

Irish Blood Donors: An expanding role in public health surveillance

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WE
LOVE OUR
DONORS



WE IMPROVE
PATIENTS LIVES,
TOGETHER



WE
LEAD BY
EXAMPLE



WE
STRIVE FOR
EXCELLENCE



WE
ARE THE
IBTS

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Blood Donor Surveillance

- The emergence of SARS-CoV-2 brought with it a need to quickly generate accurate and real-time surveillance data. In 2020, the IBTS, along with many blood establishments worldwide undertook SARS-CoV-2 seroprevalence studies using residual blood donor serum or Plasma.
- Blood Establishments have blood collection infrastructure with large geographic reach, high throughput testing systems and residual samples from routine blood donation screening. This creates a unique opportunity to contribute to infectious disease surveillance in a healthy subset of the wider population.
- In 2022 the Virology Lab tested ~138,000 donations, from ~74,000 donors ranging from 18-80 years, from all counties in ROI. In theory, these residual samples could be made available for surveillance. 95% of donations in 2022 were from repeat donors , which would also facilitate longitudinal sampling.

SARS-CoV-2 Serosurveillance

- IBTS began collecting residual blood donor plasma samples at the end of March 2020 with a view to conducting seroprevalence work. Ethical approval was granted by NREC COVID-19.
- We used three serology assays on the Abbott Architect instrument to screen 8,509 donations from February to September, to track the first wave of infections in Ireland.
- This study identified the earliest evidence of SARS-CoV-2 infection in Ireland in archived samples from February 2020.
- We continued this work in 2021 during the second and third waves of the pandemic, where we demonstrated the impact of the vaccination programme on the rate of seropositivity in blood donors, the serological profile of donors and the quantitative antibody levels.

Publications

SARS-CoV-2 antibody detection rose significantly during the first wave of COVID-19 infection, increasing from 0.2% and 0.3% in February and March to 2.9% in April.

Fig. 1. SARS-CoV-2 antibody detection in donations received between February 2020 and September 2020.

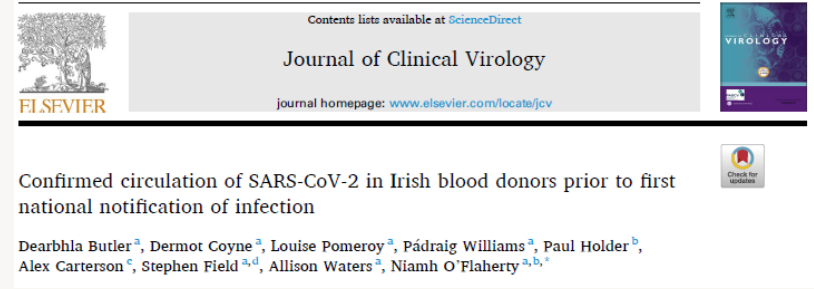
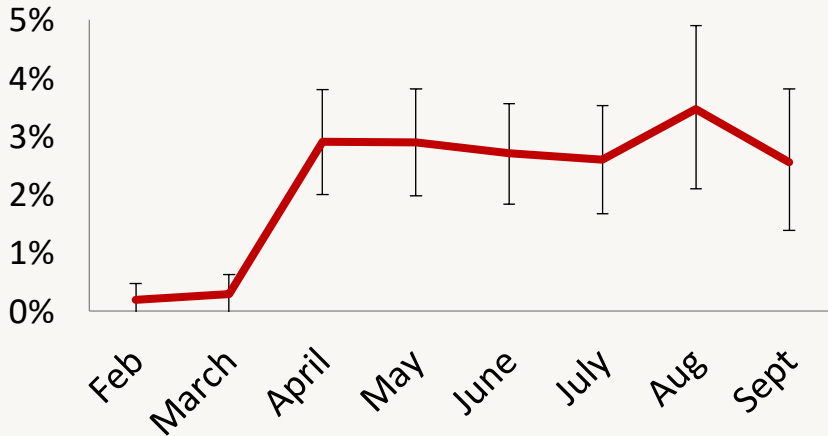
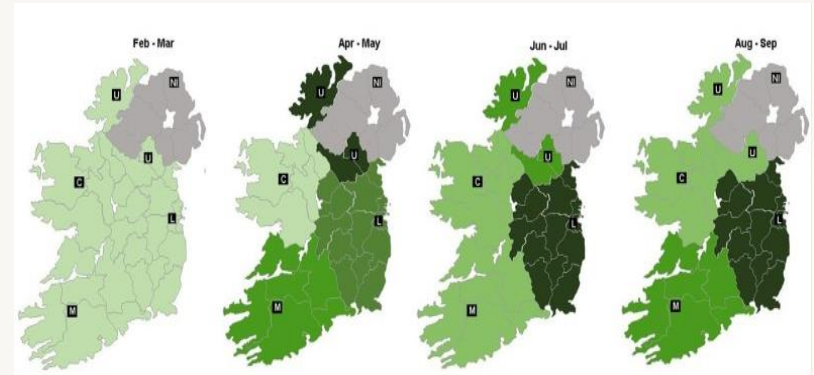


