UK Health Security Agency

# SIREN Celebratory Webinar

27 July 2022, 12:30-13:30

Welcome to the event and thank you for joining. Please use the Q&A function to ask any questions and join the conversation on Twitter using #SIRENstudy.

# Thank you message

- Victoria Hall, Consultant Epidemiologist and SIREN Study Lead

YOUR CONTRIBUTION

ONE VISIT

A FEW VISTIS

MANY VISITS

ACTIVE TESTING

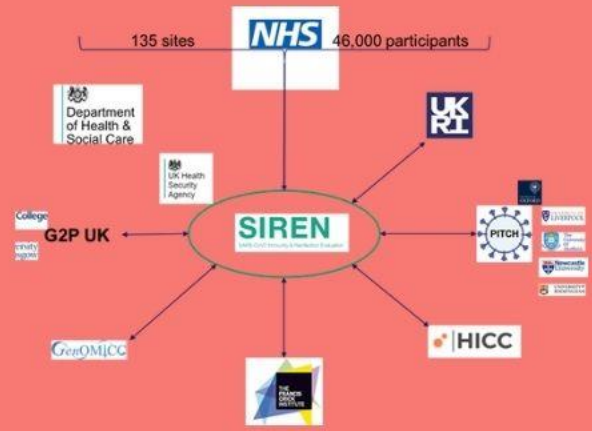
ONE VISIT

A FEW VISTIS

MANY VISITS

SIREN PUBLICATIONS


SIREN CONSORTIUM




SUB-STUDIES

YOUR CONTRIBUTION

ONE VISIT

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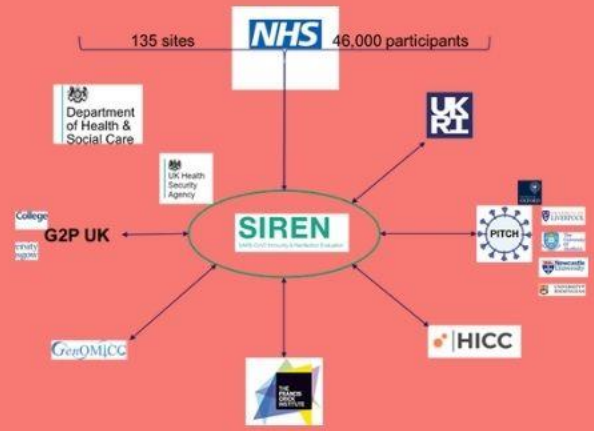



SUB-STUDIES

Enhanced questionnaire for all participants

Enhanced questionnaire for those who have had COVID-19

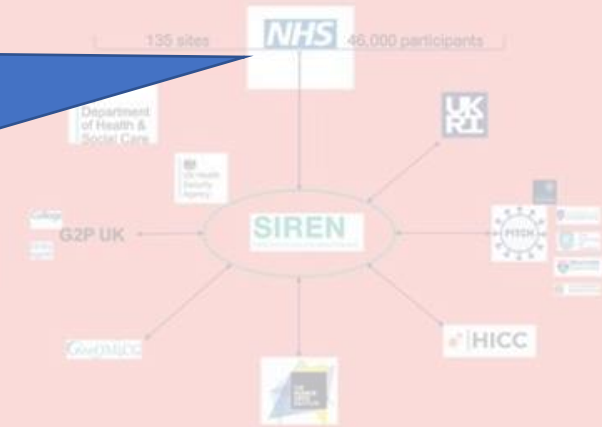
VIBRANT

Winter pressures

SIREN PUBLICATIONS

YOUR CONTRIBUTION

ONE VISIT
A FEW VISITS
MANY VISITS




# OPPORTUNITY FOR EXTENDED FOLLOW-UP

SUB-STUDIES

Enhanced questionnaire for all participants

Enhanced questionnaire for those who have had COVID-19

VIBRANT

Winter pressures

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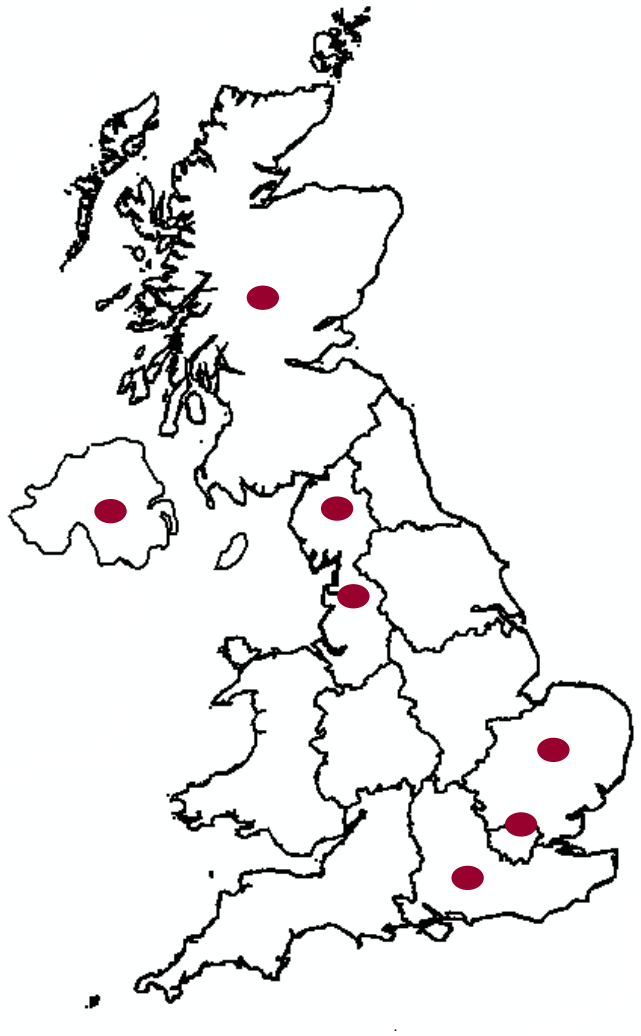
# Who are the SIREN cohort?

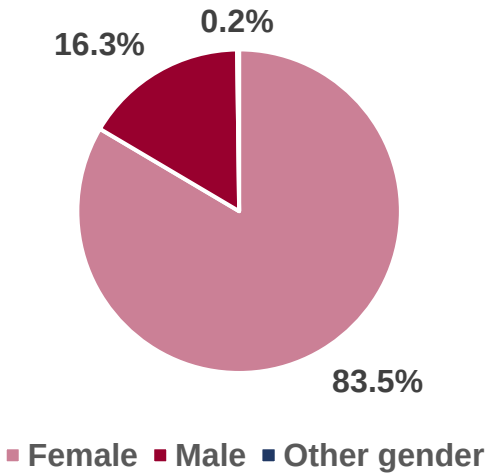
Martin Kelly, Participant Involvement Panel (PIP)

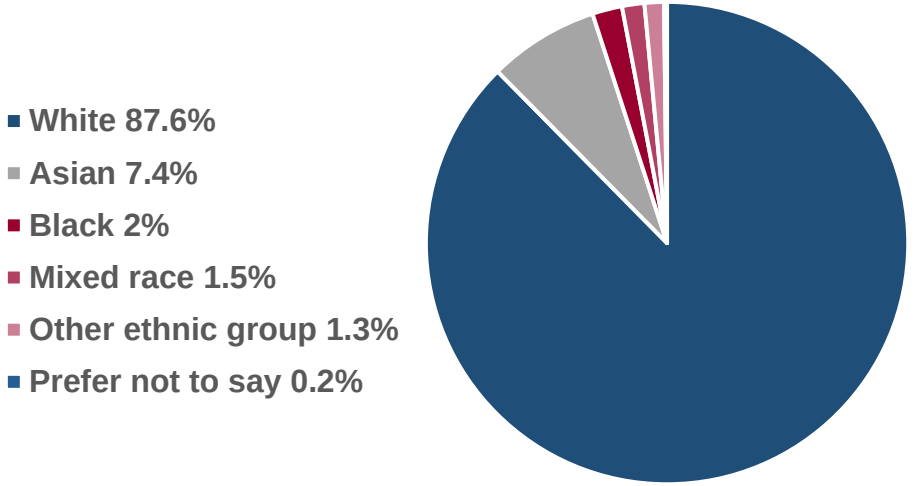
# What is the PIP?

