Return to school rapid antigen testing in Newfoundland and Labrador

Preliminary report, February 25, 2022

Background

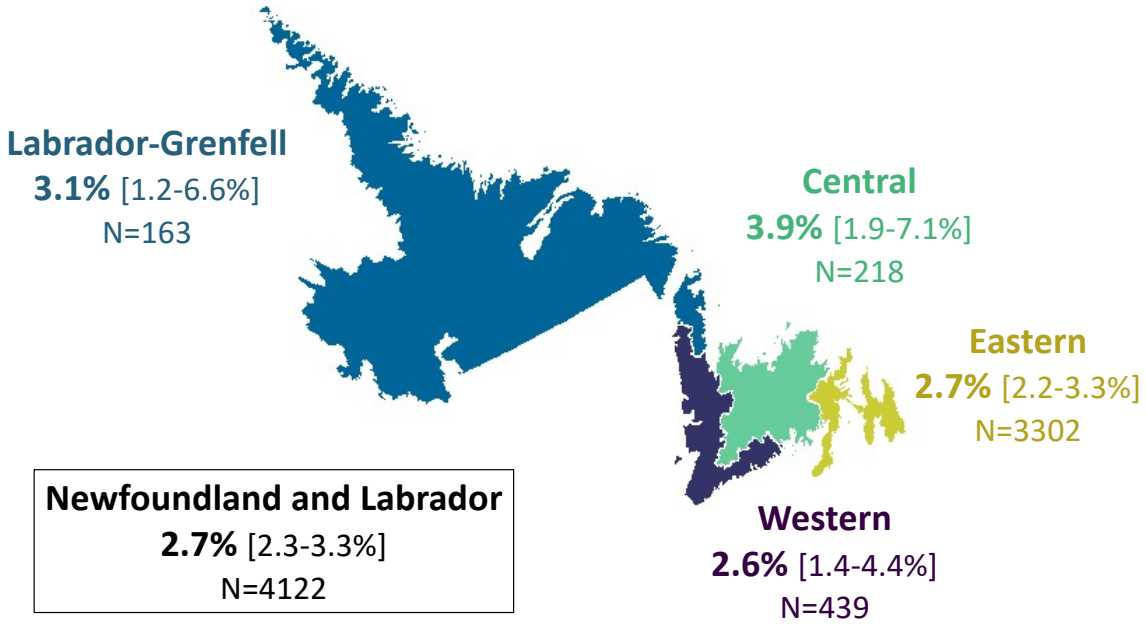
- 59,452 students in the Newfoundland and Labrador (NL) English School District were eligible to return to grades K-12 on January 25, 2022.[1] At this time, 82% of residents aged 5 to 11 years had received at least 1 dose of vaccine.[2]
- Returning students were asked to complete BTNX Rapid Response COVID-19 antigen tests on January 22. Students that tested negative were to test again on January 25.[3]
- Between February 3 and 19, parents and guardians completed a web survey reporting 4,122 test results from 1,365 households (approximately, a 3.5% response rate).

Results

- We estimate 2.7% (95% credible interval from 2.3 to 3.3%) of K-12 students in Newfoundland and Labrador were infected with COVID-19 (January 22 and 25 results combined). For comparison, the Department of Health and Community Services reported 0.5% of the general population were active cases at this time.
- We estimate that 62% (95% credible interval from 53 to 70%) of infections were asymptomatic, consistent with studies reporting 60% of Omicron variant infections were asymptomatic in individuals under age 20.[4]
- We estimate 3.0% (95% credible interval from 2.4 to 3.8%) of K-6 students, and 2.4% (95% credible interval from 1.7 to 3.2%) of grade 7-12 students were infected with COVID-19.

Estimated % of K-12 students infected with COVID-19 by Regional Health Authority

(with 95% credible intervals, N = number of tests)