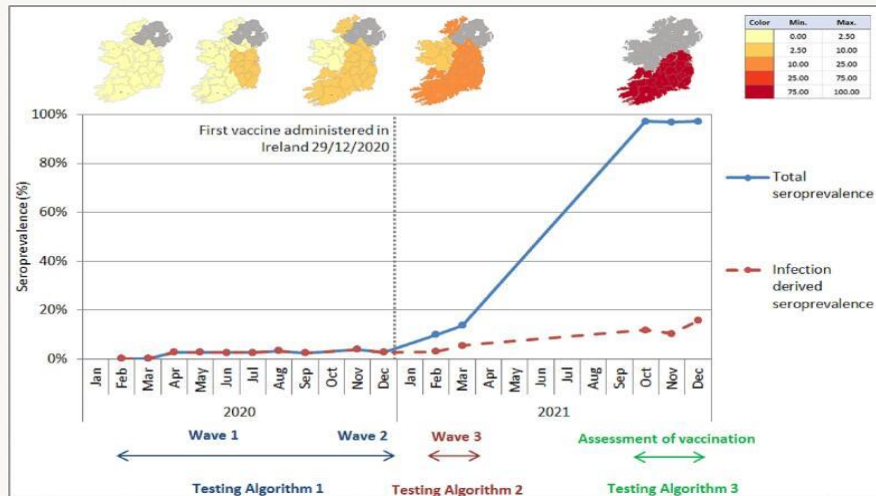
Fig. 2. SARS-CoV-2 antibody detection in donations received from different geographical locations over time



Publications

The national vaccination programme began on the 29th December 2020. We undertook a study evaluating the impact of vaccination on seroprevalence and on quantitative anti-Spike levels.

Fig. 1. SARS-CoV-2 antibody detection rate in Irish Blood Donors in 2020 and 2021.



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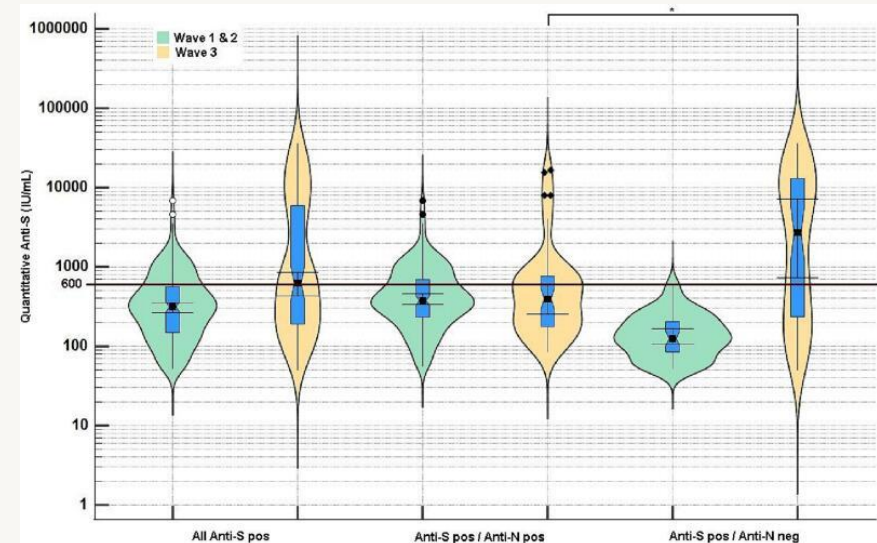
journal homepage: www.sciencedirect.com/journal/global-epidemiology

The changing profile of SARS-CoV-2 serology in Irish blood donors

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Fig. 2. Quantitative Anti-Spike antibody levels in Irish Blood donors grouped according to time of collection and serological profile



Collaboration with SEU

- In 2021 we were approached by the newly formed SeroEpidemiology Unit (SEU) in the HPSC to perform COVID-19 serosurveillance.
- In October 2021 we undertook what was to be a 12 week study to assess trends in SARS-CoV-2 quantitative antibodies on a weekly basis in blood donors. This study was extended by 6 weeks and has since been extended into 2024 on a fortnightly basis.

