

A National Household SARS CoV-2 Seroprevalence Survey in South Africa, 2020-2021

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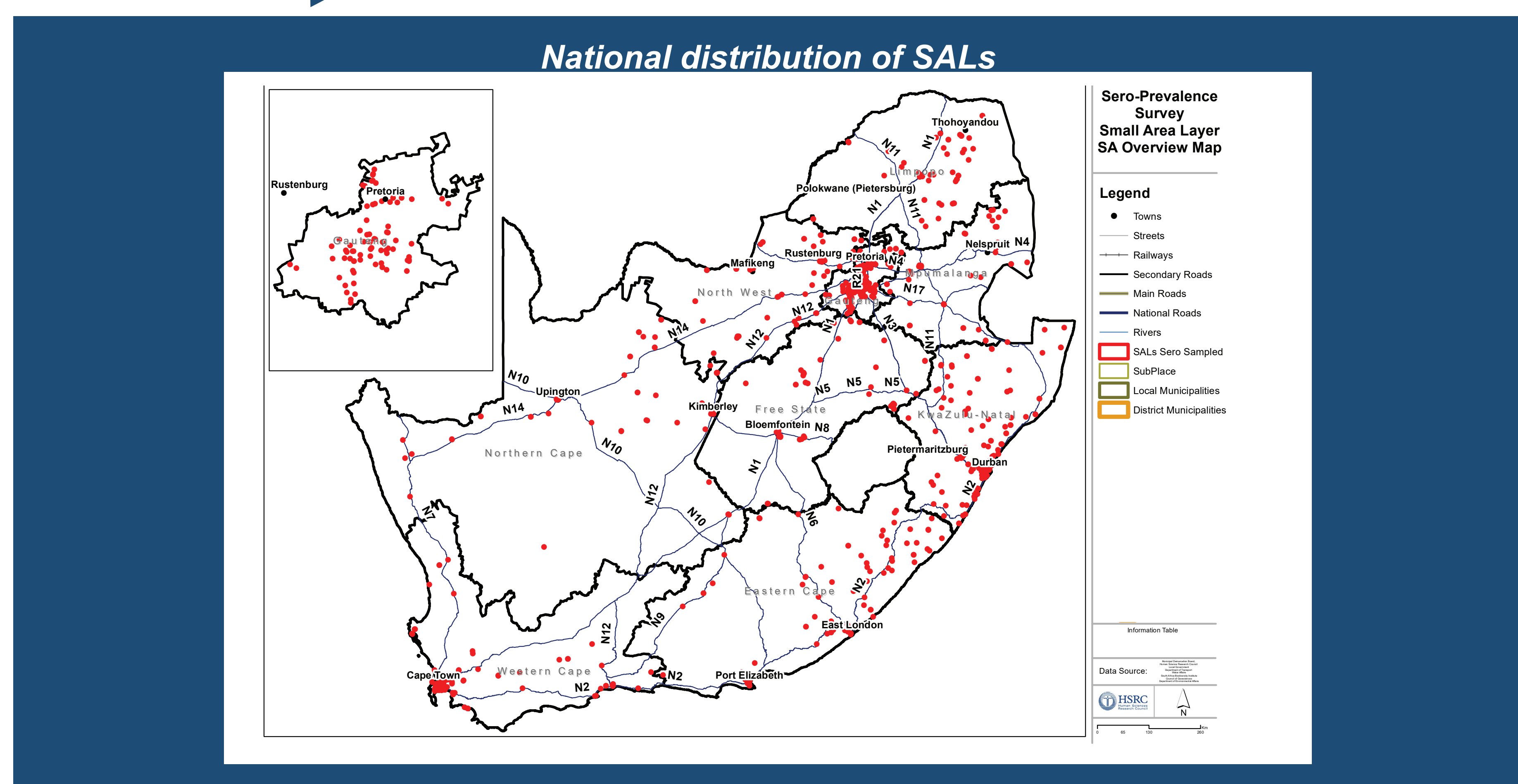
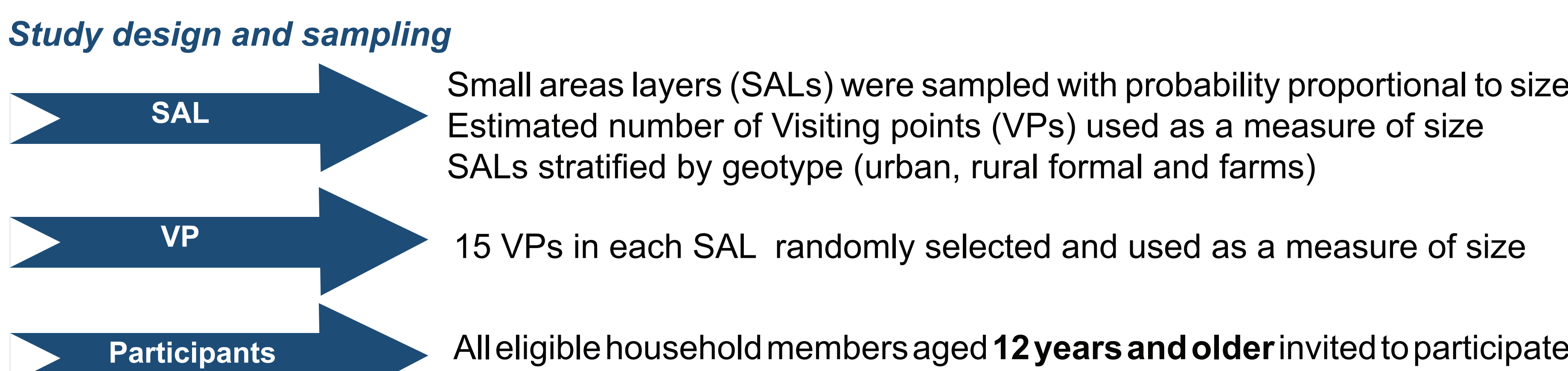
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BACKGROUND
 South Africa is one of the African countries most affected by the COVID-19 pandemic. SARS-CoV-2 seroprevalence surveys provide valuable epidemiological information given the existence of asymptomatic cases. We report the findings of the first nationwide household-based population estimates of SARS-CoV-2 seroprevalence among people aged 12 years and older in South Africa.

