

UK Biobank SARS-CoV-2 Serology Study

Weekly Report - 21 July 2020

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1. Study Summary

UK Biobank are collecting blood samples from approximately 20,200 individuals on a monthly basis for at least six months to determine the extent of past infection with SARS-CoV-2 across different regions of the UK.

A total of 20,203 participants were selected to participate and asked to provide a sample. To date, 17,862 samples have been collected over the period 27 May to 06 July. Of the 17,862 samples provided, 86 samples failed quality control checks, resulting in 17,776 samples available for analysis. An overview of the socio-demographic characteristics of these participants is shown below (Table 1).

Table 1 Socio-demographic characteristics for 17,776 participants in the study.

Characteristics		N	%
Gender	Men	7679	43.2
	Women	10097	56.8
Age Group (years)	<30	1884	10.6
	30-39	2712	15.3
	40-49	2234	12.6
	50-59	3572	20.1
	60-69	3693	20.8
	70+	3681	20.7
Ethnicity*	White	15525	87.5
	Black	417	2.4
	South Asian	509	2.9
	Chinese	143	0.8
	Mixed	656	3.7
	Other	490	2.8
Region	East Midlands	1074	6.0
	East of England	847	4.8
	London	5118	28.8
	North East	747	4.2
	North West	1949	11.0
	Scotland	1105	6.2
	South East	2331	13.1
	South West	1246	7.0
	Wales	716	4.0
	West Midlands	1233	6.9
	Yorkshire	1410	7.9
Location of Residence	Rural	2485	14.0
	Urban	15291	86.0
Townsend Deprivation Index	Less Deprived	6268	35.3
	Average	7315	41.2
	More Deprived	4193	23.6

*Ethnicity counts exclude 36 individuals with missing information.

2. Seroprevalence of SARS-CoV-2 infection

Of the 17,776 samples available for analysis, 7.1% ($N=1270$) were positive and 92.9% ($N=16,506$) were negative.

2.1 Gender

There is no evidence of a difference in seroprevalence by gender with 7.2% of women and 7.0% of men being seropositive for SARS-CoV-2 infection (Figure 1).

