

# National Eye Survey of Trinidad and Tobago: the prevalence and risk factors for refractive error

Poster B0143 / 3976

Ramsewak S<sup>5</sup>, Verlander N<sup>4</sup>, Deomansingh F<sup>3</sup>, Fraser A<sup>3</sup>, Maharaj V<sup>3</sup>, Sharma S<sup>3</sup>, Singh D<sup>2</sup>, Bourne RR<sup>1</sup>, Braithwaite T<sup>1</sup>, for the NESTT Study Group

<sup>1</sup> Vision & Eye Research Unit, Anglia Ruskin University, UK; <sup>2</sup> Caribbean Eye Institute, Valsayn, Trinidad; <sup>3</sup> Department of Optometry, University of the West Indies, Trinidad; <sup>4</sup> Public Health England, London, UK; <sup>5</sup> London School of Hygiene and Tropical Medicine, London, UK

Postgraduate  
Medical Institute

## Introduction

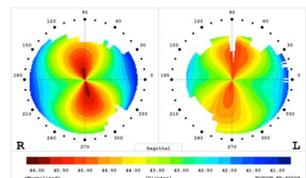
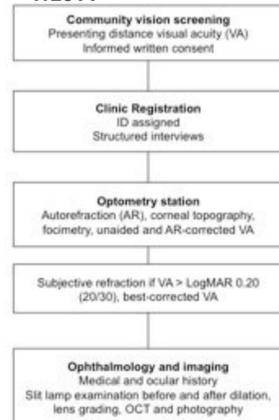
- Refractive error (RE) is a common ocular condition globally<sup>1</sup> and it can be readily corrected with cost-effective interventions
- Uncorrected refractive error (URE) remains a leading cause of blindness (21%) and moderate and severe visual impairment (MSVI, 53%) globally<sup>1</sup>, with an estimated prevalence of 44.6% in the Caribbean<sup>2</sup>.
- The prevalence of RE and URE in Trinidad and Tobago were not known. Previous data on RE in the Caribbean was from the Barbados Eye Study (1989)<sup>3</sup>, which included a mainly African population. There is evidence of ethnic variability in the prevalence of myopia, with estimates of 34.6% in Asian populations<sup>4</sup> and 26.2% in Caucasians<sup>5</sup> at similar ages. Trinidad and Tobago has a unique mix of ethnicities, with a large number of South Asian and African descendants, as well as people of mixed race<sup>6</sup>.
- The National Eye Survey of Trinidad and Tobago (2013-2014) was undertaken primarily to determine the prevalence, causes and risk factors for vision impairment and blindness in the population aged 40 years and above. A secondary objective was to determine the prevalence of common eye conditions including refractive error.

## Methods

- Study design: A national, population-based, cross-sectional survey using randomised multistage cluster sampling with probability-proportionate-to-size methods selected 120 clusters, each including 35 people aged 40 years and above
- Ethics committee approval from Anglia Ruskin University, The University of the West Indies and the Ministry of Health of the Republic of Trinidad and Tobago
- Presenting distance visual acuity was measured in the community using the 3 meter 2000 Series Revised ETDRS LogMAR chart (Precision Vision, USA) and the ETDRS Fast measurement protocol
- All participants aged 40 years and above were invited to a regional clinic for comprehensive assessment
- Refractive error, keratometry and corneal topography were measured once for each eye (Topcon KR8000-PA)
- If the autorefractometer-corrected visual acuity was worse than 20/30 then the optometrist performed subjective refraction to determine the best-corrected visual acuity
- The ophthalmologist assessed lens status at the slit lamp



Figure 1: Clinic pathway



## Statistical analysis

- Statistical analysis using STATA 13.1
- The prevalence of refractive error for participants who were phakic was assessed for the right eye only. 161 were excluded from analysis due to previous cataract surgery
- The crude prevalence was adjusted for the multilevel design, weighted for cluster response rate, and adjusted using 2011 Census population stratified into 5-year age categories, gender and ethnicity
- Multilevel single and multiple logistic regression analysis estimated the odds of responding vs not responding, of being myopic, and of being hypermetropic, according to the numerous potential explanatory variables