OBJECTIVES
Primary objectives:
 To determine the extent of COVID-19 virus infection in the general population and age-specific infection prevalence, as determined by seropositivity;
 To determine the fraction of asymptomatic or subclinical COVID-19 infections;

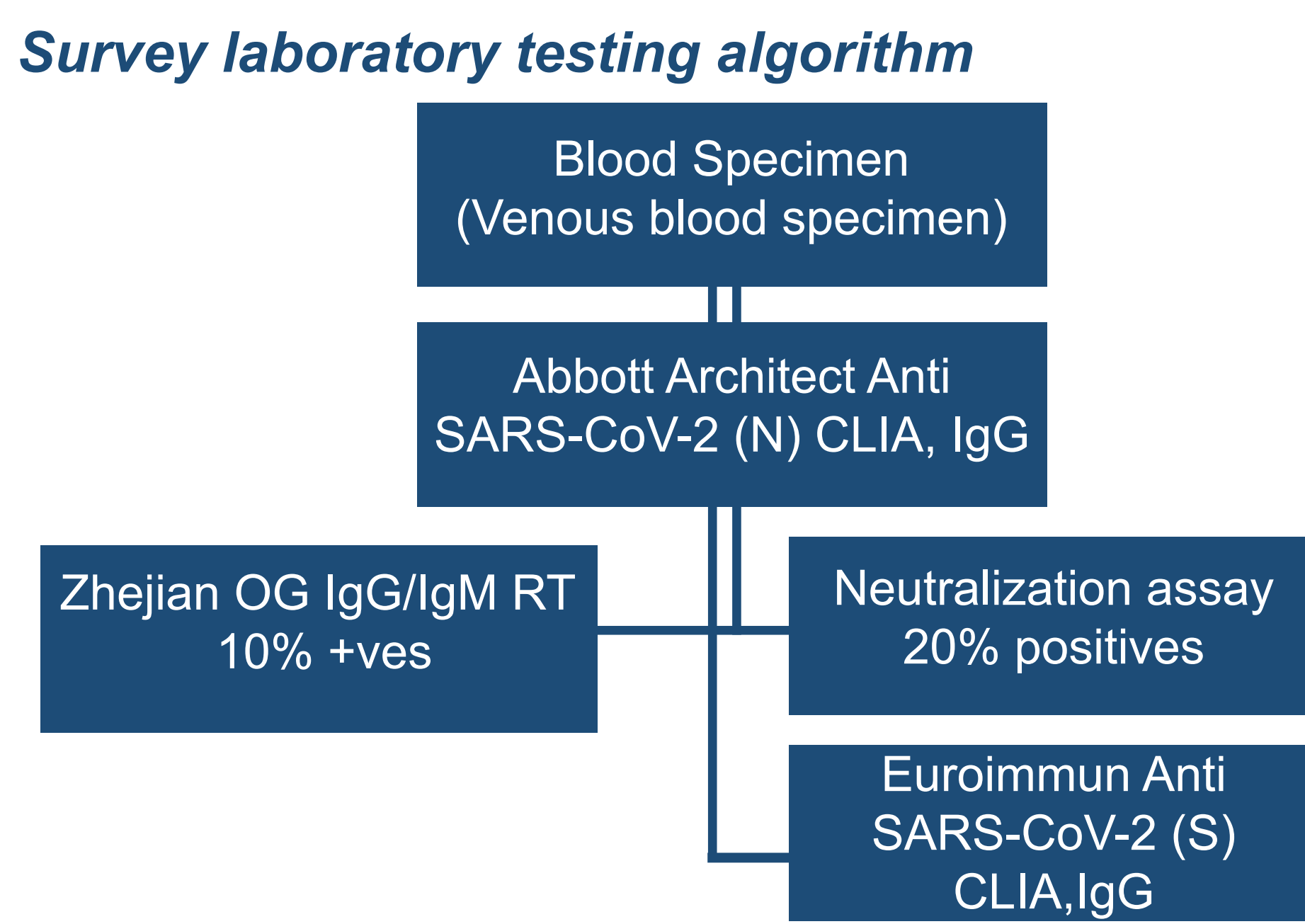
Secondary objective:
 To determine risk factors for COVID-19 virus infection
 To estimate the prevalence of COVID-19 antibodies in age and sex sub-groups

