

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

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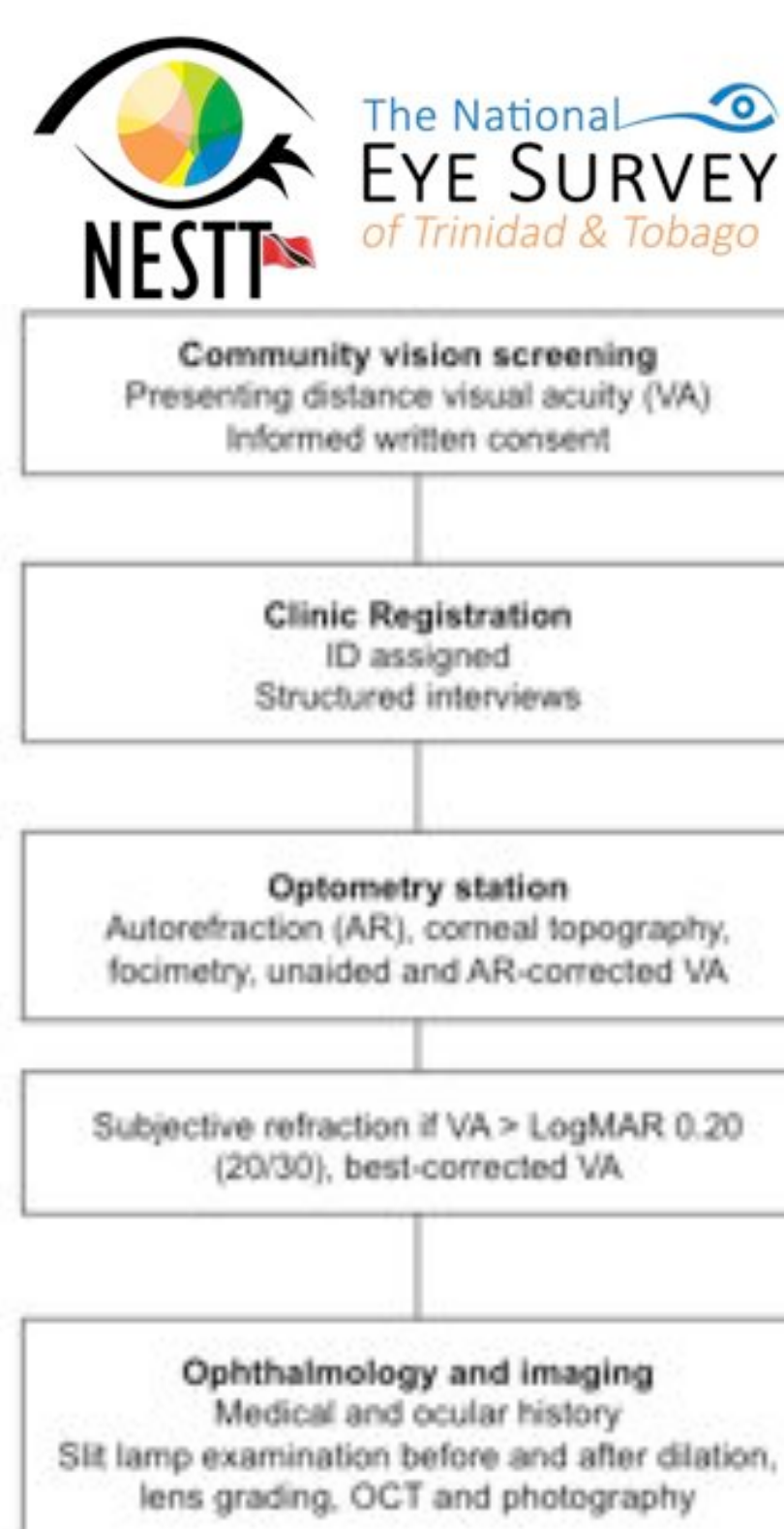
## Introduction

