Julie Bestman-Smith MD., PhD. FRCP.

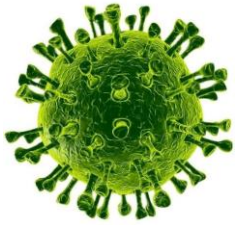
Microbiologiste et infectiologue,
HEJ, CHU de Québec

CHU de Québec Université Laval

COVID-19

Conflict of Interest Disclosure

Member of the provincial (Quebec) PCR laboratory test comity for the detection of SARS-CoV2



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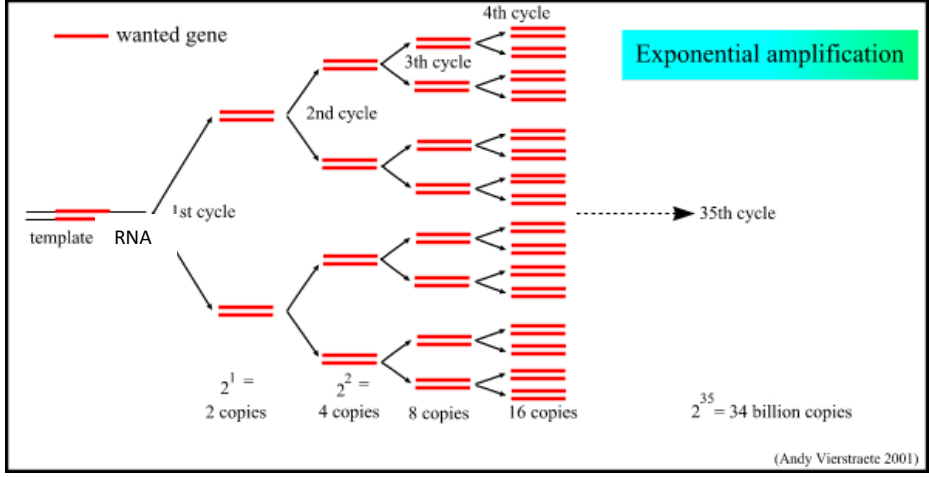
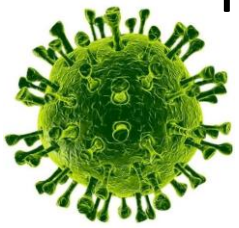
PCR testing



- Diagnosis of the SARS-CoV-2 relies on PCR testing which currently is the gold standard.
- Viral ARN is amplified from a patient sample (oral-nasopharyngeal) and the laboratory will release a result as ‘’detected’’ or ‘’non detected’’ .
- In Canada, the test was developed by the National Laboratory of Microbiology (NLM) in Winnipeg, and is similar to the one recommended by the CDC in the US.



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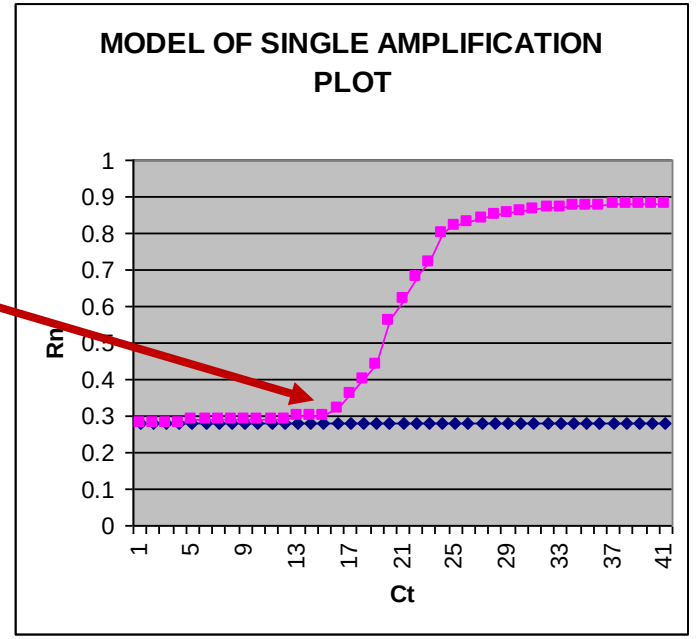
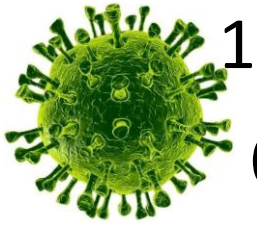
PCR testing

Cycle threshold (Ct) reflets LOD



- The test detects a concentration of virus as low as 300 copies of virus/ml.
- That level of detection (LOD) was well accepted from the beginning of the pandemic in Canada, and we rely on it to contain the infection.
- Currently, there are numerous FDA and Health Canada approved tests that were launched and their level of detection vary between 100-1000 copies.



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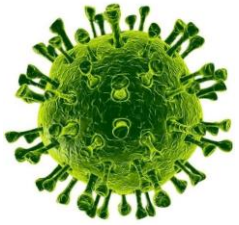
What is the reliability of our test to detect SARS-CoV-2 infected individuals?

