

PLENARY 1

FOCUS ON VISION
PAST, ONGOING, AND NEW STUDIES

Amy Millen, PhD; Emily Gower, PhD; Luis Zambrana, PhD;
Thasarat Vajaranant, MD

Photos from unsplash.com



Overview of the Women's Health Initiative Vision and Age-related Eye Disease Data and Associated Ancillary Studies

Amy E. Millen, PhD, Associate Professor
Department of Epidemiology & Environmental Health

University at Buffalo
School of Public Health and Health Professions

Photos from unsplash.com

Plenary Speakers

The Vision Impairment Project (VIP): Overview, Design and Available Data



Emily Gower, PhD
Professor
Department of Epidemiology
Gillings School of Global Public Health
University of North Carolina Chapel Hill

Association between vision impairment and physical and psychological functioning among older women



Luis Zambrana, PhD
Postdoc Research Associate
Department of Epidemiology
Gillings School of Global Public Health
University of North Carolina Chapel Hill

Seeing Brain Aging Through the Eye: WHI Insights on Glaucoma Risk and Brain Aging



Thasarat Vajaranant, MD
Professor
Director, Glaucoma Service
Department of Ophthalmology & Visual Sciences
University of Illinois

Most Common Chronic Eye Diseases in Older Individuals

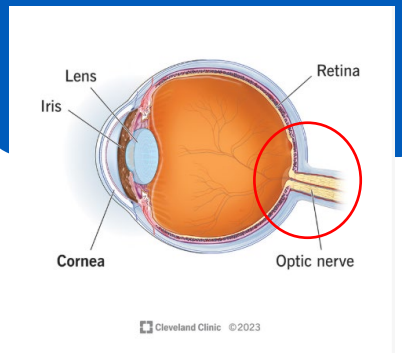




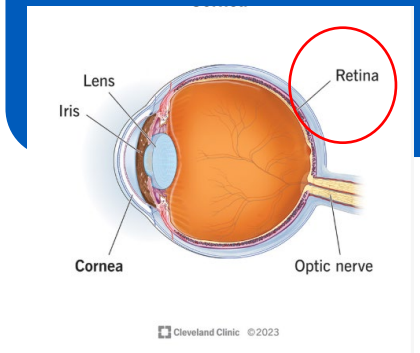




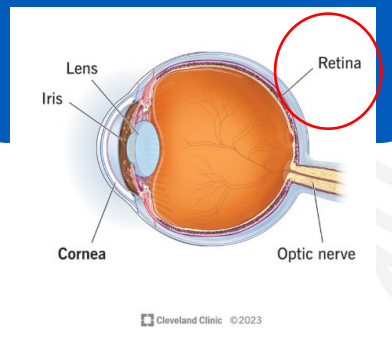
Glaucoma



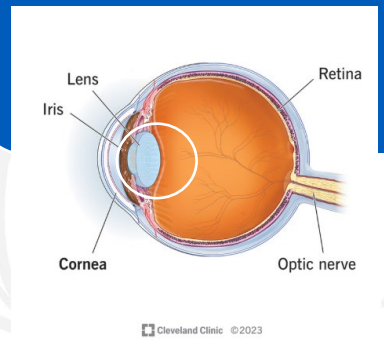
Age-related macular degeneration



Diabetic retinopathy



Cataract



Photos from : NEI

The Global Burden of Blindness & Vision Impairment will Continue to Increase

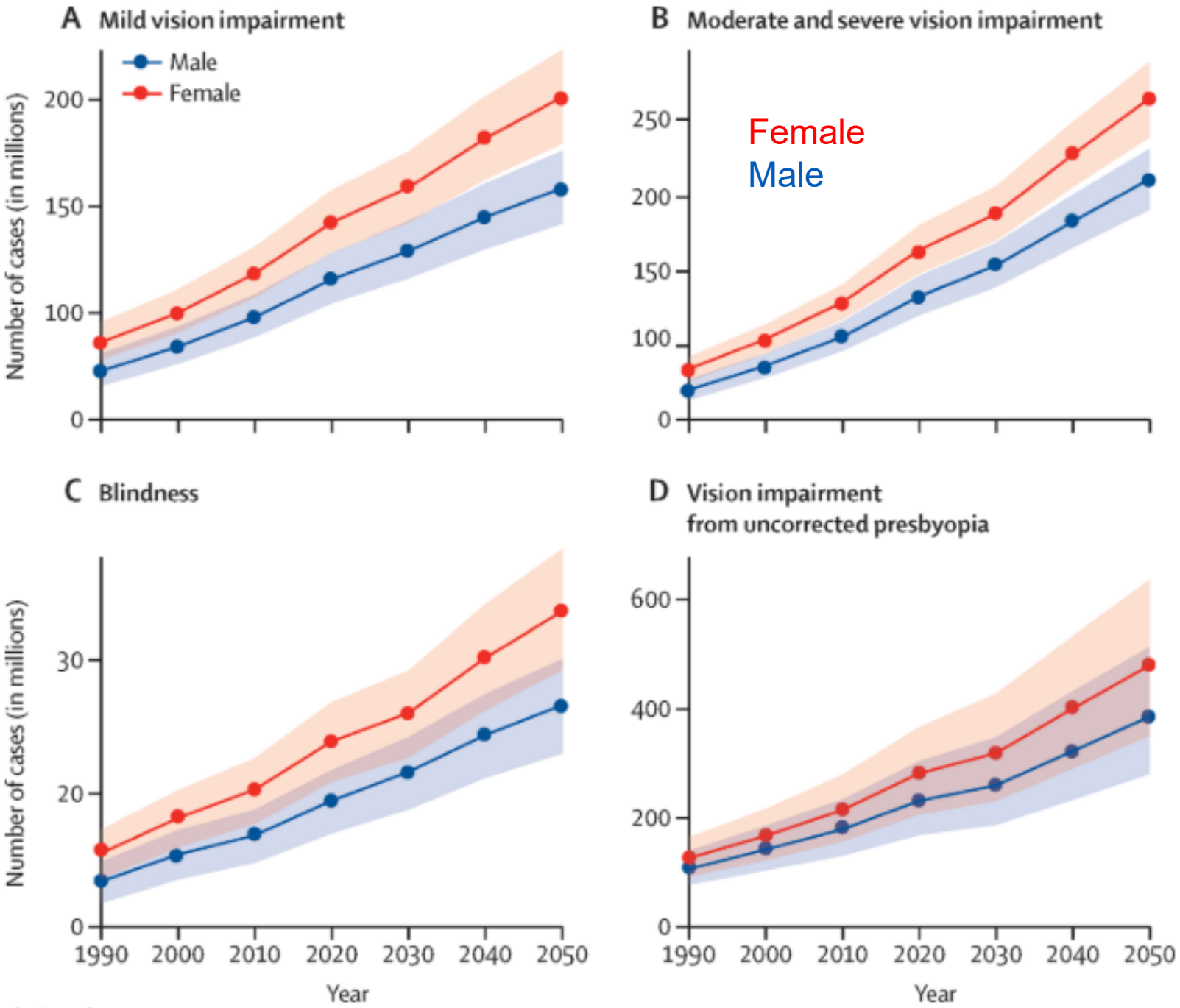


FIGURE 3

Trend in prevalence of blindness and distance and near vision impairment over 20 years: an analysis for the Global Burden of Disease Study. 2021 Lancet Glob Health 9(2):e130-e143.

Vision and the WHI - Main Study 1993-2005



Baseline Medical History
(Form 30 - all)
Cataract & glaucoma

Annually, Medical History Update
(Form 33 - all)
Cataract & glaucoma

(1993-1998)

(2005)

Baseline **Year 3** **Year 4** **Year 8** **Closeout**

Observational Study only

OS Follow-up Questionnaire
(Form 143 – OS only)
AMD & Cataract

Annually, OS Follow-up Questionnaire
(Forms 144-148 – OS only)
AMD & Cataract

Vision and the WHI: Main Study → Extension Studies



Main Study: 1993-2005



Extension 1: 2005-2010



Extension 2: 2010-2027

Extension 2
Medical History Update
(Form 33 - all)
AMD
Self-report as previously done

Vision and the WHI - Extension 2: 2010-2025



Annually, Medical History Update
(Form 33 - all)
AMD
Self-report as previously done

2010 — **2027**

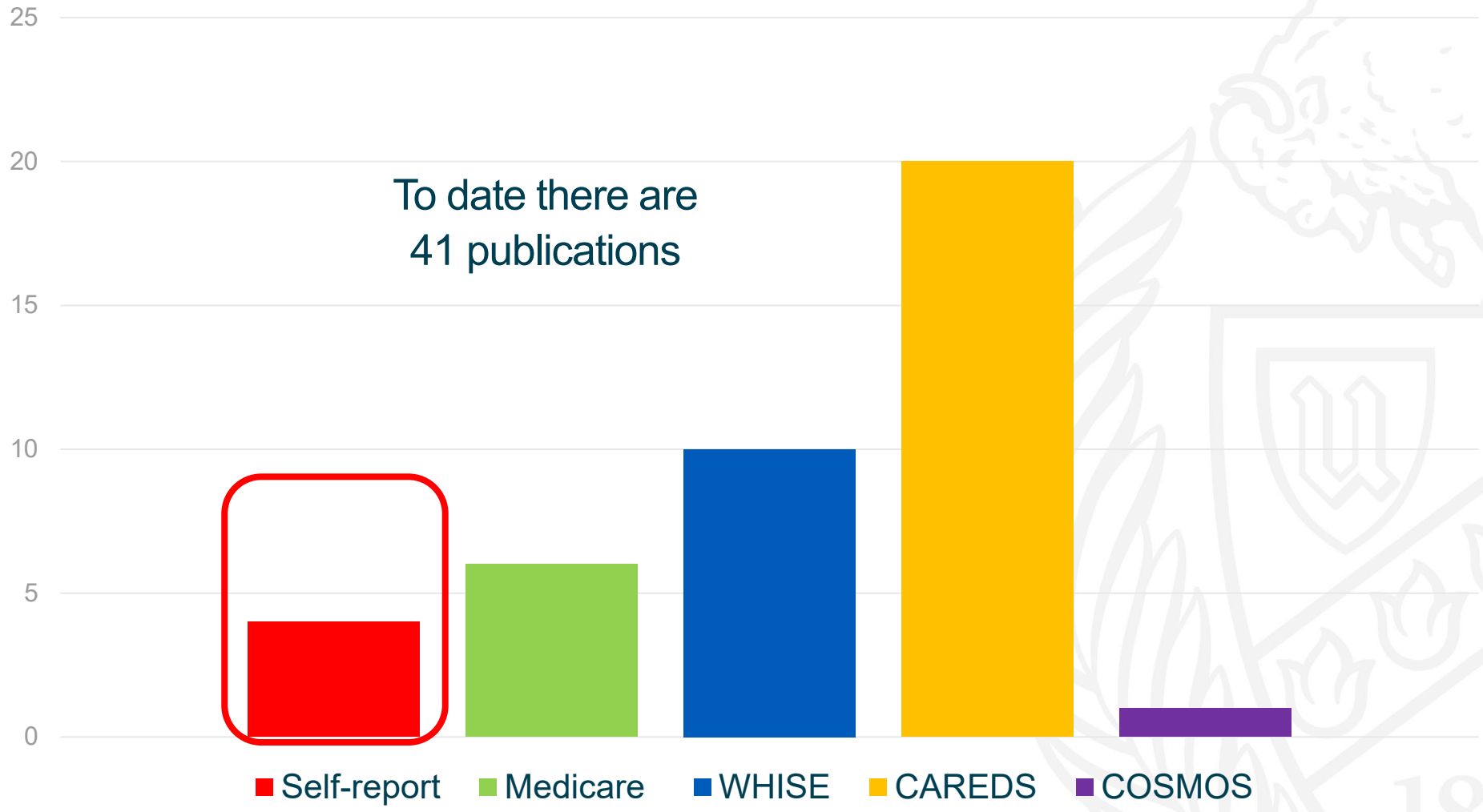
2013 — **2018**

Cataract Surgery
Diabetic retinopathy
Glaucoma
Dry eye

2013 (Form 156)
Supplemental Questionnaire
Additional Eye Questions

2018 (Form 159)
Supplemental Questionnaire
Additional **AMD** Questions

WHI Publications on Vision

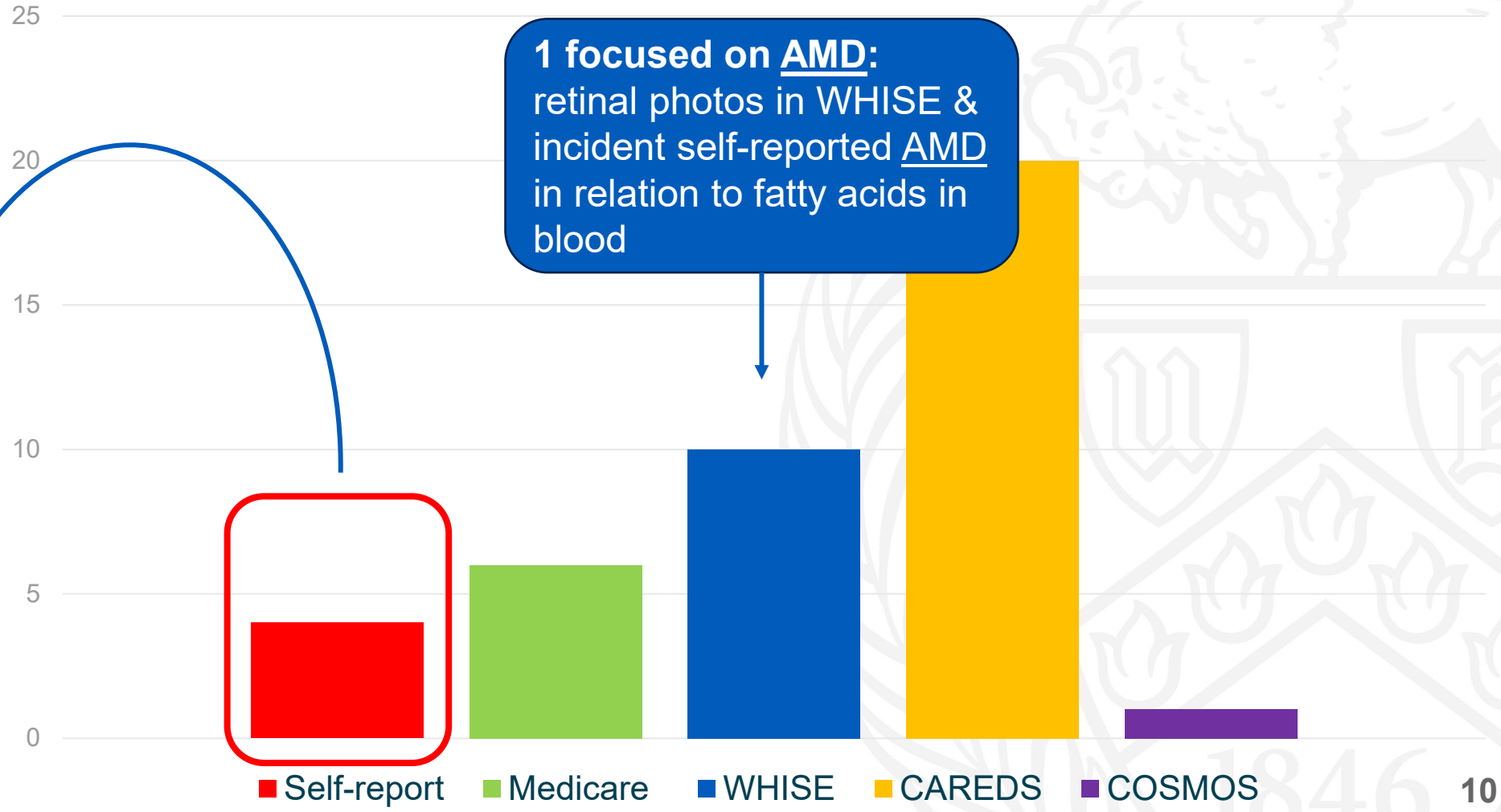


WHI Publications on Vision

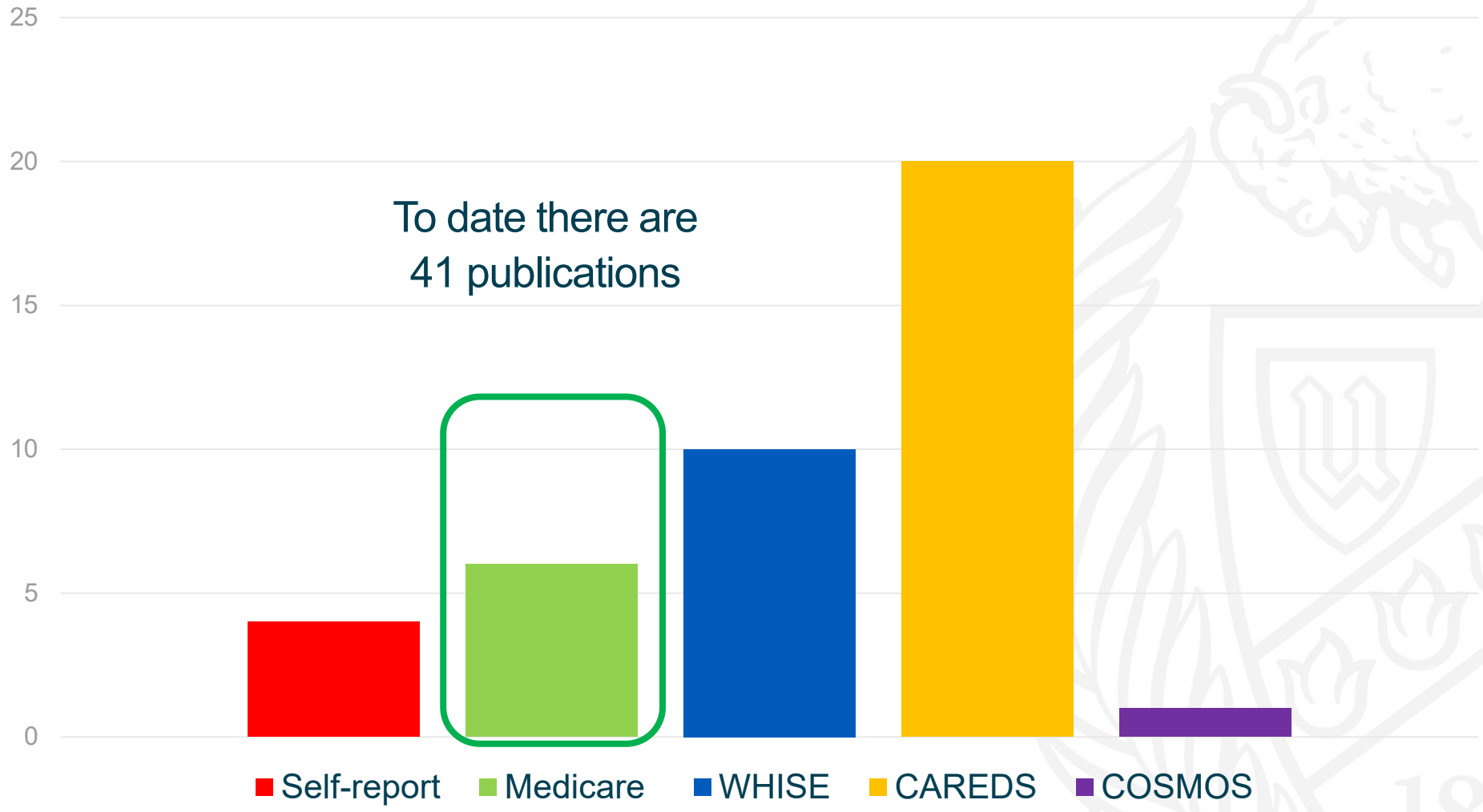
To date there are 41 publications

4 focused on <u>Glaucoma</u>
- blood pressure
- vitamin D
- genetics

1 focused on <u>AMD</u>: retinal photos in WHISE & incident self-reported <u>AMD</u> in relation to fatty acids in blood



