

**THE ABORIGINAL  
DIABETES STUDY**  
Together we can beat diabetes



**Flinders**  
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# Prevalence and Treatment Coverage Rates of Refractive Error among Aboriginal Australians

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## Acknowledgement of Country

I acknowledge and respect the traditional custodians whose ancestral lands we are meeting upon here today, the Kurna people. I acknowledge the deep feelings of attachment and relationship of the Kurna people to their Place.

I also pay respects to the cultural authority of Aboriginal and Torres Strait Islander peoples visiting from other areas of Australia here today, and pay my respects to Elders past, present and emerging.

# Refractive Error

Refractive error is an eye condition whereby incoming light rays do not 'focus' on the retina (light-sensitive tissue)

## Types:

- Short-sightedness (Myopia)
- Long-sightedness (Hyperopia)
- Astigmatism
- Near-Vision Impairment (Presbyopia)



**Myopia (short-sightedness)**

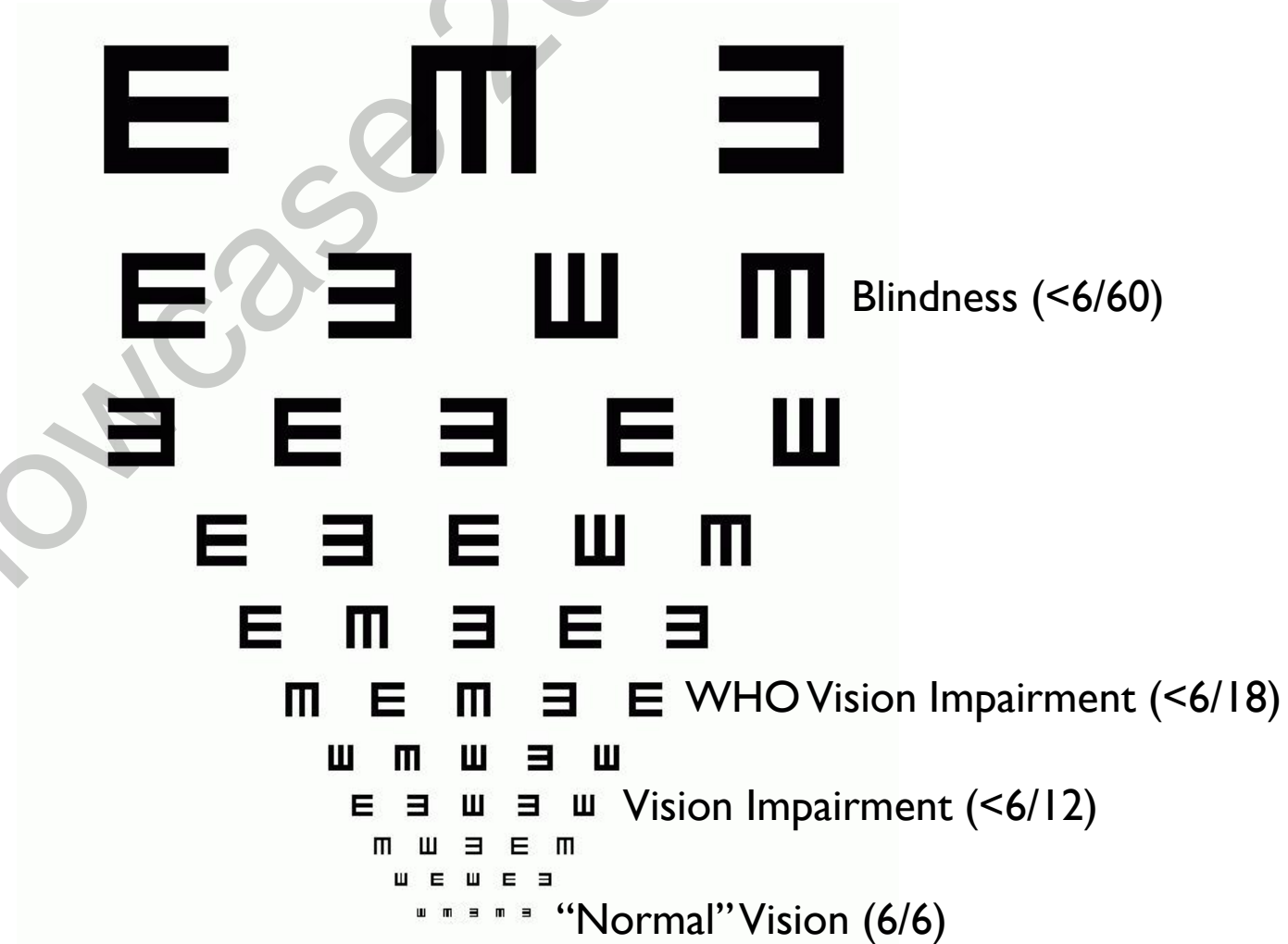


**Hyperopia (long-sightedness)**

# Refractive Error Impact

**Untreated:** has a significant burden on quality of life and linked to higher rates of mortality

- Education
- Economic
- Social isolation
- Depression
- Increased risk of falls
- General wellbeing