Collaboration with SEU

- Study Aims:
 - To measure the prevalence of antibodies due to both infection and vaccination by age group and sex
 - To measure the quantitative antibody levels by age group and sex
 - To measure quantitative antibody levels in repeat donors
 - To monitor trends that may indicate waning immunity and to use this data to inform public health actions, including modeling and vaccination strategy

COVID-19 Data Hub

The service:

- Samples are collected, de-identified, and subsampled
- Testing for quantitative anti-S is carried out at IBTS
- Samples are referred to CPL for anti-N testing
- Donor demographic details including age, sex, location of collection are compiled with screening results
- Results are reported to SEU fortnightly for upload to the COVID-19 Data Hub, which is publicly available.

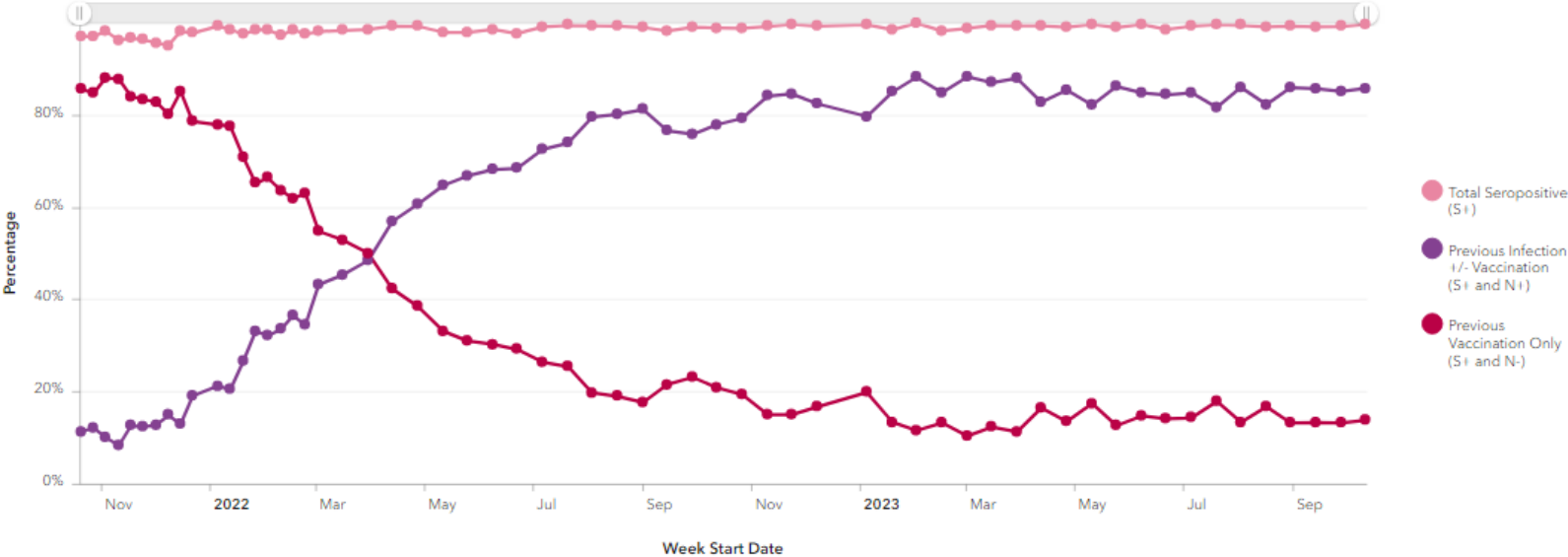
Summary of COVID-19 Seropositivity Over Time

Summary of COVID-19 Seropositivity Over Time

Select Data Source
IBTS

Selected Data Source: IBTS, Total Samples to Date: 26,533

Click tabs below graph to change between Rate and Count - Drag slider to filter by date.