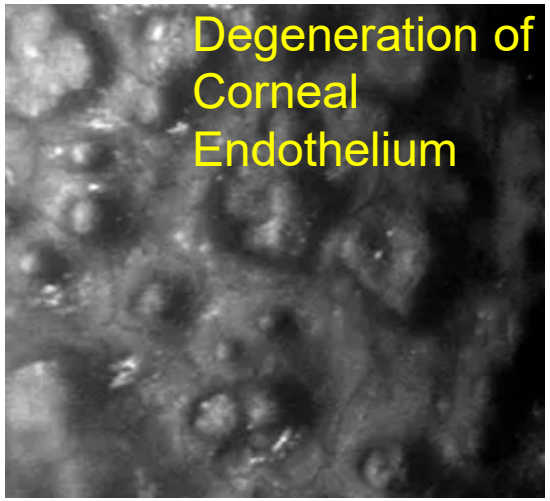
WHI Publications on Vision



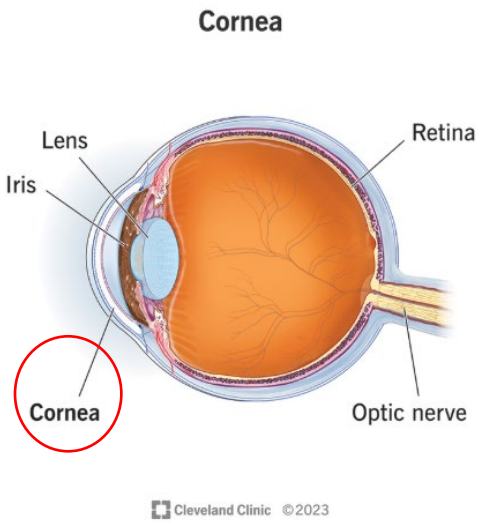
Using Medicare Claims Data to Study **Other** Ocular Outcomes

Use of Medicare Claims data in WHI to identify cases with ICD-9 & 10 codes

- 6 papers (4 corneal disease, 2 glaucoma)
- **Fuchs endothelial corneal dystrophy**
  - NEI R21 EY032544



From Evaluation & Management of Fuchs Dystrophy. By Alex Im, BS et al. 2020





https://physicians.wustl.edu/blurred-lines-fuchs-corneal-dystrophy/

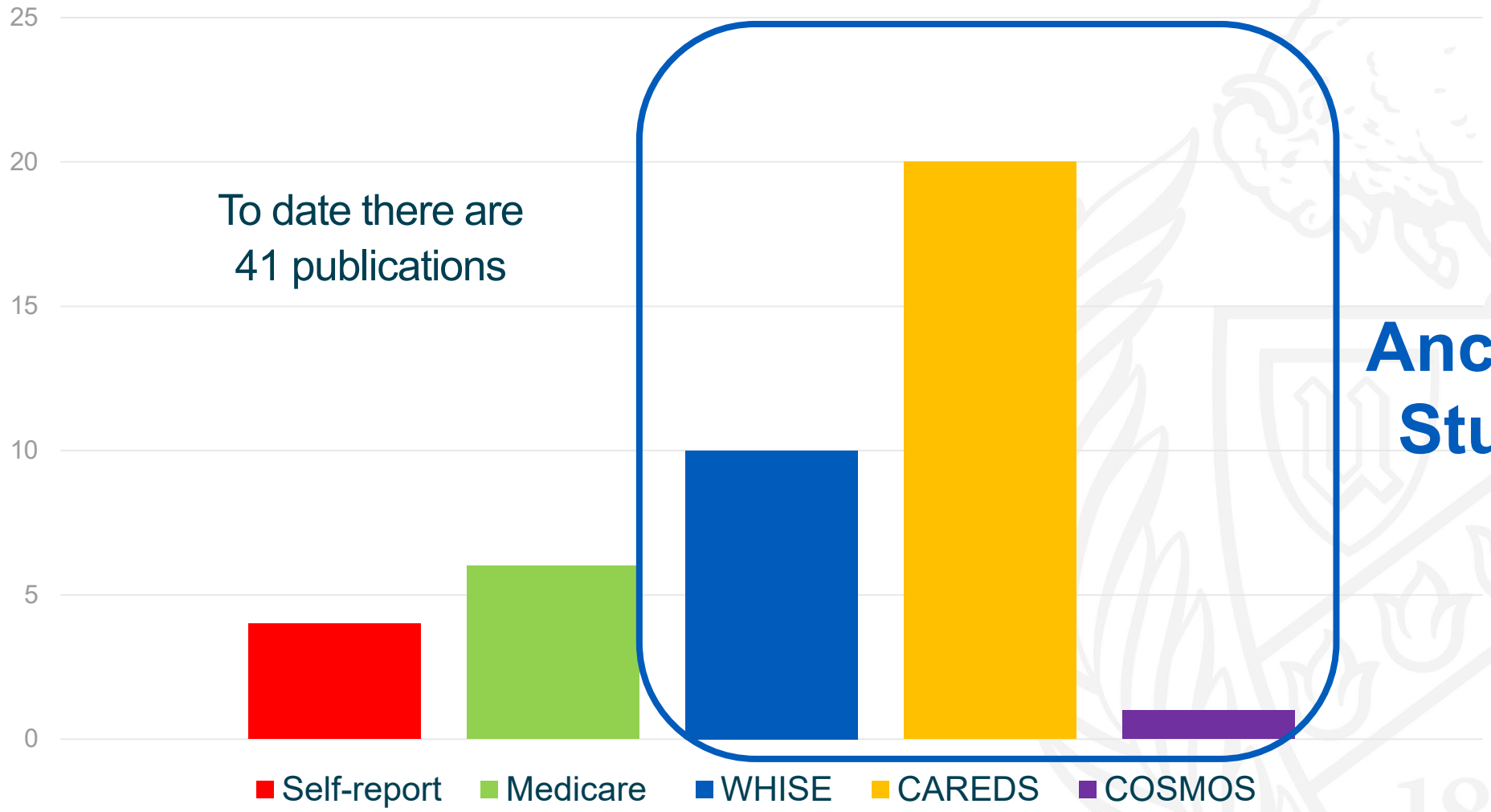
RESEARCH LETTER

WOMEN'S HEALTH

Fuchs Endothelial Corneal Dystrophy: A Post Hoc Analysis of the Women's Health Initiative Randomized Hormone Therapy Clinical Trials

Millen AE, Nie J, Wactawski-Wende J et al. JAMA Ophthalmol 2026 Apr 1144 (4): 362-364

WHI Publications on Vision



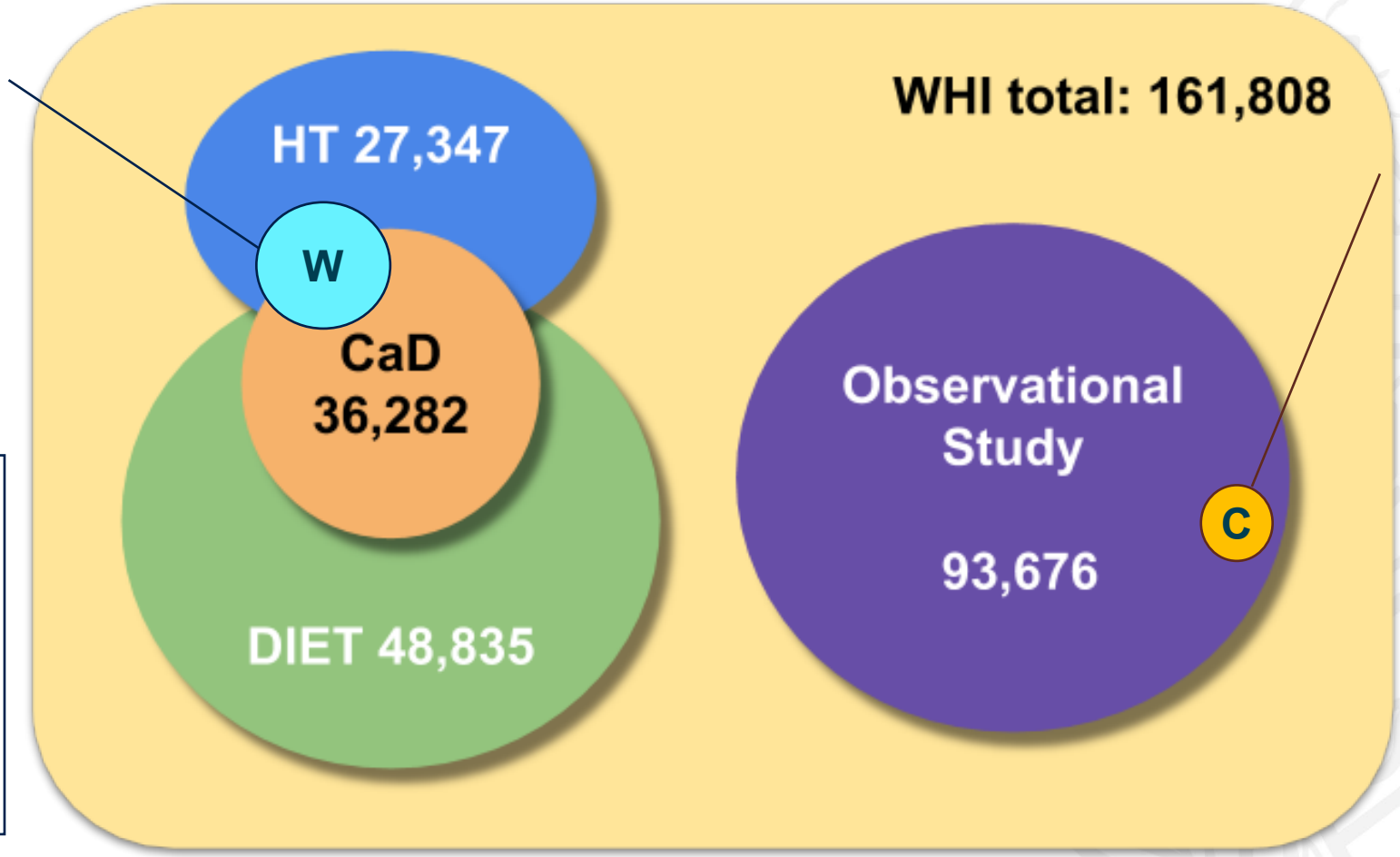
Ancillary Studies

Vision and the Women's Health Initiative - Ancillary Studies

2000-2002
WHI Sight Exam
(WHISE)
n=4,262
65+ years

21 clinic sites

2015-2020
COSMOS
N~5,228
~70+ years
Randomized trial
Both WHI OS & CTs



Baseline
2001-2004
Carotenoids and Age-related Eye Disease Study
(CAREDS)
n=2,005
54+ years

Madison, WI
Iowa City, IA
Portland, OR

Follow-up
2016-2019

Cocoa Supplement and Multivitamin Outcomes Study (COSMOS)

AS62 - Prevention of age-related maculopathy in the WHI HRT CT:

WHI Sight Exam (WHI-SE): 2001-2002

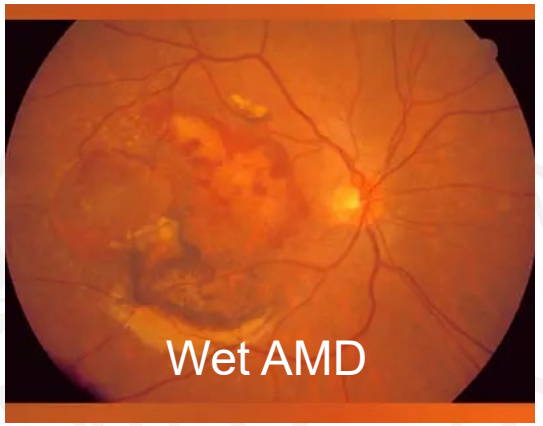
Principal Investigator: Mary Haan, Dr.PH - University of California San Francisco



- Ancillary to the WHI Hormone Trials
- Primary Aim: Study the influence of randomization to HT on development of AMD
- 65+ years
- Recruited ~ 5.1 (median, 5.0; range, 1-10) years after randomization
- 21 WHI clinic sites
- n = 4,349 completed enrollment with photographs of at least 1 eye
- 2nd eye examination to determine incident AMD never occurred Wyeth Ayerst Laboratories canceled funding after the WHI HT CT main results were published.

WHI-SE Ocular Measures

- **Questionnaire** on ocular and medical history on conditions such as:
  - cataracts, glaucoma, diabetes mellitus, early and late AMD, retinal detachment, trauma, and previous treatment or ocular surgery.
- **Visual Acuity**
- **Fundus Photographs of Retina**
  - Pupillary dilation
  - 30° or 35° stereoscopic fundus photographs
  - n=8,694 eyes photographed (94.5% with both eyes photographed)
  - University of Wisconsin protocol Fundus Photography Grading
    - Any, early and late AMD
    - AMD and Diabetic Retinopathy





WHI Sight Exam (**WHI-SE**)

Hormone therapy and AMD: The WHI-SE Study. *(Haan M et al. 2006)*

Table 2. The Effect of Hormone Therapy on Different Stages of AMD

	CEE Trial (n = 1627)			CEE + P Trial (n = 2635)		
		OR (95% CI)			OR (95% CI)	
Model	Treated/Placebo Group (n = 782/845)	Unadjusted	Full Model*	Treated/Placebo Group (n = 1379/1256)	Unadjusted	Full Model*
Any early AMD	166/182	0.98 (0.78-1.25)	0.99 (0.78-1.26)	252/247	0.91 (0.75-1.11)	0.84 (0.68-1.04)
Any soft drusen	243/257	1.03 (0.83-1.27)	1.05 (0.84-1.30)	387/380	0.89 (0.76-1.06)	0.83 (0.68-1.00)
Increased pigmentation	59/69	0.92 (0.64-1.32)	0.92 (0.63-1.32)	92/80	1.03 (0.76-1.41)	0.94 (0.66-1.32)
RPE depigmentation	29/29	1.08 (0.64-1.83)	1.14 (0.67-1.94)	47/40	1.07 (0.70-1.65)	0.90 (0.56-1.44)
Late AMD	9/9	1.08 (0.43-2.73)	1.15 (0.45-2.98)	13/15	0.77 (0.37-1.63)	0.57 (0.25-1.35)
Geographic atrophy	3/2	1.62 (0.27-9.71)	NA†	6/2	2.68 (0.54-13.29)	2.36 (0.45-12.38)
Neovascular late AMD	6/7	0.92 (0.31-2.76)	1.02 (0.34-3.12)	7/13	0.31 (0.10-0.95)	0.29 (0.09-0.92)

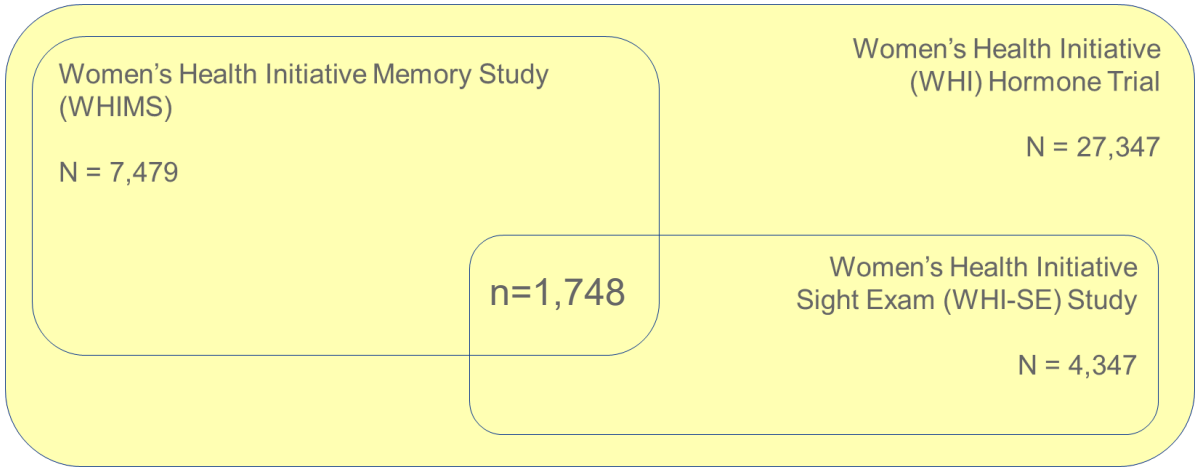
Abbreviations: AMD, age-related macular degeneration; CEE, conjugated equine estrogen; CEE + P, CEE plus progestin; CI, confidence interval; NA, data not applicable (no cases); OR, odds ratio; RPE, retinal pigment epithelial.

*Logistic regression model, including age, randomization assignment, age at menopause, and adherence.

†No cases.

WHI-SE:
Other Ocular Measures

- **Intraocular pressure (IOP)**
- **Do you currently use eye drops?**
  - What kind?
- **Large Cup to Disc Ratio →**
  - None
  - Questionable
  - Present
  - Cannot grade
- **Overlap with WHI Memory Study**



Jyoti Patil and Sharmila Chaudhari. *Acta Scientific Ophthalmology* 4.3 (2021): 44-53.

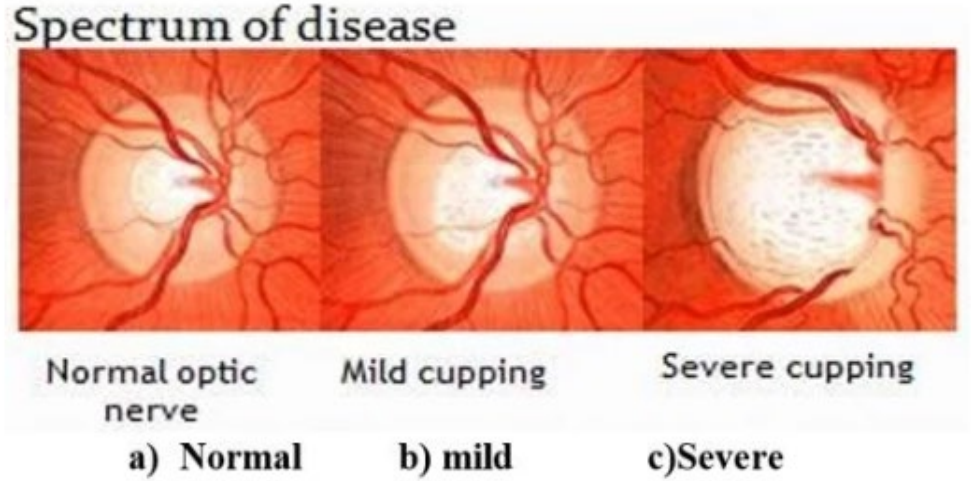


Figure 5: Stages of Glaucoma.