## Results

Figure 2: Flow diagram of multistage sampling and response rates

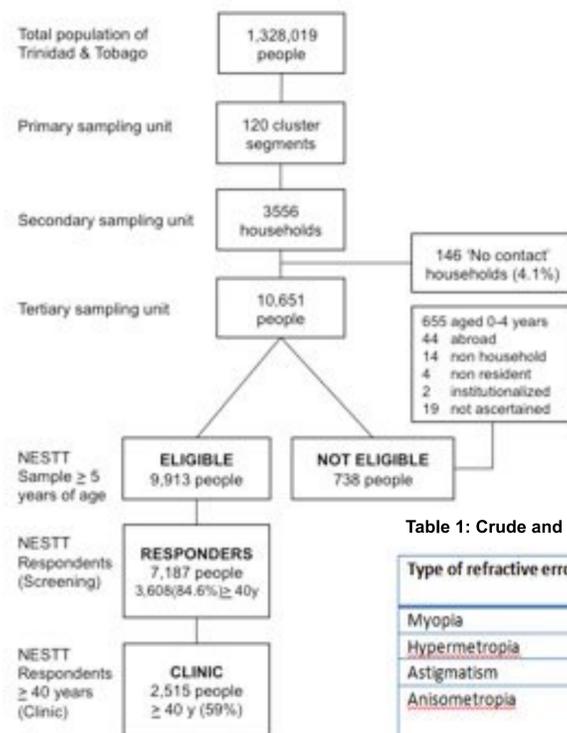


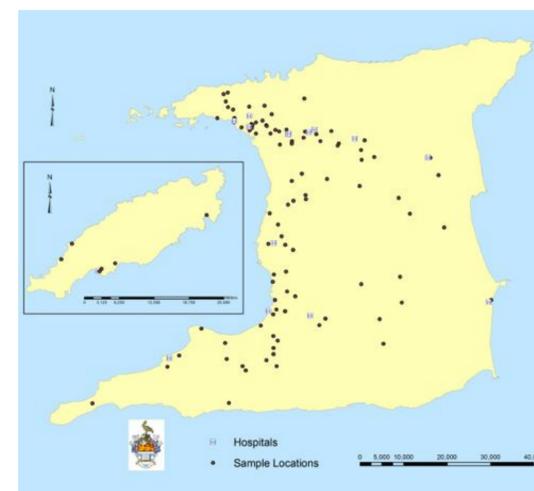
Table 1: Crude and adjusted prevalence of refractive error in adults ≥ 40 years

Type of refractive error	Definition	Crude prevalence % (95% CI)	Adjusted prevalence* % (95% CI)
Myopia	SE less than -0.50 D	18.6 (17.0 to 20.2)	19.2 (17.5 to 21.0)
Hypermetropia	SE greater than 0.50 D	47.5 (45.4 to 49.6)	45.7 (43.4 to 48.1)
Astigmatism	Cyl less than -0.50 D	37.1 (35.4 to 38.7)	-
Anisometropia	Difference in right and left eye SE greater than 1.00 D	12.0 (10.7 to 13.5)	-

\*Adjusted for sampling design, using response-based weighting, and post-stratification based on age, sex and municipality

- RESPONSE RATE in adults ≥ 40 years of age (See Figure 2)**  
84.6% (n = 3608) had measurement of presenting visual acuity  
59.1% (n = 2515) attended clinic for refraction and assessment
- CHARACTERISTICS of responders (See Table 2)**  
Mean age 57.2 (sd 11.9) years, 54.4% female  
Ethnicity: 42.6% African, 39.0% South Asian, 14.9% mixed  
37.5% owned spectacles for distance correction
- Adjusted PREVALENCE of vision impairment and blindness**  
0.73% (95% CI 0.53 to 1.02) Blind (< 20/400 in better eye)  
5.34% (95% CI 4.71 to 6.04) MSVI (< 20/60 but ≥ 20/400 in better eye)  
URE is the leading cause of MSVI in Trinidad & Tobago (44.0%)
- Adjusted PREVALENCE of refractive error (See Table 1)**  
19.2% Myopia  
45.7% Hypermetropia
- RISK FACTORS for refractive error (See Table 2)**  
MYOPIA: The odds increase linearly with years of education (OR 1.06, 95% CI 1.01-1.10, p=0.01); the odds are lower in people of South Asian than African race (OR 0.74, 95% CI 0.56 to 0.99), and the odds are higher in those aged 50-69 years than those aged 40-49 years (p = 0.01)  
HYPERMETROPIA: The odds increase significantly with age (p<0.001) and are greater in people of South Asian than African race (OR 1.25, 95% CI 1.01 to 1.56, p=0.04)

Figure 1: Map of Trinidad & Tobago 120 NESTT Clusters



## Results continued

Table 2: Characteristics of responders versus non responders, and risk factors for myopia and hypermetropia

