

Supplementary Table S1. Characteristics of CAREDS participants included and excluded in the analysis (N=2,005)

Characteristics*	All CAREDS participants (n = 2005)	Included (n = 379)	Excluded (n = 1,626)	p-value
Age (years) - CAREDS baseline	69.7±0.2	65.4±0.3	70.7±0.2	< .001
Race/Ethnicity				.84
Native American	0.0%	0.0%	0.1%	
Asian	0.7%	0.9%	0.7%	
Native Hawaiian/Pacific Islander	0.0%	0.0%	0.1%	
Black	1.0%	1.5%	1.1%	
White	97.1%	97.0%	96.7%	
More than one race	0.8%	0.4%	1.0%	
Unknown/not reported	0.3%	0.1%	0.4%	
Ethnicity				.93
Non-Hispanic	99.5%	98.6%	99.4%	
Hispanic	0.4%	1.4%	0.4%	
Unknown	0.1%	0.0%	0.1%	
Education				< .001
High school graduate or less	22.1%	13.9%	24.0%	
College graduate	47.8%	48.4%	47.8%	
Post-college education	30.0%	37.7%	28.1%	
Self-reported annual household income ≥ \$75,000 - WHI baseline	17.2%	24.8%	15.3%	< .001
Pack years smoked - CAREDS baseline				.15
Never smoker	58.3%	62.4%	57.8%	
< 7 pack years	22.3%	24.0%	22.3%	
≥ 7 pack years	19.4%	13.6%	19.9%	
Intraocular lens – CAREDS baseline	16.0%	11.0%	16.6%	.04
Waist circumference (inches) - CAREDS baseline	34.71±0.12	33.9±0.3	34.9±0.1	.003
Body mass index (kg/m ²) - CAREDS baseline	28.0±0.1	27.1±0.3	28.2±0.1	.001
Self-reported hypertension – CAREDS baseline	28.2%	28.9%	29.0%	.18
Self-reported diabetes - CAREDS baseline	7.1%	4.2%	7.8%	.02
Self-reported glaucoma - CAREDS baseline	6.1%	4.2%	6.4%	.32
MPOD - CAREDS baseline (ODU) [†]	0.36±0.01	0.38±0.01	0.36±0.01	.08

*Values are as mean ± SE for continuous variables and percentages for categorical variables.

[†]Data presented from the right eye only

Abbreviations: CAREDS - Carotenoids in Age-Related Eye Disease Study; WHI - Women's Health Initiative; ODU – optical density units

Supplementary Table S2. Participant characteristics by manifest POAG status at CAREDS2 (N=379)

Characteristics*	No Manifest POAG (n = 347)	Manifest POAG (n = 32)	p-value
Age (years)	65.2±0.3	67.8±1.0	.01
Race			.53
Asian	0.6%	1.9%	
Black	0.6%	5.0%	
White	98.2%	93.1%	
More than one race	0.3%	0.0%	
Unknown/not reported	0.3%	0.0%	
Ethnicity			.99
Non-Hispanic	99.4%	100.0%	
Hispanic	0.6%	0.0%	
Education			.93
High school graduate or less	13.5%	5.8%	
College or vocational training	46.9%	57.8%	
Post college	39.6%	36.4%	
Household Income			.74
< \$75,000	72.3%	72.2%	
> \$75,000	27.7%	27.8%	
Pack years smoked			.03
Non-smoker	56.9%	74.1%	
< 7 pack years	24.2%	25.9%	
≥ 7 pack years	18.9%	0.0%	
Intraocular lens implantation*	5.7%	18.6%	.03
Intraocular pressure (mmHg)*	14.4±0.2	14.7±0.6	.58
Axial length (mm)*	23.6±0.1	23.8±0.2	.22
Corneal thickness (µm)*	558.5±1.9	554.5±6.5	.55
Waist circumference (in.)	34.1±0.3	33.6±0.9	.63
Body mass index (kg/m ²)	27.5±0.3	26.8±0.9	.44
Self-reported hypertension	21.2%	28.3%	.74
Self-reported diabetes	3.8%	1.9%	.76
Cup to disc ratio ≥ 0.6 – CAREDS baseline	2.5%	20.9%	< .001
MPOD – CAREDS baseline (ODU)†	0.39±0.01	0.31±0.04	.03