Thasarat Vajaranant, MD

University at Buffalo
School of Public Health and Health Professions

Collaborate Resources Participants About WHI

NEI Funded
U10 EY013018
R01 EY016886
R01 EY025292

AS105 - Carotenoids in age-related eye disease study (CAREDS)

Principal Investigator: Julie Mares, PhD - University of Wisconsin-Madison



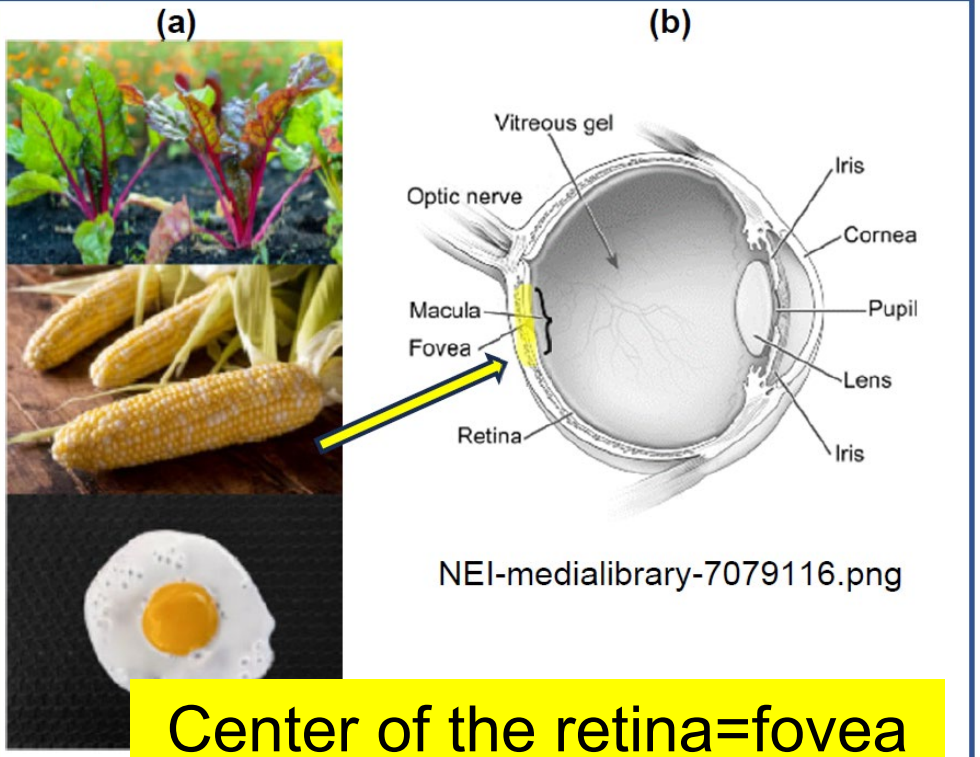
- Ancillary study of the Women's Health Initiative (WHI) Observational Study
- Objective: To study the association of lutein and zeaxanthin with age-related eye disease
- Postmenopausal women, 54+ years at CAREDS baseline (2001-2004)
- n=2,005 enrolled
- Participants are from 3 WHI sites:
  - University of Wisconsin (Madison)
  - University of Iowa (Iowa City)
  - Kaiser Center for Health Research (Portland)

– Dietary lutein intake <28th or >78th percentiles



CAREDS: Carotenoids lutein, zeaxanthin, isomer meso-zeaxanthin are concentrated in the retina

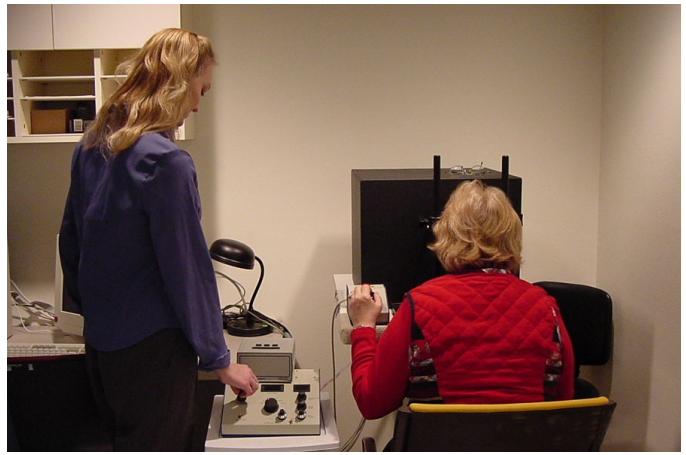
Figure 1 (a) Lutein-rich food sources & **(b)** Retinal diagram highlighting the location of macular pigment in the eye



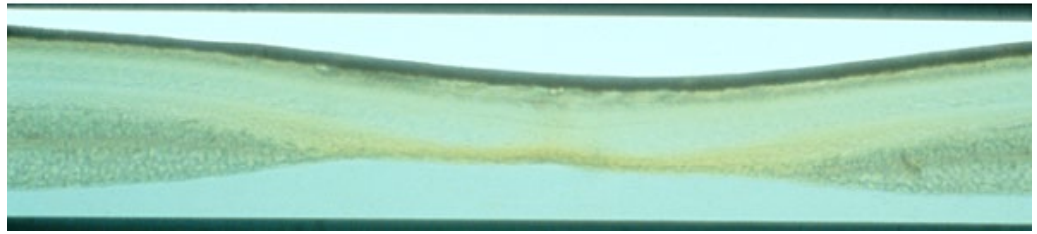
Center of the retina=fovea
Fovea is yellow

Macular pigment optical density (MPOD) =
Retinal Macular Pigment Concentrations

measured by customized heterochromatic flicker photometry



Macular pigment in primate retina – courtesy of Dr. Max Snodderly



CAREDS Data and Design

- **Measured at WHI baseline in CAREDS women**
  - **Serum**
    - Carotenoids
    - Total triglycerides
    - Total cholesterol
    - 25-hydroxyvitamin D
  - **Single nucleotide polymorphism of candidate genes** related to AMD risk and carotenoid metabolism

- **CAREDS baseline and follow-up**
  - **Diet**
    - Food frequency questionnaire (FFQ)
    - Retrospective FFQ (1986-1989)
  - **Supplement Use**
  - **Sunlight exposure**
  - **Family history of eye disease**
  - **Iris color**



CAREDS Baseline
(2001-2004)
n=1,874
Retinal photography at study visit

n=327 died

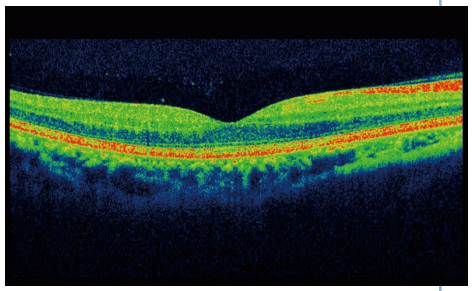
n=213 lost to follow-up

n=1,296 eligible to be followed for AMD incidence

CAREDS Follow-up
2016-21019
n=454 attended follow-up visit

Ocular Measures collected at CAREDS visit exams

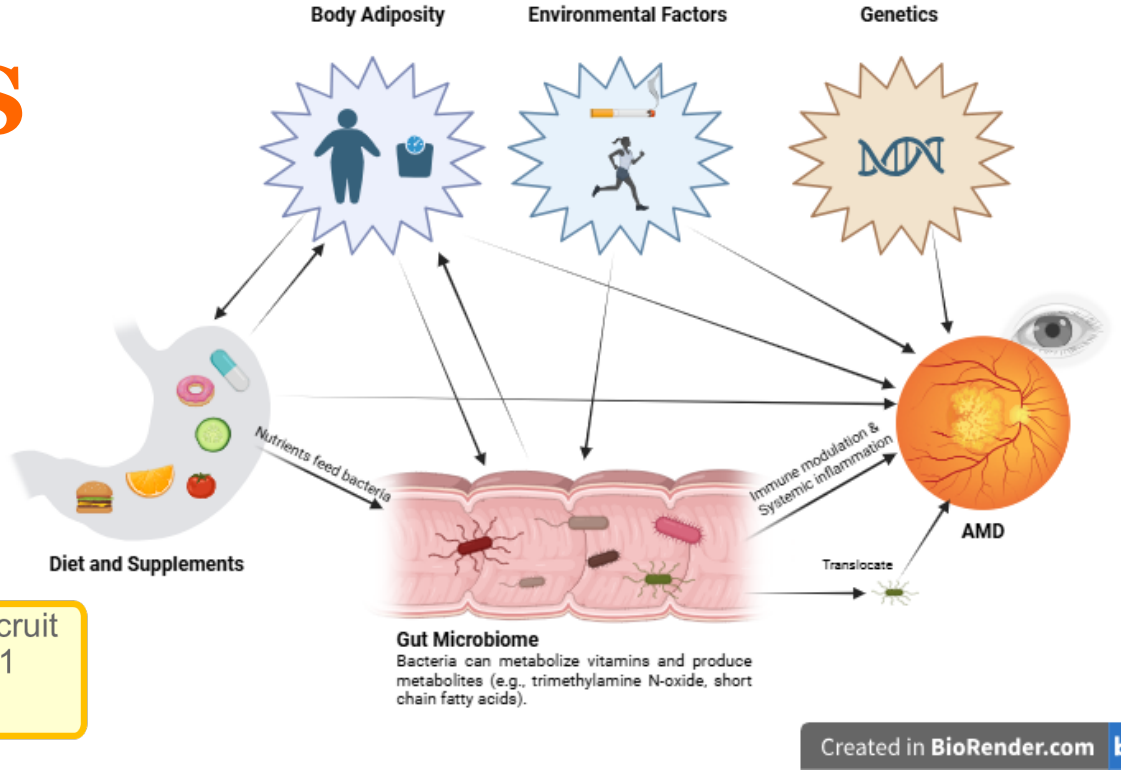
Baseline (n=1,874)	Follow-up (n=454)
○ **Best corrected visual acuity** both eyes ○ **Fundus photography of retina** ○ Assessed previous **cataract surgery** ○ **Lens opacities** using slit-lamp ○ **Macular pigment optical density (MPOD)** was measured by customized heterochromatic flicker photometry **CAREDS**	○ **Best corrected visual acuity** both eyes ○ **Digital fundus photography** of retina ○ Assessed previous **cataract surgery** ○ **Lens opacities** with fundus reflex images ○ **Macular pigment optical density (MPOD)** ○ **Spectral Domain Optical Coherence Tomography (SD-OCT).** after pupillary dilation ○ **Intraocular pressure (IOP)** ○ **Vision field tests (glaucoma)** ○ **Retinal vessel caliber** ○ **Central corneal thickness** ○ **Axial length**



Optical Coherence Tomography - Varcoe Eyecare



CAREDS



Surviving and Eligible to recruit for the **ME Study** in 2021
n=609

Lost to follow-up or did not respond
n=91

Died or could not participate due to cognitive challenges
n=36

Declined to participate
n=125

Consented to participate
N=357

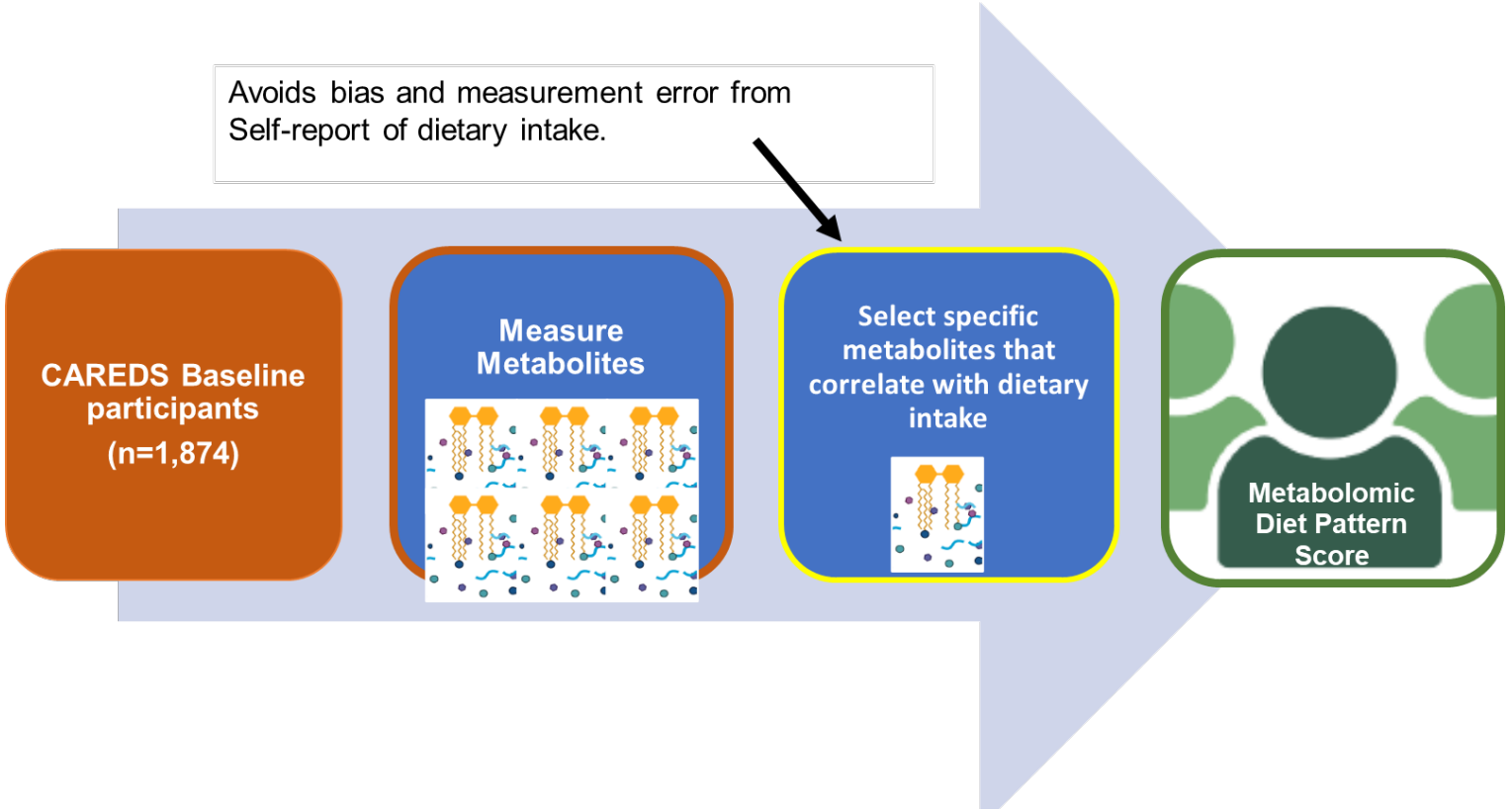
Returned stool samples of good quality
N=307

16s rRNA sequencing

BrightFocus® Foundation
Cure in Mind. Cure in Sight.

Nutritional Metabolomics in AMD and Retinal Integrity

R01 EY036600 (4 year)



CAREDS

Integrating diet and metabolomic studies has enormous potential to identify:

- metabolic pathways mediating the relationship between diet and AMD,
- novel metabolomic biomarkers to help refine our prediction of disease incidence and progression, and
- targets for therapeutic interventions in drug/supplementation trials to move us beyond the current nutritional treatment of high-dose antioxidant supplements.

Summary

Self-reported Outcomes
Glaucoma
Cataract
AMD
Diabetic retinopathy
Dry eye

WHISE (HTs)
2000-2001
Visual Acuity
Retinal Photographs
Intraocular pressure
Cup-to-disc ratio

Medicare Claims
For all eye diseases
identified by ICD 9/10 codes

CAREDS (OS)
2001-2004 Baseline
2016-2019 Follow-up
Visual Acuity
Retinal Photographs
Macular Pigment Optical Density
Lens Opacities
Intraocular pressure – *follow-up*
Glaucoma – *follow-up*
Ocular coherence tomography – *follow-up*

Please work with us!

- I invite anyone interested in working with the data I just presented today to reach out to me. I'd be happy to talk about potential collaborations.

- aemillen@buffalo.edu

POSTER:
Multimodal Capture of the 15-year Incidence of Intermediate or Late Age-related Macular Degeneration (AMD) and its Association with Macular Pigment Optical Density (MPOD) in the Carotenoids in Age-Related Disease Study (CAREDS)

Collaborators on WHI Vision Projects

University of Wisconsin (UW)
Julie Mares PhD
Barbara Blodi MD
Corinne Engelman PhD
Gloria Sarto MD PhD
Amitha Domalpally, MD
Yao Liu, MD
Tom Lawler, PhD

Oregon Health Sciences University
Michael Klein MD
Erin LeBlanc MD (Kaiser Permanente)

University of Arizona
Cheryl Ritenbaugh PhD (was at OHSU)

University at Buffalo (UB)
Jean Wactawski-Wende, PhD
Sangita Patel, MD, PhD
Rachael Hageman Blair, PhD
Troy Wood, PhD
Kaelyn Burns, PhD

University of Michigan
Chris Andrews, PhD

University of Iowa
Karen Gehrs MD
Jennifer Robinson MD
Robert Wallace MD

University of Texas
Max Snodderly PhD

Brown University
Billy Wooten PhD

Tufts University
Elizabeth Johnson PhD

University of Utah
Paul Bernstein, MD, PhD

Women's Health Initiative
Lesley Tinker PhD
Marian Neuhouser, PhD

University of California, San Francisco
Mary Haan, DrPh

Case Western Reserve University
Sudha Iyengar PhD
Robert P. Igo, Jr. PhD
Barb Truitt MS

Wake Forest University
Mark Espeland, PhD

Thank You!

Funding

- **National Eye Institute**
- **National Heart Lung & Blood Institute**
- **National Institutes on Aging**
- UW Depart. of Ophthalmology
  McPherson Eye Research Institute
- UB IMPACT Grant

MERI
UW-MADISON

BrightFocus® Foundation
Cure in Mind. Cure in Sight.