Characteristic	Subcategory	Responders % (n)	Non-Responders % (n)	OR myopia	95% CI	p-value	OR hyperopia	95% CI	p-value	Census (2011)
Sample >40 y	N	84.6 (3597)	15.4 (654)							520351
Gender	Male	45.5 (1637)	57.5 (374)	1.00			1.00			49.4
	Female	54.4 (1960)	42.6 (277)	1.03	0.80-1.33	0.80	1.15	0.94-1.40	0.18	50.6
Age (in years)	Mean (sd)	57.2 (SD 11.9)	53.5 (11.3)							
	Range	40 to 103	40 to 98							
	40-49	30.5 (1096)	40.4 (264)	1.00			1.00			35.0
	50-59	31.9 (1147)	33.3 (218)	0.67	0.49-0.91	0.01	3.99	3.02-5.27	0.00	30.8
	60-69	20.8 (748)	15.4 (101)	0.60	0.41-0.87	0.01	7.67	5.53-10.63	0.00	19.8
70-79	12.1 (433)	7.5 (49)	1.42	0.90-2.23	0.27	4.37	2.91-6.56	0.00	9.8	
	80 and above	3.4 (168)	3.4 (22)	1.59	0.70-3.63	0.81	5.18	2.47-10.89	0.00	4.5
	Ethnicity	African	42.6 (1533)	37.3 (244)	1.00			1.00		
South Asian	39.0 (1402)	39.6 (259)	0.74	0.56-0.99	0.04	1.25	1.01-1.56	0.04		35.4
	Other	1.1 (38)	0.8 (5)	0.53	0.11-2.50	0.42	1.73	0.60-5.02	0.31	1.3
Mixed	14.9 (537)	18.8 (123)	1.02	0.70-1.52	0.88	1.04	0.75-1.43	0.85		22.8
	Years of education	Completed secondary school or higher			1.06	1.01-1.10	0.01	0.98	0.95-1.01	0.23

Odds ratios from the multilevel multiple logistic regression models were adjusted for all variables (age category, sex, ethnicity). Global p-values from likelihood-ratio test

## Conclusions

- In adults ≥ 40 years of age, the adjusted prevalence of myopia (19.2%) and of hypermetropia (45.7%) were similar to those reported by the 1989-1992 Barbados Eye Survey (4709 adults aged 40 to 84 years, 93% African origin), which reported a prevalence of myopia of 21.9% myopia and of hypermetropia of 46.9%<sup>3</sup>
- As predicted by the GBD Study<sup>1,2</sup> uncorrected refractive error was the leading cause of presenting moderate and severe vision impairment in Trinidad and Tobago (44% of total)
- Policies and health service development which address the unmet need for refractive correction in T&T would reduce the burden of avoidable vision loss

## Key References

- Bourne, R, Stevens, GA, White RA, *et al.* Causes of vision loss worldwide, 1990-2010: a systematic analysis. *Lancet Global Health* (2013); 1 (6):339-49
- Leasher, J.L.; Lansingh, V.; Flaxman, S.R. *et al.* Prevalence and causes of vision loss in Latin America and the Caribbean: 1990-2010. *British Journal of Ophthalmology* (2014); 98(5):619-28
- Wu, S.Y. Refractive errors in a black adult population: the Barbados Eye Study. *Invest Ophthalmol Vis Sci* (1999); 40(10):2179-84
- Krishnaiah S, Srinivas M, Khanna RC, Rao GN. Prevalence and risk factors for refractive errors in the South Indian adult population: the Andhra Pradesh Eye disease study. *Clinical Ophthalmology* (2009); 3:17-27
- Wang Q, Klein BE, Klein R, Moss SE. Refractive status in the Beaver Dam Eye Study. *Investigative Ophthalmology and Visual Science* (1994); 35(13):4344-7
- Index Mundi. Trinidad and Tobago Demographics Profile 2014. available from [http://www.indexmundi.com/trinidad\\_and\\_tobago/demographics\\_profile.html](http://www.indexmundi.com/trinidad_and_tobago/demographics_profile.html). Accessed 27/4/16

**Funding:** Ministry of Health of The Republic of Trinidad and Tobago; Fight for Sight UK (Grant 1339/40); Anglia Ruskin University UK  
**Conflicts of interest:** Nil to declare  
**Acknowledgements:** We are most grateful for technical support and generous sponsorship from Medilex LLC. We also thank Precision Vision Ltd and Core Distribution Ltd for their sponsorship. We would like to thank Dr Neville Verlander for statistical support in preparing this poster

