Seroprevalence, seroconversion, and seroreversion of infection-induced SARS-CoV-2 antibodies among a cohort of children and youth in Montreal, QC

Laura Pierce, MSc

Centre de recherche en santé publique, Université de Montréal

Kate Zinszer, PhD

Associate Professor at l'École de santé publique, Université de Montréal

Centre de recherche en santé publique, Université de Montréal

Disclaimer

We have no COIs to declare related to this study.

Study objectives and methods

- Estimate seroprevalence, seroconversion, and seroreversion of infection-induced SARS-CoV-2 antibodies
- Identify participant characteristics associated with increased risk of seroconversion

Data collected longitudinally at four time points:

Round 1
October 2020 to April 2021

Round 2
May to September 2021

Round 3
November 2021 to February 2022

Round 4
May to October 2022

Study population

Table 1 Study population characteristics by round of data collection.

	Round 1 n (%)	Round 2 n (%)	Round 3 n (%)	Round 4 n (%)
Total	1632	936	723	726
Sex				
Female	801 (49.1)	449 (48.0)	342 (47.3)	359 (49.4)
Male	831 (50.9)	487 (52.0)	381 (52.7)	367 (50.6)
Age, years				
2-4	329 (20.2)	151 (16.1)	89 (12.3)	105 (14.5)
5-11	727 (44.5)	448 (47.9)	346 (47.9)	324 (44.6)
12-18	576 (35.3)	337 (36.0)	288 (39.8)	297 (40.9)
Parental respondent's race and ethnicity				
Racial or ethnic minority	201 (12.3)	110 (11.8)	76 (10.5)	101 (13.9)
White	1406 (86.2)	815 (87.1)	640 (88.5)	614 (84.6)
Annual household income				
< $100,000	329 (20.2)	270 (28.8)	202 (27.9)	173 (23.8)
≥ $100,000	686 (42.0)	585 (62.5)	401 (55.5)	440 (60.6)

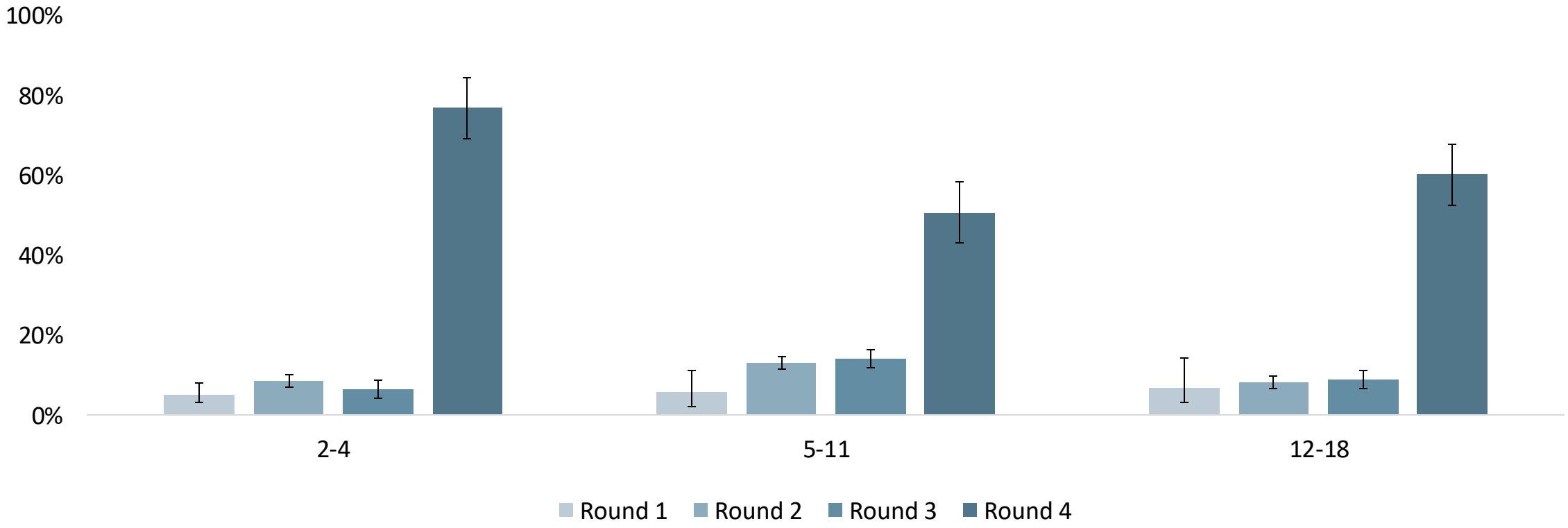
Infection-induced seroprevalence

Table 2 Unadjusted infection-induced seroprevalence of SARS-CoV-2 by demographic characteristics and round of data collection weighted by inverse probability of censoring weights.