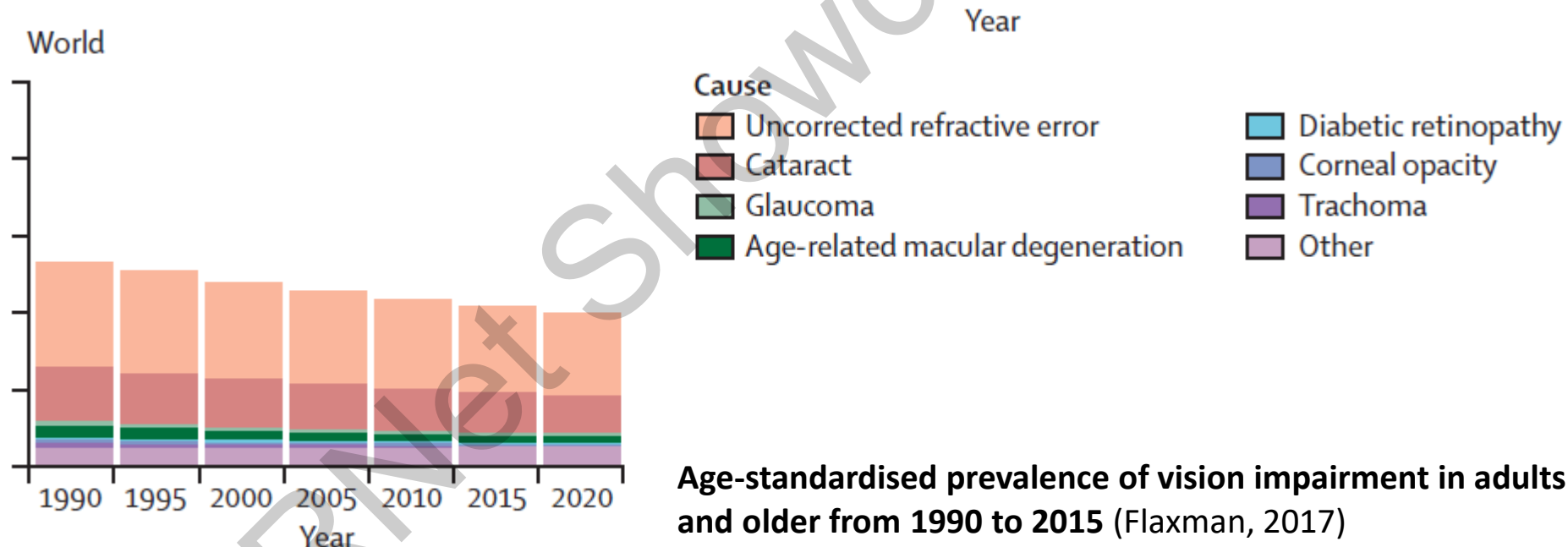


**Refractive Error** is the most common eye condition & uncorrected refractive error is a major public health challenge

## Uncorrected refractive error

- **Number one** cause of vision impairment
- 116.3 million worldwide

50% of the world's population predicted to be short-sighted by 2050



# Refractive Error among Aboriginal Australians

## What do we know?

- **Untreated refractive error is also the leading cause of vision impairment among Aboriginal Australians**
- **Contributes ~60% of all vision impairment (cataract 20%, diabetes 10%)**
- **Myopia (short-sighted) was 11.1% and hyperopia (long-sighted) was 15.2% in remote Indigenous communities of Central Australia (Landers, 2009)**



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# Refractive Error among Aboriginal Australians

## What do we know?

- Treatment coverage rates among Indigenous Australians was 82.2% in a national survey (93.5% in non-Indigenous Australians) (Foreman, 2018)
- This is despite existing state-level subsidised spectacles scheme
- Opportunity exists for coordinated and evidence-based community-led eye health service delivery initiatives



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### Objectives:

1. Determine the prevalence, types and severities of refractive errors (myopia and hyperopia)
2. Define the treatment coverage rate of refractive error across regions