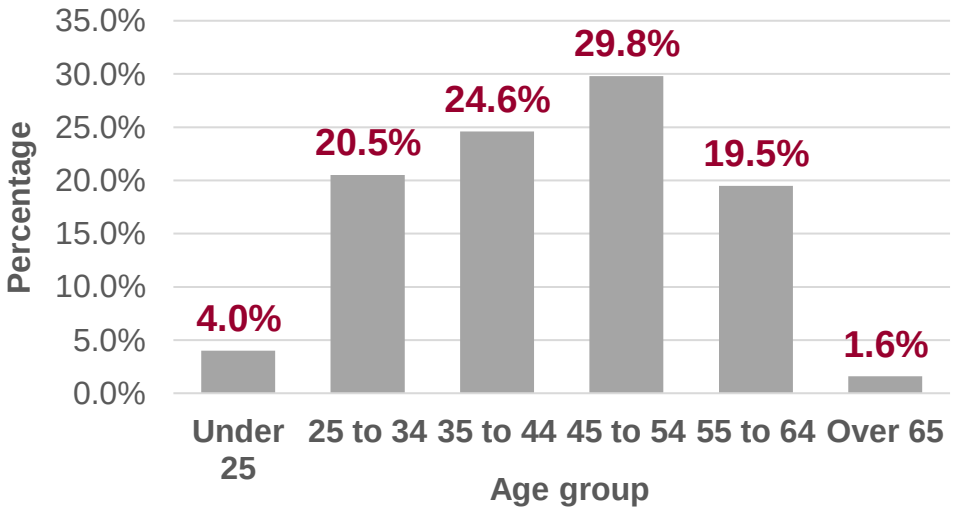
- Seven study participant recruited from a range of geographical and professional backgrounds
- Meet on a six weekly basis
- Our role includes:
  - Providing open and honest feedback on SIREN research aims and outputs
  - Helping with engagement activities
  - Ensuring participant concerns are heard

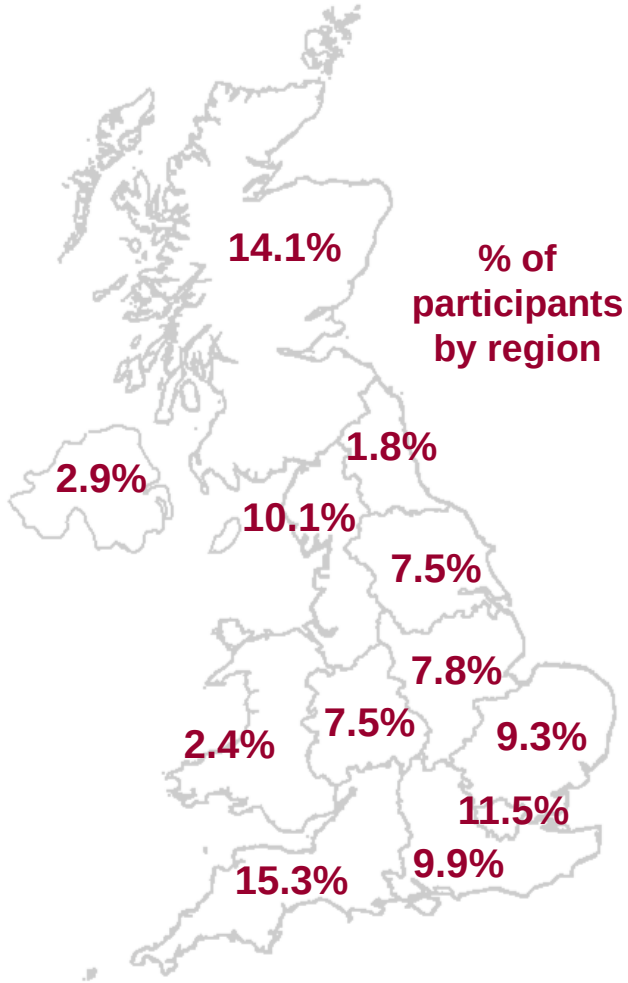


# About the SIREN cohort



# Cohort retention

- **85%** completed their 12-month follow-up
- Factors associated with retention
  - Age (retention highest in older participants)
  - Ethnicity (retention highest in Black participants)
  - Site (retention higher in sites with fewer participants)
- Among withdrawn participants, most stayed for over **6 months**
  - Reasons for withdrawal:
    - workload commitments (36%)
    - moving sites/leaving the NHS (19%)
    - medical reasons (11%)

# Why join the PIP?

- The SIREN team will shortly be advertising a new round of PIP recruitment
- We are excited for the PIP to grow and continue to guide the SIREN study over the next six months
- Please consider applying for a spot in the panel – we are keen to hear from as wide a range of voices as possible

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# SIREN in review: The journey to date

Dr Dominic Sparkes, SIREN Clinical Fellow in Infection

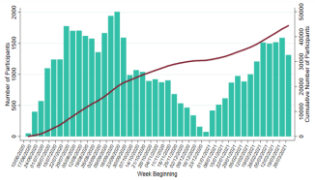
# Recruitment

**18 June 2020**
First participant recruited

**October 2020**
Scotland start recruitment

**December 2020**
Northern Ireland start recruitment

**January 2021**
Wales start recruitment



**31 March 2021**
End of recruitment

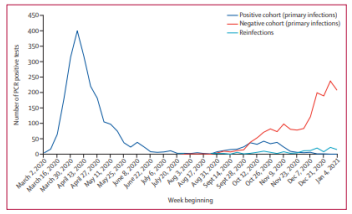
**July 2021**
Recruitment to extended follow-up

**August 2021**
Awarded funding for SIREN Consortium

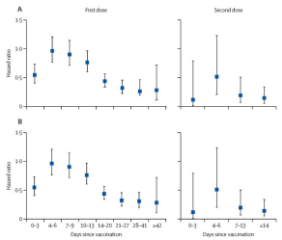
**31 March 2023**
End of extended follow-up

**December 2020**
MedRxiv – Do Ab positive HCWs have less reinfection?

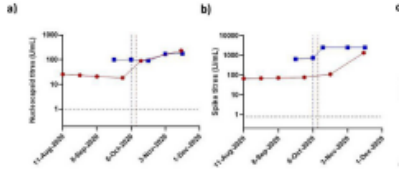
**April 2021**
Lancet – SARS-CoV-2 infection rates of Ab +ve compared to Ab –ve HCWs in England



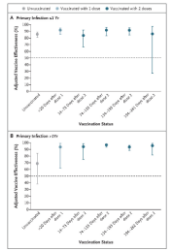
**May 2021**
Lancet – Vaccine coverage and effectiveness of BNT162b2 vaccine



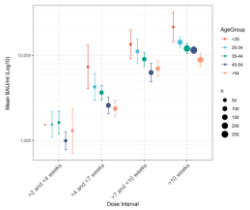
**February 2022**
Journal of Infection – Serological profile of first reinfection cases



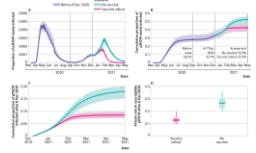
**March 2022**
NEJM – Protection against SARS-CoV-2 after COVID-19 vaccination and previous infection



**April 2022**
MedRxiv – anti-spike antibody levels following BNT162b2 vaccination



**July 2022**
BMJ - without vaccines, second wave infections could have been 69% higher in HCWs



# Publications (not all of them!)

# The Lancet – SARS-CoV-2 infection rates of antibody-positive compared with antibody-negative health-care workers in England: a large, multicentre, prospective cohort study (SIREN)

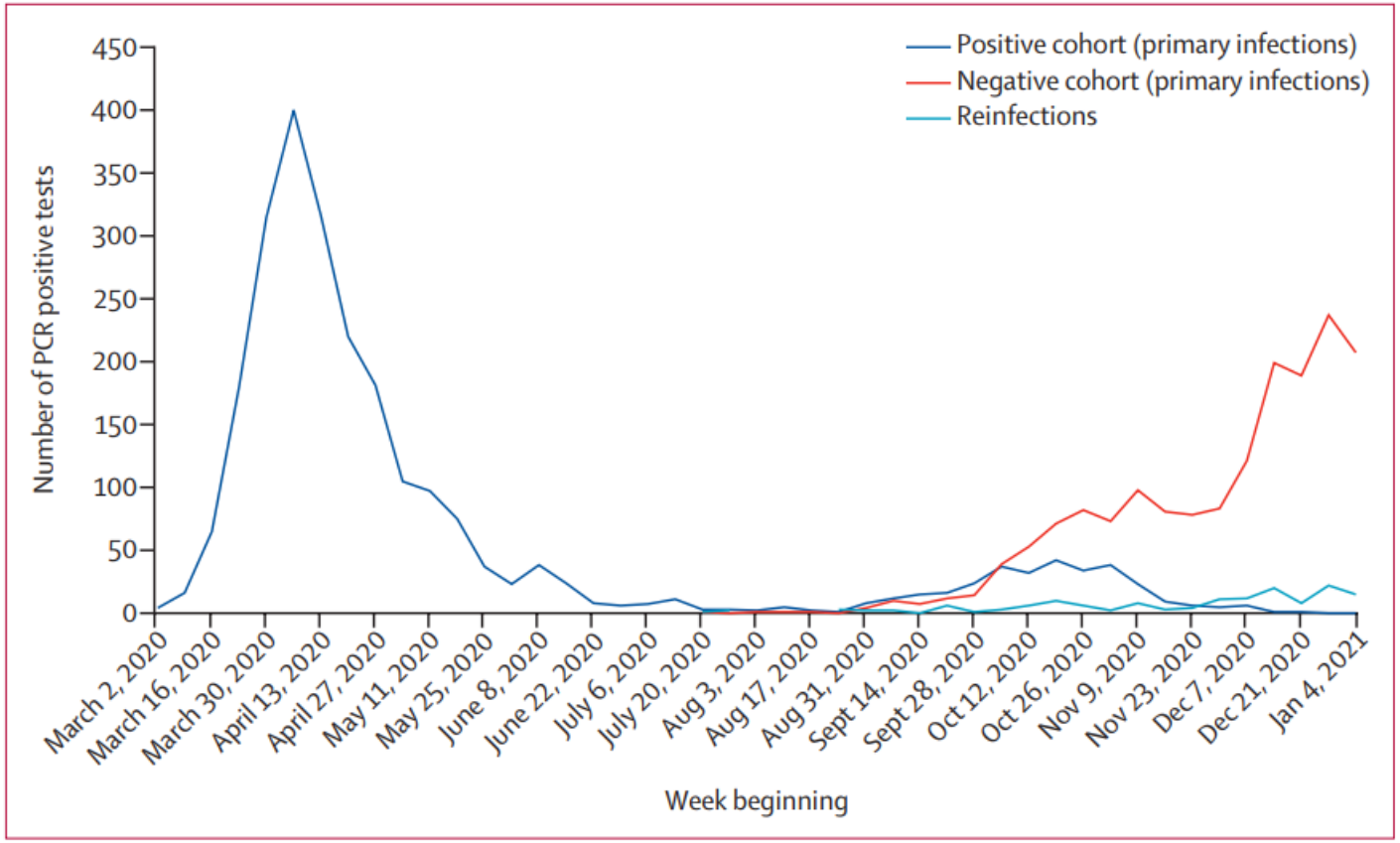



***Figure 2:*** **Weekly frequency of SIREN participants with a first positive PCR test result by baseline cohort assignment, from March, 2020, to January, 2021**

SIREN=The SARS-CoV-2 Immunity and Reinfection Evaluation study.

