Statistics Jersey

SARS-CoV-2: Prevalence of antibodies in Jersey

Statistics Jersey: www.gov.je/statistics

Community survey – round 3

The Government of Jersey has recently completed the third round of the community antibody study. This is a survey of Islanders using rapid test kits in order to estimate the prevalence of SARS-CoV-2 related antibodies in the Jersey population.

Analysis and results

Overall prevalence

Our key finding is that the estimated population prevalence rate of SARS-CoV-2 antibodies is:

4.0% ± 1.2 pp (95% confidence interval)

There is no statistically significant difference between the results of this and the previous round of this study.

This prevalence rate is for the adult resident population living in private households in Jersey. The survey did not perform testing on any person aged under 16 years and did not include residents of communal establishments (such as care homes).

It is important to note that there remains a degree of uncertainty in the performance characteristics of the devices. This uncertainty is not reflected in the above confidence interval.

The estimated prevalence rate implies that the total number of cases of SARS-CoV-2 that have occurred in households living in private accommodation was approximately 3,500. Whilst it is anticipated that there may be differences between this population and those who were excluded from this study, applying the estimated prevalence rate to the full Island population would equate to approximately 4,300 cases having occurred to date.

Due to the initial lag between infection and antibodies becoming detectable, some cases in their early stages of infection will not be detected. The resultant prevalence rate should, therefore, be considered as the prevalence as of around 16th June 2020.

Demographic breakdowns

In addition to the overall prevalence rate in the population of interest, some basic demographic information for each of the participants was obtained and the following tables show the resulting prevalence rates broken down by these variables. It should be noted that some participants declined to provide all the requested information, so total sample sizes for the groups will vary. There were no statistically significant differences (at 95% confidence level) between prevalence rates for any of the following breakdowns.

Table 1 – Prevalence rate by broad age group

Age group	Prevalence rate	Sample size
16-34	3.6%	321
35-44	3.5%	238
45-54	2.2%	244
55-64	5.9%	274
65+	5.4%	298

There are no statistically significant differences between the prevalence of the different age groups.

Table 2 – Prevalence rate by sex

Sex	Prevalence rate	Sample size
Male	4.2%	623
Female	3.9%	764

There are no statistically significant differences between the prevalence of the different sexes.

Table 3 – Prevalence rate by broad geographic area*

Area	Prevalence rate	Sample size
Urban	3.4%	484
Semi-urban	3.7%	491
Rural	5.1%	378

*Urban = St Helier, Semi-urban = St Clement, St Saviour & St Brelade, Rural = All other Parishes

There are no statistically significant differences between the prevalence of the different geographical areas.

Due to data quality issues that occurred as part of the collection process, additional breakdowns have not been possible in this round of analysis.

Longitudinal aspects

The design of this study included a longitudinal aspect whereby participants were asked to participate in multiple rounds of the survey so that changes could be monitored over time. The longitudinal aspect of the survey consisted of 834 participants who took part in both round 2 and round 3 of the survey. There was an overall dropout rate between rounds of 21%; however, analysis of the prevalence rate of the participants that dropped out suggests that these dropouts did not have any material impact on the overall estimated prevalence rate for round 3.

Table 4 below shows the test results of those participants who took part in both rounds of the study to date:

Table 4 – Test results of participants who took part in both rounds of study

Result round 2	Result round 3	Number of individuals
Negative	Negative	786
Negative	Positive	11
Positive	Positive	26
Positive	Negative	11

Of particular note is the 11 participants who tested positive during the second round of testing but subsequently tested negative in the third round. This is potentially accounted for by the level of sensitivity and specificity expected from the testing devices that have been used.

As noted previously, the choice of testing device was changed between round 1 and round 2 of this study, which limits the usefulness of comparisons between round 1 and all subsequent rounds.

Potential sources of error / uncertainty

Non-response error

Adjusting for ineligible addresses, the survey obtained an overall response rate of 60% for households and an estimated response rate of 59% for individuals.

Compensation for non-response error in this analysis has been addressed using appropriate household-level and individual-level weighting. Specifically, weighting has been applied based on the characteristics of the Jersey population (as observed in the 2011 Census) using the following variables:

- age
- sex
- household size

To ensure maximum comparability the variables used are the same as were used in the previous rounds of this survey.

The unweighted response rates for each of the variables used in weighting, together with the corresponding proportions from the 2011 Census, are detailed in Tables 8, 9 and 10 below.