Research to Prevent Blindness

The Vision Impairment Project (VIP): Overview, Design and Available Data



Emily Gower, PhD
Professor
Department of Epidemiology
Gillings School of Global Public Health
University of North Carolina Chapel Hill



The Vision Impairment Project (VIP): Overview, Design and Available Data

Emily Gower, PhD

Professor

University of North Carolina at Chapel Hill

Vision Impairment

- Vision loss is associated with increased mortality
- 15% of IADL limitations could be avoided by addressing refractive error
- 10-60% of nursing home residents have visually significant cataracts
- Cataract surgery can slow cognitive decline by 50%

The State of Eye Health in the US

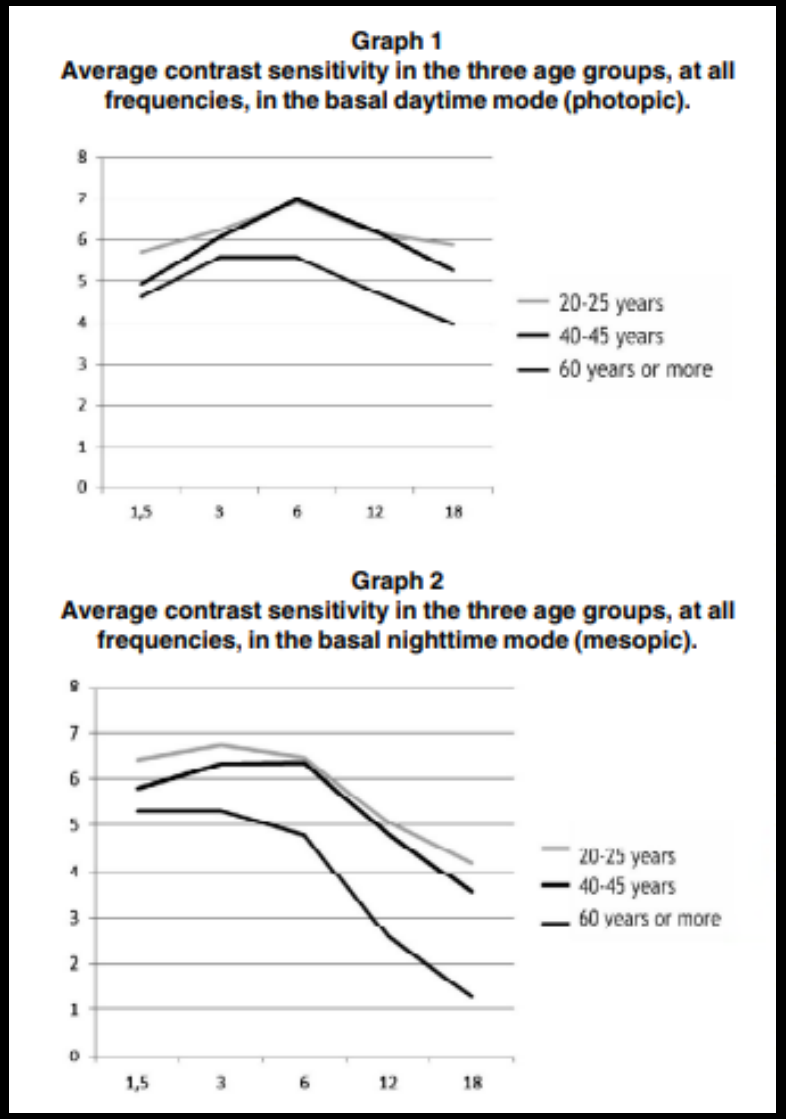
15-25% of individuals aged 80+ have vision impairment

Among adults 50+ years, women carry an excess burden of 1 million cases of vision impairment compared to men

Distance visual acuity can be accurately measured with a smartphone







- Sieiro 2016



Contrast Sensitivity is Also Important

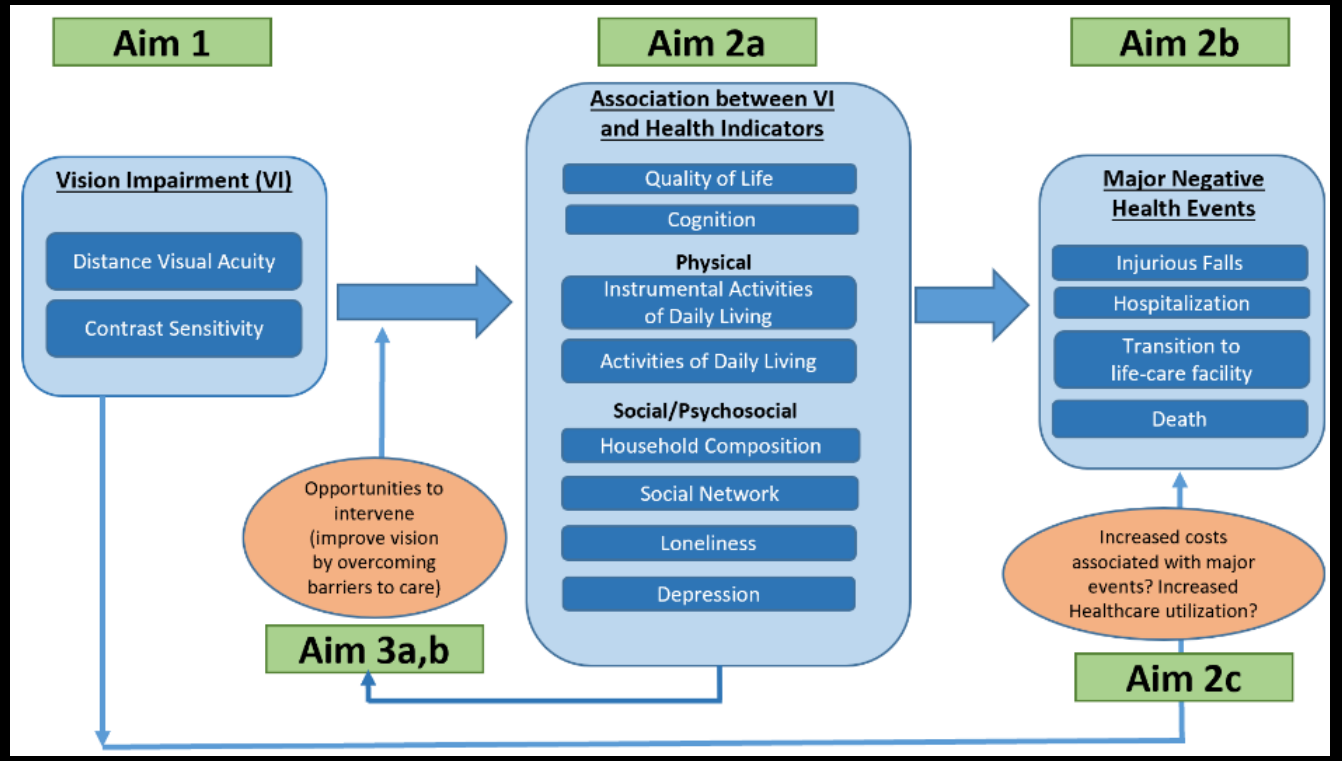
Design

WHI Vision Impairment Project Aims

1. Quantify VI prevalence among older, community-dwelling women

2. Determine the impact of VI on key social, psychological, and physical health variables among the oldest old population

3. Compare healthcare utilization among those with and without impairment



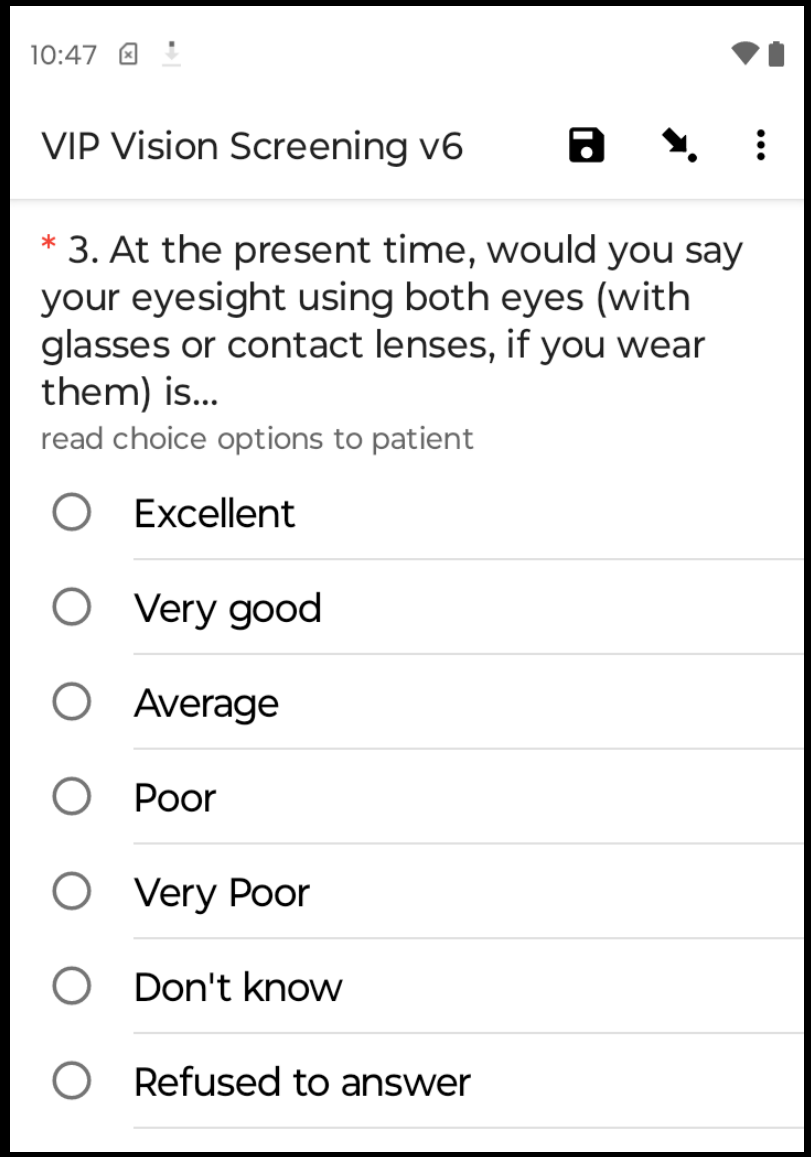
NEI-funded, February 2023

WHI-VIP Data Collection

- Distance vision assessment
- Pinhole vision test for those with worse than 20/40
- Contrast sensitivity
- Questionnaire
- Medical records request



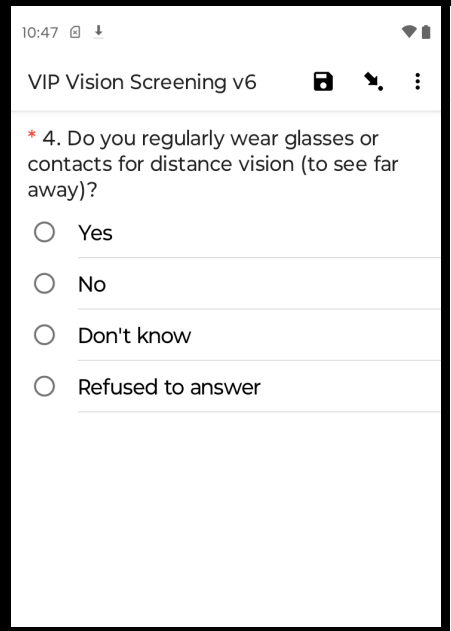
Participants' Perceived Vision

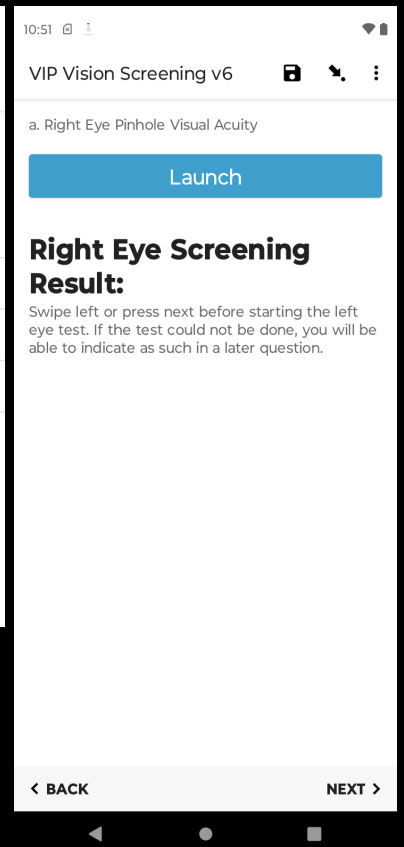


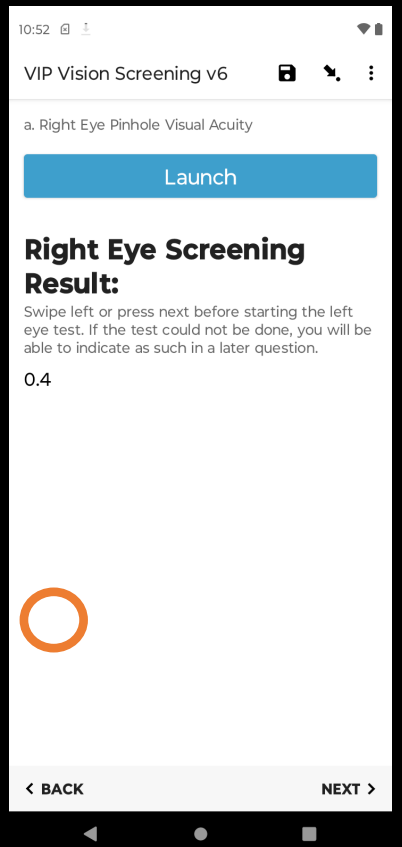
Vision Assessment











ODK data collection system

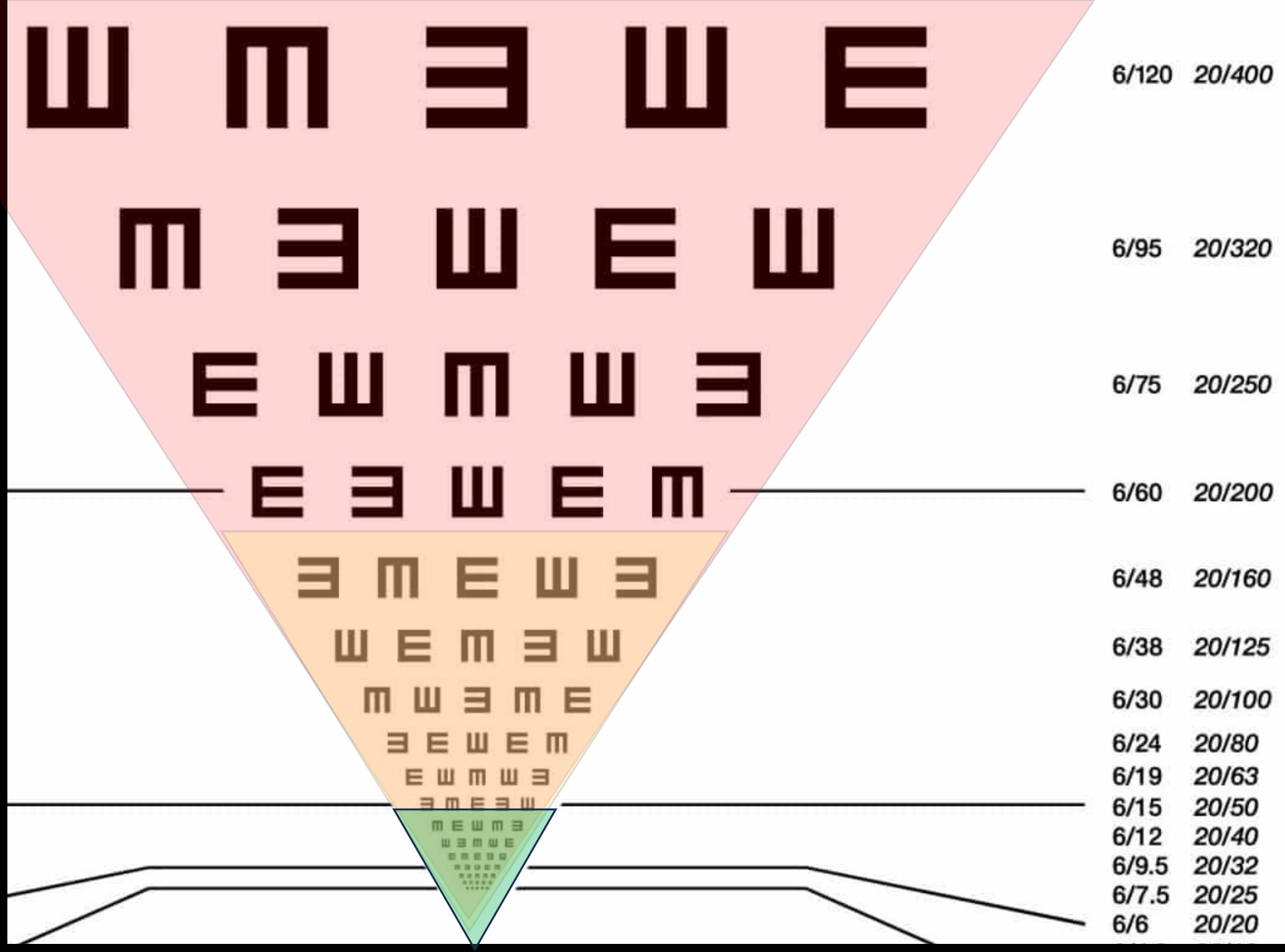
Vision Impairment Classification

Eye-level

- Good: better than 20/40
- Impaired: 20/40 - <20/200
- Blind: 20/200+

Person-level

- Both eyes good
- One eye impaired
- Both eyes impaired
- One eye blind
- Both eyes blind



Contrast Sensitivity





Visit Card

Vision Screening Recommendations

1. ❑ Your distance vision screening is normal.

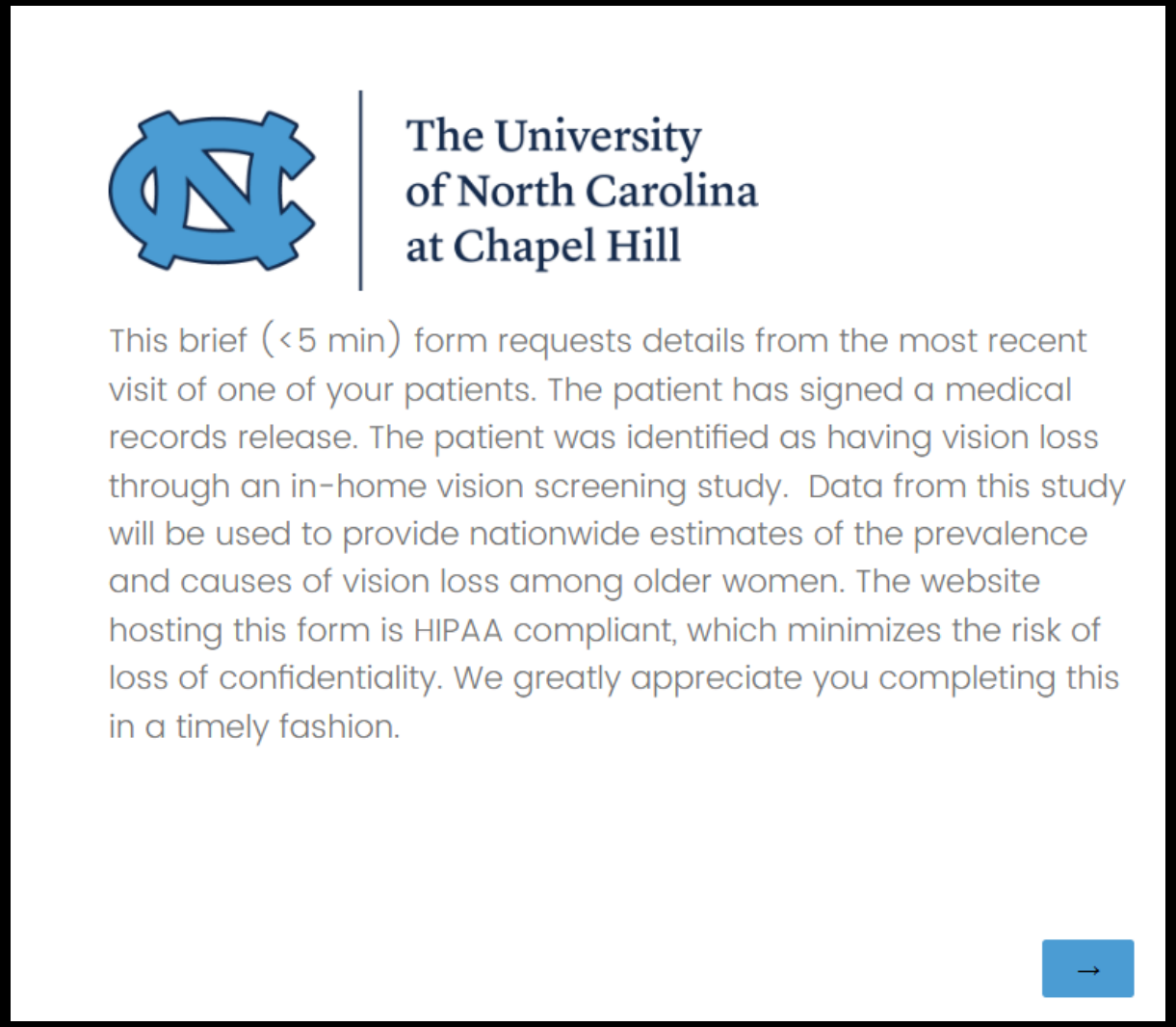
2. ❑ You might benefit from a new or updated glasses prescription. We recommend that you see an optometrist.