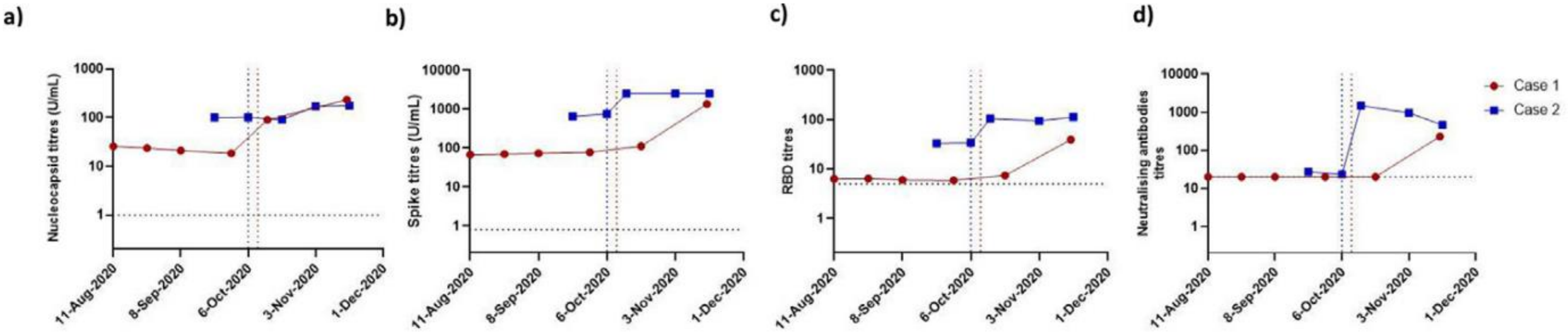
https://doi.org/10.1016/S0140-6736(21)00675-9

# The Lancet – COVID-19 vaccine coverage in health-care workers in England and effectiveness of BNT162b2 mRNA vaccine against infection (SIREN): a prospective, multicentre, cohort study

- Vaccine effectiveness shortly after the first dose of Pfizer was 70%
- Vaccine effectiveness increased to 85% after the second dose
- More participants were asymptomatic following the vaccine

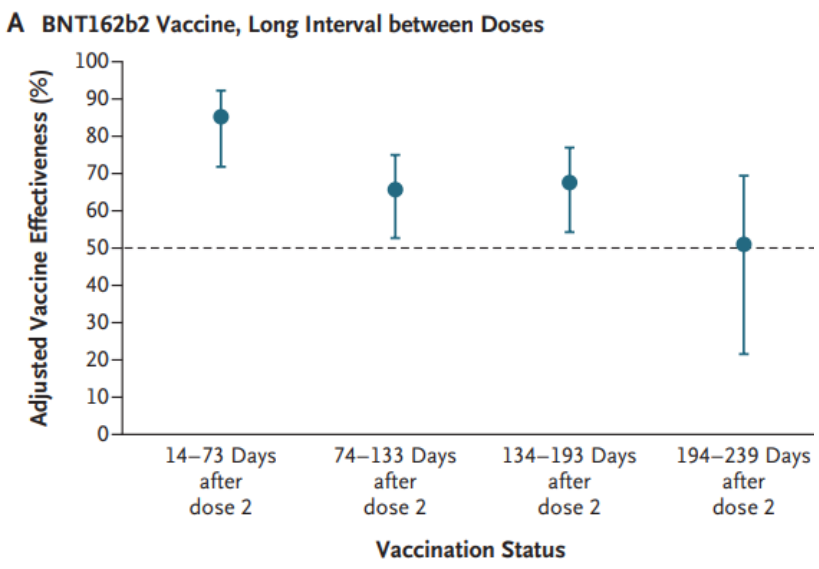
https://doi.org/10.1016/S0140-6736(21)00790-X

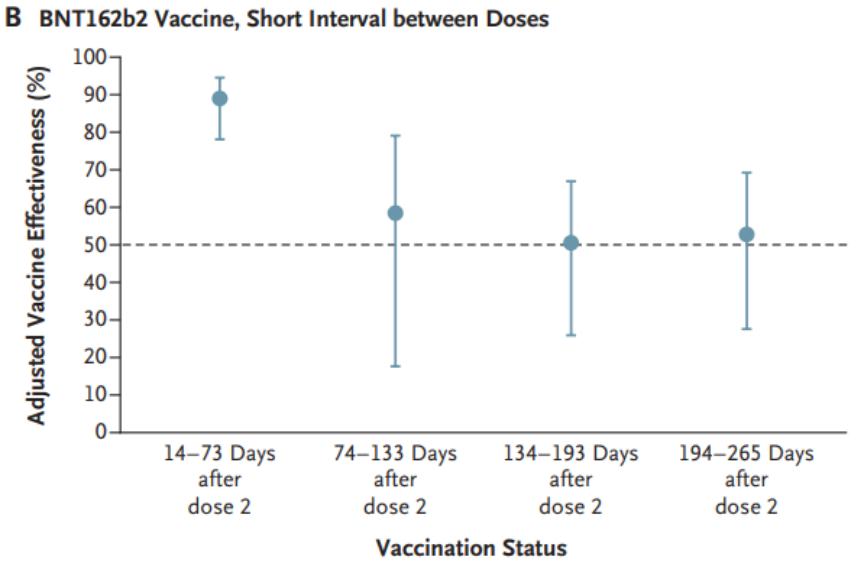
# Journal of Infection – Serological profile of first SARS-CoV-2 reinfection cases detected within the SIREN study (Feb 2022)

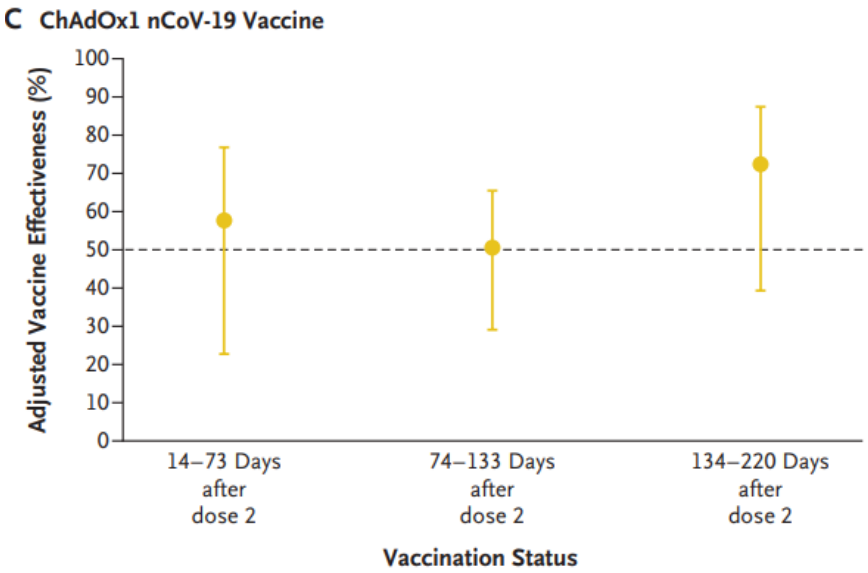



https://doi.org/10.1016/j.jinf.2021.09.019

# New England Journal of Medicine – Protection against SARS-CoV-2 after COVID-19 Vaccination and Previous infection (Mar 2022)

