Public Health England

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Serological Surveillance: Summary report 5
PHE Surveillance Cell

19 May 2020

Key messages:

- **Results from testing an additional 1942 blood donor samples (collected in early May from London, the East of England and North West regions; weeks 18 and 19) are included in this week's report.**
- **Observed prevalence rates in blood donors in the North West have increased from 5.9% [4.5% - 7.6%] in week 16 to 9.6% [7.8% - 11.6%] in week 19.**
- **Prevalence has increased in older adults between weeks 16 and 19 (mirroring an effect seen last week in the London data), potentially suggesting that older adults are being affected later.**
- **Initial prevalence results in the East of England are well above baseline (8.2% [95%CI: 6.5 – 10.1%] although slightly lower than the prevalence seen in the North West during the same period, and significantly lower than the prevalence in London in week 18.**
- **Prevalence amongst individuals aged under 30 years through the Sero-epidemiology Unit (SEU) and Royal College of General Practitioners (RCGP) collections are included for the first time. These data suggest that prevalence in children aged 5 – 18 years is approaching that seen in adults.**

Background

Control of COVID-19 requires the ability to detect asymptomatic and mild infections, that would not present to healthcare and would otherwise remain undetected through existing surveillance systems. This is important to determine the true number of infections within the general population to understand transmission, to inform control measures such as social distancing and school closures and to provide a denominator for the estimation of severity measures such as infection fatality and infection hospitalisation ratios.

Enhanced Sero-surveillance

Details of the serosurveillance sample sources can be found in previous reports. The data presented in this report has been ascertained using adult samples from blood donors in England (NHS Blood and

Transplant (NHSBT)) and Wales (Welsh Blood Service, WBS) with regions sampled at different time periods at regular intervals. Whilst there are no additional results from testing samples from Great Ormond Street Hospital (GOSH), for the first time we present data on testing of samples in individuals under the age of 30 years from the Sero-epidemiology Unit (SEU) (residual serum from participating NHS laboratories across England submitted to the Sero Epidemiology Unit, all ages) and Royal College of General Practitioners (RCGP) collections (samples from individuals aged 10 years and above attending for routine bloods across 300 participating practices of the RCGP Research and Surveillance Centre (RSC) network across England).

Results

Seroprevalence estimates presented here are based on a total of 10,554 adult samples from NHSBT and Welsh Blood Service (WBS) and includes the results of 959 new samples from the North West (collected in week 19), 963 samples from the East of England (collected in week 19) and 20 new samples from London (collected in week 18).

Seroprevalence estimates amongst blood donors were adjusted for the sensitivity and sensitivity of the EuroImmun assay, based on sensitivity of 71/100 (71%) and specificity of 777/786 (98.9%) and uncertainty using a Bayesian approach. Further details have been provided in previous reports. Matched analysis of the EuroImmun assay was also performed using the in-house Receptor Binding Domain (RBD) assay to gain further insight into the sensitivity of the commercial assay.

In addition, samples tested in individuals under 30 years of age from the SEU (n= 545) and RCGP (n=184) collections are also presented. These samples were tested using the in house RBD assay and estimates adjusted using a sensitivity of 92.9% and a specificity of 98.6%.

The NHSBT analysis includes adjusted prevalence weighted to match the age and gender distribution of the general population – weightings used ONS population data by NHS region (1). For NHSBT, age standardisation was for ages 17 – 70, using age group categories as given in Figure 1.

Blood donor data

The additional results from week 19 (**Table 1**) show that adjusted prevalence in the North West continues to be above all other regions except London, with an increase from 6.4% (week 16) to 12.2% in week 19 (observed difference of 3.7% (1.3% - 6.1%)). The week 19 data for the East of England (first sample set from this region) indicates a prevalence significantly above baseline in the other regions – although not quite as high as the prevalence seen in the North West during the same period, and lower than that seen in London during the preceding week (week 18).

The observed prevalence estimates by ~10 year age bands are shown in **Figure 1**. Week 19 data continues to show a higher prevalence among younger adults in the North West, however the gap between the age groups has narrowed considerably, due to a significant increase in prevalence among all older age groups. The week 19 data from the East of England shows little disparity between the age groups with regards to prevalence, with only the 60-70 year age group displaying a significantly lower prevalence.

Please note that about 1-2% of the samples come without demographic data, and hence prevalence estimates in this report are based on the 98-99% sets with available data.