- The real epidemiologic sensitivity of the analysis is steel unknown.
- We need good specific serologic tests to confirm that a person was really infected by the virus and then corroborate with the PCR analysis.
  - IgM+ and/or IgG+ patient=Truly infected patient
  - IgM+ and/or IgG+ patient with a positive PCR test=True positive PCR
  - IgM+ and/or IgG+ patient with a negative PCR test=False negative PCR

➢**Sensitivity of PCR test=True positive PCR/Truly infected patient**



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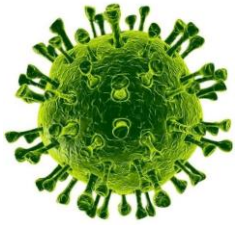
What is the risk that we miss an infection with our PCR test?

What we think we know:

- Most of SARS-CoV-2 infected and symptomatic patients maximally excrete the virus around the time of symptoms appearance.
- Some individuals are asymptomatic yet, they can excrete the virus as much as symptomatic patient.
- Most of those asymptomatic yet infected individuals are in fact pre-symptomatic and will end up with symptoms eventually.

➢ At any time point over the course of the infection, if the individual excretes viruses over the LOD of the test, the PCR should be positive.



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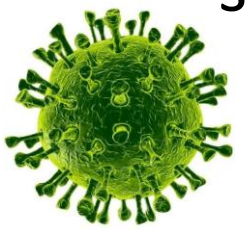
What can influence PCR testing?

- Preanalytical variables:
  - Mucosal density of the virus in the sampled patient
  - Type of sample: Nasopharyngeal>nasal>oral (saliva, nasopharyngeal wash, tongue?)
  - Quality of sample collection
  - Storage and transport (media, temperature, delay until processing)
- If collection of a sample (known as acceptable) is done exactly as recommended in a patient whose mucosal density of the virus exceeds the LOD, the PCR should yield a positive result.
- As with any test, clerical mistakes (wrong identification, lost of sample) are possible yet unlikely.



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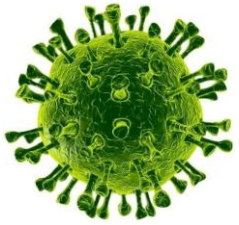
What is the risk that our PCR test misses an infected individual?

- We can calculate the probability that the disease is not present when the test is negative, that is the definition of the Negative Predictive Value (NPV)
- Need to make specific assumptions for:
  - **Sensitivity** of the test: 70%?, 90%? We don't actually know (80%)
  - **Specificity** of the test: 98%
  - **Prevalence** of infection in asymptomatic patients?
    - Based on PCR testing, we estimate that currently, in Quebec City, the prevalence of the disease in symptomatic patients is 3%. It is therefore reasonable to assume that current infection is not as frequent in asymptomatic individuals so...0,5% 1,0%?



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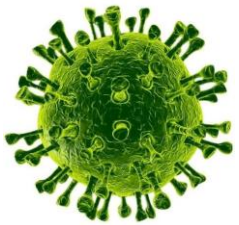
Prevalence of the infection (CHU de Québec)

Tests COVID-19 dans les urgences du CHU de Québec du 11 au 17 mai 2020					
	n inscrits urgence	n tests COVID	TESTS COVID/100 VISITES	n COVID POS	% TESTS POS
CHUL	1045	158	15	1	0,63%
HEJ	1022	251	25	5	1,99%
HSFA	636	142	22	2	1,41%
HSS	414	48	12	2	4,17%
L'HDQ	274	69	25	1	1,45%
TOTAL	**3391**	**668**	**20**	**11**	**1,65%**

Tests COVID-19 dans les urgences du CHU de Québec du 19 mars au 17 mai 2020					
	n inscrits urgence	n tests COVID	TESTS COVID/100 VISITES	n COVID POS	% TESTS POS
CHUL	7823	1225	16	25	2,04%
HEJ	7633	1330	17	27	2,03%
HSFA	4711	900	19	15	1,67%
HSS	2956	387	13	9	2,33%
L'HDQ	1916	494	26	11	2,23%
TOTAL	**25039**	**4336**	**17**	**87**	**2,01%**