Quantitative Spike Antibody Levels by Target Antigen

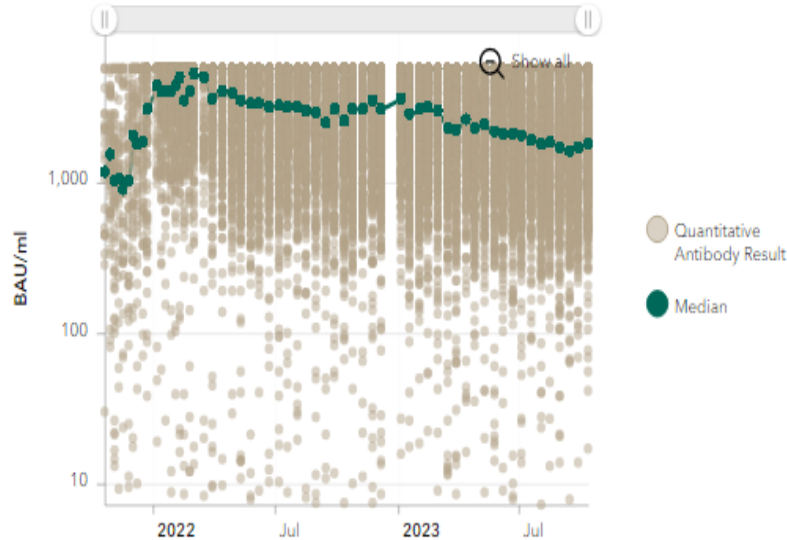
Quantitative Spike Antibody Levels by Target Antigen

Click top right corner to expand graph section (note: y-axis log scale)

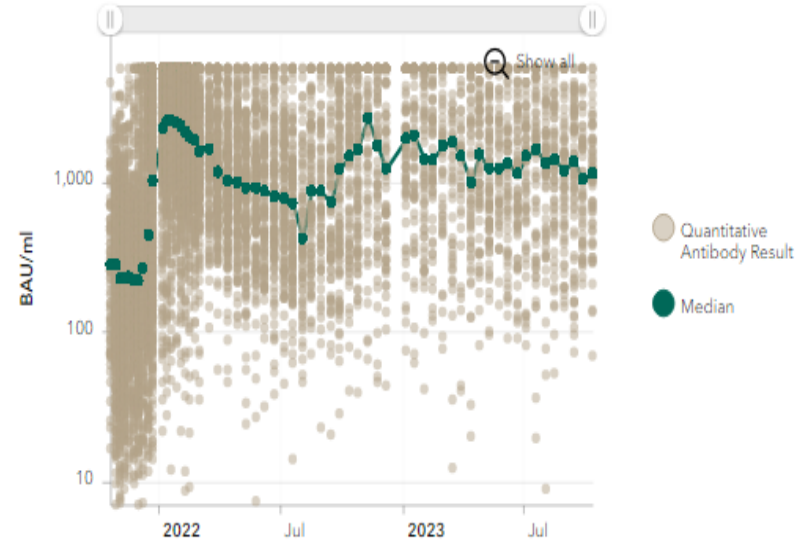
Select Data Source
IBTS

Selected Data Source: IBTS

Previous Infection +/- Vaccination (S+ and N+)



Previous Vaccination Only (S+ and N-)



Blood Donors as a Study Population

Strengths

National reach of blood collection

Laboratory capacity

Passive study population- lower cost

Longitudinal cohort sampling

Limitations

Underrepresentation of some groups

“Healthy Donor Effect”

Ethical Implications

Blood Donors- A representative population?

- Studying a sample of blood donors may allow us to extrapolate these findings to the wider population.
- However, blood donors may not be representative of the whole general population. They are considered a healthy subset of the general population.
- Donors may differ from the general population in a number of ways;
 - Donor demographics- under-representation of certain age groups, ethnic minorities etc.
 - Socioeconomic status/Geographic location- likely under-presentation of higher deprivation index areas
 - Health- deferrals for certain illnesses, haemoglobin deferrals etc.
 - Infectious disease risk- deferral of donors for BBV related risk behaviors

Pathogens suitable for Blood Donor Surveillance

- SARS-CoV-2 seroprevalence appears to be similar in Ireland in the LSN population and the blood donor population- the relevance of the “Healthy Donor Effect” depends on a number of factors, including the pathogen in question.
- Infections that are not transmissible by blood, or by risk behaviors that would lead to donor deferral, and those that are commonly asymptomatic may be suitable for blood donor surveillance.
- Blood donor surveillance can provide data on the unseen proportion of cases or on asymptomatic cases. This can provide data for estimates of true prevalence.
- There may be a role for blood donor studies in surveillance of vaccine preventable infections (measles, mumps etc.)