METHODS
 The survey used a cross-sectional multi-stage stratified cluster design undertaken over two separate time periods (November 2020 - February 2021 and April - June 2021) which coincided with the second and third waves of the pandemic in South Africa.



Survey data collection tools
Questionnaires
 Two questionnaires were used in this survey:
Household questionnaire: questions about the household including listing of household members.
Individual questionnaire: for persons aged 12 years and older: based on the WHO model, with additions from other questionnaires developed by the HSRC, SAMRC, and SAPRIN

- socio-demographic variables, risk perception, co-morbidities, tobacco use, movement, history of diagnosis, history of SARS-CoV-2 virus contact, symptoms, and incubation periods of 14 days up to 21 days, and preventive behaviours such as social distancing and washing of hands.



The Abbott® and Euroimmun® anti-SARS CoV-2 antibody assays were used to test for SARS-CoV-2 antibodies, the latter being the final result.

Data analyses
 The survey data was weighted with final individual weights benchmarked against 2020 mid-year population estimates by age, race, sex, and province.

Frequencies were used to describe characteristics of the study population and SARS-CoV-2 seroprevalence. Bivariate and multivariate logistics regression analysis were used to identify factors associated with SARS-CoV-2 seropositivity.

RESPONSE RATES

Valid households	10 109
Households that were interviewed	5 580
Household level response (%)	55.2%
Eligible individuals	16 646
Individuals interviewed	15 115
Individual level response (%)	90.8%
Blood samples	13 640
Testing response (%)	81.9%

Individual response rate by sex

Sex	Inter-viewed and blood (%)	Inter-viewed and blood (n)	Inter-viewed only (%)	Refused/not at home (%)	Total
Male	80.1	5 731	88.4	11.6	6326
Female	83.8	7 912	93.1	6.9	8788

Testing response rates were consistent across all age groups ranging from 76.1% to 86.1%

Individual response rate by province

Province	Inter-viewed and blood (%)	Inter-viewed and blood (n)	Inter-viewed only (%)	Refused/not at home (%)	Total
Western Cape	94.1	3367	96.7	3.3	3461
Eastern Cape	95.1	2717	99.6	0.4	2847
Northern Cape	89.0	909	93.8	6.2	958
Free State	93.6	1076	95.3	4.7	1095
KwaZulu-Natal	73.1	2319	87.0	13.0	2760
North-west	72.9	548	83.8	16.2	630
Gauteng	63.4	1501	81.7	18.3	1933
Mpumalanga	73.8	630	87.7	12.3	749
Limpopo	64.2	573	76.5	23.5	682