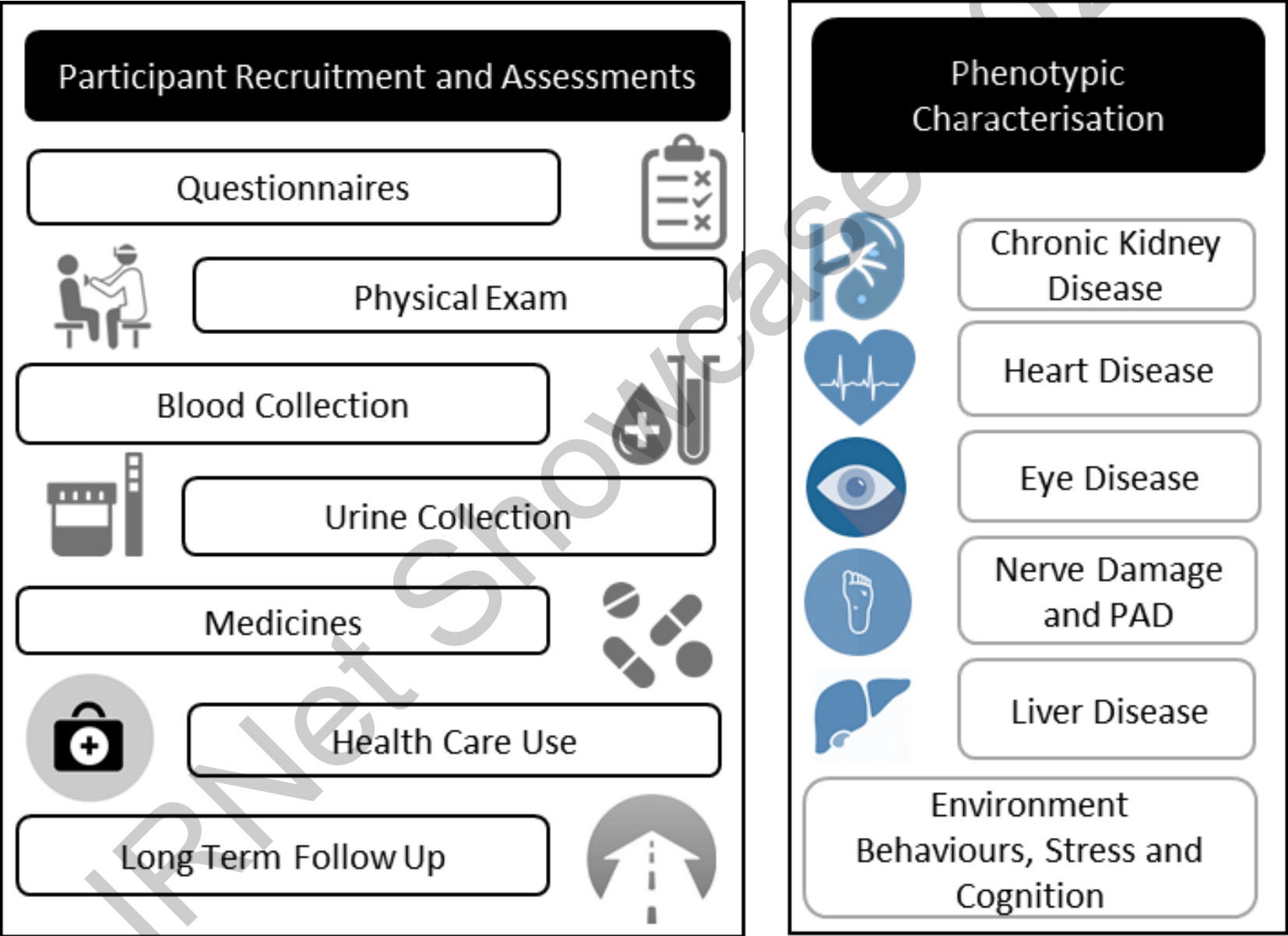


## The Aboriginal Diabetes Study (ADS)

- Multi-centre, population-based biomedical cohort study of Indigenous Australians.
- Coverage across urban, regional and remote areas within South Australia.
- Standardised social and medical questionnaires and a series of clinical assessments.



# Phenotypic Characterisation ADS



# The Aboriginal Diabetes Study (ADS) Eye Assessment

## Eye Health and Retinal Assessment

- Visual acuity, **refraction**, eye pressures, dilated slit-lamp examination
- Retinal photography and optical coherence tomography imaging
- Questionnaires around vision related difficulties and access to refractive error treatments (i.e. spectacles)
- Spectacles were provided to all participants requiring refractive correction



  
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# The Aboriginal Diabetes Study (ADS) Eye Assessment