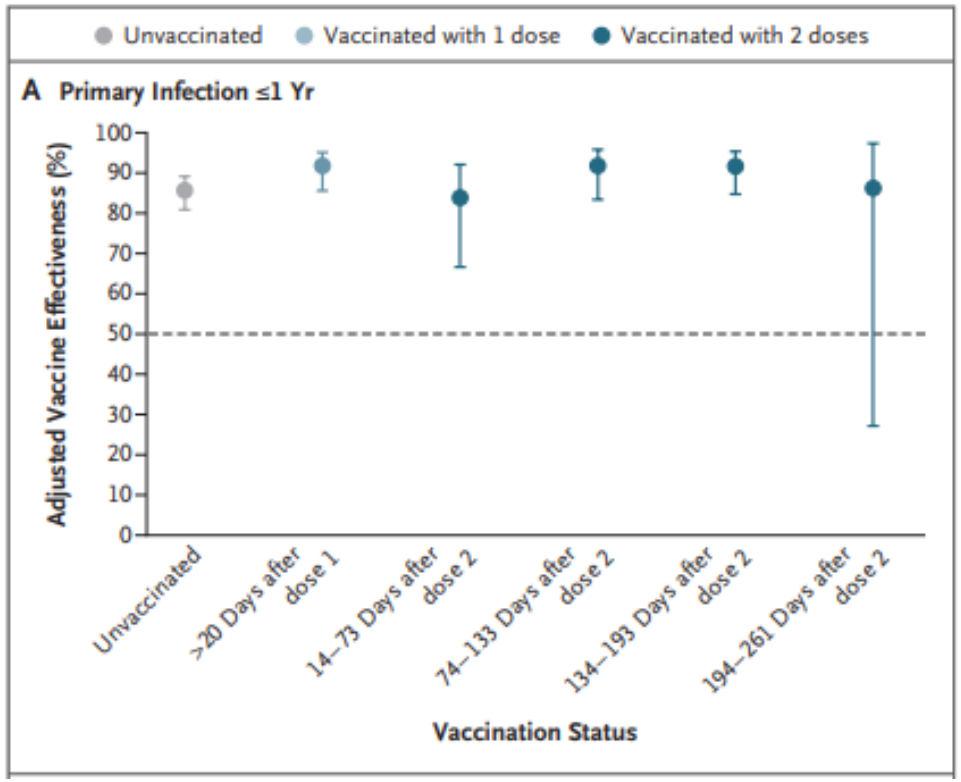


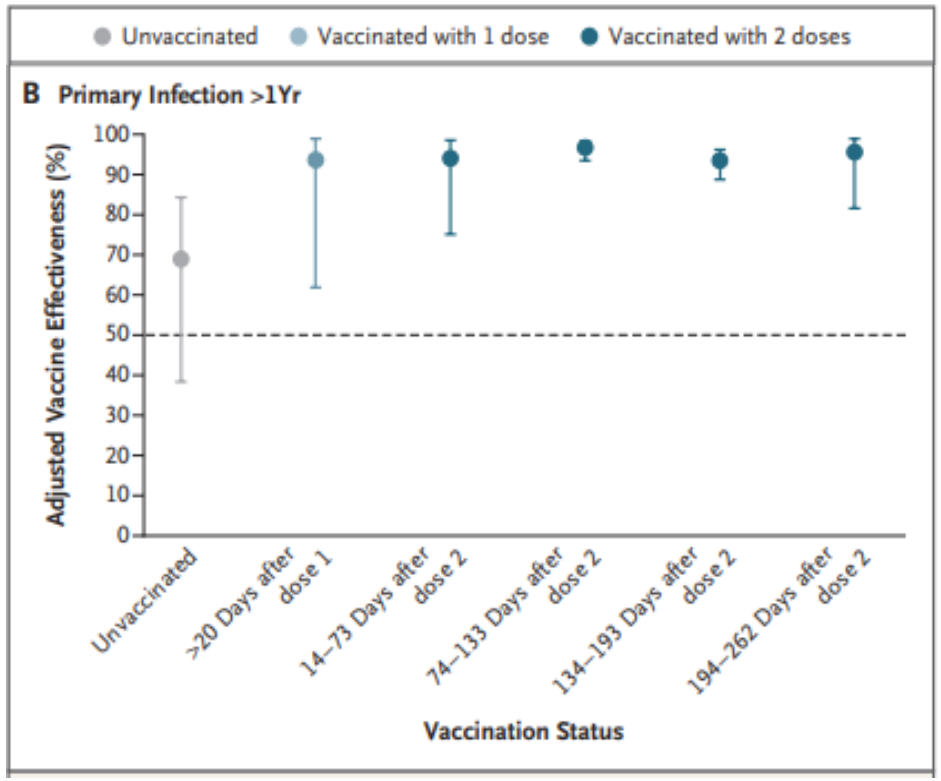




https://doi.org/10.1056/nejmoa2118691

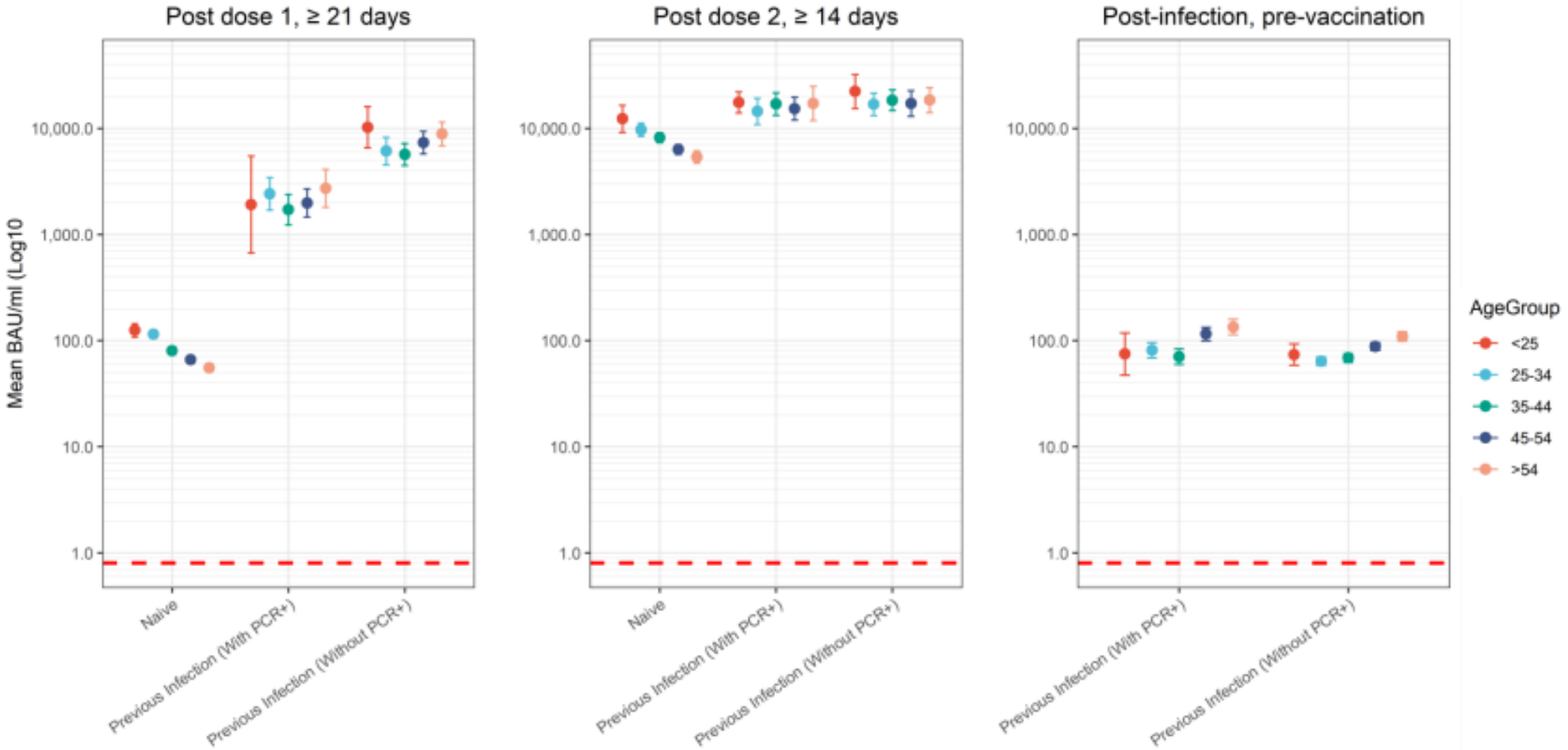
# New England Journal of Medicine – Protection against SARS-CoV-2 after COVID-19 Vaccination and Previous infection (Mar 2022)




https://doi.org/10.1056/nejmoa2118691

# MedRxiv – Determinants of SARS-CoV-2 anti-spike antibody levels following BNT162b2 vaccination: cross sectional analysis of 6,000 SIREN study participants (Apr 2022)




https://doi.org/10.1101/2022.04.21.22274025

# ECCMID 23-26 April 2022

## Antibody correlates of protection from SARS-CoV-2 reinfection: a case-control study

Ana Atti*, Ferdinando Insalata, Edward Carr, Javier Castillo-Olivares, Ashley Otter, Sarah Foulkes, Andrew Taylor-Kerr, Nipunadi Hettiarachchi, Caio Tranquillini, Davina Calbraith, Michelle Cole, Edgar Wellington, Jameel Khawam, Katie Munro, Mary Wu, Michael Howell, Ruth Harvey, Jonathan Lyall, Angalee Nadesalingam, Kelly Da Costa, Diego Cantoni, Nigel Temperton, Noshin Sajedi, Jacqueline Hewson, Edward Monk, Iain Milligan, Diane Corrigan, Lisa Cromey, Lesley Price, Chris Norman, Ezra Linley, Meera Chand, Colin Brown, Jasmin Islam, Amanda Semper, Maria Zambon, Jonathan Heeney, Rupert Beale, Andre Charlett, Tim Brooks, Victoria Hall, Susan Hopkins

### BACKGROUND

An understanding of whether antibody titres against SARS-CoV-2 can predict protect against symptomatic and asymptomatic SARS-CoV-2 remains elusive. It is essential to determine how antibody levels can translate into protection against reinfection and cross-protection against different SARS-CoV-2 variants, as still critical for ongoing pandemic management.

Evidence suggests that absence of a suitable antibody response after first infection and decrease in neutralising antibody titres over time might be associated with SARS-CoV-2 reinfection, with increasing evidence that antibody titres immediately before an infection episode are especially relevant to prevent a new infection.