	Seroprevalence % (95% CI)			
	Round 1	**Round 2**	**Round 3**	**Round 4**
Total	5.8 (4.8-7.1)	10.5 (8.6-12.7)	11.0 (8.8-13.5)	58.4 (54.7-62.1)
Parental respondent's race and ethnicity[R1, R2, R4]				
Racial or ethnic minority	10.9 (7.3-16.1)	18.8 (12.3-27.7)	13.8 (7.5-24.0)	74.9 (65.3-82.6)
White	5.2 (4.1-6.5)	9.4 (7.5-11.7)	10.4 (8.2-13.1)	55.7 (51.6-59.7)
Annual household income[R1, R2, R4]				
< $100,000	11.9 (8.8-15.8)	14.9 (10.9-19.9)	12.8 (8.6-18.6)	68.9 (61.3-75.6)
≥ $100,000	5.8 (4.3-7.9)	8.3 (6.3-10.9)	10.3 (7.6-13.8)	57.3 (52.5-61.9)

Infection-induced seroprevalence

Figure 1 SARS-CoV-2 infection-induced seroprevalence by age group and round of data collection.



Infection-induced seroconversion in the Omicron era

Table 3 Crude seroconversion rates and adjusted seroconversion rate ratios for study population characteristics (Round 4).

	Crude seroconversion rate per 100 person-years (95% CI)	Relative risk (95% CI)
Overall	138.9 (121.0-156.8)	
Sex		
Male	118.8 (96.7-140.9)	Ref
Female	150.3 (123.4-177.2)	1.3 (1.0-1.6)
Age, years		
2-4	184.4 (121.5-247.3)	1.4 (1.0-1.8)
5-11	115.2 (91.1-139.2)	0.8 (0.6-0.9)
12-18	139.2 (113.2-165.3)	Ref
Parental respondent's race and ethnicity		
White	127.3 (109.4-145.2)	Ref
Racial or ethnic minority	179.3 (118.2-240.5)	1.4 (1.1-1.9)
Vaccinated prior to sample collection		
No	211.7 (154.1-269.2)	Ref
Yes	120.4 (102.7-138.0)	0.4 (0.3-0.6)

Pre-Omicron seroreversion of infection-induced SARS-CoV-2

Figure 2 Kaplan-Meier curve of time to seroreversion in the sample of unvaccinated children and vaccinated children censored at vaccination (Rounds 1-3).