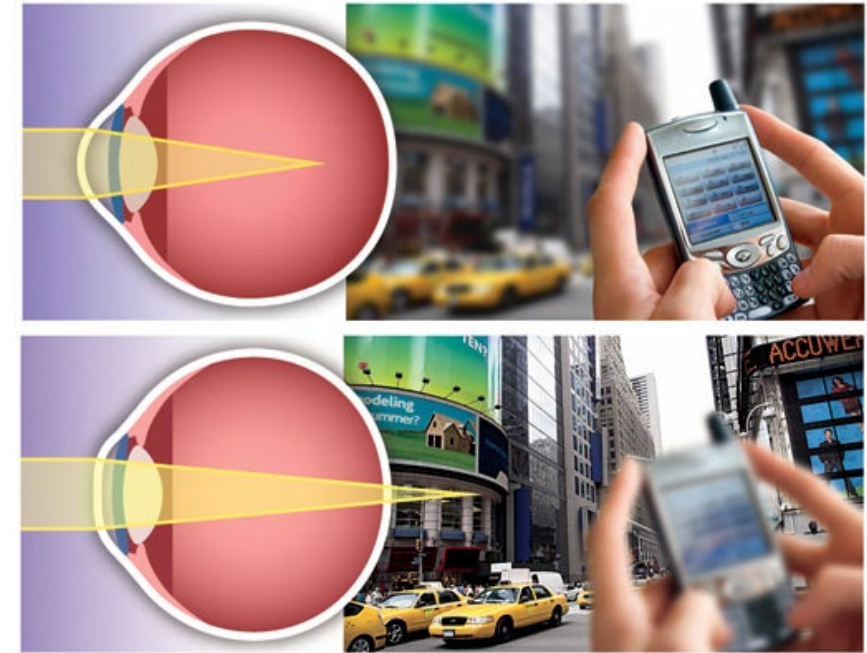
## Definitions

### Refractive Error Type

- determined through a refraction by a study optometrist and categorised into;
  - Myopia/short-sightedness ( $<-0.50$  dioptres (D)) and
  - Hyperopia/long-sightedness ( $\geq +1.00$  D).

### Treatment Coverage Rates (TCR)

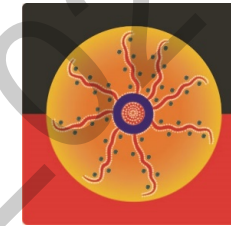
Calculated based on the number of individuals with glasses (treated refractive error,  $n_1$ ) divided by the total number of individuals with untreated refractive error ( $n_2$ ):  $\frac{n_1}{n_1+n_2} \times 100$



**Table 1: ADS Baseline Characteristics (n=1166)**

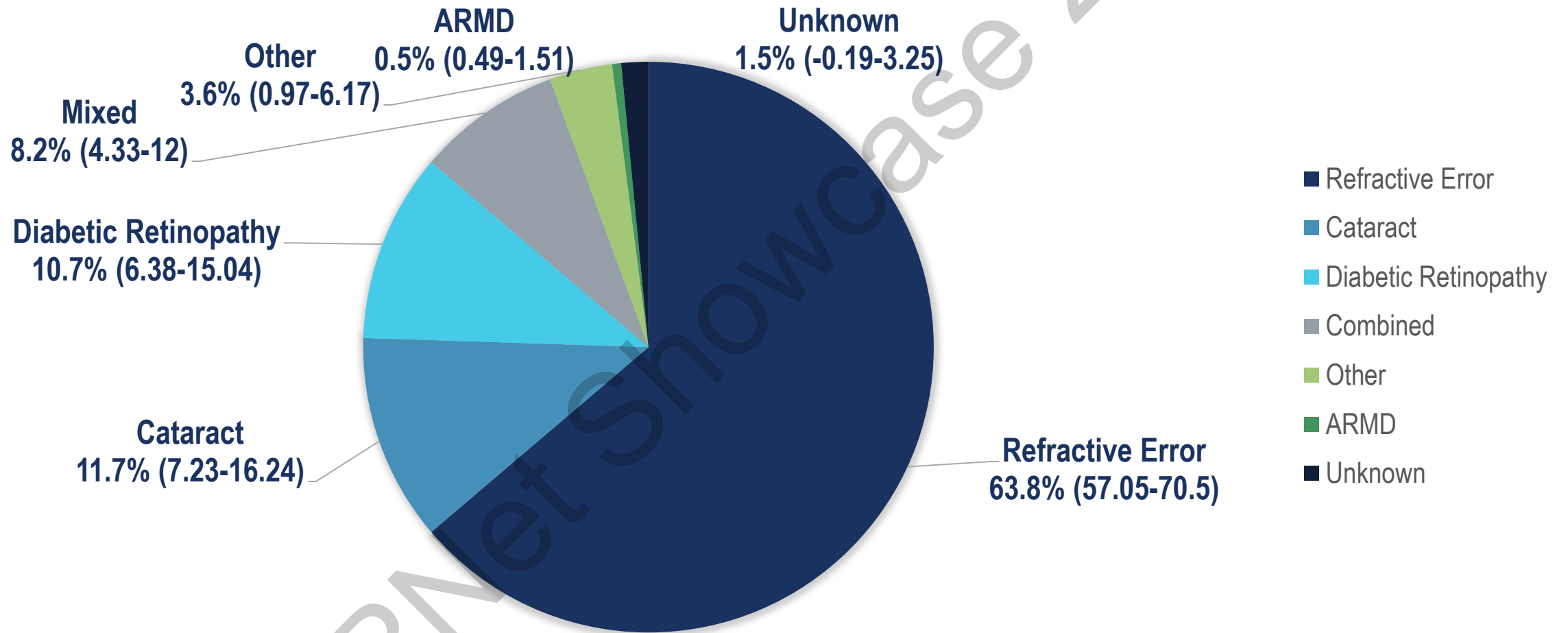
<b>Mean age (years, range)</b>	45.5 (15 - 87)
<b>Gender (% Male)</b>	41.0
<b>Remoteness (%)</b>	
Urban	34.1
Inner Regional	9.9
Outer Regional	29.1
Remote	8.3
Very Remote	18.7
<b>T2DM (%)<sup>£</sup></b>	41.6
<b>Self-reported stroke (%)</b>	5.3
<b>Ischaemic heart disease (%)</b>	13.5

<sup>£</sup>Diabetes status was determined clinically or self-reported.