We aimed to investigate differences in serological profiles between SARS-CoV-2 reinfection cases within the SIREN (SARS-CoV-2 Immunity and Reinfection Evaluation) Study and matched controls, as well as to identify potential correlates of protection against reinfection.

### METHODS

A case-control study, in which reinfection cases were identified according to SIREN case definitions and singly infected individuals were selected as controls, matched by gender, age, geographic region and first infection period.

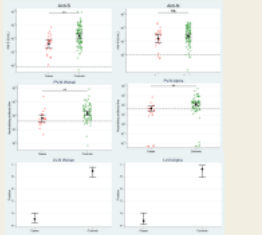
- Primary infections occurred during ancestral virus circulation.
- Reinfections occurred: October 2020 to February 2021.
- Serum samples: closest sample before reinfection from cases and similar calendar time sample from matched controls before vaccination.
- Samples tested for:
  - Anti-SARS-CoV-2 spike IgG (S) and antiSARS-CoV-2 nucleocapsid (N) assays
  - Pseudovirus microneutralisation (PV-N)
  - Live virus microneutralisation (LV-N) assays against different variants.

Differences between antibody titres were analysed and a conditional logistic regression model estimated antibody titres that could correlate with protection against SARS-CoV-2 reinfections.

### RESULTS

Anti-S, PV-N Wuhan, PV-N Alpha, LV-N Wuhan and LV-Alpha antibody titres before reinfection were significantly lower among cases when compared to controls, whilst no significant difference was observed for anti-N titres.

For LV-N assays, as data not fully quantitative, we have compared the proportion of samples with titres above threshold (>40) between cases and controls.



** p<0.01

**Figure: Comparison between antibody titres: closest sample before reinfection from cases and similar calendar time sample from matched controls**

When looking for an association between antibody titres and odds of reinfection, we have demonstrate:

- **Anti-S titres:** as anti-S titres doubled, odds of reinfection were reduced by 36% (OR 0.63 [CI 0.48-0.85]).
- **Anti-N titres:** No significant association was observed for anti-N levels (OR 0.87 [CI 0.72-1.06]).
- Neutralising antibodies titres:
  - **Live virus neutralisation (LV-N):** above the lower limit of quantitative range (>40) were associated with reduced risk of reinfection for Wuhan and Alpha. No additional benefit for titres over 100.
  - **Pseudovirus microneutralisation (PV-N):** Wuhan and Alpha, titres over 100 were associated with higher protection, but not significant between 41-100.

| Neutralising antibody titres (above threshold of 40) | LV-N Wuhan OR [CI] | LV-N Alpha OR [CI] | PV-N Wuhan OR [CI] | PV-N Alpha OR [CI] |
|---|---|---|---|---|
| 41-100 | **0.02 [0.00-0.26]** | **0.04 [0.00-0.40]** | 0.35 [0.08 – 1.53] | 0.59 [0.13-2.57] |
| >100 | 0.81 [0.14 – 4.86] | 3.06 [0.14 – 65.12] | **0.16 [0.03-0.95]** | **0.08 [0.01-0.57]** |

Bolded results are statically significant (p<0.05)

**Table: Associations between neutralising antibody titres and reinfection**

### CONCLUSIONS

Our study demonstrated that SARS-CoV-2 antibody titres (S, PV-N Wuhan, PV-N Alpha, LV-N Wuhan and LV-N Alpha) were directly correlated with probability of SARS-CoV-2 reinfection, which has not been shown for anti-N antibody titres.

In addition, the presence of LV-N antibody titres (i.e. LV-N Wuhan and LV-N Alpha) above the positivity threshold (>40) infers protection against SARS-CoV-2 reinfection, whilst for PV-N antibody titres (i.e. PV-N Wuhan and PV-N Alpha) protection against reinfection was only observed for titres above 100.

Work is ongoing to explore correlation between assays, recognising its clinical relevance.

### COLLABORATIONS

This study was performed in collaboration with the SIREN Consortium members. Sample testing was performed as following:

- UKHSA Porton Down (anti-SARS-CoV-2 spike IgG (S) and antiSARS-CoV-2 nucleocapsid (N) assays)
- Humoral Immune Correlated of COVID-19 (HICC) Consortium (pseudovirus microneutralisation)
- The Francis Crick Institute (live virus microneutralisation)

### FUNDING

The SIREN study is funded by the Department of Health and Social Care (DHSC) and the UK Health Security Agency (UKHSA), with contributions from the governments of Northern Ireland, Scotland and Wales. Funding was also provided by The National Institute for Health Research (NIHR) as an Urgent Public Health Priority Study and through the Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance (NIHR200915), a partnership between UKHSA and the University of Oxford. The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The views expressed are those of the authors and not necessarily those of the DHSC, UKHSA or NIH. Research grant funding from UKRI for the SIREN Consortium.

### REFERENCES

1. Khoury, David S., et al. "Neutralizing antibody levels are highly predictive of immune protection from symptomatic SARS-CoV-2 infection." Nature medicine 27.7 (2021): 1205-1211.
2. Jeffery-Smith, Anna, et al. "Reinfection with new variants of SARS-CoV-2 after natural infection: a prospective observational cohort in 13 care homes in England." The Lancet Healthy longevity 2.12 (2021): e811-e819.
3. Lumley, Andrew G., et al. "SARS-CoV-2 seropositivity and subsequent infection risk in healthy young adults: a prospective cohort study." The Lancet Respiratory Medicine 9.7 (2021): 712-720.



## Assessing the burden of SARS-CoV-2 infection in healthcare workers during the second wave in England and the impact of vaccines: statistical analysis of a prospective multi-centre cohort study (SIREN) and mathematical model.

Edward J M Monk*†, Diane Pople†, Stephanie Evans†, Sarah Foulkes, Jasmin Islam, Edgar Wellington, Ana Atti, Russell Hope, SIREN Study Group, Julie Robotham, Susan Hopkins, Colin S Brown, Victoria J Hall. *Presenting author. †Joint first authors.

European Conference of Clinical Microbiology and Infectious Diseases (ECCMID) 2022, Lisbon, Portugal.

### BACKGROUND

The SARS-CoV-2 pandemic's second wave in England (September 2020 to April 2021) had a higher peak of COVID-19 hospital admissions than the first, and included both the emergence of the Alpha variant (B.1.1.7) and the introduction of the UK's vaccination programme.

Understanding how demographic and occupational risk factors contribute to infection risk within the healthcare workforce is essential for policy planning. Staff shortages due to illness and isolation, particularly during the peak of the second wave prior to vaccine rollout, compounded the already high clinical burden faced by the National Health Service (NHS) in winter 2020-2021; protecting healthcare workers (HCW) from infection is crucial, not only for their health but also service provision and patient safety.[1,2]

The SIREN (SARS-CoV-2 Immunity and Reinfection Evaluation) Study is a prospective UK cohort study, evaluating the immune response to SARS-CoV-2 in hospital healthcare workers (HCW). In this study, we aim to describe the incidence of, risk factors for, and impact of vaccination on primary SARS-CoV-2 infection during the second wave of the pandemic in a large cohort of susceptible HCW in England, enrolled into the SIREN study, to inform future policies aiming to protect HCW from infection.

### THE SIREN PROTOCOL

SIREN is an on-going multicentre cohort study of HCW (clinical and non-clinical) in which participants undertake SARS-CoV-2 PCR every two weeks and antibody testing every month. COVID-19 vaccination status is collected from national registries and self-reporting. Data on demographics and exposures (workplace, community and household) were collected in the enrolment questionnaire.[3]

Participant PCR and antibody testing results since the beginning of the SARS-CoV-2 pandemic are available for analysis through the UK Health Security Agency's (UKHSA) Second Generation Surveillance System (SGSS) platform, regardless of whether they were taken as part of the SIREN protocol or through symptomatic testing.

### METHODS

Our study population was SIREN participants from English sites who entered the second wave of the pandemic (1 September 2020 to 30 April 2021) susceptible to a primary SARS-CoV-2 infection: susceptibility was defined as having no record of SARS-CoV-2 polymerase chain reaction (PCR) or serological positivity. Participants were included if they were susceptible to primary infection on 1 September 2020 or on enrolment if they had a later cohort entry. Participants were excluded if they enrolled after the start of the vaccine rollout (8 December 2020) or did not have linked PCR tests during the second wave.

We calculated the weekly incidence of primary SARS-CoV-2 infection and the weekly cumulative vaccination coverage (one or more doses) in susceptible participants. We stratified primary infection attack rates during the second wave by demographic, household and occupational characteristics (gender, age group, ethnicity, medical conditions, index of multiple deprivation quintile, household size, children in household, region, frequency of exposure to patients with COVID-19, occupational setting and occupation). We calculated odds ratios (OR) and adjusted OR for primary infection: adjustment was performed using a mixed-effects logistic regression model, reported with 95% confidence intervals (CI) and Wald test results. In this regression, all stratification characteristics were included as categorical variables (fixed-effects) within organisation-level clusters (random-effects). Continuous fixed-effect variables were included to adjust for time contributing to the analysis (due to the rolling recruitment to the cohort) and for time to first vaccination.

Finally, we assessed the impact of the vaccination programme on infection rates using a mathematical model, with which we simulated a counterfactual scenario where nobody was vaccinated. We compared this to modelled output for the scenario representing the vaccine rollout in England which had been validated against data from SIREN and SGSS. This individual-based model simulated transmission between and within patients and patient-facing hospital healthcare workers. The model had a susceptible-exposed-infected-recovered (SEIR) structure: simulated individuals represented pHCW and patients, all of which were all fully susceptible at the start of pandemic, who progressed upon transmission through an incubation period before an infectious stage (including asymptomatic cases) and recovery.

### RESULTS

We included 18284 susceptible participants from England, recruited from 105 secondary care health organisations (NHS Trusts). Between the beginning of September 2020 and the end of April 2021, there were 2353 new primary infections: a crude attack rate of 12.9%.

Incidence peaked during week commencing 29 December 2020, and then rapidly decreased, coinciding with vaccination rollout and England's third national lockdown beginning 6 January 2021. Vaccination coverage (first dose) was 26.9% (4914/18284) on 31 December 2021, 88.3% (16143/18284) on 31 January 2021 and 98.1% (17576/18284) on 30 April 2021. The rate of initial vaccine coverage growth (up until 31 December 2021) was fastest amongst doctors (50.4%, [923/1832]), and staff working in intensive care settings (41.2% [417/1012]) or theatres (38.9% [124/319]). Initial vaccine coverage growth was slowest in administrators (15.9% [464/1297]), office-based staff (18.6% [736/3953]), and participants of black ethnicity (19.4% [55/284]).

Factors associated with infection included:

- Age <25 years (adjusted odds-ratio [aOR] 1.35 [CI 1.07-1.69])
- Large household size (households of ≥5: aOR 1.54 [CI 1.23-1.94])
- Frequent exposure to patients with COVID-19 (exposed every shift: aOR 1.79 [CI 1.56-2.06])
- Working in an Emergency Department/inpatient ward (aOR 1.76 [CI 1.45-2.14])
- Being a healthcare assistant (aOR 1.43 [CI 1.16-1.77])

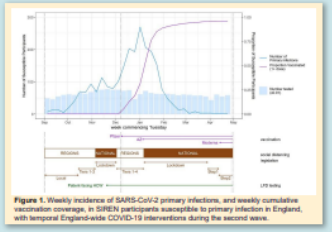


**Figure 1.** Weekly incidence of SARS-CoV-2 primary infections, and weekly cumulative vaccination coverage, in SIREN participants susceptible to primary infection in England, with temporal England-wide COVID-19 interventions during the second wave.

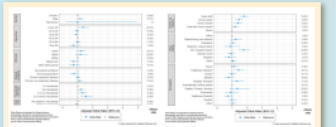


**Figure 2.** The association of demographic, household and occupational characteristics of SIREN participants susceptible to primary infection during the second wave.

Our counterfactual mathematical modelling indicated an additional 9.9% of all patient-facing hospital HCW (52.3% vs 42.5%) could have been infected by the end of the second wave without the vaccine rollout.

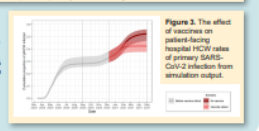


**Figure 3.** The effect of vaccines on patient-facing hospital HCW rates of primary SARS-CoV-2 infection from simulation output.

### DISCUSSION

SIREN is a large prospective cohort study that is well positioned to explore the incidence of SARS-CoV-2 infection in the hospital workforce. We have well-defined prior exposure history from an enrolment questionnaire (with very low impact from missing data), a frequent PCR testing schedule, and laboratory records since the pandemic began through SGSS, regardless of participant enrolment date.

In our multivariable analysis, risk of infection remained significantly higher for occupational groups with frequent exposure to patients with COVID-19, those working in Emergency Department/inpatient ward settings and those working as a healthcare assistant. These findings underscore the importance of research into the nature of staff-staff and patient-staff contact in difference healthcare cadres and settings, even in the context of vaccination.

The main limitation of this study is the lack of discriminatory power needed to explore variations in organisation-level infection prevention and control (IPC) policy during the second wave and organisational infrastructure. This study is also unable to unpick the behavioural nature of the demographic and occupational risk factors observed; this will be a focus of future work.

### CONCLUSIONS

- 12.9% of susceptible SIREN participants had a primary SARS-CoV-2 infection during the second wave of the pandemic in England.
- We estimate that the rapid rollout of the UK's national vaccination programme reduced patient-facing hospital HCW primary infection during the second wave in England by 41%.
- After adjustment, including time to vaccination, the occupational risk factors for infection that remained were exposure to patients with COVID-19, working in an Emergency Department/inpatient ward setting and working as a healthcare assistant.
- Demographic and household risk factors that remained after adjustment were being under 25 years old and living in a household of 3 or more people.
- Time to vaccination was a strongly associated predictor for infection: this finding is important in the context of emerging variants of concern (VOC), such as Omicron, which may require vaccine boosters for adequate protection.
- Future work will explore the nature of the occupational risk factors identified by this study, as well as the impact of the IPC policies used across healthcare organisations.

### FUNDING

The study is funded by the Department of Health and Social Care (DHSC) and the UKHSA, with contributions from the governments of Northern Ireland, Scotland and Wales. Funding was also provided by The National Institute for Health Research (NIHR) as an Urgent Public Health Priority Study and through the Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance (NIHR200915), a partnership between UKHSA and the University of Oxford. The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The views expressed are those of the authors and not necessarily those of the DHSC, UKHSA or NIH.

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2. NHS Digital. NHS Sickness Absence Rates. https://digital.nhs.uk/data-and-information/publication/statistical/nhs-sickness-absence-rates.
3. Wallace S, Hall V, Charlett A, et al. SIREN protocol: impact of detectable anti-SARS-CoV-2 on the subsequent incidence of COVID-19 in 100,000 healthcare workers: do antibody positive healthcare workers have less reinfection than antibody negative healthcare workers? MedRxiv 2020. doi: 10.1101/2020.12.15.20247981.



## SIREN

SARS-CoV2 Immunity and Reinfection Evaluation

### Is the severity of SARS-CoV-2 infections affected by vaccination and prior infection status? A comparative case-series analysis within the UK SIREN cohort study

Authors: Sarah Foulkes, Katie Munro, Victoria Hall, SIREN Study Group, Susan Hopkins

### SIREN

The **SARS-CoV-2 Immunity and Reinfection Evaluation** (SIREN) is a prospective cohort study in healthcare workers.

Over 44,000 National Health Service healthcare workers have been recruited from 135 hospital sites UK-wide.

Participants under active follow-up undergo asymptomatic SARS-CoV-2 PCR testing every 2 weeks.

### METHODS

This analysis used data collected through the SIREN study.

Participants in the study provided information on symptoms (type and duration) via fortnightly questionnaires and fortnightly PCR samples.

COVID-19 vaccination and hospitalisation data were obtained via linkage to national registries and questionnaires.

Participants were divided into those with **primary infections** and **reinfections**, both **before and after vaccination.**

Reinfections were defined as a PCR positive sample either 90 days after an initial PCR positive sample or 28 days after an antibody positive sample.

**DESCRIPTIVE ANALYSIS:** was undertaken to investigate differences between the groups in relation to type, duration and number of symptoms, hospitalisation, and CT values.

**ANALYTICAL ANALYSIS:** logistic regression to estimate odds ratios to investigate the associations between an infection resulting in COVID-19 symptoms, asymptomatic cases or symptoms lasting less than 7 days, adjusting for age, gender, ethnicity, comorbid and variant.

### DISCUSSION

Our analysis has shown that primary infections can result in a **more severe infection** compared to reinfections and infections occurring when unvaccinated vs. vaccinated.

These findings add additional support for supporting national vaccination programmes, as vaccinations can contribute to protection against severe infection.

### INTRODUCTION

There is limited information regarding the **severity** of SARS-CoV-2 infections.

Our **aim** is to determine whether the severity of SARS-CoV-2 infections are affected by vaccination and previous SARS-CoV-2 infection.

### DESCRIPTIVE ANALYSIS

8,434 participants included between 01 February 2020 and 30 November 2021.

A **higher proportion** of participants reported having COVID-19 symptoms related to a primary infection vs. a reinfection.

As well as a longer duration and higher number of symptoms.

The proportion of hospitalisations were higher in primary infections and those before vaccination.

CT values were lower in primary infections vs. reinfections.

Table 1: Number of primary infections and reinfections occurring before and after vaccination, by symptoms type, duration and number, CT value and hospitalisation

| Groups | Primary infection before vaccination (n=6898) | Primary infection after vaccination (n=1317) | Reinfection before vaccination (n=98) | Reinfection after vaccination (n=121) |
|---|---|---|---|---|
| **Symptoms type (n (%))** | | | | |
| COVID symptoms | 4794 (69.5) | 727 (55.2) | 23 (23.5) | 41 (33.9) |
| Non-COVID symptoms | 604 (8.8) | 143 (10.9) | 15 (15.3) | 20 (16.5) |
| No symptoms | 711 (10.3) | 57 (4.3) | 30 (30.6) | 26 (21.5) |
| Not known | 789 (11.4) | 390 (29.6) | 30 (30.6) | 34 (28.1) |
| **Symptoms duration (n (%))** | | | | |
| <7 days | 810 (15) | 185 (21.3) | 17 (44.8) | 16 (26.2) |
| ≥7 days | 4449 (82.4) | 670 (77) | 19 (50) | 44 (72.2) |
| Not sure duration | 139 (2.6) | 15 (1.7) | 2 (5.3) | 1 (1.6) |
| **Number of symptoms (n (%))** | | | | |
| 1 | 729 (15.2) | 126 (17.3) | 11 (47.8) | 8 (19.5) |
| 2 | 1406 (29.3) | 237 (32.6) | 6 (26.1) | 14 (34.1) |
| 3 | 1399 (29.2) | 189 (26) | 1 (4.3) | 14 (34.1) |
| 4 | 1260 (26.3) | 175 (24.1) | 5 (21.7) | 5 (12.2) |
| **CT value (median (IQR))** | 21.3 (17.2-26.9) | 20.2 (17.1-25) | 27.6 (19.8-35) | 30 (24-35) |
| **Hospitalised (n (%))** | 214 (3.8) | 3 (0.4) | 3 (3.8) | 0 (0) |

### ANALYTICAL ANALYSIS

Using primary infection before vaccination as the reference group, infections in the other three groups were **less likely** to have COVID-19 symptoms and symptoms lasting longer than 7 days.

Reinfections were more likely to be asymptomatic.

Table 2: Logistic regression investigating the association between primary infections and reinfections occurring before and after vaccination

| Logistic regression (OR (95% CI)) | COVID-19 symptoms | Symptomatic <7 days | Asymptomatic infection | Hospitalisation |
|---|---|---|---|---|
| Primary infection before vaccination (n=6898) | Ref | Ref | Ref | Ref |
| Primary infection after vaccination (n=1317) | 0.53 (0.5-0.6) | 0.67 (0.6-0.81) | 0.51 (0.4-0.67) | 0.09 (0-0.29) |
| Reinfection before vaccination (n=98) | 0.13 (0.1-0.21) | 0.2 (0.1-0.38) | 3.99 (2.5-6.35) | 0.98 (0.3-3.14) |
| Reinfection after vaccination (n=121) | 0.22 (0.2-0.32) | 0.5 (0.3-0.89) | 2.05 (1.3-3.24) | - |

UK Health Security Agency · Public Health Scotland · HSC Public Health Agency · GIG NHS

www.eccmid.org/abstracts/portal

# Other Outputs

UK Health Security Agency

**SARS-CoV-2 variants of concern and variants under investigation in England**

Technical briefing 44

22 July 2022

This report provides an update on previous briefings up to 24 June 2022

UK Health Security Agency

**SIREN**

SARS-CoV2 Immunity and Reinfection Evaluation

**Surveillance Report: OFFICIAL SENSITIVE**

Report date: 20 July 2022

Data included up to 17 July 2022. This is a rapid surveillance report and data is subject to change

Contact: siren@phe.gov.uk

# Upcoming papers from SIREN

| SIREN Paper Tracker | Publication time frame |
|---|---|
| Baseline serological analysis | Pre-printed with MedRxiv<br>Under peer review |
| Characterising the second wave in healthcare workers | Published with BMJ 20/07/22 |
| Reinfection case control study: Risk factors for reinfection | In submission |
| Rapid report on the Omicron wave: Surveillance paper | In submission |
| Protection from boosters and hybrid immunity during Omicron | August/September 22 |
| Comparing symptoms and severity of primary infections and reinfections | August/September 22 |
| Antibody response to vaccine boosters | August/September 22 |

All publications and updates can be found on our website: www.gov.uk/guidance/siren-study

# The Future of SIREN

- We have ethics approval for an extension to bring participants in line and continue until March 31st, 2023
- We have invited initially English sites to the extension as their participants finish first
- Participants of willing sites will be invited to join

UK Health Security Agency

# SIREN latest research: what we learnt from second wave

Dr Edward Monk, SIREN Clinical Research Fellow

# Characterisation of the second wave

## Aim:

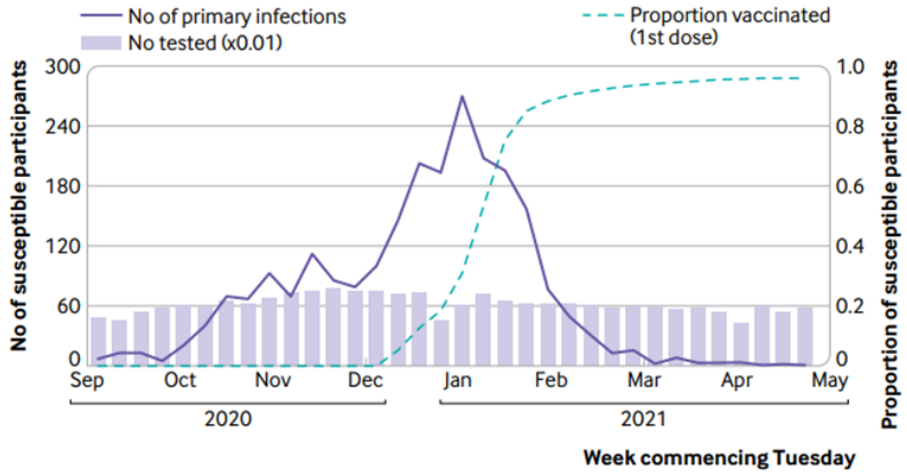
- To characterise the second wave of SARS-CoV-2 in participants susceptible to primary infection and the impact of vaccines

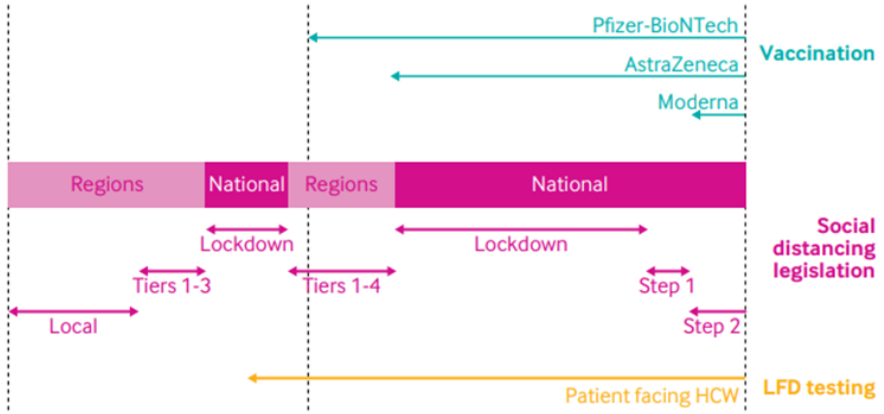
## Objectives:

- To describe the incidence of primary infection throughout the second wave in England in our susceptible cohort

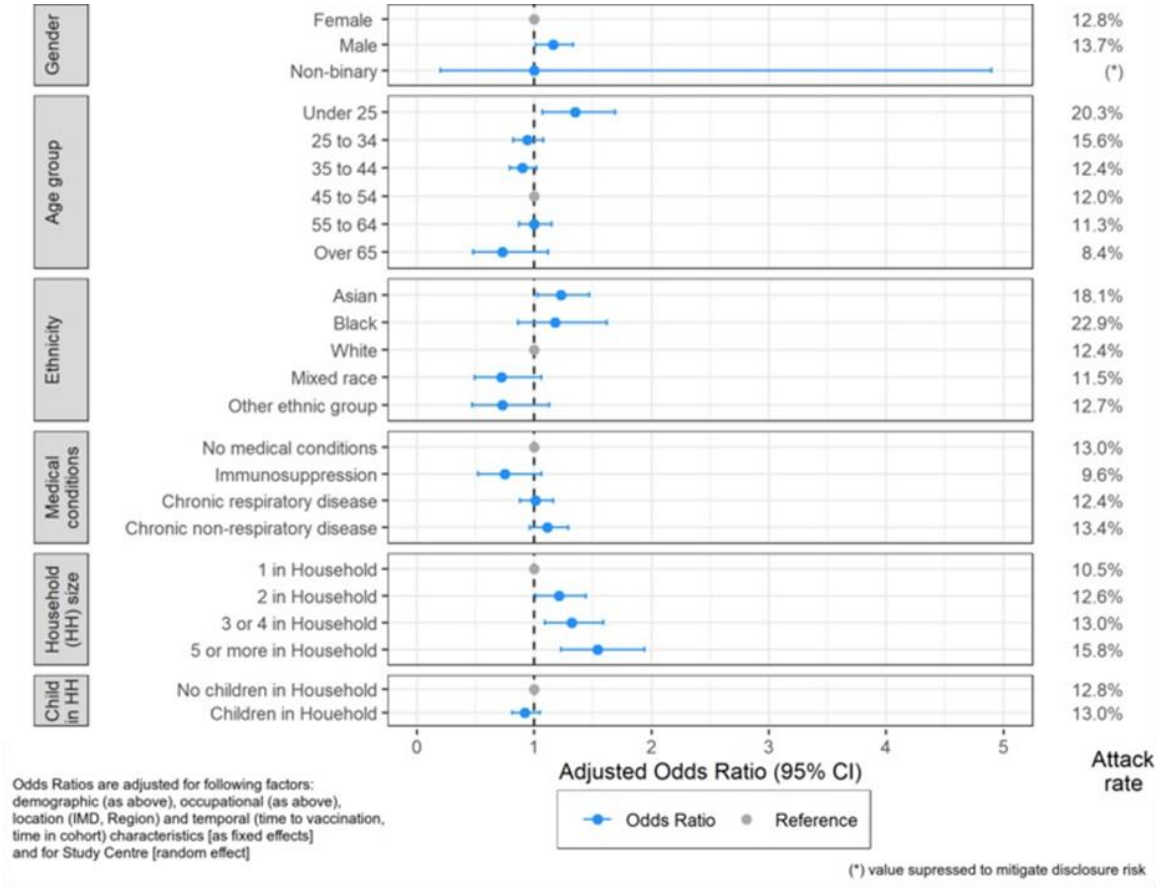
- To establish the demographic, household and occupational risk factors associated with primary infection using a mixed-effects regression analysis

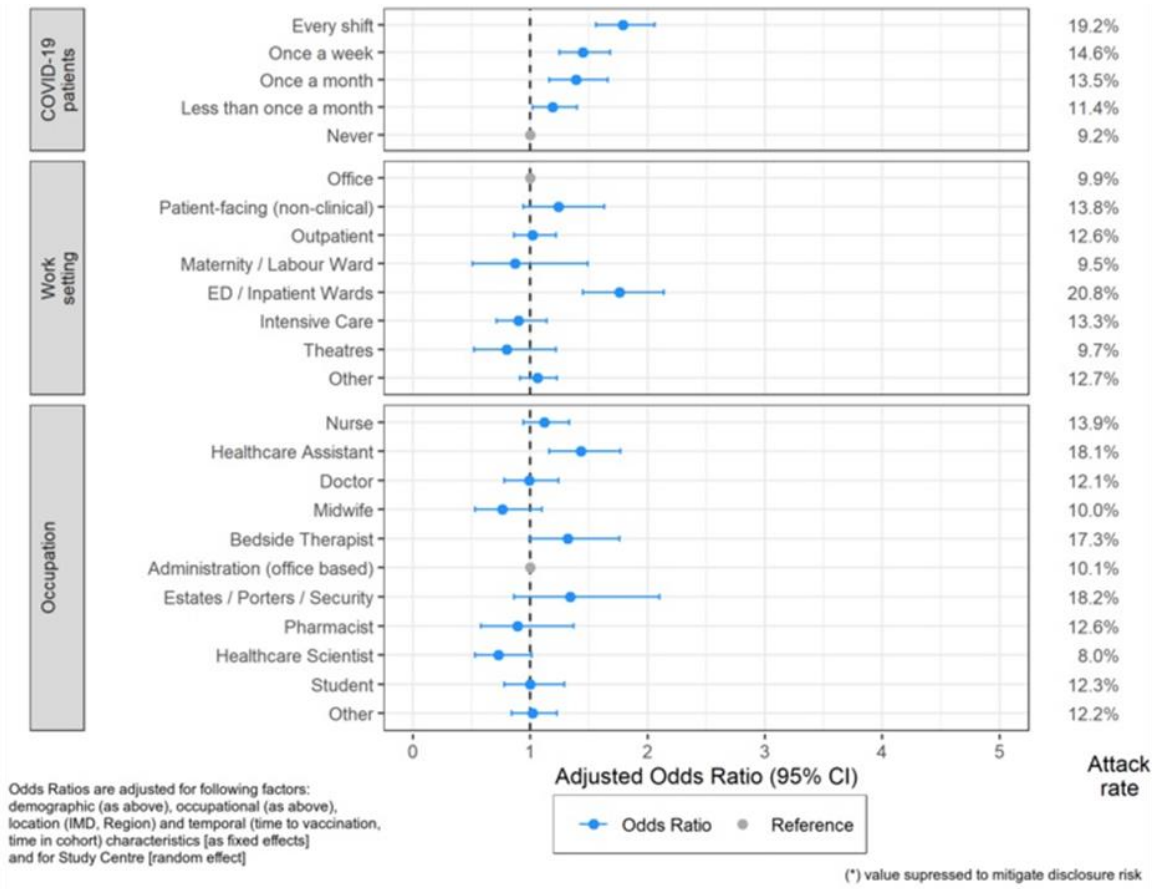
- To estimate the burden of SARS-CoV-2 on patient-facing hospital healthcare workers in England had vaccines not been available during the second wave using and individual based mathematical model



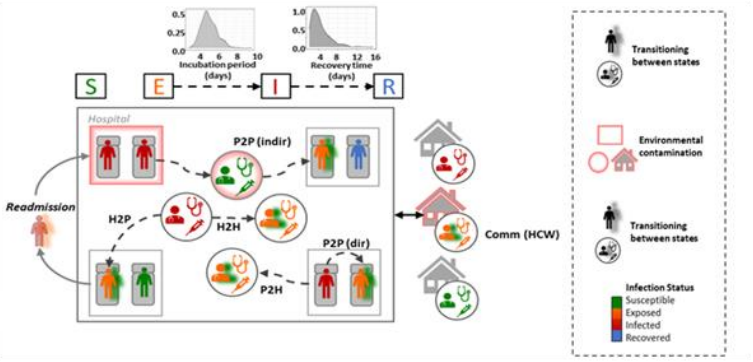
# Risk factors for infection

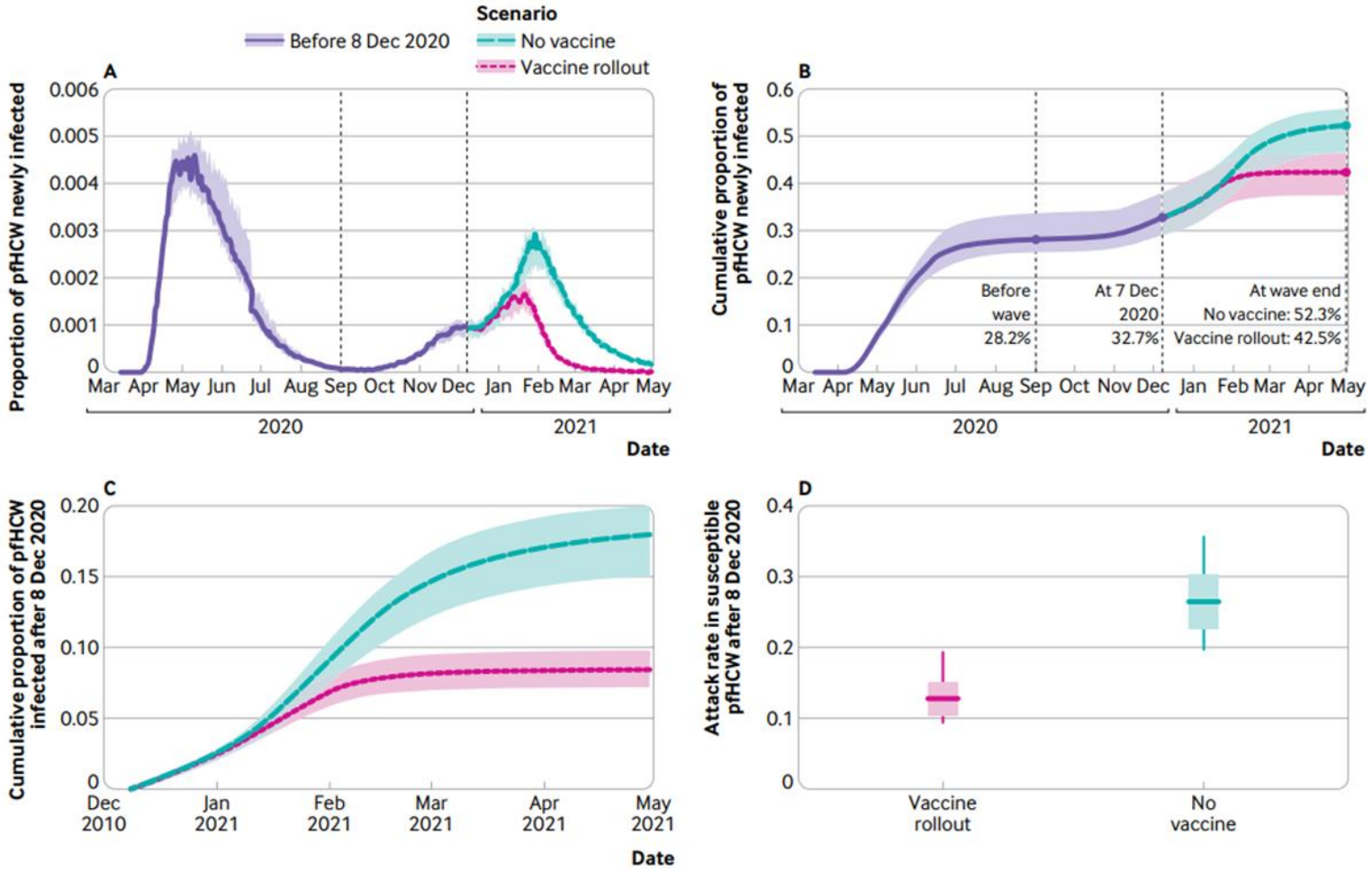


# Impact of vaccines

- Additional 9.9% of patient-facing HCW infected in second wave in no Vaccine scenario
- Represents 69% higher incidence than the vaccine rollout scenario



# Current BMJ coverage


Available at:
https://www.bmj.com/content/378/bmj-2022-070379

CONTINUE ACTIVE FOLLOW-UP

PARTICIPATE IN SUB-STUDIES

JOIN THE PIP

FILL OUT THE ENHANCED QUESITONNAIRE FOR ALL PARTICIPANTS

FILL OUT THE ENHANCED QUESITONNAIRE IF YOU HAVE HAD COVID-19

THANK YOU!

PLEASE STAY INVOLVED!

KEEP AN EYE OUT FOR NEWSLETTERS AND WEBINARS

PROVIDE FEEDBACK

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# Q&A

UK Health Security Agency

# Thank you for joining us.

We will be sharing the webinar recording and slides shortly, but please feel free to email us with any questions in the meantime.

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