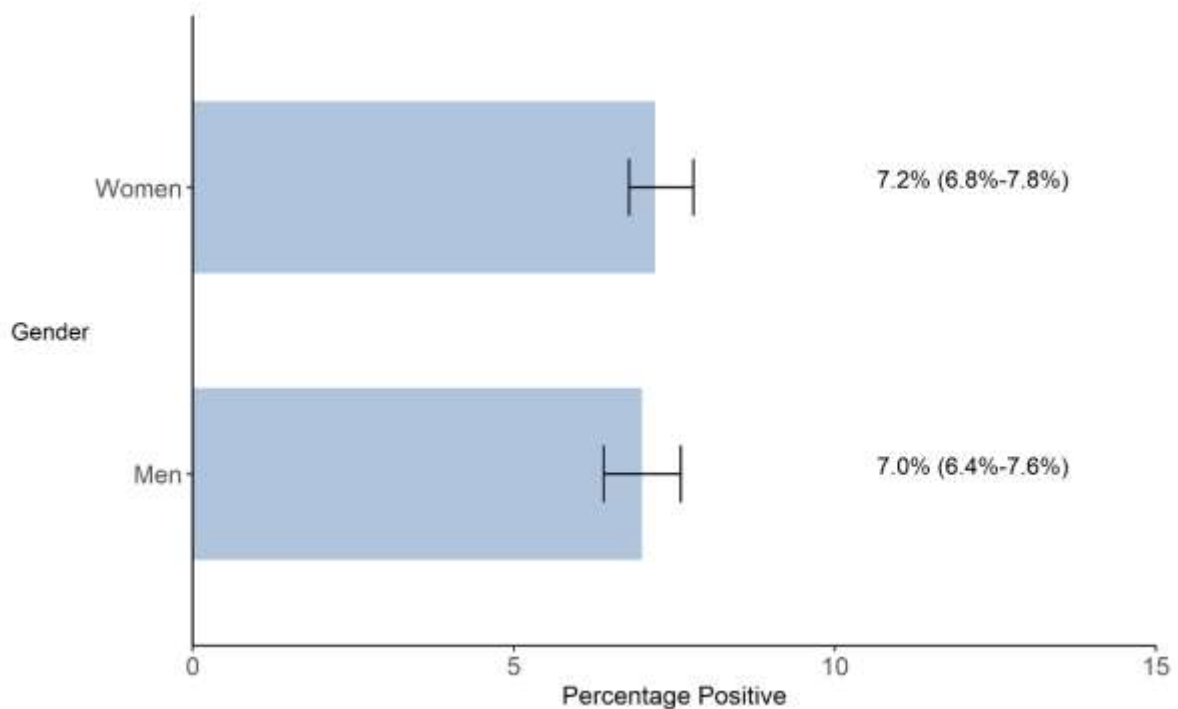


Figure 1 Percentage* of individuals seropositive for SARS-CoV-2 infection by gender.

*The black lines indicate the 95% confidence intervals about the estimate.

2.2 Age

Seroprevalence of SARS-CoV-2 infection differed by age ($P_{\text{test for heterogeneity}} < 0.001$), ranging from 10.8% among those aged <30 years to 5.4% among those aged 70 or older (Figure 2).

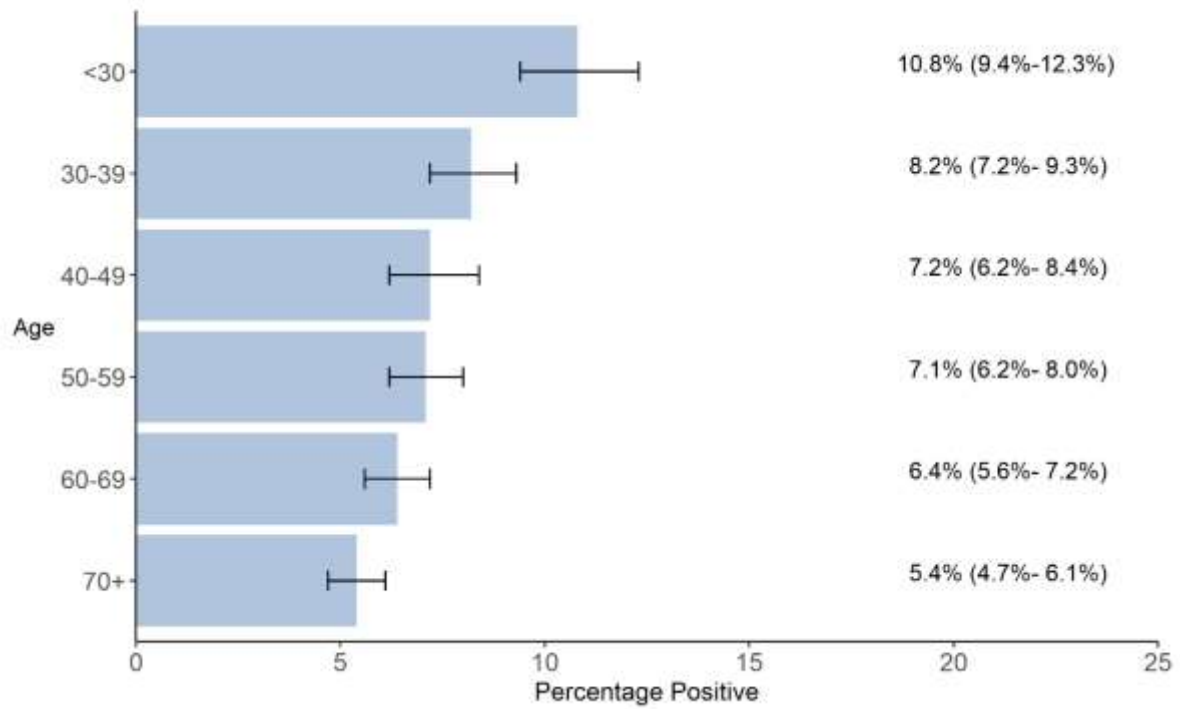


Figure 2 Percentage* of individuals seropositive for SARS-CoV-2 infection by age.

*The black lines indicate the 95% confidence intervals about the estimate.

2.3 Ethnicity

Seroprevalence of SARS-CoV-2 significantly differed by ethnicity ($P_{\text{test for heterogeneity}}=0.001$), being highest among those of Black ethnicity (11.3%) and lowest among those of White ethnicity (6.9%) (Figure 3).

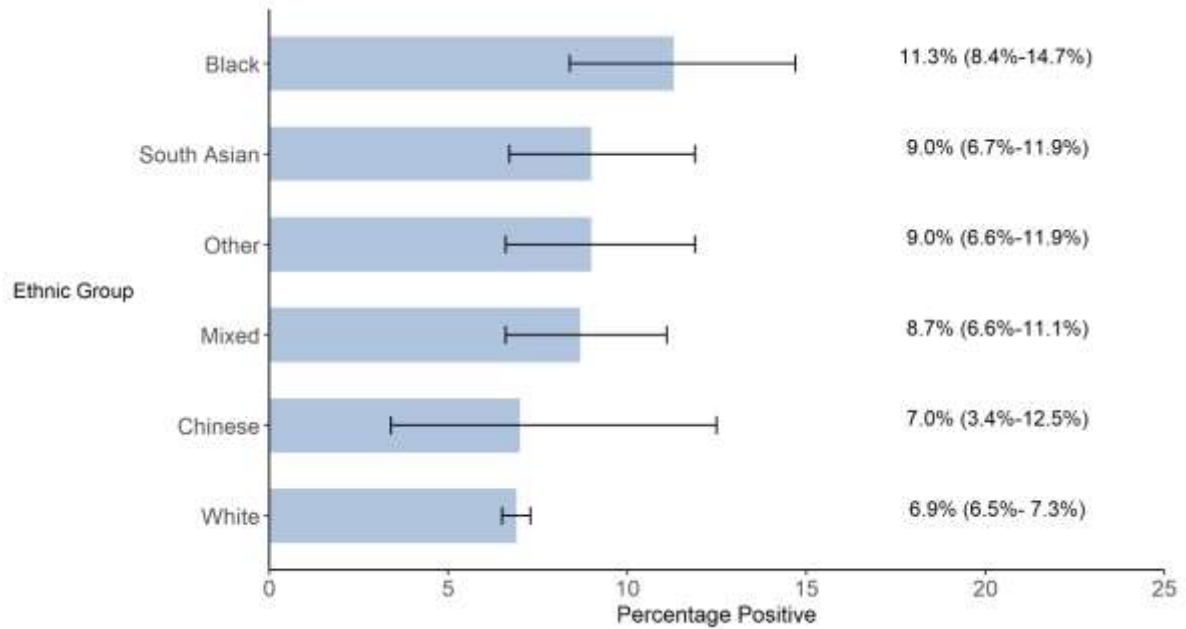


Figure 3 Percentage* of individuals seropositive for SARS-CoV-2 infection by ethnic group.

*The black lines indicate the 95% confidence intervals about the estimate.

2.4 Region

Seroprevalence of SARS-CoV-2 infection varied by region ($P_{\text{test for heterogeneity}} < 0.001$), being highest in London (10.4%) and lowest in Scotland and the South West (4.4% in both; Figure 4a and 4b).

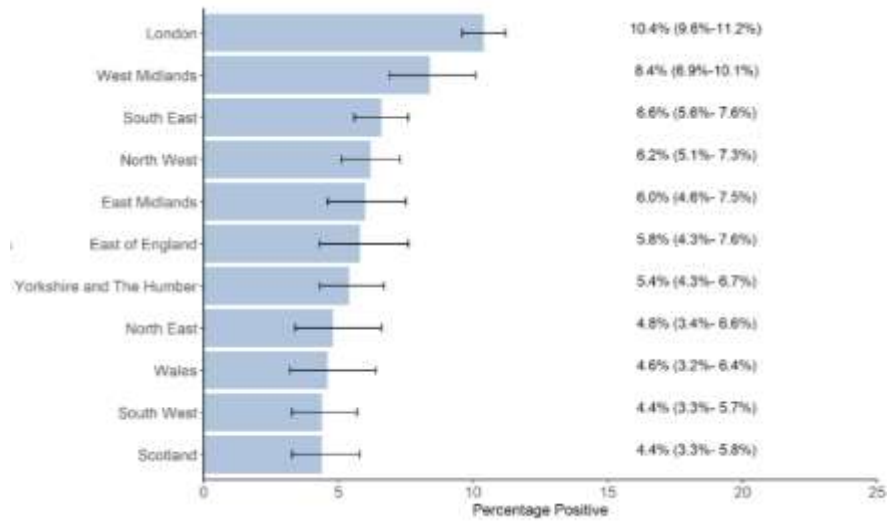


Figure 4a Percentage* of individuals seropositive for SARS-CoV-2 infection by region.
*The black lines indicate the 95% confidence intervals about the estimate.

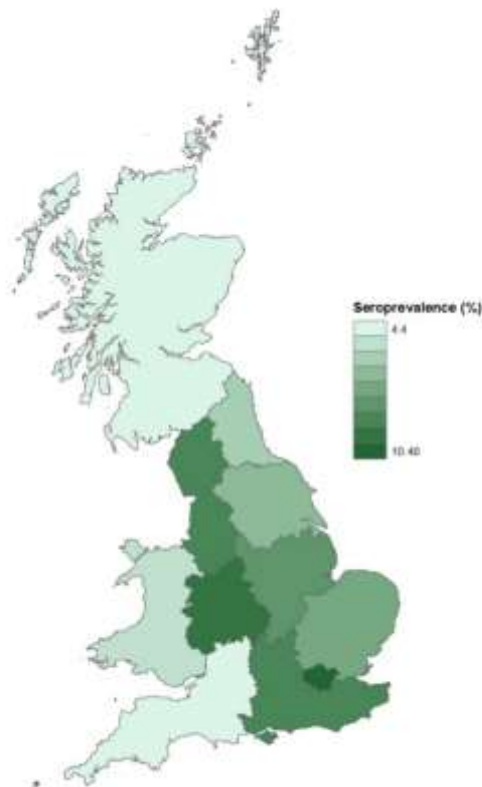


Figure 5b Map of the percentage of individuals seropositive for SARS-CoV-2 infection by region.

2.5 Rural/Urban

Seroprevalence of SARS-CoV-2 infection varied by location of residence ($P_{\text{test for heterogeneity}} < 0.001$), being higher in those living in urban (7.5%) compared to rural areas (4.8%; Figure 5).

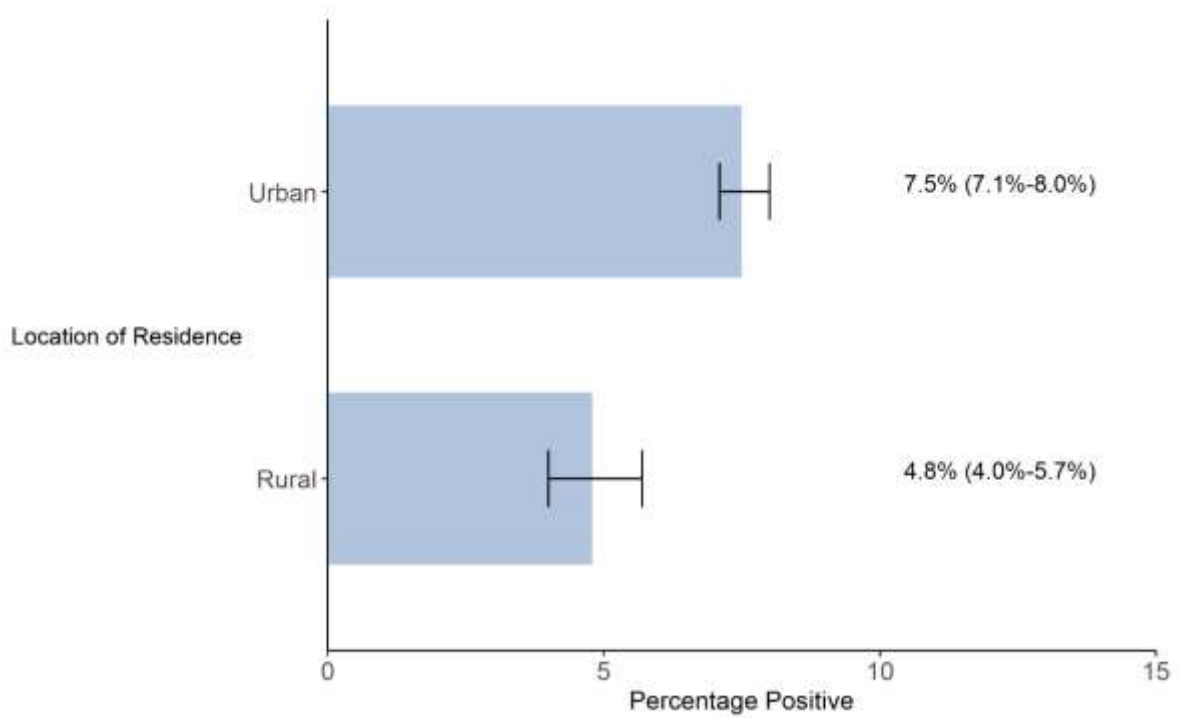


Figure 6 Percentage* of individuals seropositive for SARS-CoV-2 infection by location of residence.

*The black lines indicate the 95% confidence intervals about the estimate.

2.6 Townsend Deprivation Index

Seroprevalence of SARS-CoV-2 infection varied by socio-economic deprivation, as measured by the Townsend Deprivation Index ($P_{\text{test for heterogeneity}} < 0.001$). Seroprevalence was 8.9% in more deprived areas and 6.1% in less deprived areas (Figure 6).

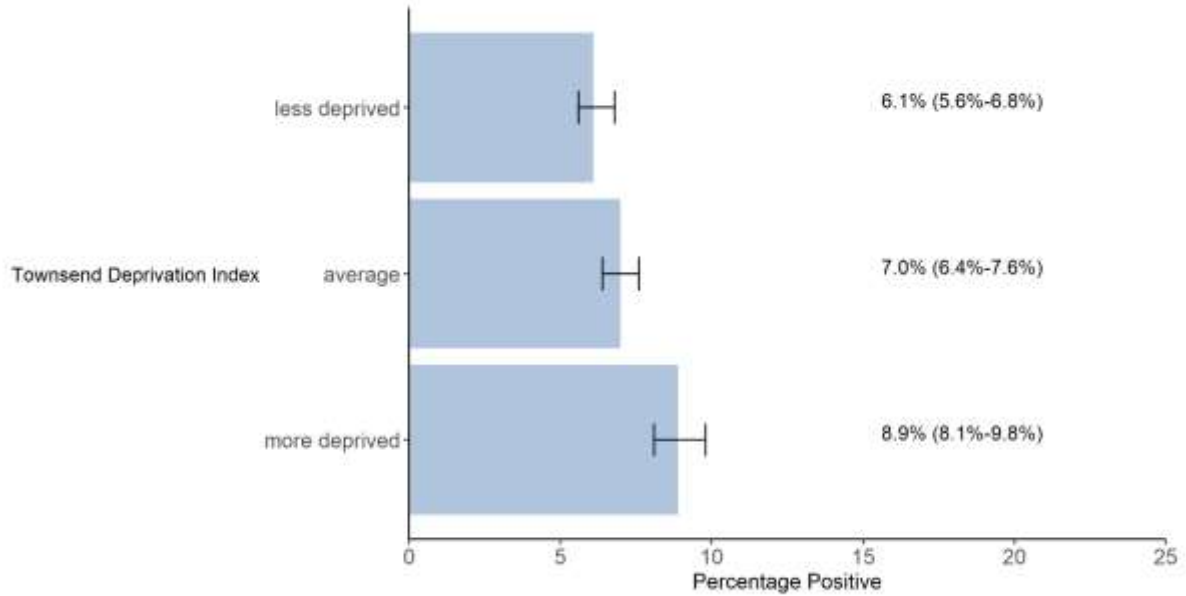


Figure 7 Percentage* of individuals seropositive for SARS-CoV-2 infection by Townsend Deprivation Index**

*The black lines indicate the 95% confidence intervals about the estimate.

**Townsend Deprivation Index categories are defined as: <-2 (less deprived), -2 to <2 (average), 2+ (more deprived)

3. Seroprevalence of SARS-CoV-2 infection in London

Owing to the relatively large numbers of participants residing in the London area ($N=5,118$; 29%), we have presented a more detailed breakdown of seroprevalence by age and ethnicity across this region.

3.1 Seroprevalence by age (London only)

In London, seroprevalence estimates were higher across all age groups than the overall average of 7.1%, although the pattern followed that of the rest of the country, being highest in those less than 30 years (14.3%) and lowest in those 70 years or older (Figure 7; $P_{\text{test for heterogeneity}} < 0.001$).

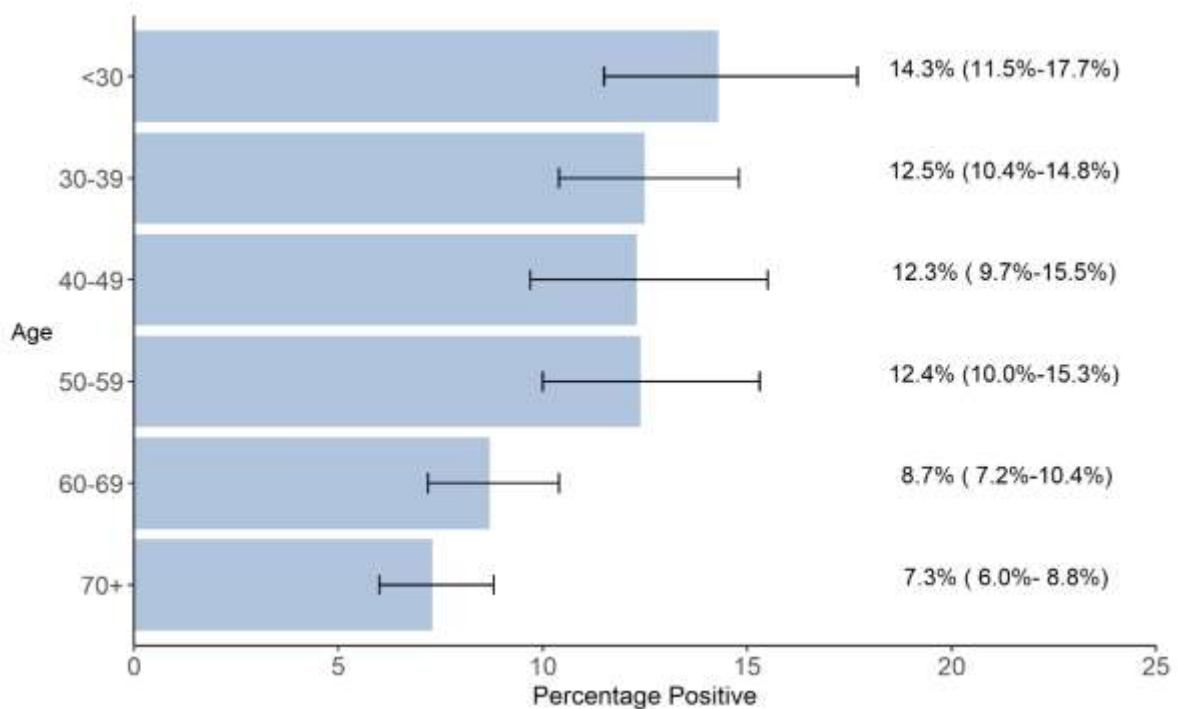


Figure 7 Percentage* of individuals seropositive for SARS-CoV-2 infection by age (London only)

*The black lines indicate the 95% confidence intervals about the estimate

3.2 Seroprevalence by ethnicity (London only)

In London, seroprevalence estimates were higher across all ethnic groups than the overall average of 7.1% and were not significantly different from each other ($P_{\text{test for heterogeneity}}=0.34$; Figure 8).

Breaking this down further, seroprevalence was 18.4% in those from London who were 30 years old and of a non-White ethnic background (data not shown).

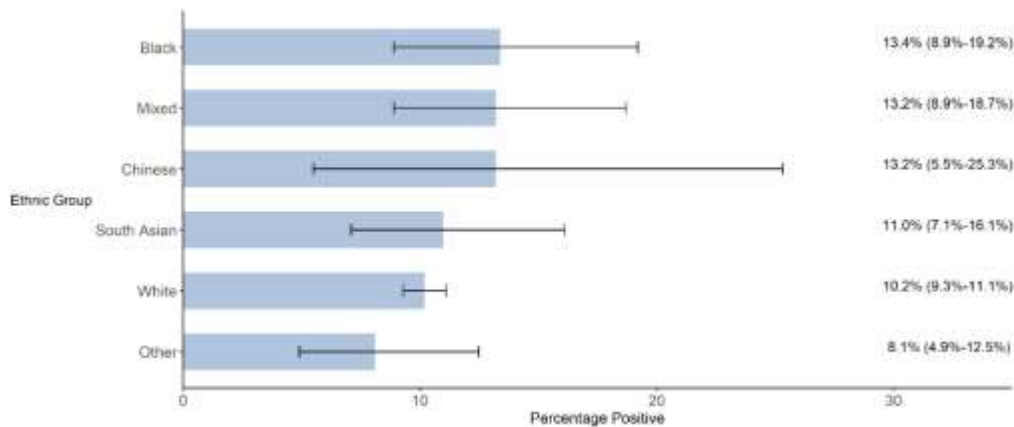


Figure 8 Percentage* of individuals seropositive for SARS-CoV-2 infection by ethnic group (London only)**

* The black lines indicate the confidence intervals about the estimate

** Based on the following number of participants (Black: 186; Mixed: 204; Chinese: 53, South Asian: 209; White: 4224; Other: 222).

3.3 Seroprevalence across boroughs (London only)

There was no statistically significant difference in seroprevalence estimates across the London region ($P_{\text{test for heterogeneity}} = 0.19$), although the rate was highest in Central London (12.0%) and lowest in North London (8.9%; Fig 9).



Fig 9. Map of percentage of individuals seropositive for SARS-CoV-2 infection across London

4. Ethnicity and SARS-CoV-2 seropositivity

Individuals of a Black, Asian and minority ethnic (BAME) background appear to be at greater risk of SARS-CoV-2 infection. At the end of month 1 of the study, seropositivity was highest among participants of a Black ethnic background (11.3%) and lowest among those of White ethnicity (6.9%).

We have investigated whether these differences are explained by known socio-demographic factors using logistic regression. Table 2 shows the odds of being seropositive in different ethnic groups compared with participants of White ethnicity. Those with a Black ethnic background were 72% more likely to be seropositive than their White counterparts (OR of 1.72, 95% CI: 1.25-2.33). After adjusting for age, sex, socio-economic deprivation, region and urban/rural status, the odds of being seropositive among Black ethnic minority participants was reduced but remained significantly higher than that of White participants (OR: 1.62, 95% CI: 1.16-2.21). Among the original (older) UK Biobank participants for whom we had additional information, further adjustment for income and education level made little difference to these estimates (data not shown).

Ethnicity	Odds Ratio (95% CI)	
	Unadjusted	Adjusted for age, sex, Townsend Deprivation Index, region and urban/rural status
White	1.00 (ref)	1.00 (ref)
Black	1.72 (1.25-2.33)	1.62 (1.16-2.21)
South Asian	1.35 (0.98-1.82)	1.32 (0.95-1.80)
Chinese	1.02 (0.50-1.85)	1.07 (0.52-1.94)
Mixed	1.29 (0.97-1.69)	1.22 (0.91-1.61)
Other	1.34 (0.96-1.82)	1.37 (0.98-1.88)

Table 2 Association between ethnic group and SARS-CoV-2 infection status before and after adjustment for sociodemographic factors