3. ❑ You might benefit from a comprehensive eye exam. We recommend that you see an ophthalmologist.

If you have questions about the vision screening, please call (919) 391-5614.

Medical Records Request

- Fax and Qualtrics
- Questionnaire:
  - Causes of vision loss
  - Procedures
  - Vision at visit closest to LLS2-VIP
- Medical Record:
  - Abstracted by ophthalmologist and UNC team

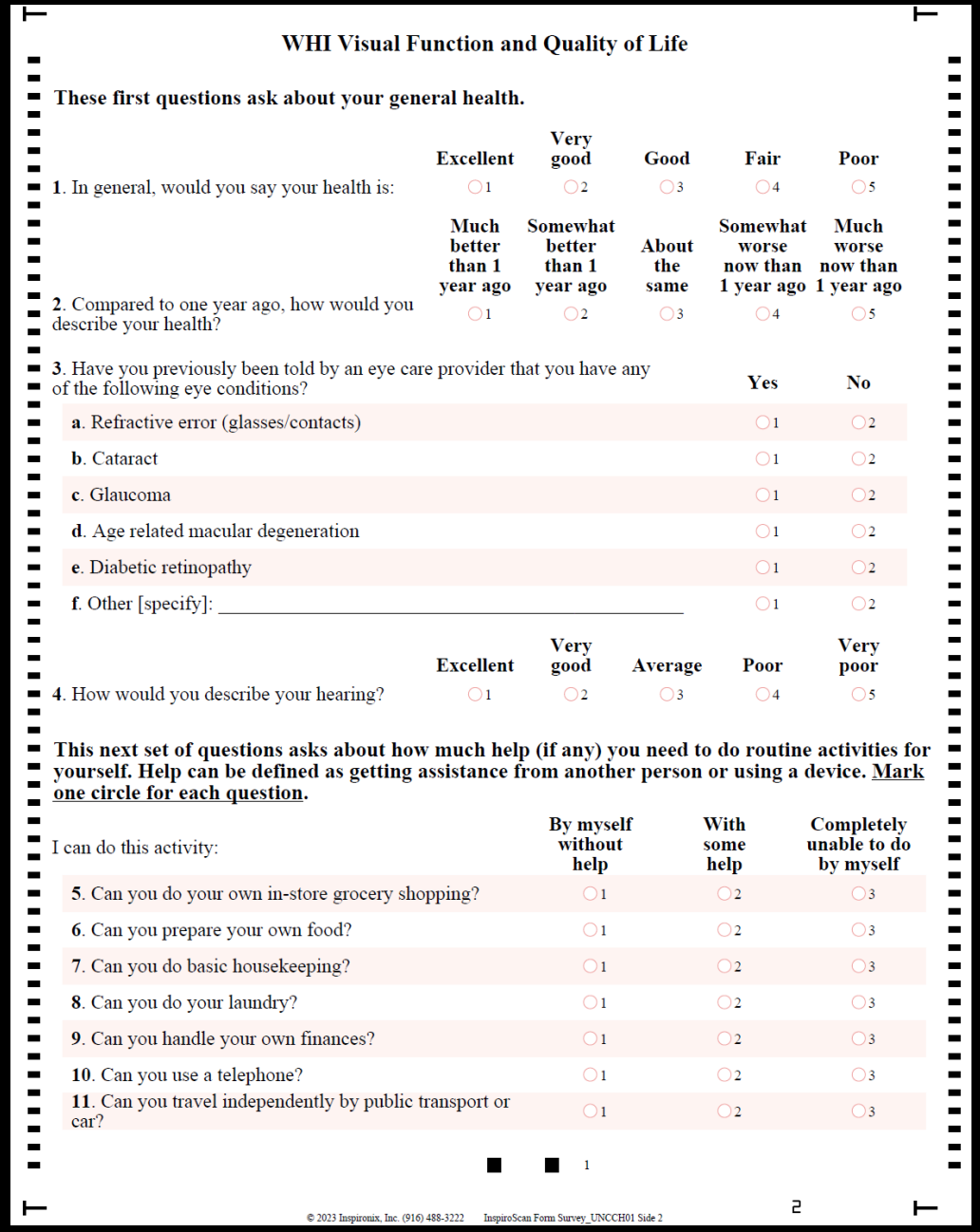


Questionnaires and Scales

- NEI Visual Function Questionnaire (NEI-VFQ)
- Low Luminance Questionnaire (LLQ)

- Center for Epidemiological Studies – Depression (CES-D)
- De Jong Gierveld Loneliness Scale
- Lubben Social Network Scale

- Activities of Daily Living (modified)
- Leisure Activities



WHI Visual Function and Quality of Life

These first questions ask about your general health.

	Excellent	Very good	Good	Fair	Poor
1. In general, would you say your health is:	○ 1	○ 2	○ 3	○ 4	○ 5

	Much better than 1 year ago	Somewhat better than 1 year ago	About the same	Somewhat worse now than 1 year ago	Much worse now than 1 year ago
2. Compared to one year ago, how would you describe your health?	○ 1	○ 2	○ 3	○ 4	○ 5

3. Have you previously been told by an eye care provider that you have any of the following eye conditions?	Yes	No
a. Refractive error (glasses/contacts)	○ 1	○ 2
b. Cataract	○ 1	○ 2
c. Glaucoma	○ 1	○ 2
d. Age related macular degeneration	○ 1	○ 2
e. Diabetic retinopathy	○ 1	○ 2
f. Other [specify]: _____	○ 1	○ 2

	Excellent	Very good	Average	Poor	Very poor
4. How would you describe your hearing?	○ 1	○ 2	○ 3	○ 4	○ 5

This next set of questions asks about how much help (if any) you need to do routine activities for yourself. Help can be defined as getting assistance from another person or using a device. Mark one circle for each question.

I can do this activity:	By myself without help	With some help	Completely unable to do by myself
5. Can you do your own in-store grocery shopping?	○ 1	○ 2	○ 3
6. Can you prepare your own food?	○ 1	○ 2	○ 3
7. Can you do basic housekeeping?	○ 1	○ 2	○ 3
8. Can you do your laundry?	○ 1	○ 2	○ 3
9. Can you handle your own finances?	○ 1	○ 2	○ 3
10. Can you use a telephone?	○ 1	○ 2	○ 3
11. Can you travel independently by public transport or car?	○ 1	○ 2	○ 3

■ ■ 1

© 2023 Inspironix, Inc. (916) 488-3222 InspiroScan Form Survey_UNCCH01 Side 2

Vision-related Questionnaires

NEI-VFQ

- Measures impact of chronic eye conditions on health-related QoL
- 25-item questionnaire
- Widely used

Low Luminance Questionnaire (LLQ)

- Patient-centered tool to assess visual difficulties in dim light
- 32-item questionnaire

Vision Questionnaire Subscales

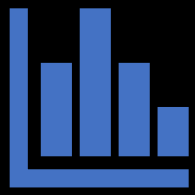
NEI-VFQ

General Health	General vision	Driving
Near activities	Distance activities	Social functioning
Role limitations	Dependency	Ocular pain
Color vision	Peripheral vision	Mental Health

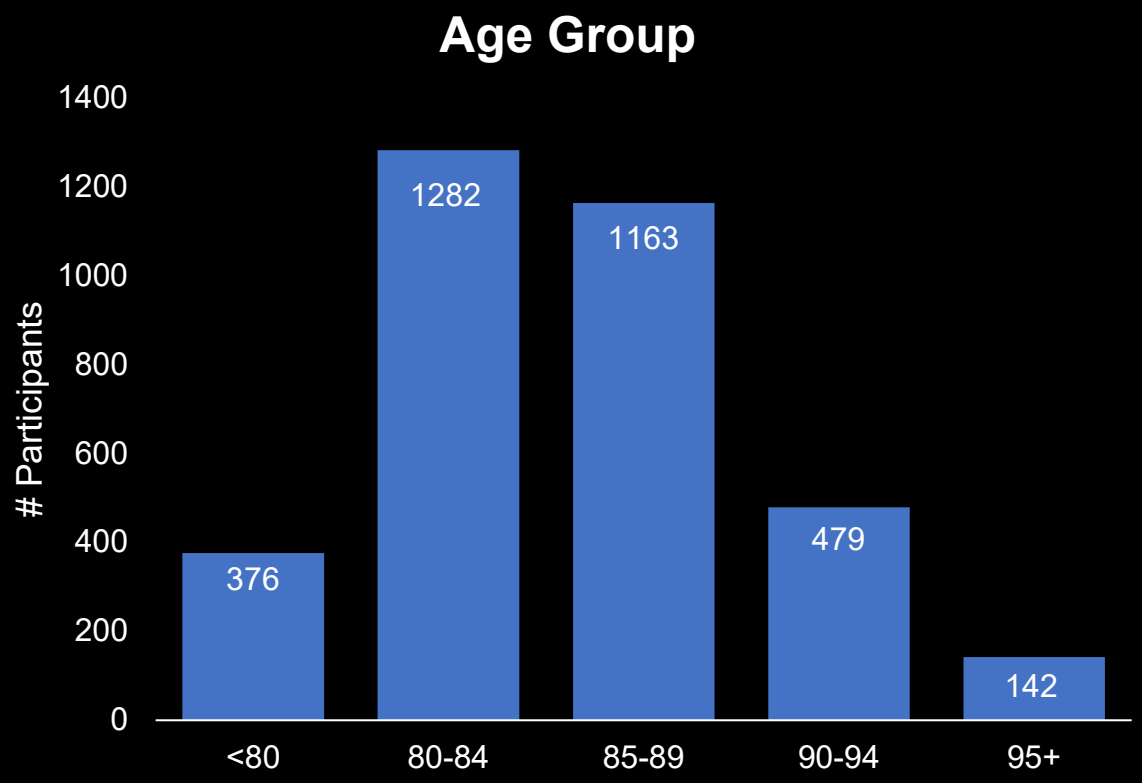
LLQ

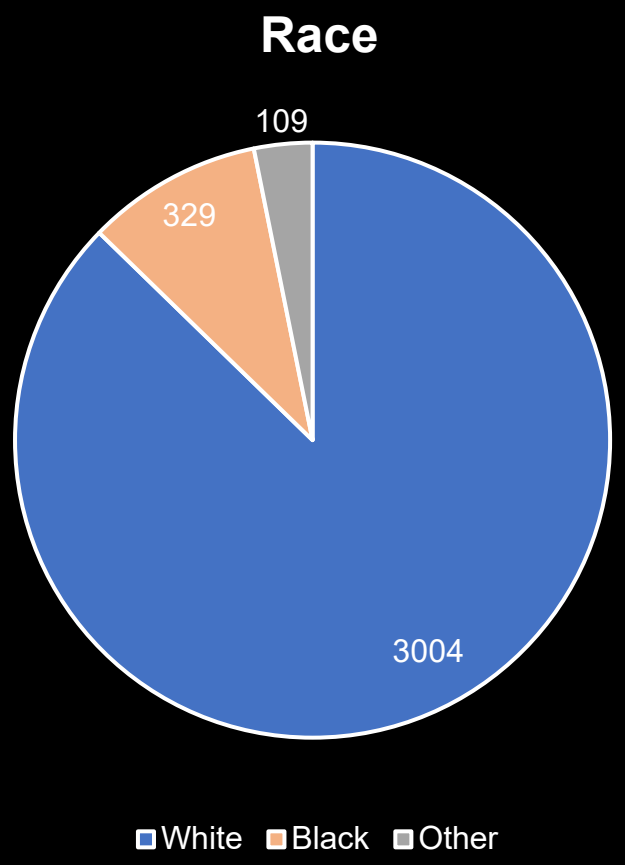
Driving	Mobility
Extreme lighting	Dim lighting
Peripheral vision	Emotional Distress

Results and Available Data

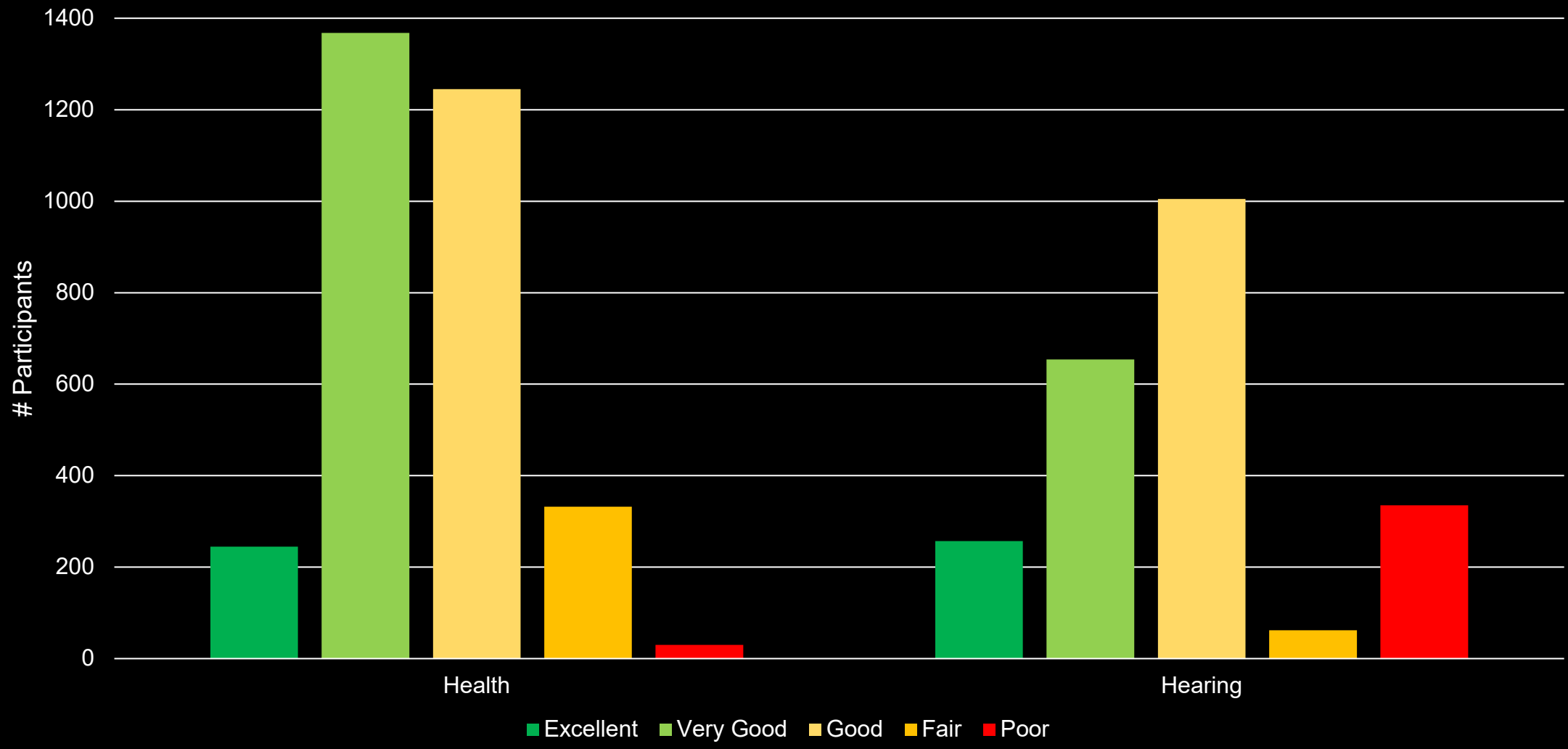


3442 Participants with Complete Data

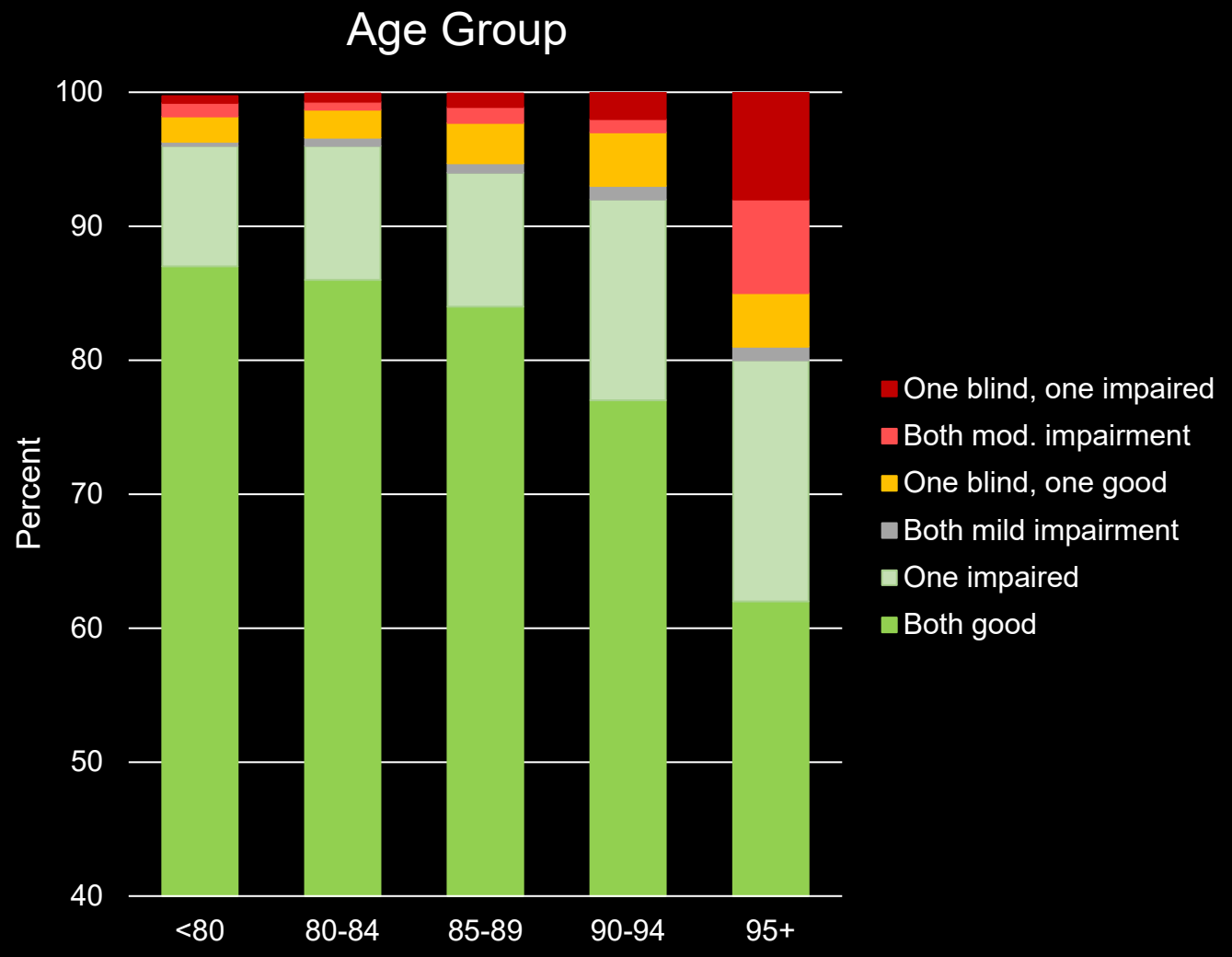


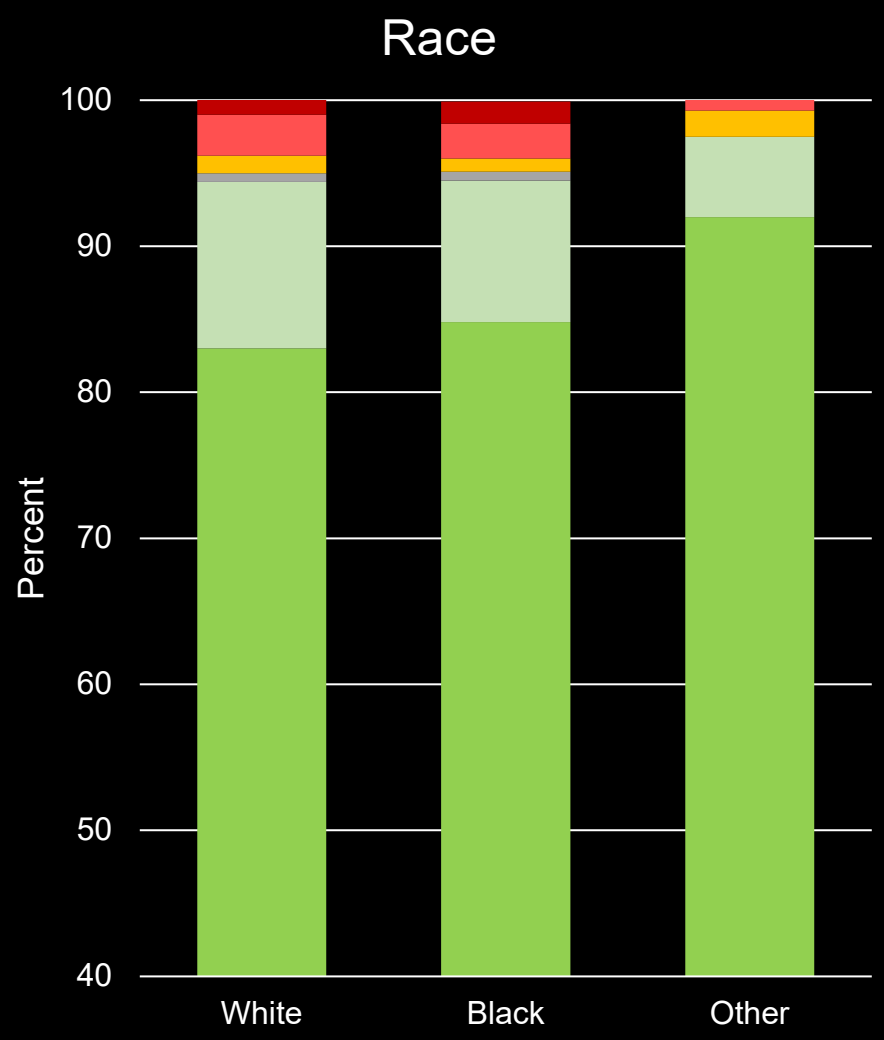


Self-Reported Health and Hearing



Demographics by Vision Status



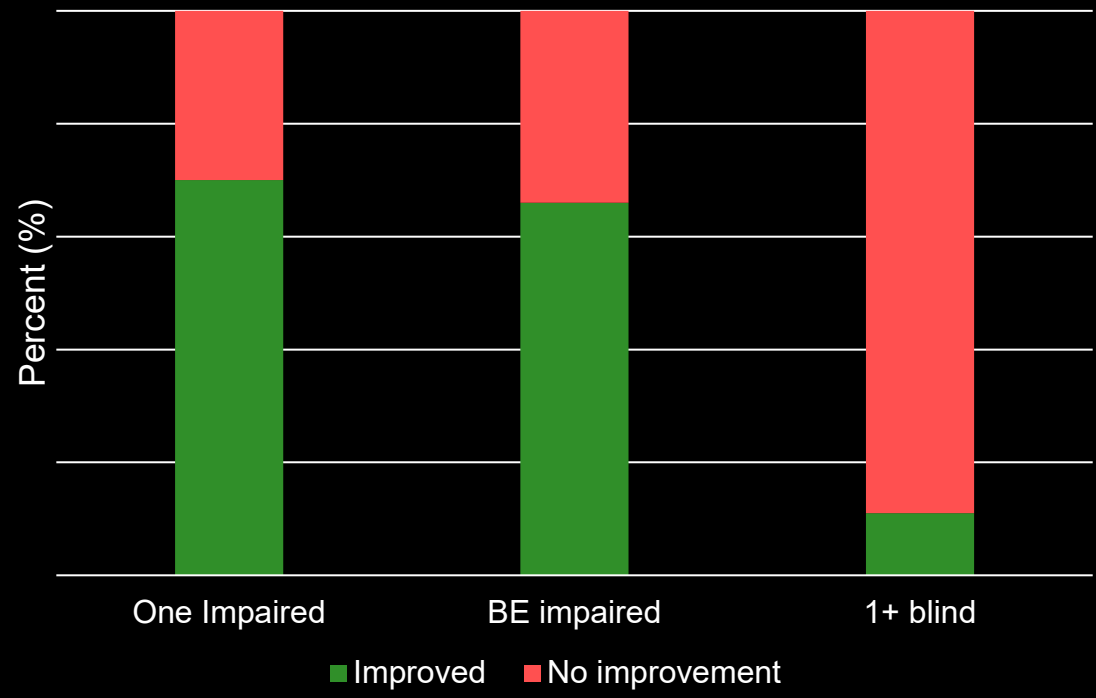


14% of women have un- or under-corrected refractive error



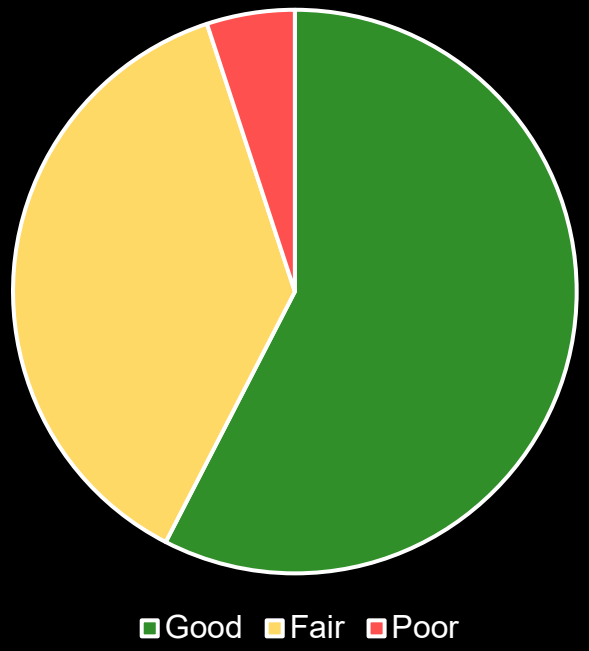
Pinhole Testing:

- ~500 women tested
- 467 women improved in 1+ eye
- 39 improved by >3 lines

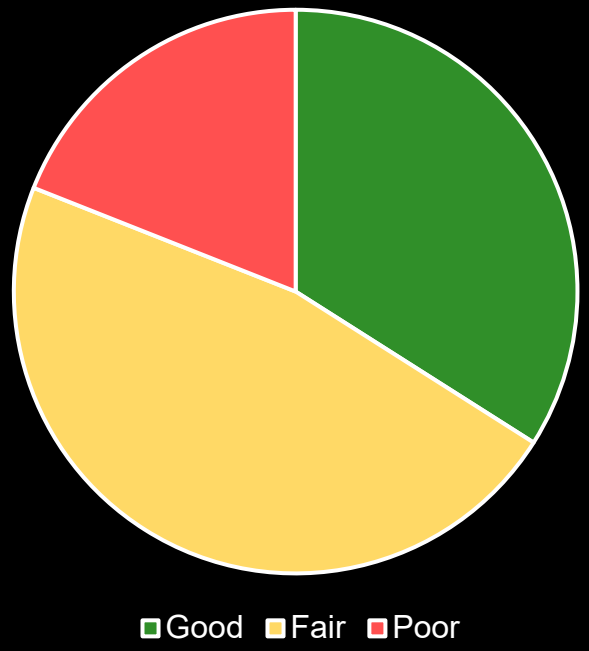


Measured and Perceived Vision Differ

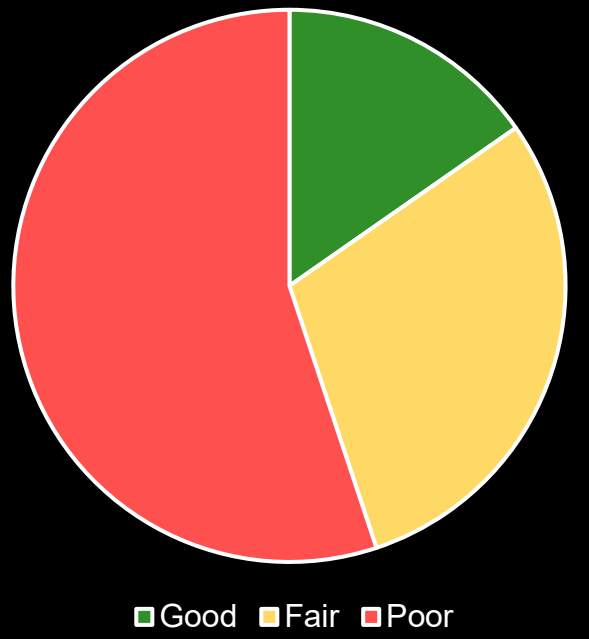
Both Good



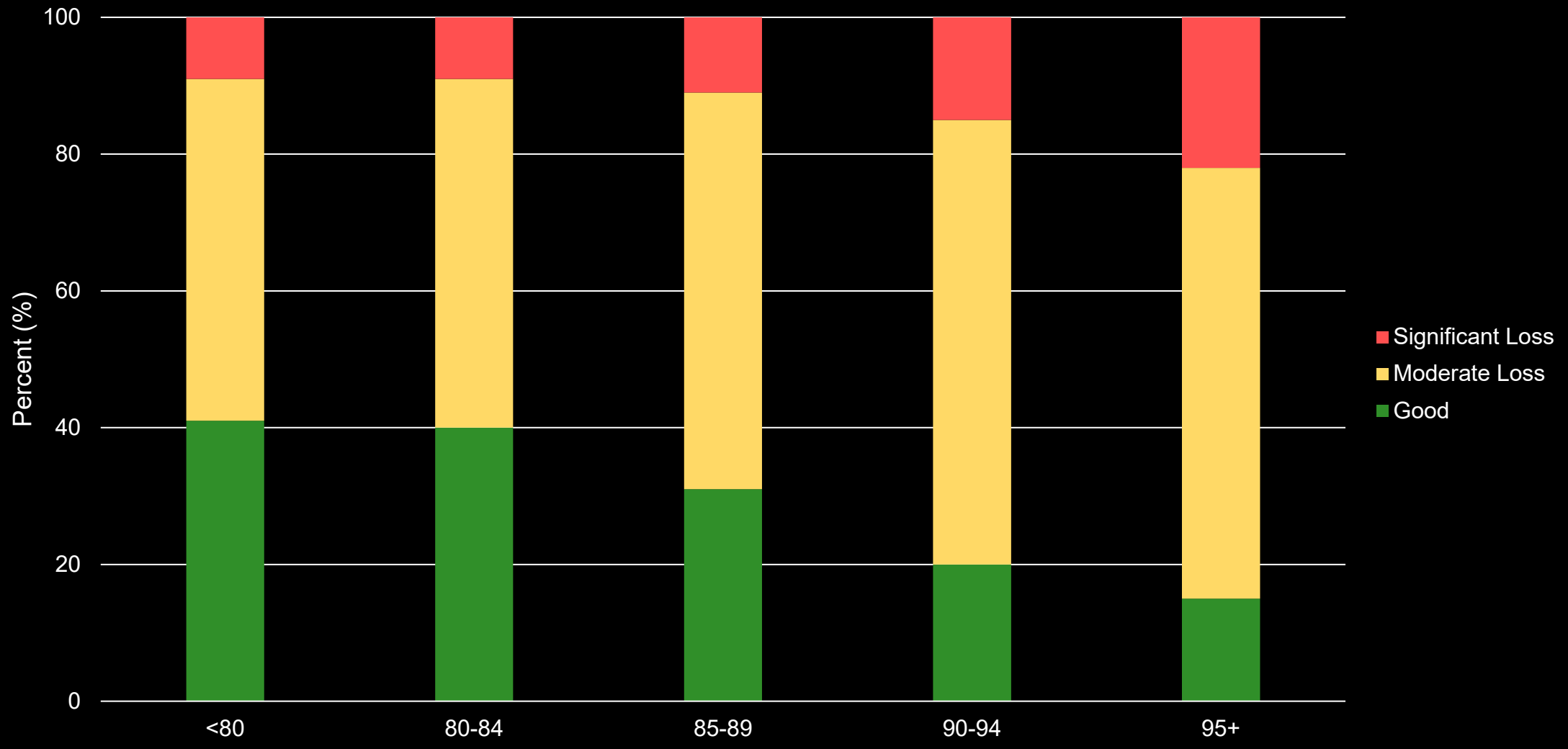
One Impaired



Both Moderate Impairment



Contrast Sensitivity Declines with Increasing Age

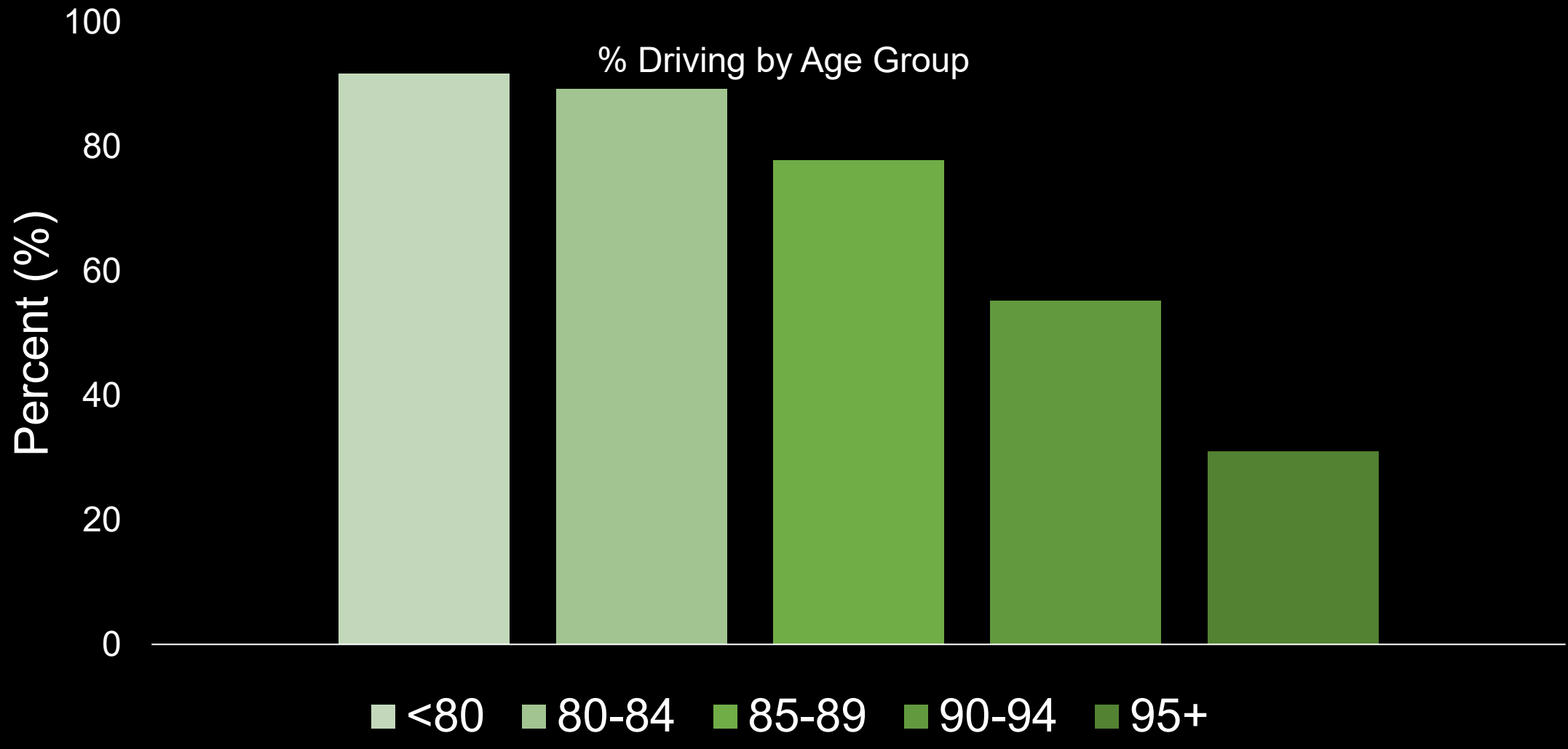


Medical Record Abstraction: ~350 records

Most common causes of vision loss:

- Refractive error
- Cataract
- AMD
- Glaucoma

Driving Declines with Increasing Age



Available Data

Vision

Driving

Cognition

Depression

Loneliness

Social Function

Activities of Daily Living

Vision Related Quality of Life

Healthcare Utilization

30+ Years of WHI Data Collection

Link to Medicare Database

Timeline and Future Directions

In-home data collection completed

Following participants until 2027

Investigate how we can increase access and reduce barriers to eye exams and receiving needed vision/eye treatments

Acknowledgements

UNC Team

Megan Yu
Truman Austin
Andrea Bankoski
Ashlyn Fortney
Michael Maizel
Joanna Maselko
Samantha Tulenko
Jerusha Weaver
Luis Zambrana
Erica Zeno