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# Vision Impairment Major Causes



Proportion (%); 95% confidence interval [CI] of vision impairment attributed to each main cause.

Combined mechanisms were assigned if there were more than one cause of vision loss.

Other causes of vision impairment included optic atrophy, retinochoroidal scarring, trauma and keratoconus. ARMD: Age-Related Macular Degeneration

PROPHECY Cohort April 2019, n=1084

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## Self-reported Measures **Results**

**71.5%** report having vision-related difficulties

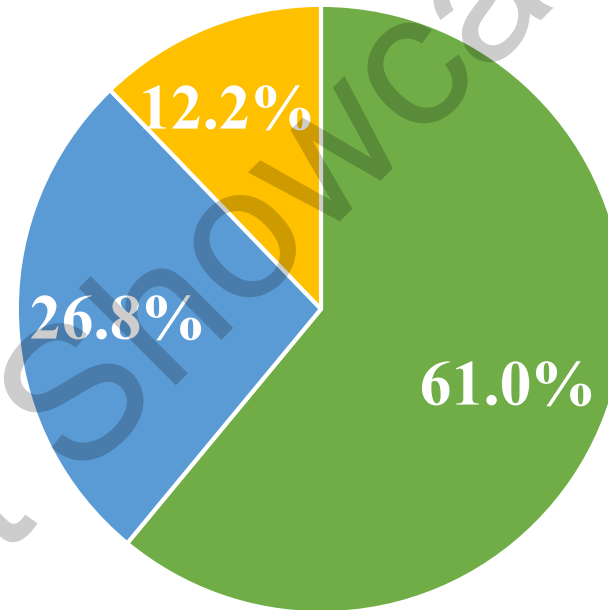
- Distance = **14.5%**
- Near = **45.1%**
- Both = **40.4%**

**57.5%** currently have spectacles for distance and/or near vision



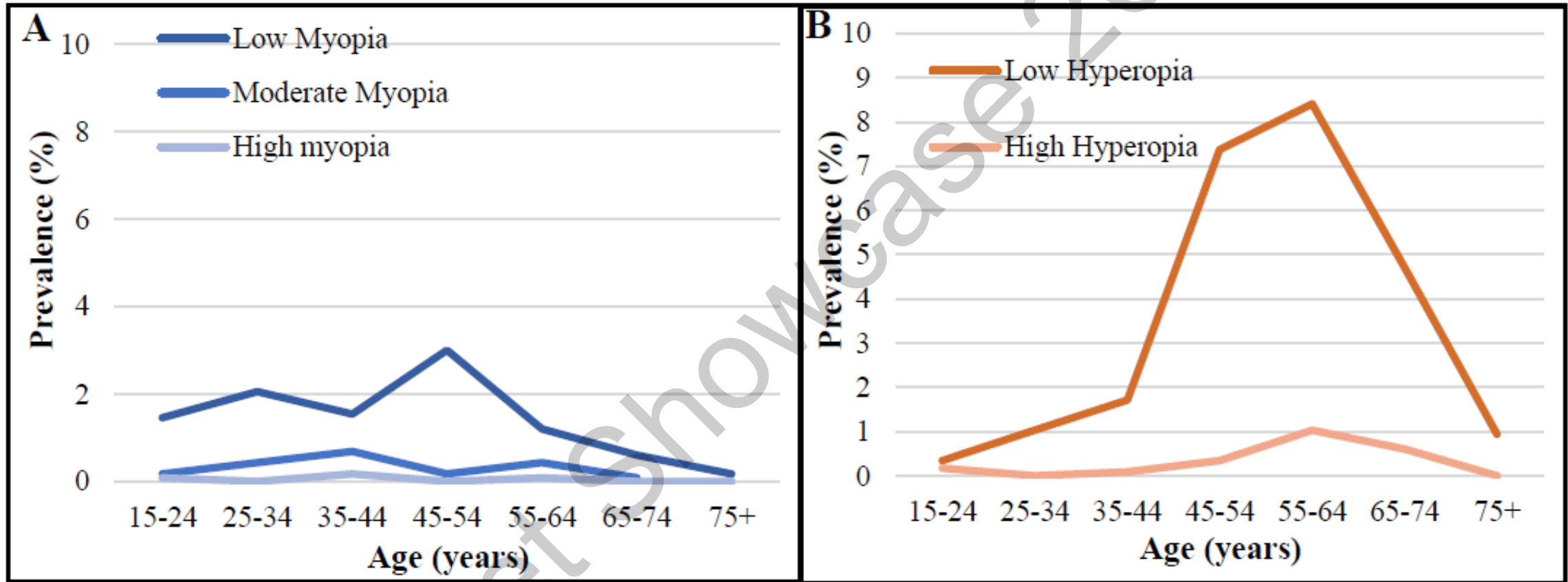
# Refractive Error Types

## The Overall Prevalance of Refractive Error Phenotypes



■ No Refractive Error   ■ Hyperopia   ■ Myopia

# Refractive Error Distribution



Natural ageing changes,  
including cataract formation in the elderly

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## Treatment Coverage Rates Results