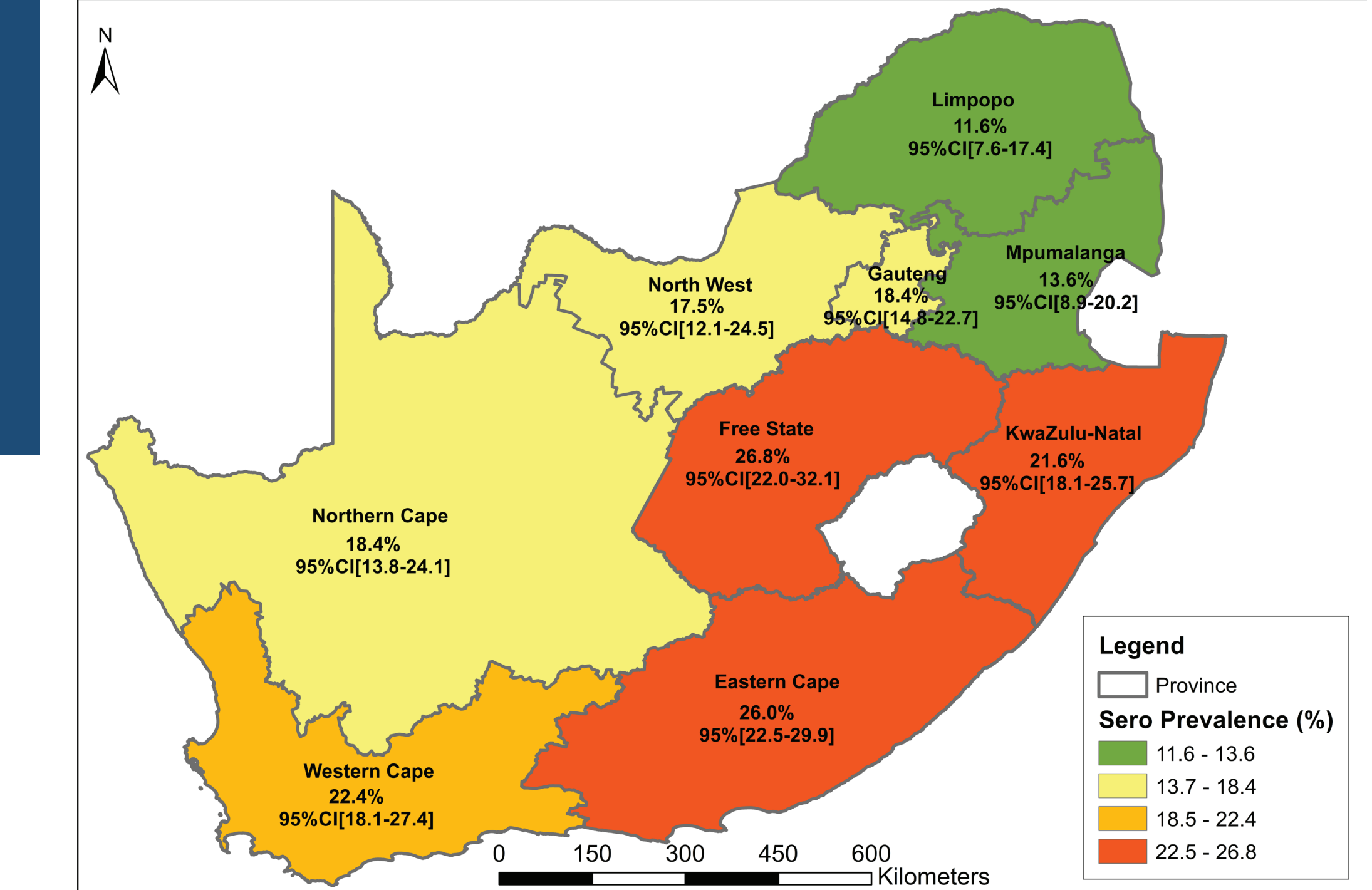
EXPLANATION OF THE ASSAYS USED
 Samples were tested first on the Abbott Architect assay and then on the Euroimmun assay.

Estimates in the original report based on Round 1 in March were based on the adjusted Abbot assay results* given evidence that Abbott anti-nucleocapsid antibodies appear to decline more rapidly than anti-spike and anti-RBD IgG antibodies

