Statistics Jersey

SARS-CoV-2: Prevalence of antibodies in Jersey

Statistics Jersey: www.gov.je/statistics

Community survey – round 2

Summary

The Government of Jersey has recently completed the second 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.

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

4.2% ± 1.3 pp (95% confidence interval)

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).

Caution should be used when comparing these results with those previously published in the first round of this study, as the testing device has been changed between rounds of the survey. Whilst efforts have been made to account for differences in sensitivity and specificity between the two devices, this should still be noted when considering the results.

It is also 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 3,600. 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 4,500 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 20th May 2020.

Whilst there exists a degree of uncertainty around these figures, the results of this analysis, and the above prevalence rate, are in line with the ongoing epidemic modelling currently being conducted.

Additional analysis is provided by demographic breakdowns, as well as details on prevalence rates that correspond to reported symptoms. Of particular note is that this study does provide evidence that a high proportion of asymptomatic cases have taken place in Jersey. Indeed 62% of those who tested positive for SARS-CoV-2 related antibodies, reported no history of any symptoms. This behaviour is consistent with other emerging research on SARS-CoV-2 from other jurisdictions.

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 1,000 private addresses were randomly drawn from the Jersey Land and Property Register (JLPR) which formed the basis of the sample for this study. 700 of these addresses remained the same between rounds 1 and 2 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 2 from targeted urban and sub-urban areas.

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 80 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 629 households and 1,062 individuals. These numbers equate to a response rate of 66% for households and an estimated 58% for individuals, once ineligible addresses (such as vacant properties and non-domestic properties) have been removed.

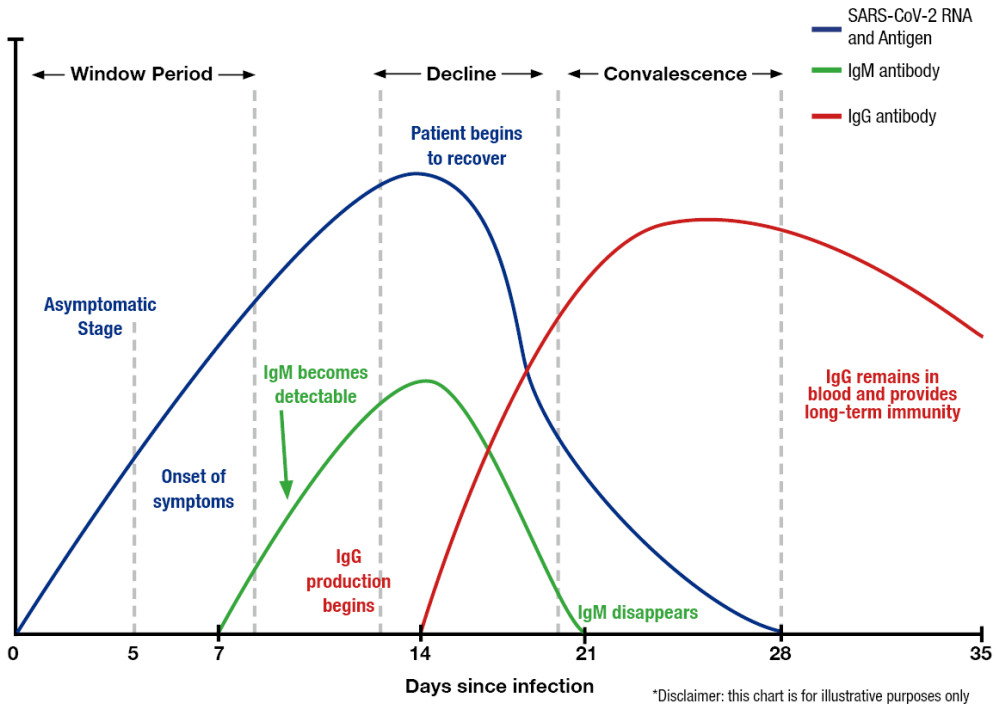
Details of testing devices

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.

Analysis and results

Overall prevalence rate

The study found that the overall prevalence rate of SARS-CoV-2 antibodies for the population of study to be:

4.2% ± 1.3 pp (95% confidence interval)

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

Caution should be used when comparing these results with those previously published in the first round of this study, as the testing device has been changed between rounds of the survey. Whilst efforts have been made to account for differences in sensitivity and specificity between the two devices, this should still be noted when considering the results.

It is also 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.

There is a degree of uncertainty around the final figure which is in part reflected in the confidence interval shown. The potential impact of non-response bias and measurement error should also be considered - see later in this report for further details on potential sources of error.