Overall refractive error treatment coverage rate was **80.5%**  
(national average is 82.2%)

- Urban: **83.3%**
- Regional: **85.7%**
- Remote: **73.2%**

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## Refractive Error Conclusions

- 39% of the Aboriginal South Australian population have a significant refractive error (myopia/hyperopia)
- Low hyperopia is the predominant refractive error type
- High myopia or hyperopia is uncommon
- Myopia is relatively low compared to global trends in other populations

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## Refractive Error Conclusions

- Differences in environmental, socioeconomic and genetic exposures may explain the variations in refractive error.
- Despite high rates of self-reported vision-related difficulties, there is an important proportion of individuals with uncorrected refractive error, especially in remote regions.
- Coordinated, affordable and accessible refractive error correction initiatives are still fundamentally needed.

# ACKNOWLEDGEMENTS

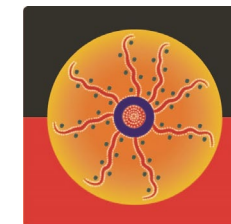


We thank the participants of the study and the communities in which this work has been undertaken

We also acknowledge the field and research team for their contributions to the study



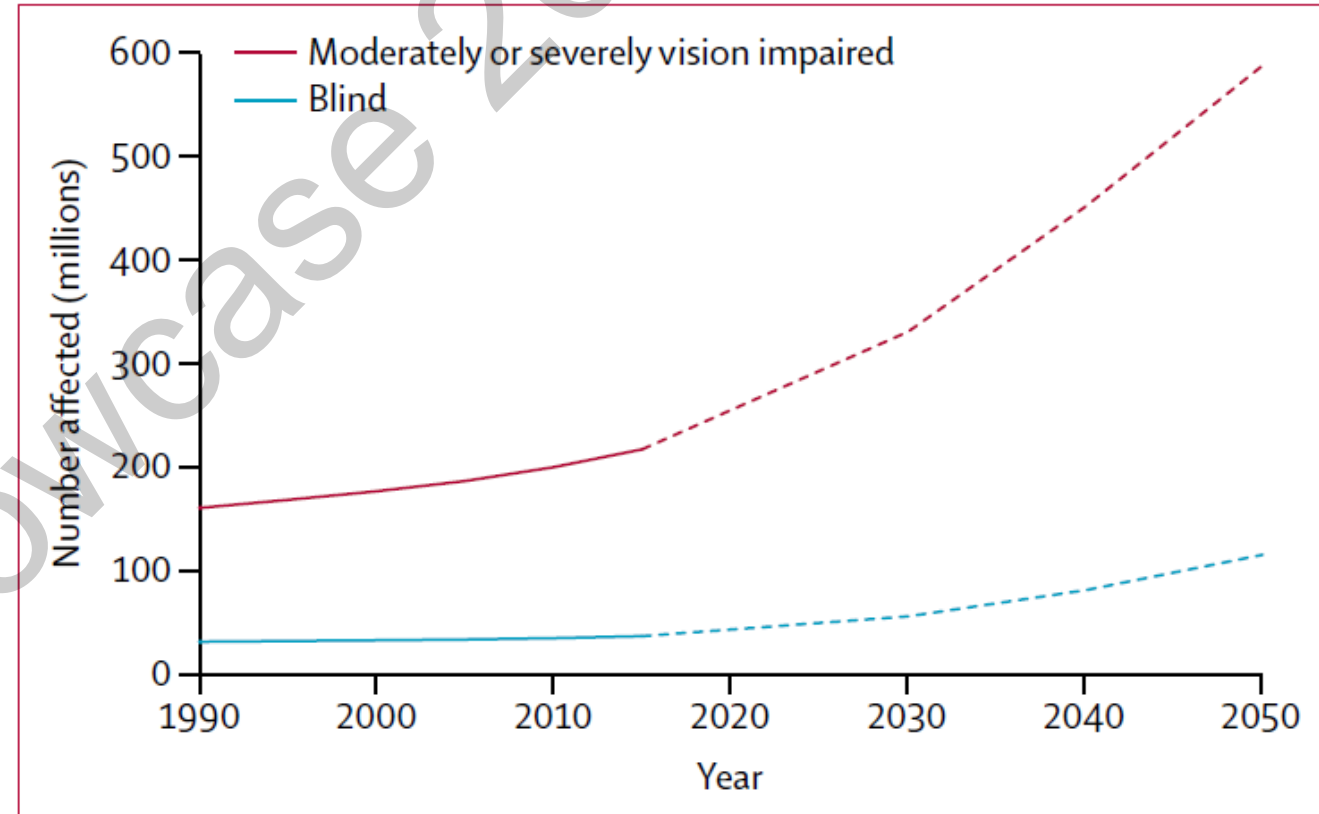
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## Vision Loss Global Burden

- 36.0 million people suffer from blindness
- 216.6 million have moderate-to-severe vision impairment