Virology research outputs since 2021

2021	Collaboration with Health Protection Surveillance Centre (HPSC): SAYBRI Study “SARS-CoV-2 Antibodies in Young Blood Donors in Ireland” https://www.irishtimes.com/health/2022/07/24/almost-90-of-young-blood-donors-have-evidence-of-previous-covid-infection/
2021	Paper 1: Butler et al. “Confirmed circulation of SARS-CoV-2 in Irish blood donors prior to first national notification of infection” published in the Journal of Clinical Virology. Part funded study. Reported in the national media https://www.irishtimes.com/news/ireland/irish-news/covid-19-circulating-in-ireland-at-least-two-weeks-before-first-confirmed-case-study-1.4751562
2021 to present	Collaboration with SeroEpidemiology Unit, HPSC: On-going serosurveillance in blood donors started in October 2021.
2022	Supervised undergraduate research project 2022: “Evaluation of Chagas Assay for Qualification of Brazilian Blood Donors”
2022	Supervised MSc research project 2022: “SARS-CoV-2 Seroprevalence in blood donors”
2023	Paper 2: Coyne et al. “The changing profile of SARS-CoV-2 serology in Irish blood donors” published in Global Epidemiology
2023	Supervised undergraduate research project 2023: “Verification of SARS-CoV-2 IgG II Quant Assay on the Abbott Alinity i”
2023	Ferritin Study, over 2000 samples tested for Ferritin, further work planned. Work presented by the R&D department at the International Society of Blood Transfusion conference (ISBT) Gothenburg, 2023.
2023	Donor Epidemiology Studies: CMV Seroprevalence and Seroconversion study: Work on-going with a view to publishing
2023	HBV donor epidemiology: Poster presentation at ISBT
2024	Investigation of Vitamin D levels, Folate RBC, Ferritin and Hg levels in Irish donors

Future Perspectives

- Further collaborations with public health on surveillance of emerging infectious diseases
- Potential role in the surveillance of vaccine-preventable infections.
- Metabolic parameters e.g. ferritin, Vitamin D levels, Folate RBC, Ferritin and Hg levels in Irish donors

Future Perspectives

- Targeted recruitment of donors for scientific studies. Danish Blood donor study model.
- The Danish Blood Donor Study (DBDS) is a prospective and evolving research platform and biobank infrastructure. More than 150,000 blood donors have until now been included in this nation-wide open cohort with the purpose of studying the impact of blood donation on health and also more broadly disease development among the participants.

Future Perspectives

- The establishment of an IBTS Biobank- Based on the Finnish model- Since 2017 around 50,000 EDTA whole blood samples have been collected from blood donors who have consented to biobanking in Finland.
- This collection contains samples of DNA, whole blood, serum and plasma. The Biobank transfers all samples and data in coded (pseudonymised) form, which means that the identity of individual sample providers cannot be revealed.
- The Biobank only releases material for use in high-quality health research and product development.
- Paper titled “Attitudes of blood donors to their sample and data donation for biobanking”
- Range of research areas using these samples is vast.

Conclusion

- The response to the COVID-19 pandemic highlights the role that blood establishments can play in informing public health policy and indicates that this role could be expanded in the future in the cases of both emerging infections and vaccine preventable diseases. Blood donor studies offer a unique opportunity to screen healthy populations for the presence of antibodies to infections on a national level and with the opportunity for longitudinal sampling of returning donors.

Conclusion

- The relationship between blood establishments and public health should be leveraged to support infectious disease surveillance programmes. Blood donor studies can provide vital surveillance data of healthy populations in real-time.
- In addition studies such as the measurement of ferritin levels in donors and Vitamin D levels are now happening.
- The area of targeted donor recruitment for studies and biobank participation- Learn from the best.

Thank you

- Dearbhla Butler-SMS- Program coordinator.
- Michael Byrne and Adrienne Meehan
- Virology Laboratory team
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- Dr Niamh O' Flaherty