Martin Coulombe, M.Sc., MAP

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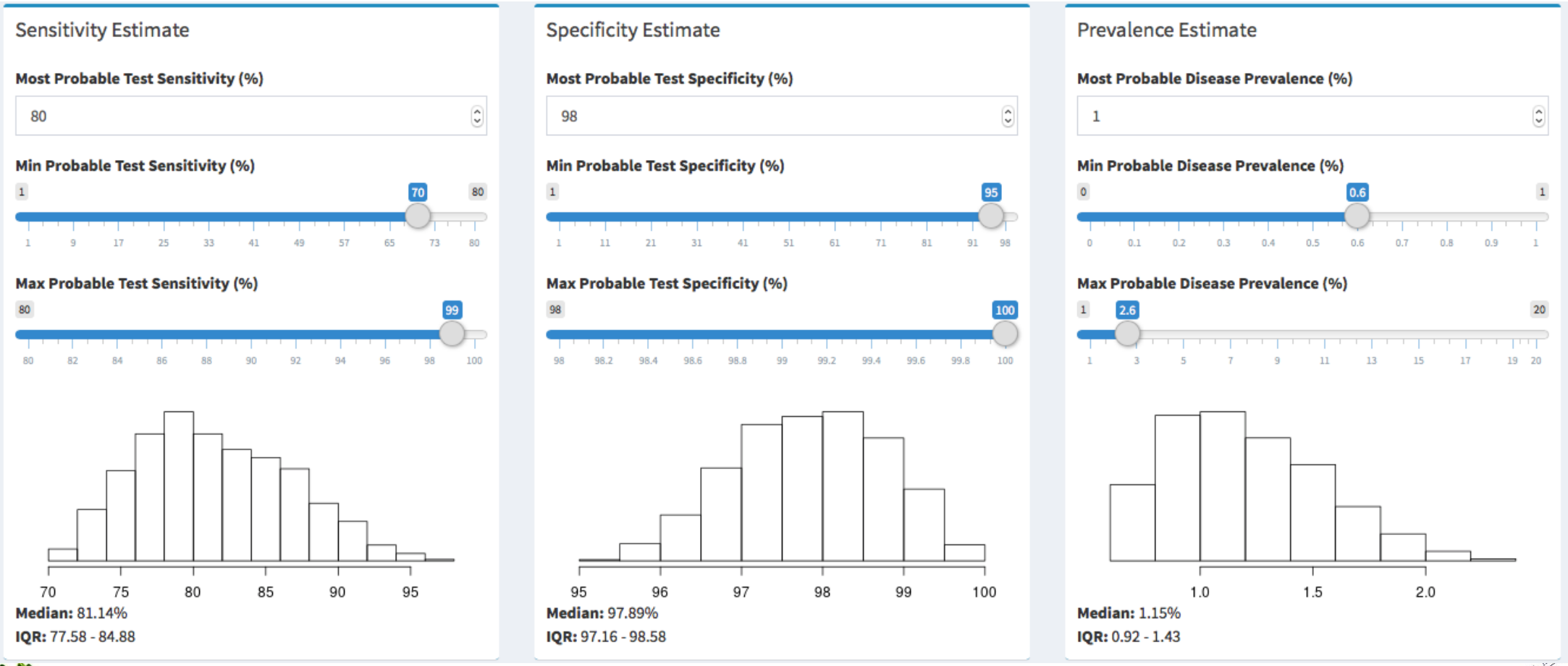
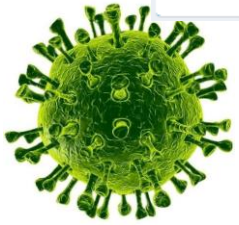
Negative Predictive Value (NPV): https://covid-airway-npv.info





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Results

Sensitivity of the test: 80%
Specificity of the test: 98%
Prevalence in asymptomatics: 1%

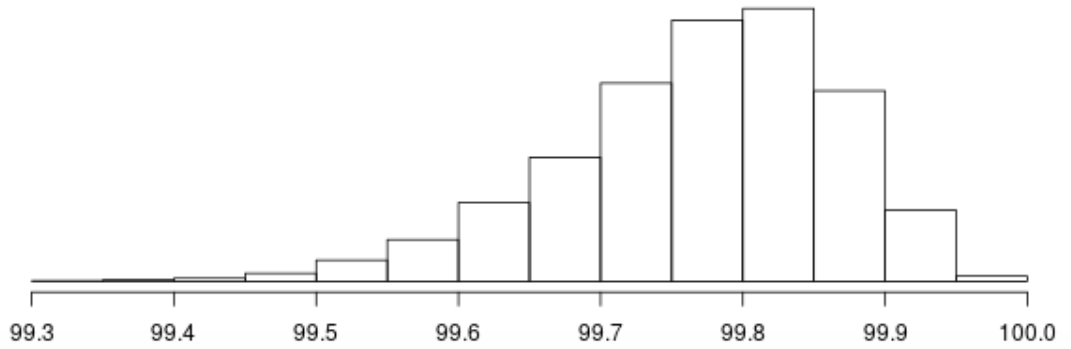
Results

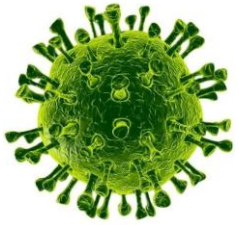
Negative Predictive Value

99.78 [90% CI : 99.6 - 99.91]

Post-Test Probability of SARS-CoV-2

1 in 456 [90% CI: 247 - 1089]





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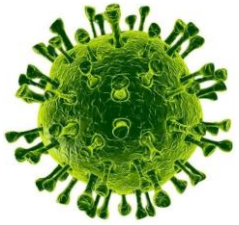
Conclusion

- The tests are evolving consistently, and hopefully they will become more sensitive, with a faster turnaround time and we will be able to demonstrate their true clinical sensitivity.
- But we must keep going, balancing the risks and benefits while answering this crucial question: **What is my (our) risk tolerance??**



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