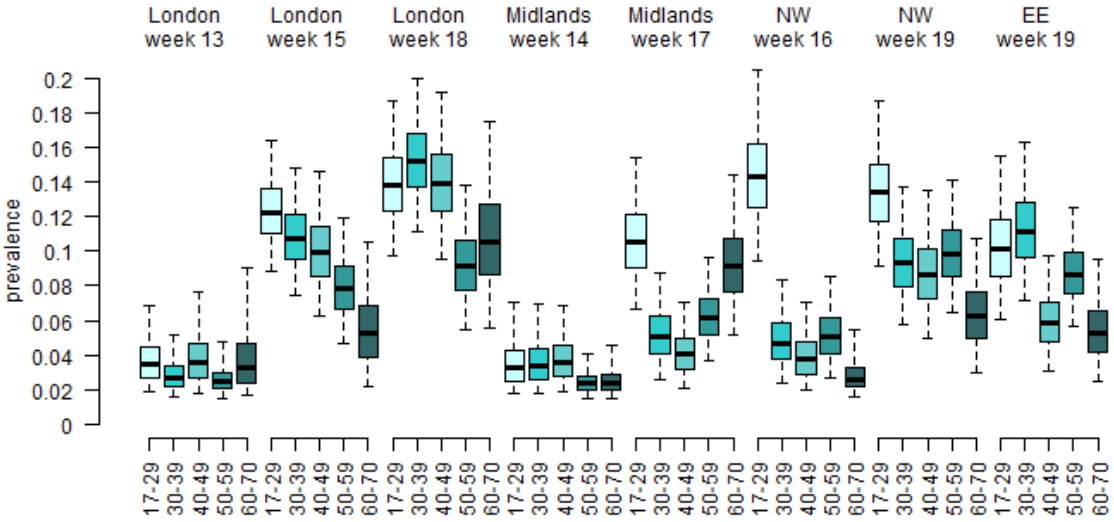
***Table 1**: Summary of the Prevalence Estimates by Collection and Period of Sampling, using the Euroimmun Assay*

region	date range	week of collection	pos	ind	neg	total	%pos (95% CI)	adjusted prevalence (95%CrI)*	age-gender weighted adjusted prevalence (95% CrI)*
NHSBT									
Lon	26-27 Mar	13	22	11	724	757	2.9% (1.8% - 4.4%)	1.8% (0% - 4.3%)	1.5% (0.2% - 3.9%)
Lon	9-13 Apr	15-16	107	15	963	1085	9.9% (8.2% - 11.8%)	12.3% (9.2% - 16.1%)	12.3% (9% - 16.4%)
Lon	1-3 May	18	126	9	819	974	13.0% (11.0% - 15.3%)	17% (13.3% - 21.5%)	17.5% (13.4% - 22.8%)
Mid	2-3 Apr	14	25	13	878	916	2.7% (1.8% - 4.0%)	1.6% (0% - 3.9%)	1.6% (0.3% - 3.9%)
Mid	23-24 Apr	17	70	9	964	1043	6.7% (5.3% - 8.4%)	7.6% (4.9% - 10.7%)	8% (5% - 11.4%)
NE	14-16 Apr	16	46	12	958	1016	4.5% (3.3% - 6.0%)	4.3% (1.9% - 6.9%)	4.2% (1.6% - 7.1%)
NW	15-20 Apr	16-17	55	11	870	936	5.9% (4.5% - 7.6%)	6.3% (3.7% - 9.3%)	6.4% (3.6% - 9.8%)
NW	6-8 May	19	92	15	852	959	9.6% (7.8% - 11.6%)	12% (8.8% - 15.8%)	12.2% (8.8% - 16.6%)
SW	24-26 Apr	17	42	8	815	865	4.9% (3.5% - 6.5%)	4.8% (2.3% - 7.6%)	4.8% (2.1% - 8.1%)

SE	30-1 May	18	49	11	960	1020	4.8% (3.6% - 6.3%)	4.7% (2.3% - 7.5%)	4.2% (1.6% - 7.1%)
EE	7 -10 May	19	79	13	871	963	8.2% (6.5% - 10.1%)	9.9% (6.9% - 13.4%)	10.1% (6.8% - 14.2%)
Welsh blood service									
Wales	-	17	34	4	968	1006	3.4% (2.4% - 4.7%)	2.6% (0.3% - 4.9%)	-

Lon – London, Mid – Midlands, NE – North East England, NW - North West England, SW – South West England, SE – South East England, EE – East of England.
**adjusted based on sensitivity of 71/100 (71%) and specificity of 777/786 (98.9%) - uncertainty of these estimates incorporated into the adjustment using Bayesian analysis (median and 95% credible interval)*

Figure 1: *Observed Prevalence by Age Group and Collection, NHSBT data*



SEU and RCGP samples from individuals aged under 30 years

This report presents data from the SEU and RCGP collections for the first time (further details on these samples can be found in Appendix 1). These samples cover a different age range to the NHSBT and WBS samples; the SEU samples cover ages zero to 29 years, and the RCGP samples cover ages 11 – 29 years. The SEU collection includes samples from all regions; however over half of the samples were taken in the north of England (32% NW, 21% NE), while only 4% originated from London. London was similarly under-represented in the RCGP data with 7% samples originating from London.