Table 5 – Age (individual level) profile of unweighted survey response compared to the 2011 Census

	Percent	
	Survey	**Census 2011**
16-34 years	23	30
35-44 years	17	19
45-54 years	18	19
55-64 years	20	15
65 years or over	22	17
Total	**100**	**100**

Table 6 – Sex (individual level) profile of unweighted survey response compared to the 2011 Census

	Percent	
	Survey	**Census 2011**
Men	45	49
Women	55	51
Total	**100**	**100**

Table 7 – Household size profile of unweighted survey response compared to the 2011 Census

	Percent	
	Survey	**Census 2011**
1	15	16
2	36	36
3	19	20
4	19	18
5+	11	10
Total	**100**	**100**

Prior to weighting the observed prevalence rate was 4.5% and after weighting it was 4.2%.

It should be noted that it is not possible to completely control for non-response error as there may be characteristics that impact non-response that may also impact the prevalence rate in that population. This is a potential source of bias in the result that can only be improved by achieving a higher level of response.

Sampling error

The sampling design used for this survey was that of cluster sampling, with a simple random sample of Jersey addresses being drawn in order to identify Jersey households (the clusters); within sampled households, all individuals (the subject of interest) were then asked to participate in the testing. The resultant sample consisted of 745 households and 1,386 individuals.

There was limited within cluster / household variance (most households either had all individuals test positive or negative). The resultant 95% confidence interval around the weighted observed prevalence rate was:

Weighted observed prevalence rate: 4.2% ± 1.2pp

Measurement error

A key component of error / uncertainty within studies of this type is the level of accuracy of the testing instrument itself. Adjustment must be made for such measurement error in order to produce an estimate of the true population level prevalence. Any uncertainty in respect of the accuracy of the tests introduces additional uncertainty in the final estimates.

The testing instrument used in this study was the DNA World / CTK Biotech Onsite COVID 19 IgG/IgM rapid test kits, and the following characteristics have been used for the purpose of this analysis:

Overall sensitivity: 90.00%
Overall specificity: 99.39%

The observed prevalence is adjusted for the sensitivity and specificity of the test kits in order to provide an estimate for the true population prevalence.

Estimated population prevalence rate 4.0% ± 1.2 pp

These characteristics have been obtained from two sources; the manufacturers own internal assessment of characteristics as detailed in the local validation report (for overall specificity) and an evaluation conducted by the Statens Serum Institute of Denmark (for overall sensitivity). These were supplied to Statistics Jersey for the purposes of conducting this analysis.

There is a degree of remaining uncertainty around the above figures, as to date, desktop research indicates that other studies into these devices has sometimes resulted in quite different sensitivity and specificity figures. This is difficult to resolve definitively as the amount of research conducted has been limited and various approaches have been used in attempting to determine these characteristics. Differences in the types of samples used in each of these studies quite clearly has an impact on the reported sensitivity and specificity figures.

Care should therefore be taken in interpreting these results, as any potential deviation from the above sensitivity and specificity figures would impact the estimated prevalence rate. This uncertainty could potentially be resolved through large-scale testing of the testing kits themselves to provide additional certainty around the sensitivity and specificity levels. It should also be noted that in the absence of such a detailed study we have not been able to incorporate the uncertainty into the associated confidence interval.

Appendix - Survey methodology

The survey was designed as a single stage cluster sample survey, with each cluster representing one Jersey private household and the individuals within households as the unit of interest. All individuals aged 16 and over who formed part of the selected household were asked to participate in the survey.

A list of 1,300 private addresses were randomly drawn from the Jersey Land and Property Register (JLPR) which formed the basis of the sample for this study. 1,000 of these addresses remained the same between rounds 2 and 3 of this survey and thus formed the basis for the longitudinal aspect of the study. An additional 300 addresses were selected for inclusion in round 3.

The sample drawn excluded communal establishments (such as care homes), commercial properties and a small number of other properties known not to be residential in nature.

Contact was attempted to be made with the households residing at the sampled addresses using three methods:

1. A letter was sent to each address asking for the household to contact the Jersey coronavirus helpline to arrange an appointment at one of the testing centres.

2. The addresses were matched to the CLS “Populus” directory to try and determine contact details for any named individual who resided at that address. These individuals were then contacted by telephone by the helpline team, to arrange an appointment at one of the testing centres. Checks were made by the call maker to ensure that the individual contacted continued to reside at the selected address. In many cases contact details were also obtained for the household during the previous round of the study.

3. A small team of fieldworkers visited addresses where no contact was able to be made via the above two methods. The fieldworkers endeavoured to make contact with the resident household and request their participation, and also investigated if a property was potentially ineligible for inclusion (such as due to being unoccupied).

The antibody testing was conducted at two separate testing centres by health care workers who had received training on how to administer the testing kits. The healthcare teams were supported by staff from other government departments. Provision was also made for a mobile testing team to attend households at their home address when they could not attend the testing centres in person (approximately 90 households were tested in this way). The results of the antibody tests were supplied to the participants together with a fact sheet detailing what the results meant.