*based on Round 2 Euroimmune results only

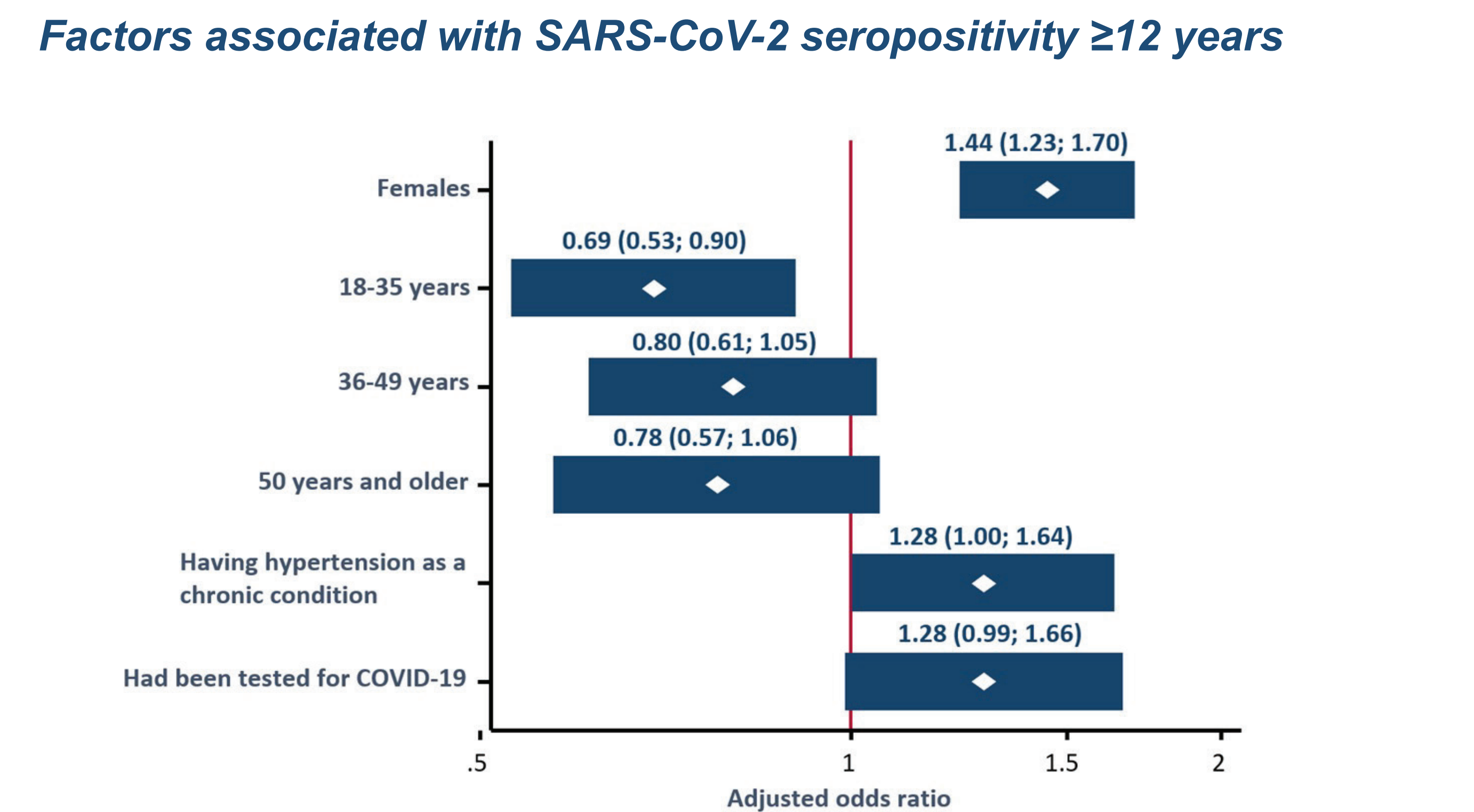