In combination with the data from GOSH, these data show a significantly higher prevalence in London when compared to the rest of England and Wales – a pattern that mirrors that seen in NHSBT data. When compared to previous analyses of data from GOSH (Appendix 1), prevalence

outside London in weeks 16-17 is in line with week 16-17 prevalence among the SEU samples and week 17-18 prevalence among the RCGP samples. Any comparison with the GOSH data, however, must take into account that these samples were analysed using the EuroImmun assay, while the RCGP and SEU samples were analysed using the RBD assay. Further testing using the recently validated Abbott assay is underway.

***Table 2**: Summary of the RCGP and SEU Prevalence Estimates by period of sampling, using the RBD assay*

date range	week of collection	pos	ind	neg	total	% pos (95% CI)	adjusted prevalence (95% CrI)
RCGP							
16 Mar - 10 Apr	12-15	1	0	33	34	2.9% (0.1% - 15.3%)	2% (0% - 12.3%)
13-30 Apr	16-18	9	1	140	150	6.0% (2.8% - 11.1%)	4.6% (0.9% - 9.7%)
SEU							
1-29 Mar	09-13	4	2	178	184	2.2% (0.6% - 5.5%)	0.6% (0% - 3.5%)
30 Mar - 12 Apr	14-15	6	5	211	222	2.7% (1.0% - 5.8%)	0.9% (0% - 3.9%)
13-26 Apr	16-17	12	2	125	139	8.6% (4.5% - 14.6%)	7.6% (3.2% - 13.7%)

When stratified by age (Figure 2), the SEU data shows an increasing prevalence among children under the age of 18, with school aged children (ages 5 – 19) displaying a higher prevalence than either younger children or adults by weeks 16 – 17. Although this pattern is not quite reflected in the RCGP data, this analysis also shows a prevalence approaching that of adults among those aged 11 – 19.

Figure 2a: *Observed Prevalence by Age Group and Collection, SEU data*

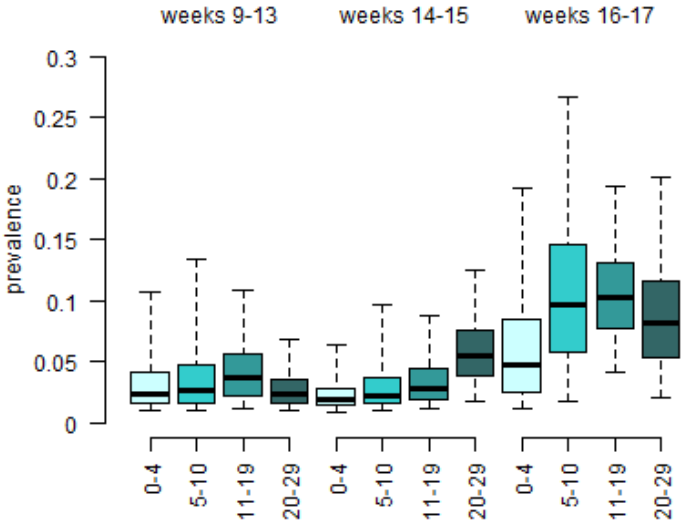
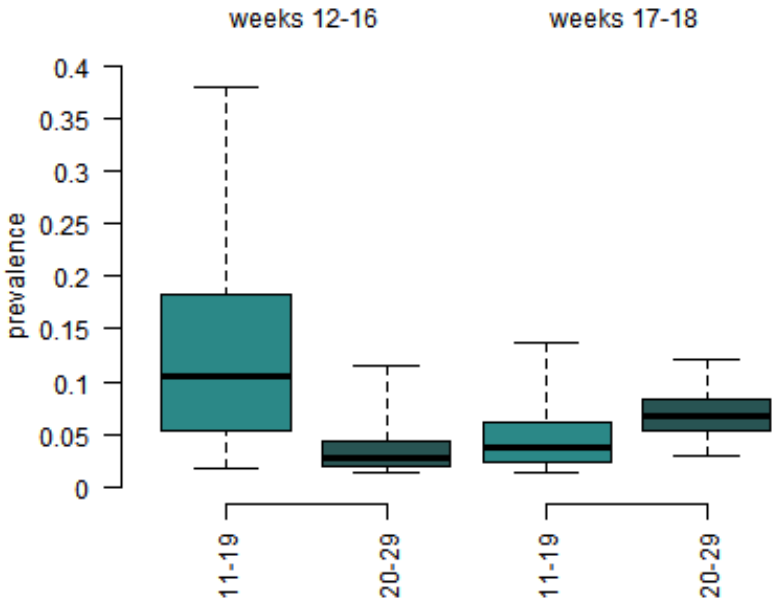