*Values for ocular characteristics are shown only for the right eye, except for cup to disc ratio ≥ 0.6 at CAREDS baseline, which refers to whether this characteristic was present in at least one eye

† Data presented from the right eye only

Abbreviations: CAREDS - Carotenoids in Age-Related Eye Disease Study; MPOD - macular pigment optical density; POAG – primary open-angle glaucoma; SE – standard error

Supplementary Table S3. Retinal layer thickness* by quartile of macular pigment optical density (MPOD) at CAREDS baseline among eyes without manifest POAG, excluding participants using lutein and zeaxanthin supplements (≥ 1 mg/day) prior to CAREDS2 (N = 302)

Retinal layer thickness* (μm , mean \pm SE)	Number of Eyes	MPOD – CAREDS baseline, 0.5° (optical density units)				$\beta \pm$ SE (1-SD increase)	P-trend
		Quartile 1 (0.00-0.23)	Quartile 2 (0.23-0.38)	Quartile 3 (0.38-0.51)	Quartile 4 (0.51-1.00)		
Peripapillary RNFL							
Average	535	94.2 \pm 1.0	93.8 \pm 1.1	93.1 \pm 1.1	93.9 \pm 1.0	-0.2 \pm 0.5	.64
Inferior	535	121.2 \pm 1.5	121.8 \pm 1.7	120.7 \pm 1.8	121.4 \pm 1.6	-0.2 \pm 0.8	.83
Superior	535	111.7 \pm 1.6	111.2 \pm 1.6	110.0 \pm 1.6	113.1 \pm 1.5	0.5 \pm 0.8	.55
Nasal	535	72.6 \pm 1.3	72.5 \pm 1.3	70.7 \pm 1.3	72.1 \pm 1.2	-0.5 \pm 0.7	.42
Temporal	535	71.3 \pm 1.3	69.9 \pm 1.5	71.0 \pm 1.2	68.8 \pm 1.3	-0.7 \pm 0.7	.27
Macular RNFL							
Central	566	13.1 \pm 0.3	12.7 \pm 0.2	13.0 \pm 0.2	13.7 \pm 0.3	0.2 \pm 0.1	.12
Inner	566	23.7 \pm 0.3	23.1 \pm 0.3	23.6 \pm 0.3	23.5 \pm 0.3	0.0 \pm 0.1	.71
Outer	564	40.0 \pm 0.6	38.5 \pm 0.6	39.7 \pm 0.6	39.3 \pm 0.6	-0.1 \pm 0.3	.68
Macular GCL							
Central	565	15.4 \pm 0.5	15.0 \pm 0.4	16.1 \pm 0.4	17.1 \pm 0.4	0.6 \pm 0.2	.004
Inner	566	46.1 \pm 0.5	45.7 \pm 0.6	46.2 \pm 0.5	46.7 \pm 0.5	0.3 \pm 0.3	.27
Outer	564	30.3 \pm 0.3	30.2 \pm 0.3	30.5 \pm 0.4	30.3 \pm 0.3	0.1 \pm 0.2	.52
Macular IPL							
Central	567	20.7 \pm 0.4	20.4 \pm 0.3	21.4 \pm 0.3	22.5 \pm 0.4	0.7 \pm 0.2	< .001
Inner	567	38.0 \pm 0.3	37.9 \pm 0.4	38.1 \pm 0.3	38.6 \pm 0.3	0.3 \pm 0.1	.07
Outer	566	25.5 \pm 0.2	25.6 \pm 0.2	25.6 \pm 0.2	25.8 \pm 0.2	0.2 \pm 0.1	.16
Macular GCC							
Central	555	48.5 \pm 1.0	47.6 \pm 0.9	50.3 \pm 0.9	53.0 \pm 1.1	1.7 \pm 0.5	.001
Inner	556	107.5 \pm 0.9	106.5 \pm 1.1	107.8 \pm 1.0	108.7 \pm 0.9	0.6 \pm 0.5	.23
Outer	555	95.4 \pm 0.9	94.2 \pm 1.0	95.8 \pm 1.1	95.4 \pm 0.9	0.2 \pm 0.5	.65