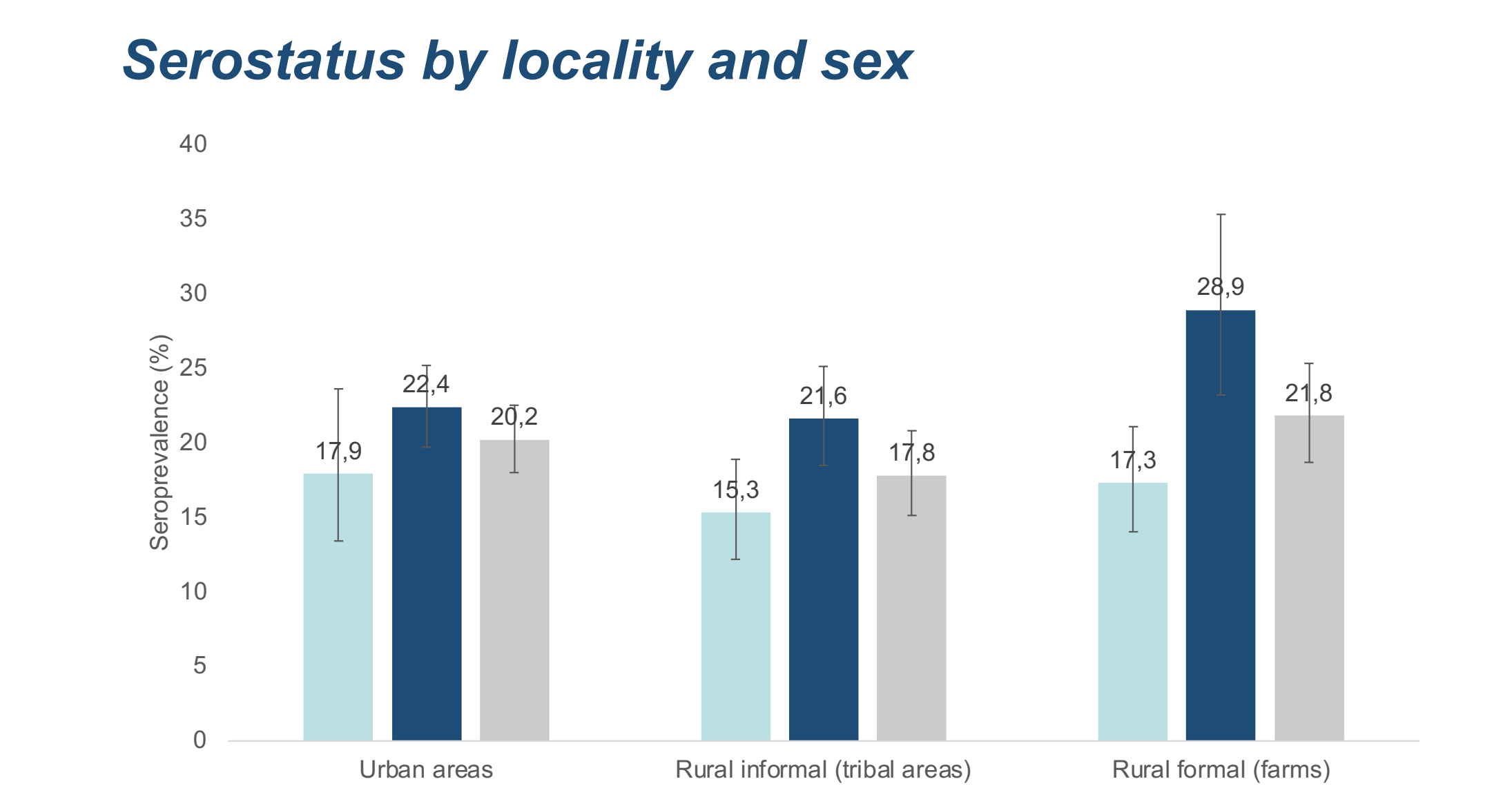
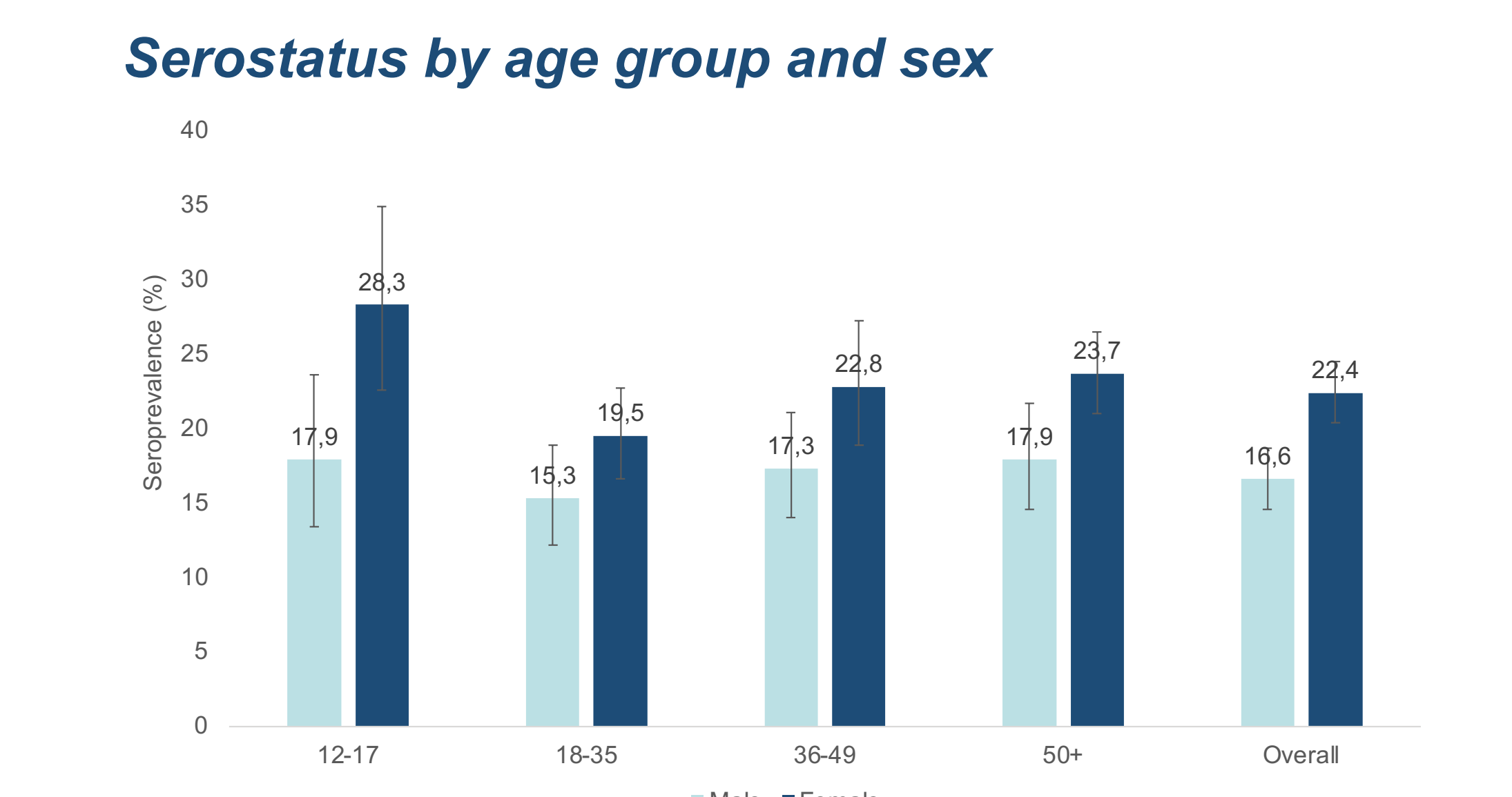