Fred Hutch Team

Catherine Duggan
Patti Olee
Lesley Tinker
Jude Warner
Emily Wion

Exam One Team

Jennifer Dean
Doug McCarthy
Stephanie Tate
Nationwide examiners

Harvard

David Friedman

Funding

National Institutes of Health (NIH)
National Eye Institute (NEI)

Southeastern Regional Center

Sally Shumaker

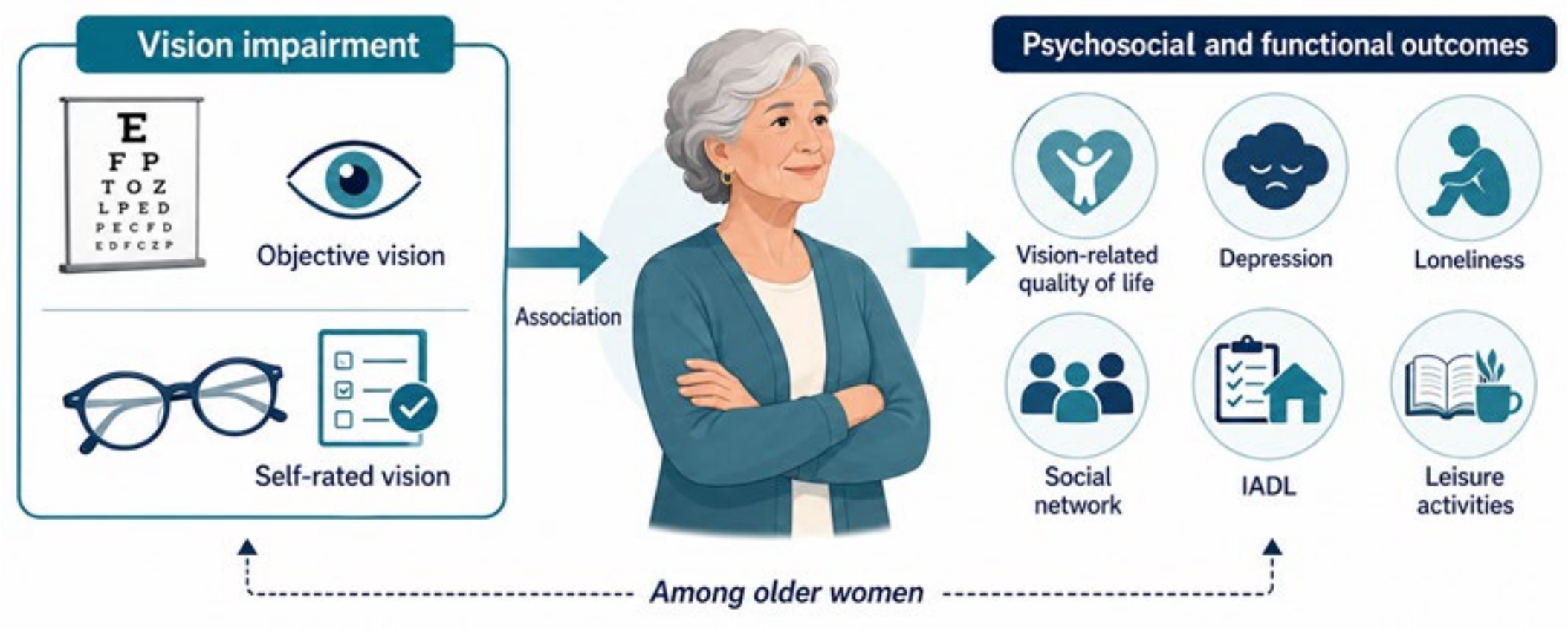
Association between Vision Impairment and Physical and Psychosocial Functioning among Older Women

Luis Zambrana, Megan Yu, Jerusha U. Weaver,
Lesley F. Tinker, David S. Friedman, Joanna Maselko, Emily W. Gower

University of North Carolina at Chapel Hill
Department of Epidemiology

UNC | GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

Objective


Vision impairment
E
F P
T O Z
L P E D
P E C F D
E D F C Z P
Objective vision
Self-rated vision
Association
Psychosocial and functional outcomes
Vision-related quality of life
Depression
Loneliness
Social network
IADL
Leisure activities
Among older women

Distance VA Categorizations

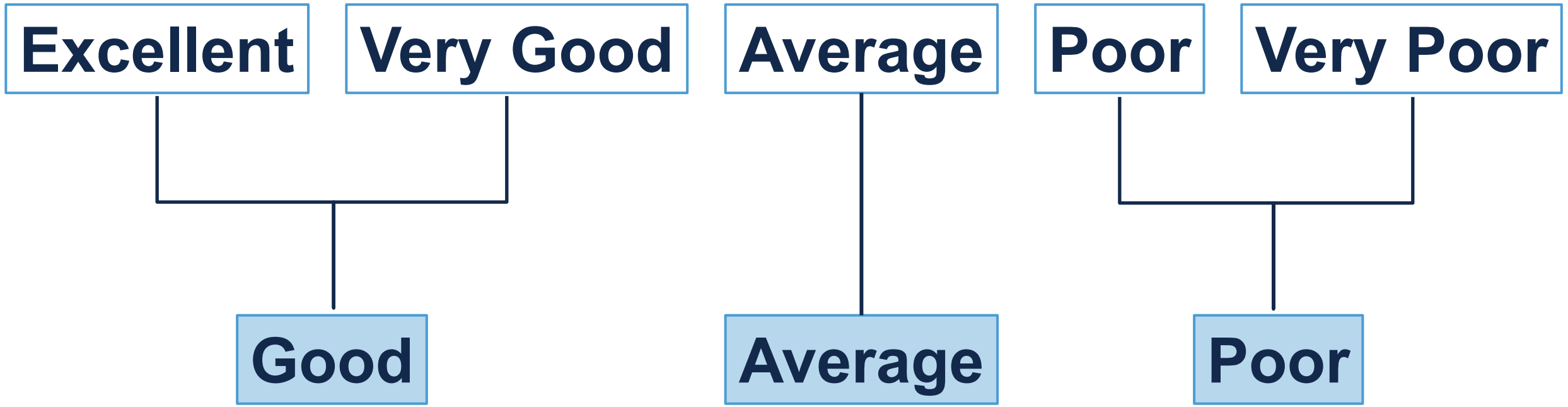
Eye-level

- **Good**
  ≤0.30 logMAR 0/40 or better
- Mild Impaired
  >0.3 to ≤0.5 logMAR
  >20/40 to 20/60
- **Moderate Impairment**
  >0.5 to ≤ 1.0 logMAR
  Worse than 20/60 to 20/200
- Blind >1.0 Worse than 20/200

Person-level

- Both eyes good
- One eye Impaired
- Both eyes mild impaired
- One blind, one good
- Both eyes moderate impaired
- One blind, one impaired/blind

Self-Rated Vision



Measures Included in This Analysis

Psychosocial and functional outcomes in the WHI vision study



Vision-related quality of life

NEI VFQ-25

Perceived impact of vision on daily life.



Social connection

LSNS-6

Social network size and support.



Emotional well-being

CES-D-10

Depressive symptoms.



De Jong Gierveld Loneliness Scale

Loneliness; measures feelings of emotional and social loneliness.

Composite scores were analyzed as **continuous outcomes**.

1) Mangione. *Arch Ophthalmol*. 1998. 2) Mangione. *Arch Ophthalmol*. 2001. 3) Lubben et al. *The Gerontologist*. 2006. 4) Gierveld & Tilburg. *Res Aging*. 2006. 5) Andresen et al. *Am J Prev Med*. 1994. 6) Irwin et al. *Arch Intern Med*. 1999. 7) Lawton & Brody. *Gerontologist*. 1969. 8) Graf. *AJN Am J Nurs*. 2008.

Function and Activity Measures

Everyday independence and participation

Lawton IADL Scale

Assesses independence in instrumental activities of daily living.

- Phone
- Shopping
- Food prep
- Housekeeping
- Laundry
- Transportation
- Finances

Leisure Activities

Counts participation in common leisure activities that reflect day-to-day engagement.

- Reading
- Baking
- Sewing
- Religious
- Hobbies
- Games
- Walking
- Music

These measures reflect how vision may influence daily independence and activity engagement.

1) Mangione. *Arch Ophthalmol*. 1998. 2) Mangione. *Arch Ophthalmol*. 2001. 3) Lubben et al. *The Gerontologist*. 2006. 4) Gierveld & Tilburg. *Res Aging*. 2006. 5) Andresen et al. *Am J Prev Med*. 1994. 6) Irwin et al. *Arch Intern Med*. 1999. 7) Lawton & Brody. *Gerontologist*. 1969. 8) Graf. *AJN Am J Nurs*. 2008.

Statistical Analysis

1



Composite Scores

- Questionnaire items combined using standard scoring rules
- Composite outcomes included psychosocial and functional domains
- Composite scores analyzed as continuous outcomes

2



Descriptive Statistics

- Participant characteristics and outcome distributions summarized overall
- Also summarized by vision impairment and self-reported vision

3



Linear Regression

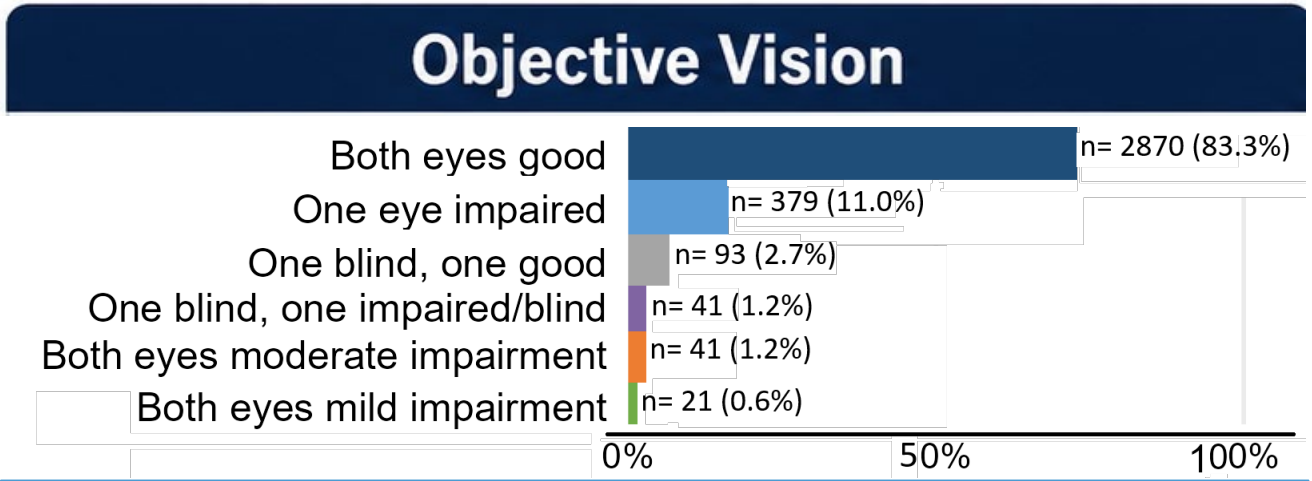
- Unadjusted linear regression was used
- "Both eyes good" was the reference category
- The graphs show the predicted mean change/difference in score versus the reference group
- β estimates were plotted for each vision category
- P-trend was added to assess whether there was a progressive pattern as distance vision worsened

Composite outcomes were modeled as continuous measures for regression analysis across objective & self-rated vision categories.

Study Population

Objective and self-rated vision among older women

N = 3,442 | Mean age = 85 years



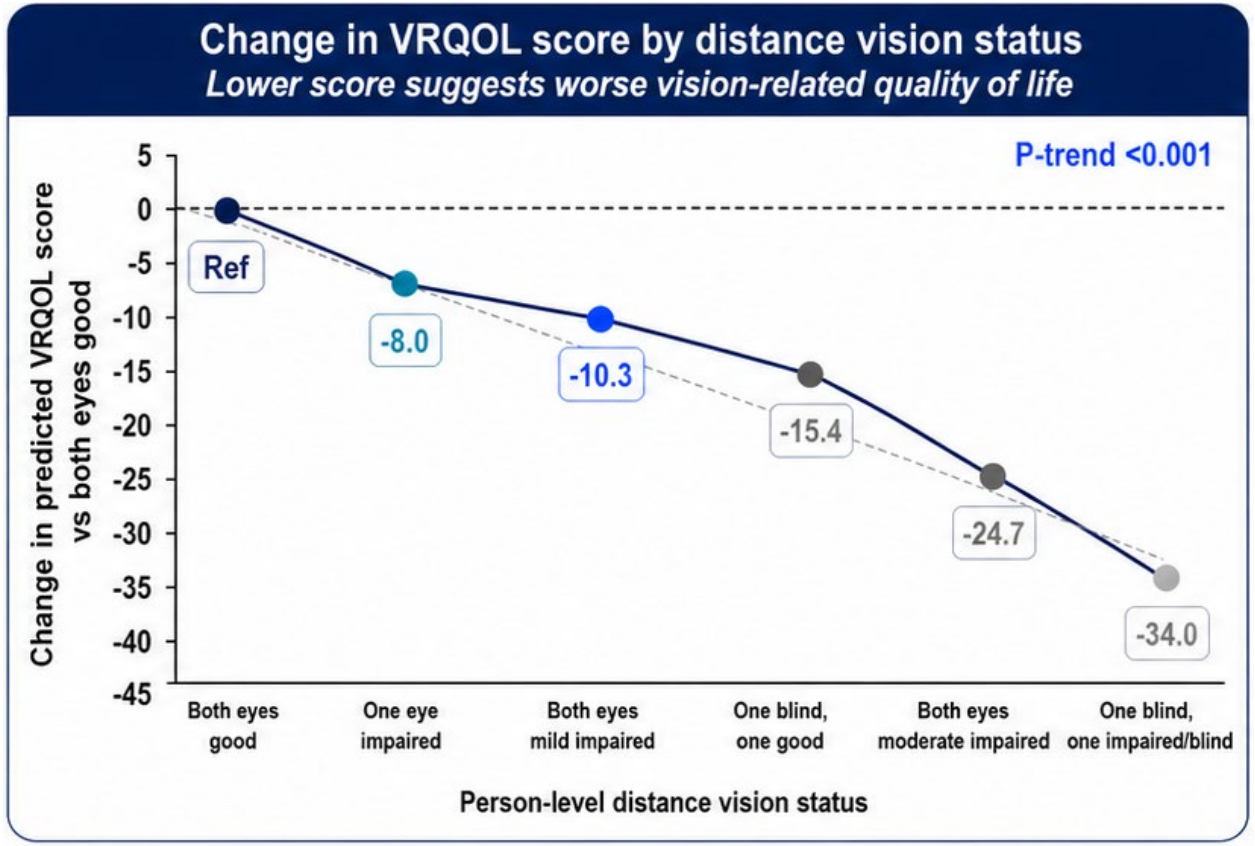


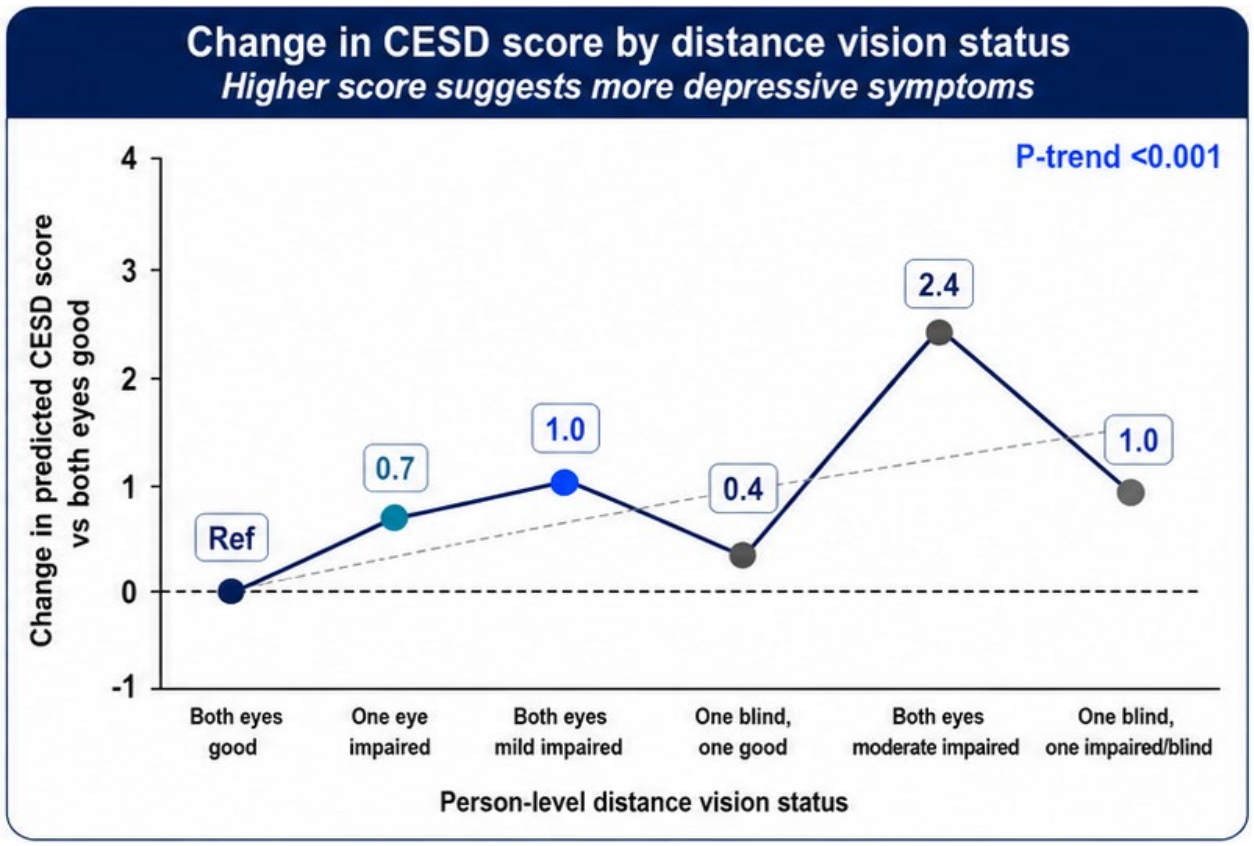
Distance vision impairment prevalence = 17%

47.5% Self-rated as Average / Poor

Most participants had objectively good vision, but self-rated vision was less favorable.

Worse distance vision was associated with lower VRQOL and higher depressive symptoms.