The results of the completed antibody test, together with basic demographic information and answers to a series of questions concerning the participants symptom history were then input via a web-based form into a database.

The survey obtained testing results from a total of 745 households and 1,386 individuals. These numbers equate to a response rate of 60% for households and an estimated 59% for individuals, once ineligible addresses (such as vacant properties and non-domestic properties) have been removed.

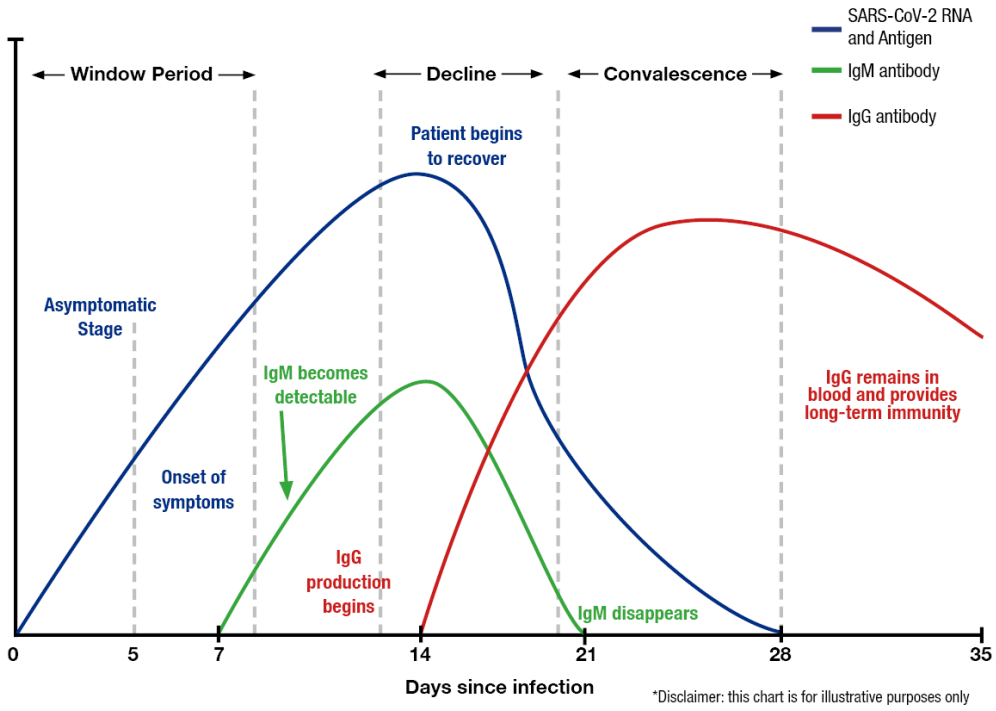
Details of testing devices

Testing for this round of the study was conducted using lateral flow testing devices produced by DNA World / CTK Biotech, rather than the devices produced by Healgen that were used in round 1. These devices are designed for the qualitative detection of SARS-CoV-2 antibodies using whole blood, serum or plasma. Testing for this study consisted of the sampling of whole blood obtained using a "pin prick" method administered by suitably trained healthcare professionals. Approval was obtained from the Ethics Committee for the conducting of the testing.

The test devices themselves have been subject to testing, both internationally and locally by the Microbiology Department of the General Hospital. It is acknowledged that these devices have limitations and in particular have a comparatively low level of sensitivity when compared to some other diagnostic devices. This sensitivity issue can, however, be compensated for in respect of the broad population monitoring that this study is aiming to achieve.

The test devices are designed to detect the presence of two types of SARS-CoV-2 antibodies, IgG and IgM. These antibodies are produced at different times in the infection cycle: IgM antibodies are typically detectable approximately 7-10 days after exposure and indicate acute SARS-CoV-2 infection is present; IgG production occurs later and suggests recent or past infection.

Figure 1 - Variation of the Levels of SARS-CoV-2 RNA and Antigen, IgM and IgG after infection – For illustrative purposes only, Source: http://www.diazyme.com/covid-19-antibody-tests



The test itself provides separate indications as to the presence of the two different antibodies. For the purposes of this initial analysis, a combined positive result has been used for estimating prevalence; a respondent who tested positive for either IgG or IgM antibodies (or both) was regarded as testing positive for the presence of SARS-CoV-2 antibodies.

It should be noted that there is currently no evidence regarding what / if any immunity the presence of IgG confers, or its longevity; the determination of immunity is not a part of this study. Instead, addressing the purpose of this study, the detection of these antibodies serves as an indication as to the level of infection that has taken place in recent months.