**Global trends and projections for vision impairment and blindness through to the year 2050 (Bourne, 2017)**



PROPHECY total cohort (n = 1166)																
	All Myopia ( $<-0.75\text{D}$ )		Low myopia ( $-0.75\text{D}$ to $-3.00\text{D}$ )		Moderate myopia ( $-3.25\text{D}$ to $-5.75\text{D}$ )		High Myopia ( $\leq -6.00\text{D}$ )		All Hyperopia ( $\geq +1.00\text{D}$ )		Low hyperopia ( $+1.00\text{D}$ to $+3.00\text{D}$ )		High Hyperopia ( $\geq +3.25$ )		Astigmatism ( $\leq -1.00\text{Dc}$ )	
	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)
<b>Age, yrs.</b>																
15-24 (168)	20	11.9 (7.4 – 17.8)	17	10.1 (6.0 – 15.7)	2	1.2 (0.1 – 4.2)	1	0.6 (0.0 – 3.3)	6	3.6 (1.3 – 7.6)	4	2.4 (0.7 – 6.0)	2	11.9 (0.1 – 4.2)	14	8.3 (4.6 – 13.6)
25-34 (200)	28	14.0 (9.5 – 19.6)	24	12.0 (7.8 – 17.3)	4	2.0 (0.5 – 5.0)	0	-	12	6.0 (3.1 – 10.2)	12	6.0 (3.1 – 10.2)	0	-	23	11.5 (7.4 – 16.8)
35-44 (169)	28	16.6 (11.3 – 23.0)	18	10.1 (6.4 – 16.3)	8	4.7 (2.1 – 9.1)	2	1.2 (0.1 – 4.2)	21	12.4 (7.9 – 18.4)	20	11.8 (7.4 – 17.7)	1	5.9 (0.0 – 3.3)	26	15.4 (10.3 – 21.7)
45-54(282)	37	13.1 (9.4 – 17.6)	35	12.4 (8.8 – 16.8)	2	0.7 (0.1 – 2.5)	0	0 (0.0 – 0.0)	90	31.9 (26.5 – 37.7)	86	30.5 (25.2 – 36.2)	4	1.4 (0.4 – 3.6)	38	13.5 (9.7 – 18.0)
55-64(229)	20	8.7 (5.4 – 13.2)	14	6.1 (3.4 – 10.0)	5	2.2 (0.7 – 5.0)	1	0.4 (0.0 – 2.4)	110	48.0 (41.4 – 54.7)	98	42.8 (36.3 – 49.5)	12	5.2 (2.7 – 9.0)	47	20.5 (15.5 – 26.3)
65-74 (99)	8	8.1 (3.6 – 15.3)	7	7.1 (2.9 – 14.0)	1	1.0 (0.0 – 5.5)	0	-	62	62.6 (52.3 – 72.1)	55	55.6 (45.2 – 65.5)	7	7.1 (2.9 – 14.0)	33	33.3 (24.2 – 43.5)
75+(19)	2	10.5 (1.3 – 33.1)	2	10.5 (1.3 – 33.1)	0	-	0	-	11	57.9 (33.5 – 79.7)	11	57.9 (33.5 – 79.7)	0	-	7	36.8 (16.3 – 61.6)