This prevalence rate implies that the total number of cases of SARS-CoV-2 that have occurred within this population is approximately 3,600. Whilst it is anticipated that there may be differences between this population and those who have been excluded from this study, if this prevalence rate were to be applied to the full Island population, this would equate to approximately 4,500 infection 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 20th May 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. Please note 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	4.3%	247
35-44	0.3%	168
45-54	5.5%	189
55-64	4.4%	211
65+	6.7%	47

Table 2 – Prevalence rate by sex

Sex	Prevalence rate	Sample size
Male	5.1%	476
Female	3.3%	586

Table 3 – Prevalence rate by broad geographic area*

Area	Prevalence rate	Sample size
Urban	3.6%	383
Semi-urban	4.6%	391
Rural	4.5%	284

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

Table 4 – Prevalence rate by industry of occupation (self-defined)

Industry sector	Prevalence rate	Sample size
Construction & tradesmen	3.3%	81
Finance (including legal & insurance)	5.8%	211
Hotels, restaurants and bars	1.0%	33
Private education or private health	1.3%	45
Public sector	6.4%	111
Other	2.6%	243

Table 5 – Prevalence rate by tenure of accommodation

Industry sector	Prevalence rate	Sample size
Owner occupied	3.0%	610
Private rental	5.3%	217
Social housing	8.6%	91
Non-qualified accommodation	6.3%	53

As previously noted there were no statistically significant differences (at 95% confidence level) between prevalence rates for any of the above breakdowns.

Symptomatic and asymptomatic cases

As part of the study all participants were asked if they had personally had any history of possible SARS-CoV-2 symptoms. The resultant prevalence rates for those individuals reporting those specific symptoms are detailed below:

Table 6 – Prevalence rate by reporting of symptoms

Reported symptom	Prevalence rate of those reporting symptom	Prevalence rate of those NOT reporting symptom	Number of individuals reporting symptom
Loss of smell and taste *	47.1%	3.7%	12
Muscle ache	14.5%	3.3%	78
A new or continuous cough and / or fever *	14.4%	3.4%	68
Headaches	13.1%	3.6%	64
Respiratory symptoms besides cough such as a sore throat, blocked or runny nose	12.5%	3.8%	52
Tiredness	10.2%	3.8%	68
Gastro-intestinal symptoms	0.0%	4.3%	16

* Generally recognised as being significantly associated with SARS-CoV-2.

In addition to the above it is also useful to consider specifically the symptom history (or lack of) for those individuals who tested positive for SARS-CoV-2 antibodies. Table 6 below details the breakdown of symptoms reported by the 45 individuals who participated in the study and tested positive for SARS-CoV-2 antibodies:

Table 6 – Symptom history of individuals who tested positive for SARS-CoV-2 antibodies

History	Percentage reporting	Sample size
No reported symptoms	62%	28
Any reported symptoms	38%	17
Reported recognised symptoms *	29%	13

* Reporting a new or continuous cough and / or fever and / or loss of smell and taste

Whilst the sample size is small, there is evidence that a high proportion of asymptomatic cases have taken place in Jersey. This behaviour is consistent with other emerging research on SARS-CoV-2 from other jurisdictions.

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. Between rounds 1 and 2 however the testing device was changed from the test device manufactured by Healgen to the device produced by DNA World / CTK Biotech. This decision was made following a quality assessment of both devices. This limits the comparability of this longitudinal element between rounds 1 and 2 as any changes could also be influenced by the change of testing device. It is intended that all future rounds of this survey will utilise the same testing device.

With the above noted, the longitudinal aspect of the survey consisted of 609 participants who took part in both round 1 and round 2 of the survey. There was an overall drop out rate between rounds of 29%; however, analysis of the prevalence rate of the participants that dropped out suggests that these drop outs did not have any material impact on the estimated prevalence rate for round 2.

Table 7 below shows the test results of those participants who took part in both rounds of the study to date:

Table 7 – Test results of participants who took part in both rounds of study

Result round 1	Result round 2	Number of individuals
Negative	Negative	577
Negative	Positive	15
Positive	Positive	12
Positive	Negative	5

Of particular note is the 5 participants who tested positive during the first round of testing but subsequently tested negative in the second round. This is potentially explained by the change in testing device.

Potential sources of error / uncertainty

Non-response error

Adjusting for ineligible addresses, the survey obtained an overall response rate of 66% for households and an estimated response rate of 58% 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 round 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 8 – 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	16	19
45-54 years	18	19
55-64 years	20	15
65 years or over	23	17
Total	**100**	**100**

Table 9 – 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 10 – Household size profile of unweighted survey response compared to the 2011 Census

	Percent	
	Survey	**Census 2011**
1	17	16
2	36	36
3	18	20
4	18	18
5+	11	10
Total	**100**	**100**

Prior to weighting the observed prevalence rate was 4.2% and after weighting it was 4.4%.

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 629 households and 1,062 individuals.

There was very little 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: 4.4% ± 1.3 pp

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 4.2% ± 1.3 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.