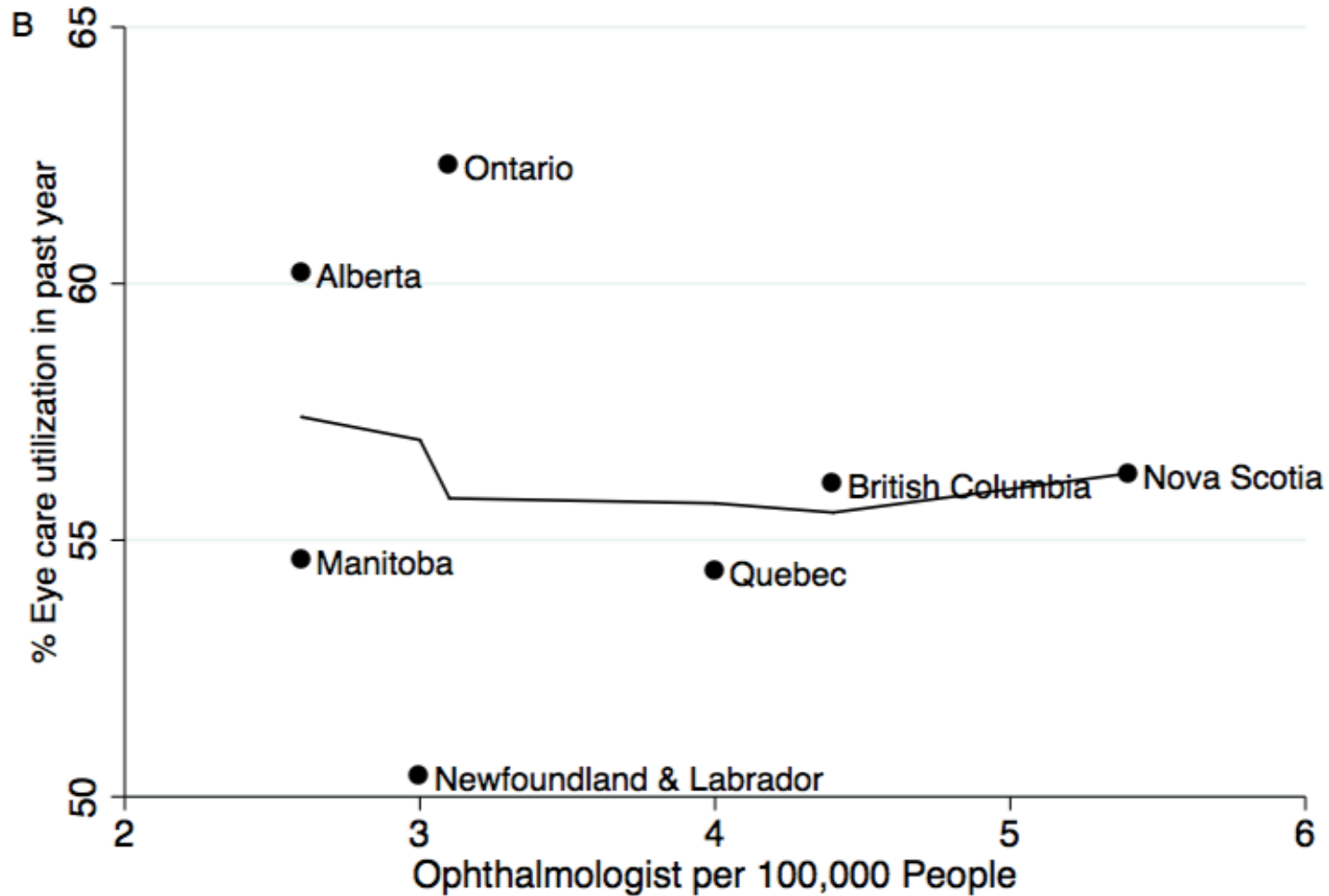


# ECU by Optometrist Rate



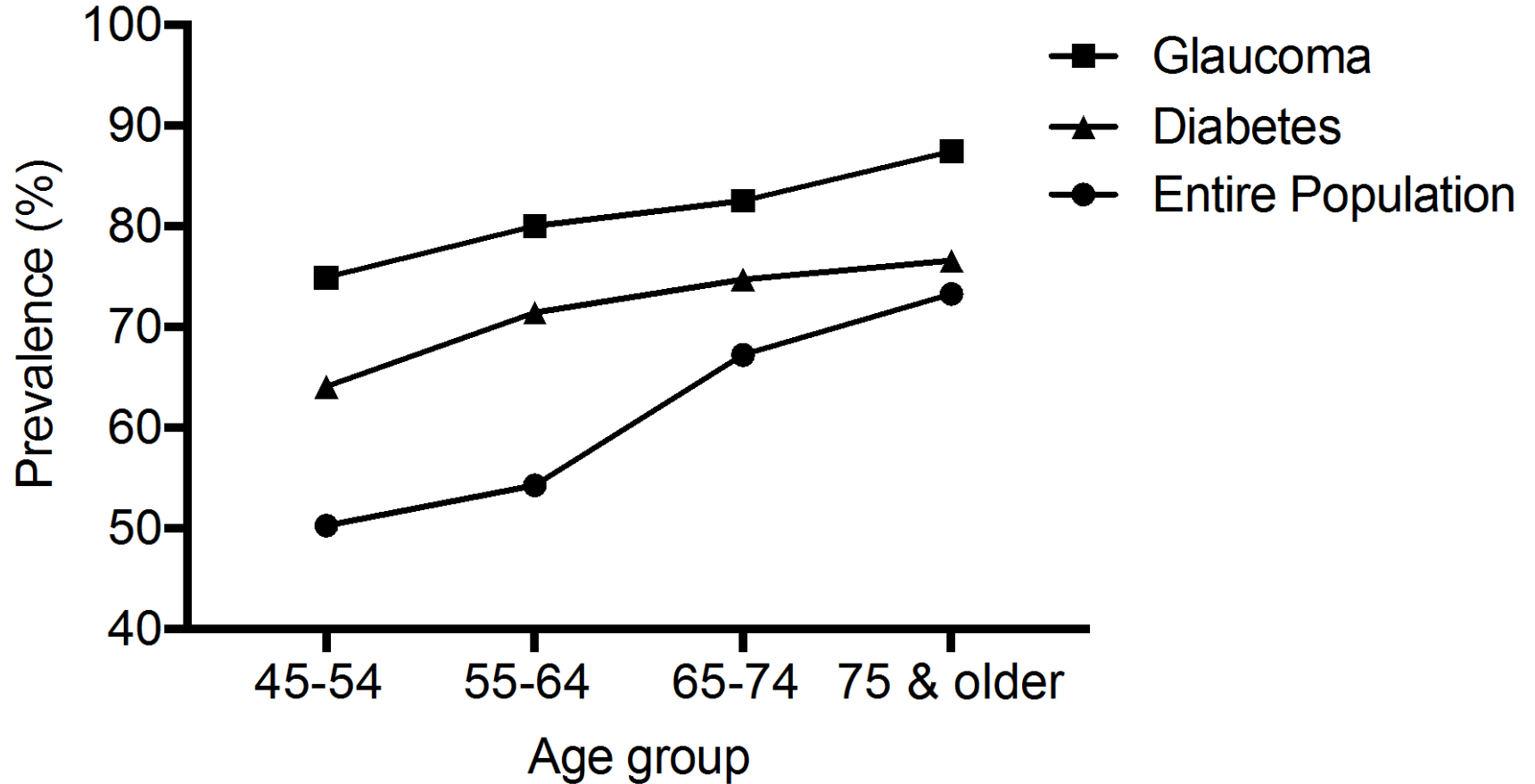
bandwidth = .8

# ECU by Ophthalmologist Rate



bandwidth = .8

# Eye Care Utilization



	Eye Care Use Odds Ratio	95% CI
Age, per 1 year	1.02	1.02, 1.03
Male sex	0.67	0.62, 0.71
Household Income		
>\$100K	1.00	
\$50-100K	0.84	0.77, 0.91
\$20-50K	0.63	0.56, 0.70
<\$20K	0.70	0.57, 0.86
Education		
More than Bachelor's	1.00	
Bachelor's Degree	1.02	0.94, 1.12
Less than Bachelor's	0.86	0.79, 0.94
Smoking		
Never	1.00	
Former	0.97	0.90, 1.04
Current	0.75	0.66, 0.86

Logistic regression model also included marital status, ethnicity, urban/rural residence, and province



	Eye Care Use Odds Ratio	95% CI
Diabetes		
None	1.00	
Type 1	4.33	2.27, 8.27
Type 2	2.01	1.75, 2.31
Glaucoma	2.51	2.00, 3.16
Cataract		
None	1.00	
Past cataract	1.46	1.25, 1.69
Current cataract	2.44	2.09, 2.84
Macular degeneration	1.56	1.25, 1.95
Visual impairment	1.15	0.99, 1.34

Logistic regression model also included marital status, ethnicity, urban/rural residence, and province

# Differences by Province

- Province was related to both VI and ECU
- Possible reasons include:
  - Different populations
  - Different provincial eye care coverage (e.g. N & L does not cover an annual eye exam for seniors)