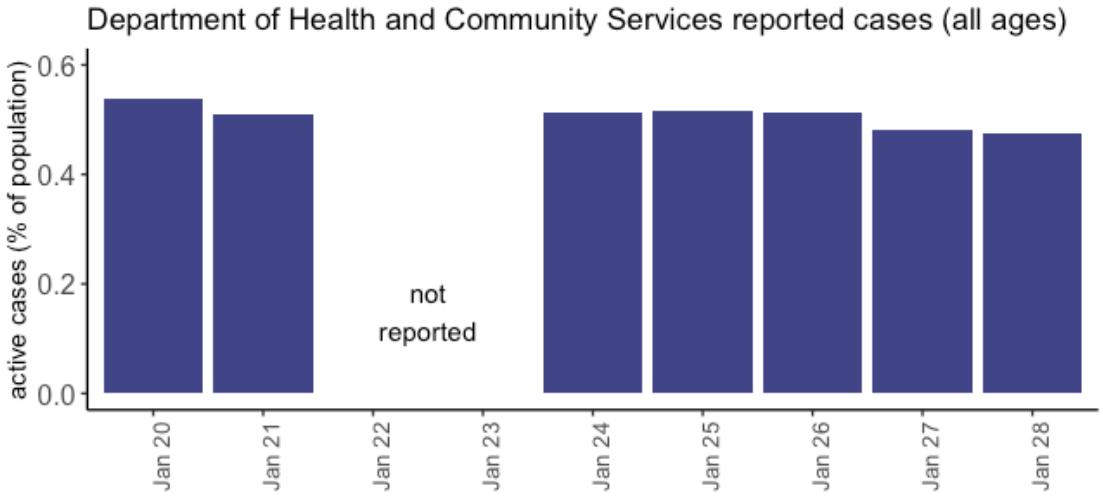


Figure 1: Active cases reported by the Department of Health and Community Services Public Advisories[5] (all ages) as a percentage of the population of Newfoundland and Labrador (estimated 521,542). From January 24, under the provincial testing system PCR tests were recommended for non-household close contacts who are fully vaccinated and do not have symptoms, and anyone that has symptoms but has not been identified as a close contact of someone that tested positive for COVID-19[6]. The mean percentage of people in Newfoundland and Labrador reported as active COVID-19 cases from the Public Service Advisories was 0.5%[5] (January 20 to 28). We estimate the prevalence of COVID-19 in K-12 students using the rapid antigen test results as 5.4 times greater than the prevalence in the general population reported by the provincial testing system during a similar time period.

Methods The observed number of positive test results is,

$$N^+ = pN\sigma^+ + (1-p)N(1-\sigma^-), \tag{1}$$

which is the sum of observed positive test results from infected individuals and false positive test results from uninfected individuals, where p is the proportion infected, and N is the total number of tests. The estimated sensitivity of rapid antigen tests, i.e., the probability of testing positive if infected, is $\sigma^+ = 0.75$. This sensitivity is intermediate to the low and high sensitivity scenarios from the Coronavirus (COVID-19) Infection Survey in the United Kingdom[7]. Low sensitivity may have occurred for the January 25th return to K-12 school in Newfoundland and Labrador as the tests were self-administered or administered by caregivers. The estimated specificity of rapid antigen tests, i.e., the probability of testing negative if uninfected, is $\sigma^- = 0.992$, and was calculated as the mean across brands from Table S7 of Wells et al. 2022[8].

We estimate the proportion of K-12 students infected with COVID-19 by rearranging equation (1):

$$p = \frac{1 - \sigma^- - \frac{N^+}{N}}{1 - \sigma^- - \sigma^+}. \tag{2}$$

Credible intervals report the interval expected to contain a given percentage of estimates. Credible intervals were calculated using Jeffreys interval, i.e., a beta distribution with shape parameters $pN + 1/2$ and $N(1-p) + 1/2$.

References

1. Email from NLESD to Mark Quinn (CBC News): `https://twitter.com/CBCMarkQuinn/status/1486099716018483203`

2. As of January 22: `https://health-infobase.canada.ca/covid-19/vaccination-coverage/`

3. Rapid testing program for students and staff at schools. Newfoundland and Labrador. `https://www.gov.nl.ca/covid-19/schools-children/school-rapid-testing-program/`

4. Diamandis, C., *et al* (2021). Asymptomatic Covid-19: a major source of infection at the onset of an Omicron storm. Authorea Preprints. `https://www.authorea.com/doi/full/10.22541/au.164004638.87453812/v1`

5. Department of Health and Community Services, Public Advisories. `https://www.gov.nl.ca/releases/category/health/`.

6. Department of Health and Community Services, Public Advisories, January 24, 2022. `https://www.gov.nl.ca/releases/2022/health/0124n05/`

7. Coronavirus (COVID-19) Infection Survey: methods and further information. Office for National Statistics (United Kingdom). `https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/methodologies/covid19infectionsurveypilotmethodsandfurtherinformation`

8. Wells, C., *et al* (2022). Comparative analyses of FDA EUA-approved rapid antigen tests and RT-PCR for COVID-19 quarantine and surveillance-based isolation. medRxiv `https://www.medrxiv.org/content/10.1101/2021.08.23.21262499v4`.

Principal Investigator: Dr. Amy Hurford (ahurford@mun.ca). **Team members:** Dr. Maria Martignoni; Dr. Zahra Mohammadi; Francis Anokye; George Adu-Boahen; Ashley Locke. **Logistical support:** Faculty of Science, Memorial University of Newfoundland and Labrador; Dr. Yolanda Wiersma. **Expert review:** Dr. Caroline Colijn (Simon Fraser University), Dr. David Champredon (Public Health Agency of Canada), Dr. Monika Dutt (Medical Officer of Health, Central and Western Health, Newfoundland and Labrador), Dr. David J.D. Earn (McMaster University), Dr. Jane Heffernan (York University), Dr. J.C. Loredo-Osti (Memorial University of Newfoundland and Labrador), NunatuKavut Community Council, Dr. Sarah P. Otto (University of British Columbia). This research has engaged with Indigenous groups in the province including the Nunatsiavut Government, NunatuKavut Community Council, and the Mik'maq (Northern Peninsula Band, Burgeo Band, St. Georges Band, Benoit First Nation, and Qalipu First Nation).