D = dioptre; CI = confidence interval; yrs = years

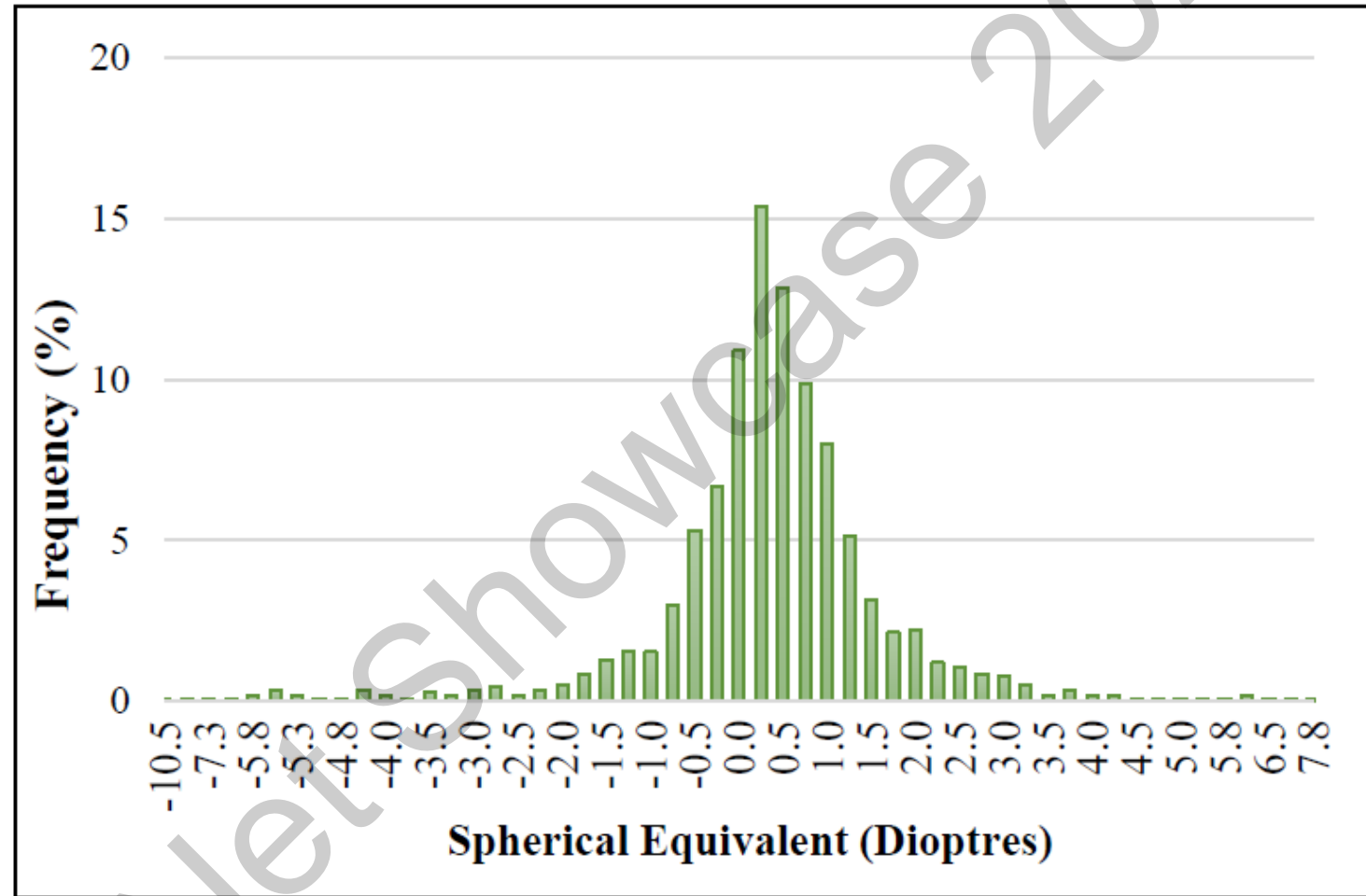
Table 2: The prevalence (n and % with a confidence interval 95%) of myopia, hyperopia and astigmatism in South Australia Indigenous Australians, stratified by age.

PROPHECY Total Cohort (n = 1166)																
	All Myopia ( $<-0.75D$ )		Low myopia ( $-0.75D$ to $-3.00D$ )		Moderate myopia ( $-3.25D$ to $-5.75D$ )		High Myopia ( $\leq -6.00D$ )		All Hyperopia ( $\geq +1.00D$ )		Low hyperopia ( $+1.00D$ to $+3.00D$ )		High Hyperopia ( $\geq +3.25$ )		Astigmatism ( $\leq -1.00Dc$ )	
	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)	n	% $\Omega$ (95% CI)
Remoteness																
Urban (384)	53	13.8 (10.5-17.7)	44	11.5 (8.5-15.1)	8	2.1 (0.9-4.1)	1	0.3 (0.0-1.4)	90	23.4 (19.3-28.0)	84	21.9 (17.8-26.3)	6	1.6 (0.6-3.4)	56	14.6 (11.2-18.5)
Inner regional (122)	16	13.1 (7.7-20.4)	11	9.0 (4.6-15.6)	4	3.3 (0.9-8.2)	1	0.8 (0.0-4.5)	32	26.2 (18.7-35.0)	29	23.8 (16.5-32.3)	3	2.5 (0.5-7.0)	27	22.1 (15.1-30.5)
Outer regional (339)	40	11.8 (8.6-15.7)	31	9.1 (6.3-12.7)	7	2.1 (0.8-4.2)	2	0.6 (0.1-2.1)	94	27.7 (23.0-32.8)	85	25.1 (20.5-30.0)	9	2.7 (1.2-5.0)	64	18.9 (14.9-23.5)
Remote (101)	16	15.8 (9.3-24.4)	15	14.9 (8.6-23.3)	1	1.0 (0.0-5.4)	0	-	23	22.8 (15.0-32.2)	23	22.8 (15.0-32.2)	0	-	20	19.8 (12.5-28.9)
Very remote (220)	18	8.2 (4.9-12.6)	16	7.3 (4.2-11.5)	2	0.9 (0.1-3.2)	0	-	73	33.2 (27.0-39.8)	65	29.5 (23.6-36.0)	8	3.6 (1.6-7.0)	23	10.5 (6.7-15.3)
D = dioptre; CI = confidence interval; yrs = years																

D = dioptre; CI = confidence interval; yrs = years

Table 3: The prevalence (n and % with a confidence interval 95%) of myopia, hyperopia and astigmatism in South Australia Indigenous Australians, stratified by remoteness.

# Refractive Error Spherical Equivalence Distribution



**Figure 3:** The distribution of refractive error (spherical equivalent refraction) within the study population ( $n=1166$ ) represented as a frequency (%).