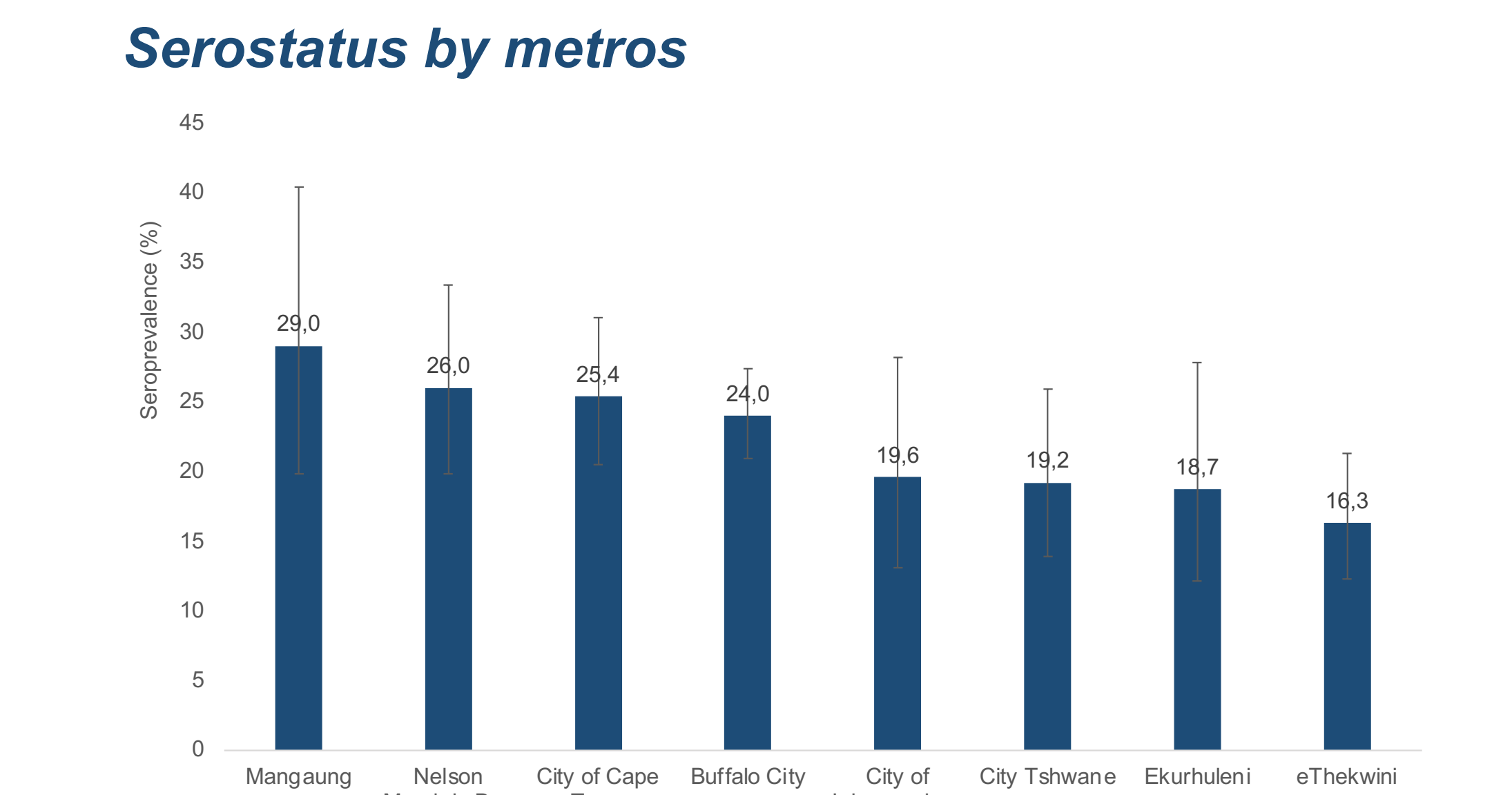
This presentation is based on the Euroimmun assay results only