Figure 2b: *Observed Prevalence by Age Group and Collection, RCGP data*



Comments

This week's report provides more detailed analyses on the results of serial sampling in North West, and first prevalence estimates for the East of England amongst adult blood donors. These supplement existing data presented in previous reports from serial sampling in London and the Midlands.

The estimates among adults show a continued increase in prevalence within London, however the increase seen between weeks 16 and 18 is relatively smaller than the increase observed between weeks 13 and 16. As antibody response takes at least two weeks to become detectable, those displaying a positive result in week 18 are likely to have become infected before mid-April, and the increased prevalence may only have just begun to slow following the impact of lockdown measures. As seen previously, the highest prevalence in all regions is found among adolescents and young adults in the 17-24 year old age group. The same finding in the unadjusted results using the slightly more sensitive RBD assay provides further evidence that supports a higher initial incidence in this age group. The increase seen in the last set of samples tested (week 18) in older age groups in London suggests that this population may have been affected later. A similar pattern, with an early high prevalence in young adults, followed by a later increase in older age groups, is now apparent in the North West. Although data is not available at many time points from all other regions, this pattern seems to be consistent, except in regions with a much lower incidence.

The age and region-specific pattern may reflect differences in behaviour and mixing patterns in the different age groups, combined with timing of the epidemic. Data from different regions should be easier to interpret when incidence has fallen, and antibody levels stabilise.

Although no new data from children at Great Ormond street is available this week, additional sources of samples from paediatric and adolescents/young adults (the 15-25 year olds) are presented for the first time. As these samples are very small volume, they have been tested using more sensitive and specific assays – the Abbott results are expected early next week. These data suggest that prevalence in London is higher than that seen in the rest of the country (in line with previous analyses), and that prevalence in children aged between 5 and 18 years is approaching that seen in adults. In addition to these paediatric collections which are accumulating. samples from What's the Story study, with healthy children and adolescents up to the age of 25, should provide more insight.

Appendix 1: RCGP and SEU samples

This week's report includes data from two new sources:

- existing opportunistic collection of residual samples of all ages from PHE's Sero-Epidemiology Unit (SEU)
- samples from patients aged 11 years and over attending participating practices in the RCGP Research and Surveillance Centre network

Unlike the NHSBT data, these datasets are predominantly paediatric, and therefore facilitate comparison with the data from Great Ormond Street Hospital (**Table 2**). Any comparison, however, must take into account that the GOSH data was tested using the Euroimmun assay, while the SEU and RCGP data was tested using the RBD assay. In addition, London is underrepresented in the samples in the SEU and RCGP collections.

***Table 2**: Summary of GOSH Prevalence Estimates by region and period of sampling, using the Euroimmun assay*

region resident	date range	week of collection	pos	ind	neg	total	%pos (95% CI)	adjusted prevalence (95%CrI)
London	20-28 Mar	12-13	6	1	77	84	7.1% (2.7% - 14.9%)	8.7% (2% - 19.2%)
	1-12 Apr	14-15	18	4	99	121	14.9% (9.1% - 22.5%)	20.1% (11.5% - 31.2%)
	13-20 Apr	16-17	24	1	100	125	19.2% (12.7% - 27.2%)	26.3% (16.9% - 38.3%)
Rest of England & Wales*	20-28 Mar	12-13	4	6	60	70	5.7% (1.6% - 14.0%)	6.5% (0.4% - 17.5%)
	1-12 Apr	14-15	6	2	62	70	8.6% (3.2% - 17.7%)	10.8% (2.9% - 22.9%)
	13-20 Apr	16-17	6	5	70	81	7.4% (2.8% - 15.4%)	9% (2.2% - 19.5%)