- 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

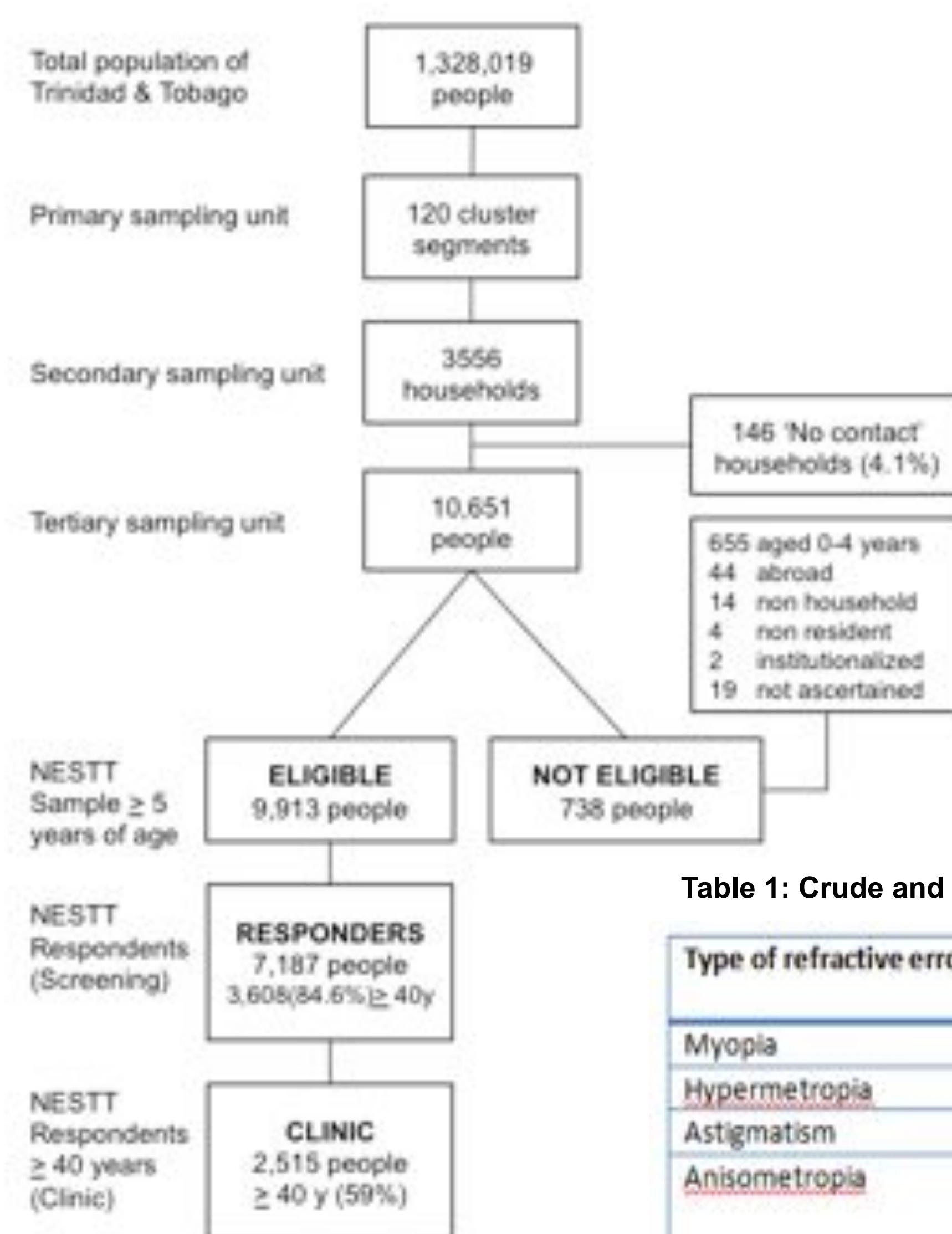


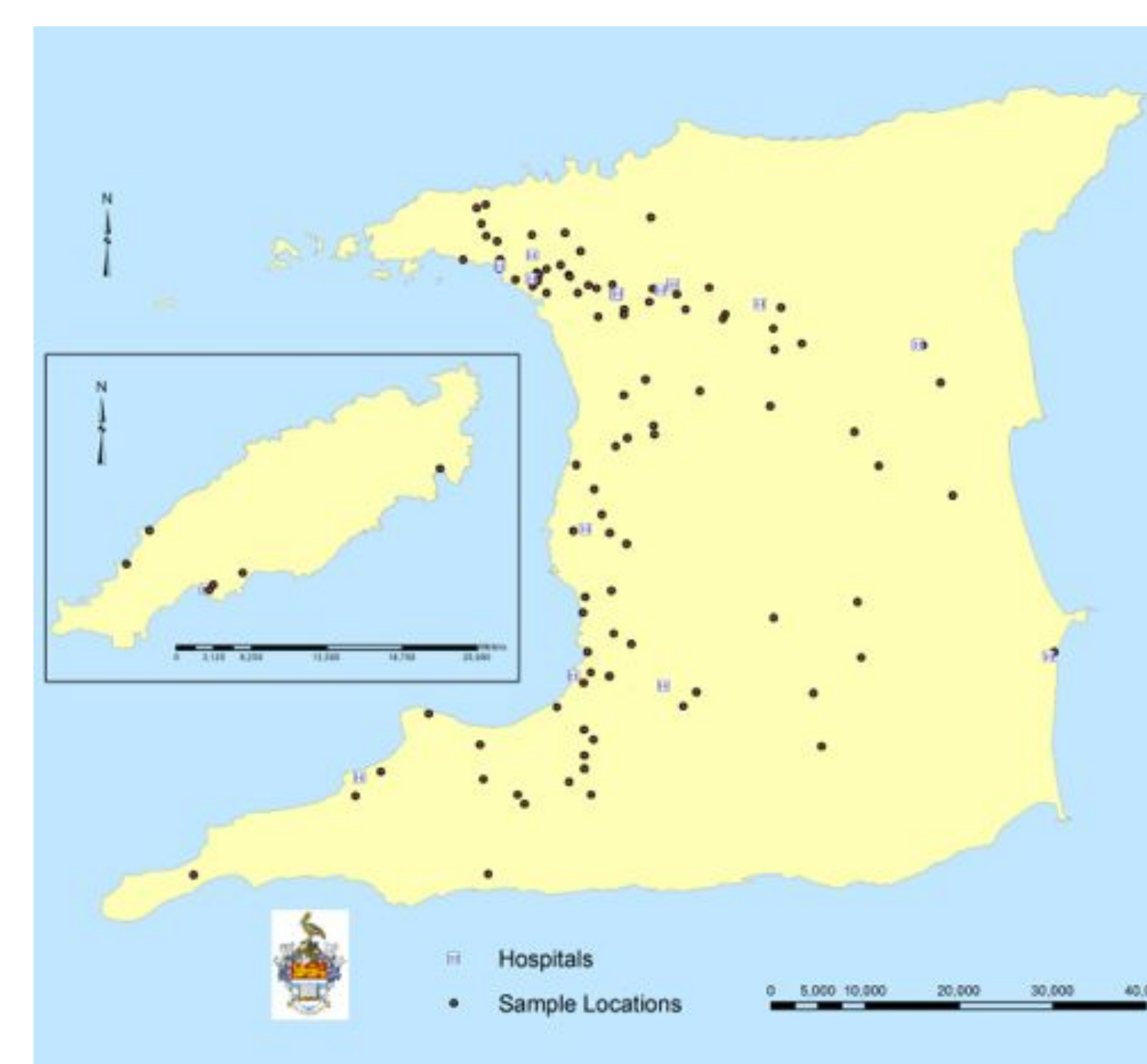
Table 1: Crude and adjusted prevalence of refractive error in adults ≥ 40 years

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
Age category	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		
Ethnicity	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

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