  - Different availability of optometrists and ophthalmologists (e.g N & L has lowest optometrist rate)

# Income

- Lower income was related to more VI and less ECU
- True even when adjusting for education
- Costs
  - \$75-\$100 for eye exam
  - >\$50 for frames
  - >\$100 for lenses
- May need to change prescriptions repeatedly in middle and older age

# Smoking

- Smoking was related to more VI and less ECU
- Smoking is a risk factor for age-related macular degeneration and certain types of cataract
- Smokers may participate less in preventive health measures

# Education

- Lower education was related to less ECU
- Lower education may be related to less awareness of the need to have comprehensive eye exams in older age
- Public health campaigns may help with this

# Comparison with Other Findings

Study Location	Age Range	% with VI
CLSA (n=30,097)	45-85	5.7%
US NHANES (n=13,265)	12+	6.4%
Melbourne (n=4,744)	40+	4%
CLSA Ontario Sites (n=6304)	45-85	3.5%
Brantford, Ontario (n=768)	40+	2.7%

# Comparison with Other Findings

Study Location	Age Range	% Used Eye Care
CLSA	45-85	57%
Canada CCHS 2005	12+	40%
USA BRFSS 2005	50+	69%
Australia BMES 1998	49+	62%

# Strengths

- Large, population-based sample of Canadians from 7 provinces
- Visual acuity measured with ETDRS chart
- Inclusion of income as a potential risk factor



# Limitations

- No comprehensive eye exam to determine primary cause of visual impairment
- Findings may not generalize to those not included in eligibility criteria
- Estimates of VI are conservative because some people could not see any letters on ETDRS chart
- Cross-sectional data does not allow assessment of temporality

# Implications

- Refractive error is a leading cause of visual impairment and is easily treatable
- Provinces should consider ways to remove cost as an obstacle to eye care utilization
- Greater education and outreach is needed to people with diabetes to ensure timely eye exams

# Acknowledgements

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# Acknowledgements

- This research has been conducted using the CLSA Baseline Comprehensive Dataset version 3.1, under Application Number 160601."
- The CLSA is led by Drs. Parminder Raina, Christina Wolfson, and Susan Kirkland

Questions?

# Upcoming CLSA Webinars



“The Development of Normative Data and Comparison Standards for the Cognition Measures Employed in Canadian Longitudinal Study on Aging”

Dr. Holly Tuokko

January 16, 2018 | 12 p.m. EST

Register: [bit.ly/clsawebinars](http://bit.ly/clsawebinars)