*Adjusted for age and axial length

Abbreviations: CAREDS - Carotenoids in Age-Related Eye Disease Study; GCC - ganglion cell complex; GCL - ganglion cell layer; IPL - inner-plexiform layer; RNFL - retinal nerve fiber layer; SE - standard error; SD – standard deviation

Supplementary Table S4. Retinal layer thickness* by quartile of macular pigment density (MPOD) at CAREDS baseline among eyes with manifest POAG, excluding participants using lutein and zeaxanthin supplements (≥ 1 mg/day) prior to CAREDS2 (N = 25)

Retinal layer thickness* (μm , mean \pm SE)	Number of Eyes	MPOD – CAREDS baseline, 0.5° (optical density units)				$\beta \pm$ SE (1-SD increase)	P-trend
		Quartile 1 (0.00-0.07)	Quartile 2 (0.08-0.30)	Quartile 3 (0.32-0.48)	Quartile 4 (0.48-0.81)		
Peripapillary RNFL							
Average	33	64.8 \pm 3.9	74.0 \pm 2.2	74.2 \pm 3.5	75.9 \pm 2.0	3.3 \pm 1.5	.03
Inferior	33	74.7 \pm 6.5	90.7 \pm 5.2	83.9 \pm 5.8	75.3 \pm 4.9	-0.1 \pm 2.8	.98
Superior	33	72.1 \pm 4.0	81.5 \pm 2.8	94.3 \pm 5.3	93.5 \pm 3.8	7.0 \pm 2.4	.004
Nasal	33	56.8 \pm 3.3	58.2 \pm 3.4	57.0 \pm 6.7	61.8 \pm 2.6	1.4 \pm 1.6	.40
Temporal	33	56.0 \pm 2.7	65.8 \pm 2.4	61.1 \pm 2.4	73.2 \pm 3.5	5.0 \pm 1.5	.001
Macular RNFL							
Central	37	11.4 \pm 0.8	13.4 \pm 0.9	9.8 \pm 1.1	13.1 \pm 0.8	0.4 \pm 0.5	.38
Inner	37	21.1 \pm 0.7	24.5 \pm 0.9	22.4 \pm 0.7	22.8 \pm 0.6	0.5 \pm 0.4	.20
Outer	37	29.6 \pm 2.2	38.0 \pm 1.8	31.7 \pm 2.2	32.2 \pm 1.6	0.2 \pm 1.1	.84
Macular GCL							
Central	37	12.8 \pm 0.9	16.9 \pm 1.7	12.2 \pm 1.8	17.2 \pm 0.7	1.2 \pm 0.6	.03
Inner	37	35.2 \pm 2.0	43.9 \pm 1.8	40.1 \pm 1.9	39.0 \pm 2.7	0.9 \pm 1.2	.44
Outer	37	25.6 \pm 0.8	27.3 \pm 0.9	26.8 \pm 0.7	25.2 \pm 0.8	-0.2 \pm 0.4	.56
Macular IPL							
Central	37	18.2 \pm 0.7	23.9 \pm 2.5	17.4 \pm 1.3	21.5 \pm 1.5	1.0 \pm 0.6	.09
Inner	37	31.3 \pm 1.1	38.2 \pm 1.5	33.8 \pm 1.0	33.6 \pm 1.7	0.4 \pm 0.7	.53
Outer	37	22.4 \pm 0.5	23.9 \pm 0.6	22.9 \pm 0.5	22.4 \pm 0.6	-0.2 \pm 0.3	.45
Macular GCC							
Central	36	42.2 \pm 2.1	51.7 \pm 3.7	39.6 \pm 4.3	52.3 \pm 2.5	2.7 \pm 1.5	.07
Inner	36	87.6 \pm 3.4	105.4 \pm 3.3	96.3 \pm 3.4	96.6 \pm 4.6	2.2 \pm 2.1	.30
Outer	36	77.6 \pm 3.0	89.2 \pm 2.8	81.3 \pm 3.1	80.0 \pm 2.6	-0.2 \pm 1.6	.90

*Adjusted for age and axial length

Abbreviations: CAREDS - Carotenoids in Age-Related Eye Disease Study; GCC - ganglion cell complex; GCL - ganglion cell layer; IPL - inner-plexiform layer; RNFL - retinal nerve fiber layer; SE - standard error; SD – standard deviation