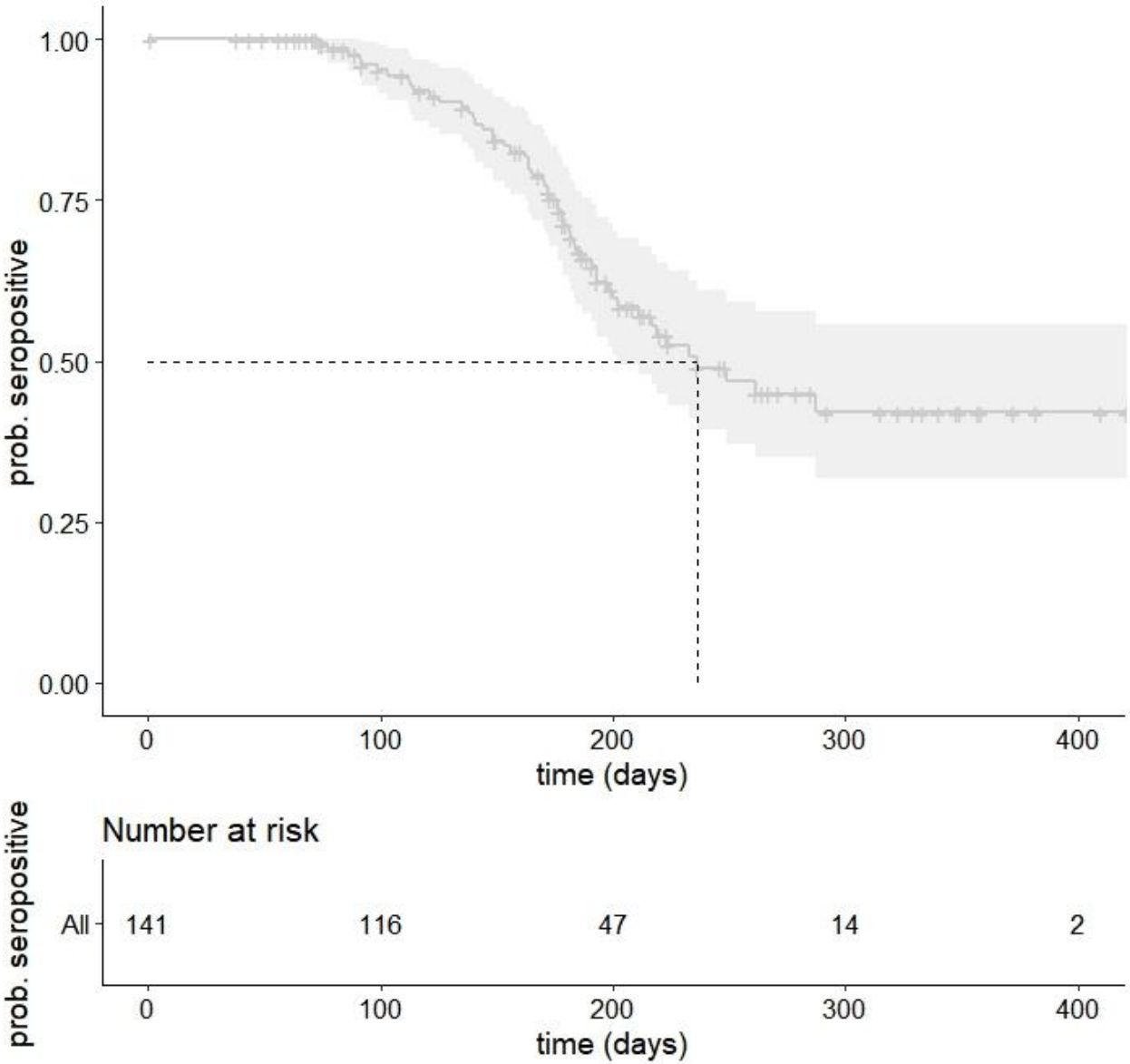


Table 4 Likelihood of remaining seropositive for infection-induced SARS-CoV-2 (95% CI)

At six months	At twelve months
68% (60-77%)	42% (32-56%)

Conclusion

Infection-induced seroprevalence has risen from 5.8% to 58.4%, reflecting the emergence of new variants over time

After the emergence of Omicron, the seroconversion rate (the rate of becoming seropositive for SARS-CoV-2 infection) was 9-12 times higher than in the previous rounds of data collection

Before Omicron, the median time to seroreversion was about 8 months. Further study data will explore antibody waning, reinfection, and hybrid immunity

Acknowledgements

EnCORE children and parents, daycares, schools, and school boards

ÉTUDE encore STUDY

Katia Charland

Adrien Saucier

Islem Cheriet

Margot Barbosa Da Torre

Co-investigators

Caroline Quach (co-PI)

Britt McKinnon

Jesse Papenburg

Guy Boivin

Gaston De Serres

Marie-Ève Hamelin

Cat Tyong Nguyen

INSPQ Institut national de santé publique du Québec

Centre intégré universitaire de santé et de services sociaux du Centre-Sud-de-l'Île-de-Montréal Québec Direction régionale de santé publique

Observatoire pour l'éducation et la santé des enfants

COVID-19 IMMUNITY TASK FORCE

Université Laval

Hôpital de Montréal pour enfants Centre universitaire de santé McGill

Montreal Children's Hospital McGill University Health Centre

ESPUM L'école de santé publique de l'Université de Montréal

CReSP Centre de recherche en santé publique

CHU Sainte-Justine Le centre hospitalier universitaire mère-enfant

Université de Montréal

Lessons learned

Institutional collaboration was strained despite the acute importance of filling knowledge gaps. We need to strengthen collaborations with schools to better facilitate future research projects.

Rapid changes in pandemic context required rapid adaptation in study protocols, including innovative recruitment and communication methods.

Informatics platforms are limited, and improvements could enhance research implementation and the quality of results.

Disseminating relevant and timely results can be challenging when data collection, analysis, and publication are ongoing. Infographics can facilitate dissemination of results to diverse stakeholders.