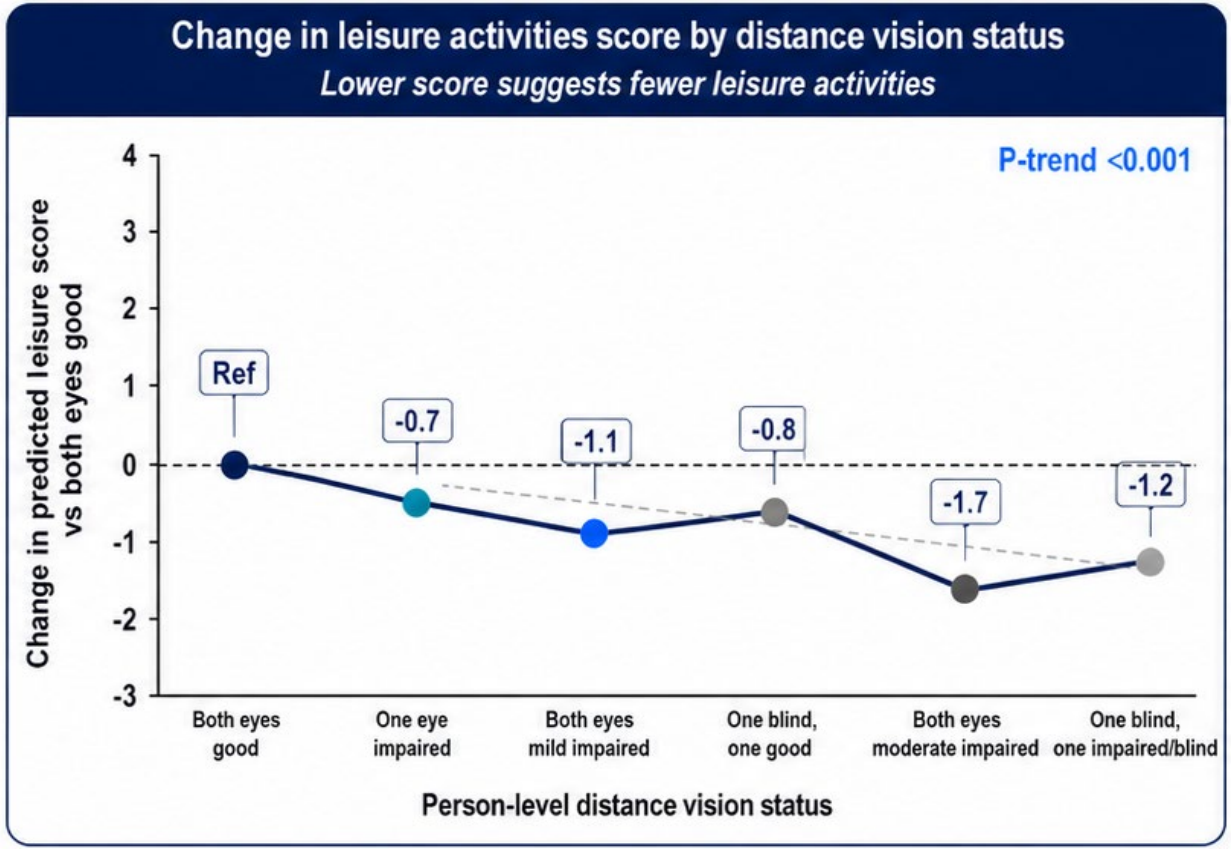


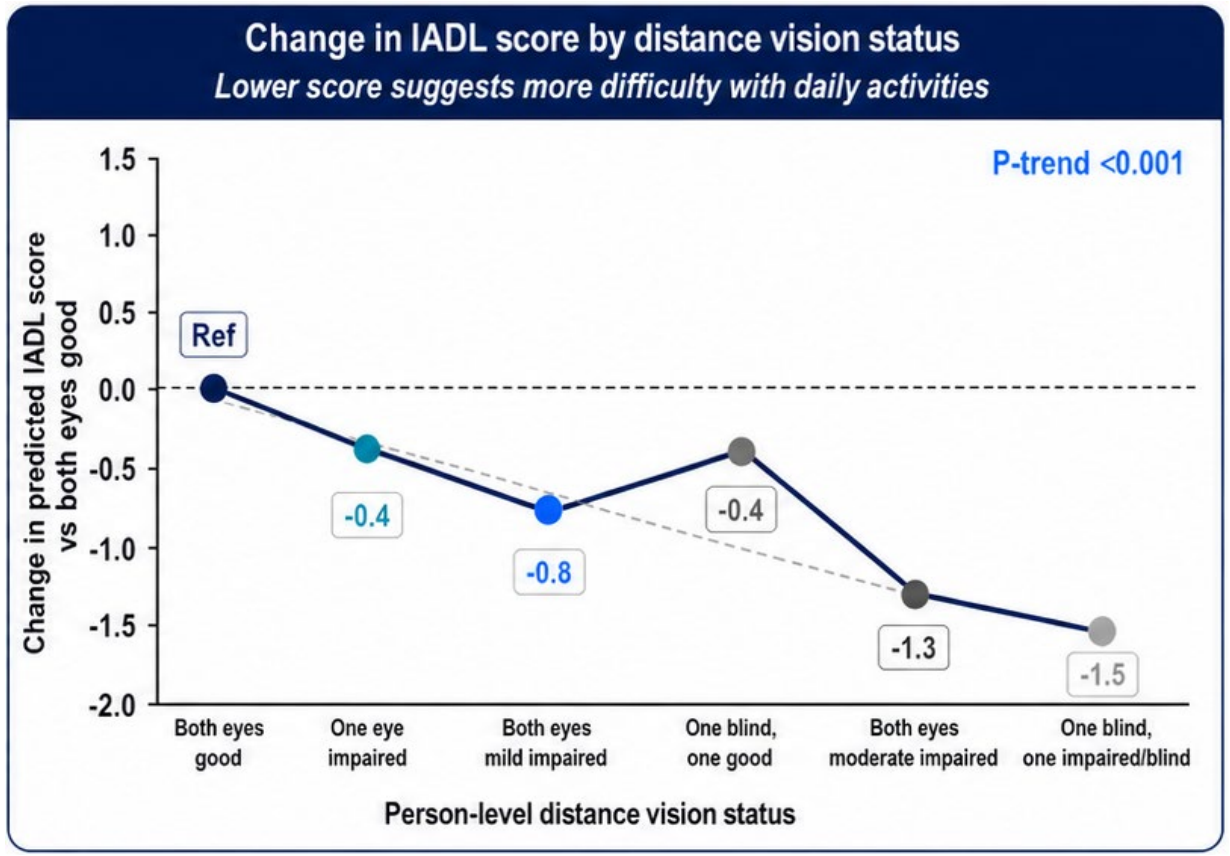


Poorer distance vision was linked to worse vision-related quality of life and more depressive symptoms.

Points show predicted mean differences from unadjusted linear regression. Both eyes good is the reference group.

Greater vision impairment was associated with fewer leisure activities and lower IADL scores

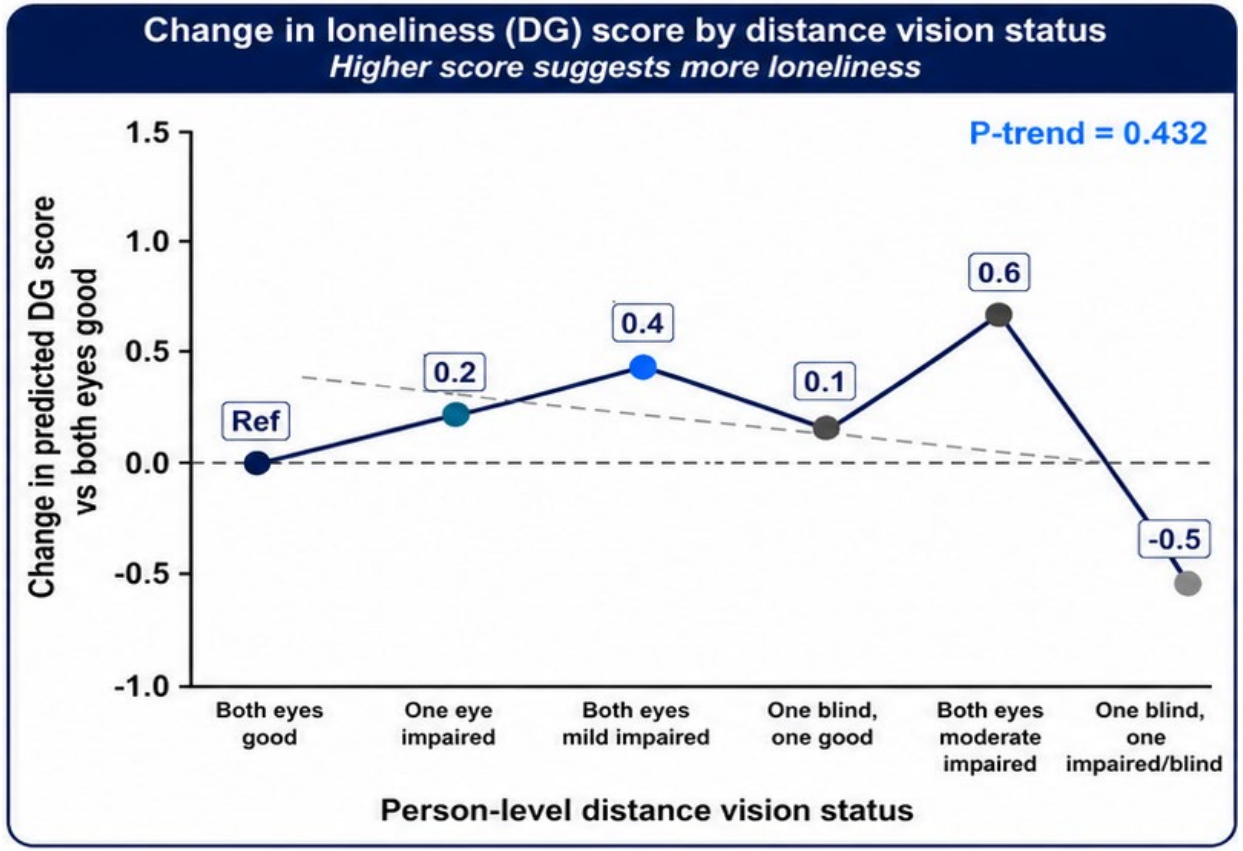


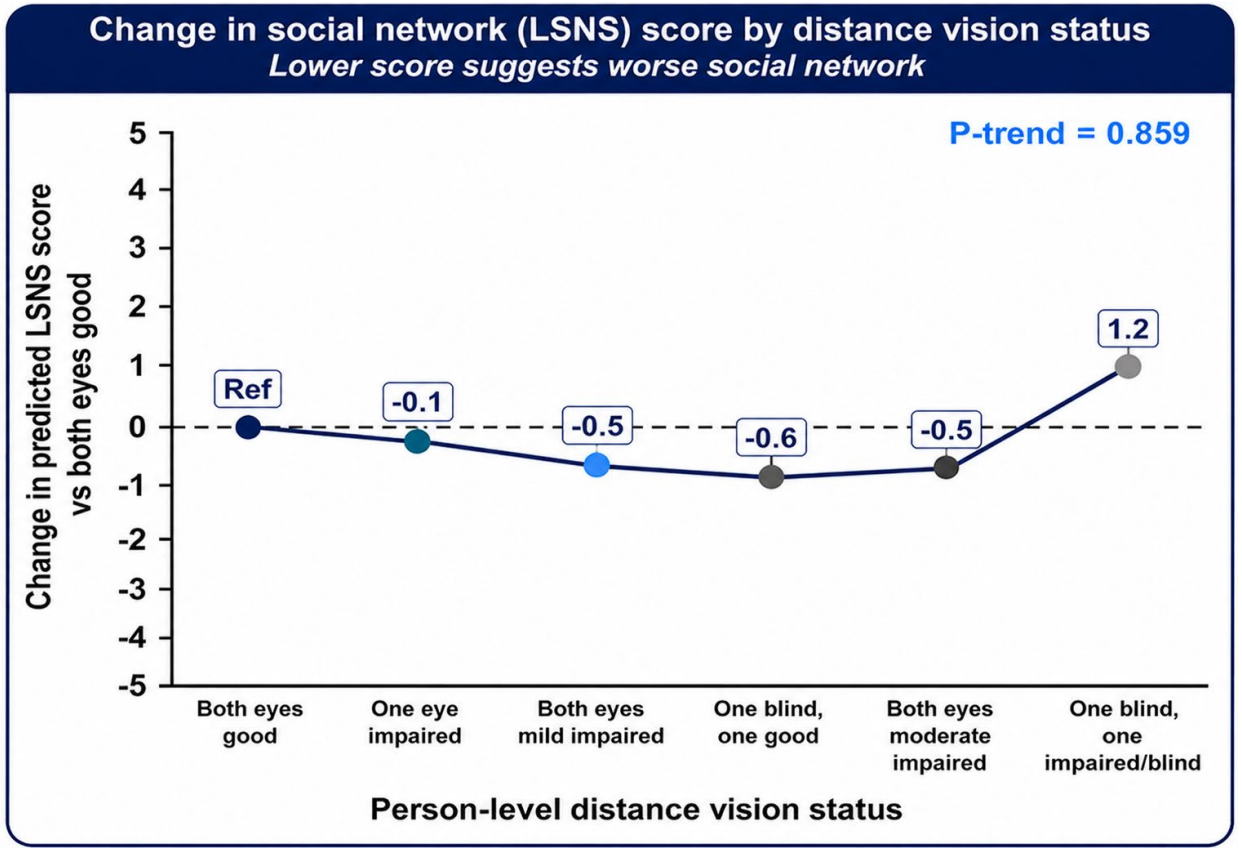


Greater vision impairment was linked to lower leisure participation and more difficulty with daily activities.

Points show predicted mean differences from unadjusted linear regression. Both eyes good is the reference group.

Loneliness and social network did not differ by distance vision status





Unlike quality of life and depressive symptoms, loneliness and social network scores were not meaningfully different across distance vision categories.

Points show predicted mean differences from unadjusted linear regression. Both eyes good is the reference group.

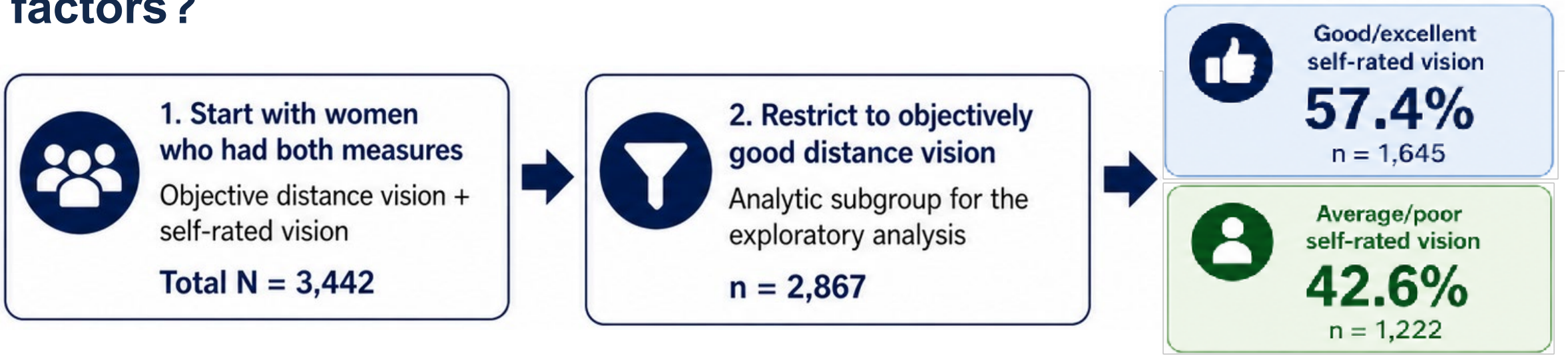
Self-rated vision showed stronger and more consistent association across all psychosocial and functional domains than objective distance vision

Outcome domain	Objective distance vision		Self-rated vision	
Quality of life & mood				
VRQOL (Quality of life)	↓ Lower scores with worse vision	P-trend <0.001	↓ Lower scores with poorer self-rated vision	P-trend <0.001
Depressive symptoms	↑ Higher scores with worse vision	P-trend <0.001	↑ Higher scores with poorer self-rated vision	P-trend <0.001
Function & participation				
IADL (Independent activities of daily living)	↓ Lower scores with worse vision	P-trend <0.001	↓ Lower scores with poorer self-rated vision	P-trend <0.001
Leisure activities	↓ Fewer activities with worse vision	P-trend <0.001	↓ Fewer activities with poorer self-rated vision	P-trend <0.001
Social connection				
Loneliness (DG)	— No meaningful difference	P-trend = 0.432	↑ Higher loneliness with poorer self-rated vision	P-trend <0.001
Social network (LSNS)	— No meaningful difference	P-trend = 0.859	↓ Lower social network with poorer self-rated vision	P-trend <0.001

Self-rated vision may capture a broader construct than objective visual acuity.

Exploratory analysis

Among women with objective good vision, what percents still reported average/poor self-rated vision? Some possible predictor factors?



- ✓ Core adjusted model: Logistic regression was used to evaluate age, CES-D, IADL, and leisure activities as possible predictor of discordant self-rated vision among women with objectively good vision.

- ✓ Follow-up analysis separated poor self-rated vision from average self-rated vision

Exploratory analysis

Among women with objectively good vision, who still report average/poor self-rated vision

Core adjusted model

Predictor	OR (95% CI)	P-value
Age	1.03 (1.01, 1.05)	0.0046
CES-D score	1.06 (1.04, 1.08)	<0.001
IADL score	0.91 (0.84, 0.98)	0.0162
Leisure score	0.93 (0.90, 0.97)	0.0004

- ✓ In the core adjusted model, poorer psychosocial and functional health was linked to higher odds of discordant poor self-rated vision.

Bivariate categorical analysis	Average/poor self-rated vision *Among women with objectively good distance vision*	Poor self-rated vision only *After excluding women with average self-rated vision*
Black vs White women	54.1% vs 41.4%	10.5% vs 8.4%
Hispanic/Latina vs non-Hispanic/Latina women	49.6% vs 42.6%	11.7% vs 8.4%
Not living with spouse/partner vs living with spouse/partner	44.1% vs 38.6%	9.2% vs 5.4%

- ✓ Black women, Hispanic/Latina women, and women not living with a spouse or marriage-like partner were more likely to report poor vision despite objectively good distance vision, compared with their respective comparison groups.

Discordant self-rated vision may identify women with additional emotional and functional burden not captured by objective vision alone.

Strengths and Limitations

Strengths

- Large, well-characterized cohort of older women
- Consistent scoring approach across validated questionnaires
- Objectively measured vision data in home setting

Limitations

- Cross-sectional analysis
- Self-rated vision may be influenced by mood, function, and overall health
- Unadjusted analysis

Conclusions

- Worse objective vision was linked to lower Vision Related QOL, more depressive symptoms, fewer leisure activities, and lower Instrumental Activities of DL scores.
- Loneliness and social network scores did not differ meaningfully by objective vision status.
- Self-rated vision showed consistent associations across all psychosocial and functional domains.
- Self-rated vision may capture the broader lived experience of visual difficulty beyond distance acuity alone.

Acknowledgements

- Sally Shumaker

UNC Team

- Megan Yu
- Truman Austin
- Andrea Bankoski
- Aaron Castelino
- Ashlyn Fortney
- Emily Gower
- Jules Layno
- Michael Maizel
- Joanna Maselko
- Samantha Tulenko
- Jerusha Weaver
- Erica Zeno

Fred Hutch Team

- Catherine Duggan
- Patti Olee
- Lesley Tinker
- Jude Warner
- Emily Wion

Exam One Team

- Jennifer Dean
- Doug McCarthy
- Stephanie Tate
- Nationwide examiners

Harvard

- David Friedman

Funding

- National Institutes of Health (NIH)
- National Eye Institute (NEI)

Thank you!



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

For further questions:
Luis Zambrana
luis_zambrana@med.unc.edu