SEROSTATUS RESULTS
National and provincial seroprevalence estimates
 National seroprevalence estimate individuals ≥12 years 19.6% (95% CI* 17.9–21.3)



Estimated infections (≥12 years) by sex and age group at 15 June 2021

Variable	Estimated number of people exposed	Lower estimate	Higher estimate
National	8 675 265	7 508 393	9 842 137
Sex			
Male	3 558 415	2 976 704	4 140 126
Female	5 116 849	4 381 584	5 852 114
Age group			
Less than 18	1 390 809	1 060 450	1 721 168
18-35	3 277 975	2 703 139	3 852 811
36-49	2 128 032	1 746 983	2 509 080
50+	1 878 447	1 592 974	2 163 920



STRENGTHS AND LIMITATIONS
Strengths
 The survey gives a national picture estimate of exposure to the virus over a time-period across all provinces and locality types by June 2021. We were able to quickly mobilise and adapt to field conditions. Used best available evidence on assays.

Limitations
 Collected in different places over time. Data collected over a prolonged time period in a rapidly changing epidemic. Excluded children younger than 12 years. Limitations and differences in assays. Low household response rate (However, once the household agreed to participate, the individual response was considerably high (90.8% of eligible individuals interviewed and 81.9% interviewed and tested)).

SUMMARY
 SARS-CoV-2 seroprevalence over the period November 2020 to June 2021 was estimated at 19.6% (95% CI 17.9–21.3). Translates to an estimated 8,675,265 people exposed to the virus across South Africa by the 15th of June 2021, the end of the survey sampling period. This is 5.1 times higher than the reported number of SARS-CoV-2 cases for all ages on 2 June 2021 when allowing for the period between infection and development of antibodies. Seropositivity was associated with females and those aged 12 to 17 years, and those with hypertension. Geographical variability in seroprevalence by province, metros and locality type: highest prevalence in the Free State, Eastern Cape and Western Cape provinces; highest in Mangaung, Nelson Mandela and the City of Cape Town; highest in rural formal/farms areas, especially among females.

CONCLUSIONS
 Given these findings, the following recommendations are made: We need to vaccinate many people of all ages especially females and young adolescents before another more virulent variant emerges. The COVID-19 response should have locally customised actions to ensure the greatest success in controlling the disease. In particular, preventive measures and vaccination should be scaled up in the rural (farm) areas as well. We need to continue with messaging about the risk among people with comorbid conditions given evidence of poorer outcomes in such instances. We need to use two or more assays in sero-prevalence surveys rather than just one. Above all, public health messaging about prevention and vaccination should continue unabated.

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RESEARCH PARTNERS
 HSRC-led consortium together with: