COVID-19 testing from a public health perspective: selection of test, cut-off and sampling scheme should depend on the purpose of testing

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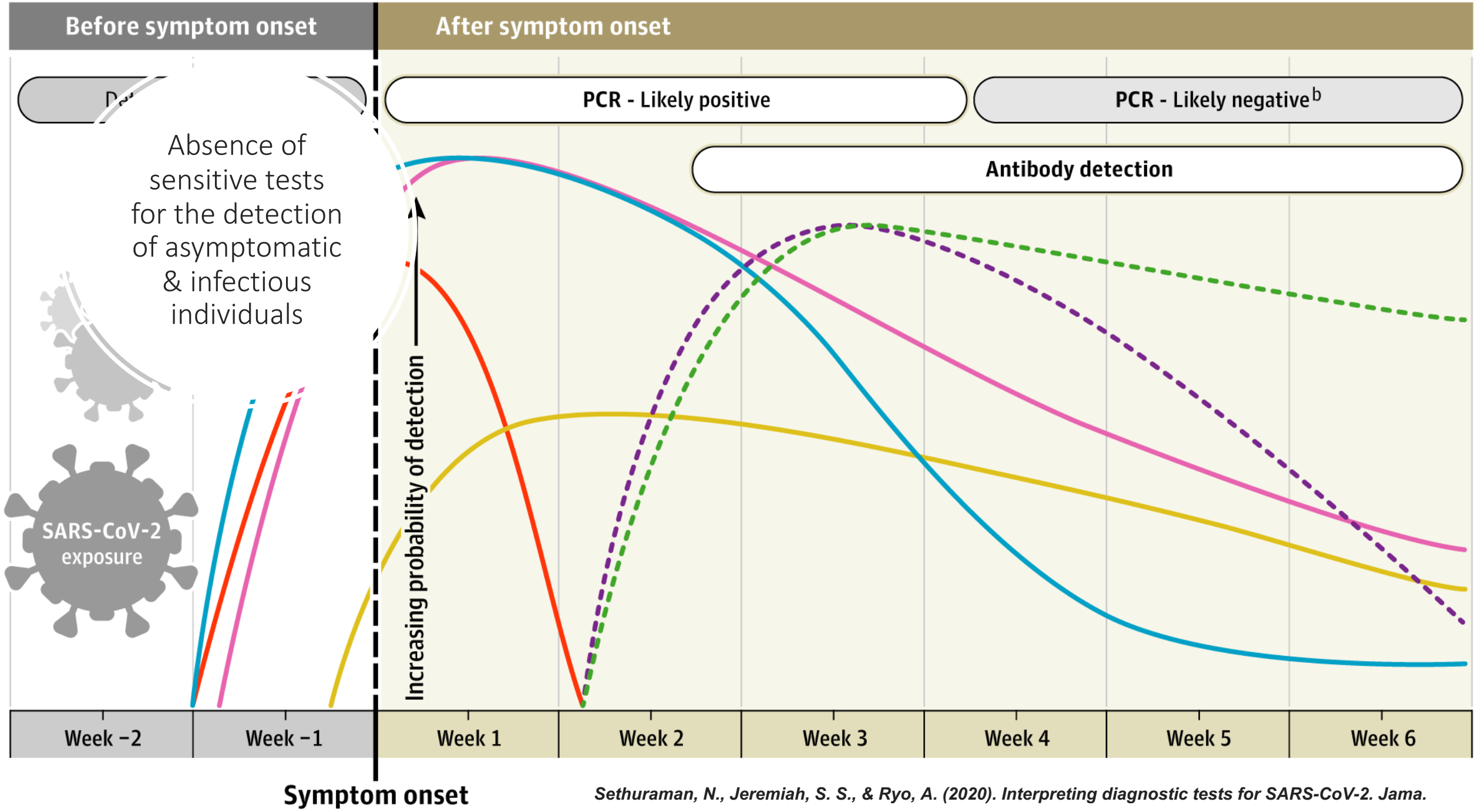
Layout

- Available tests for COVID-19
- Interpretation of test results
- Test Strategies for COVID-19
- Cut-off selection depending on the purpose of testing
- Sampling to estimate COVID-19 prevalence
- Need for population-specific diagnostic accuracy estimates
- Estimation of COVID-19 true prevalence
- Testing infrastructures for COVID-19 surveillance

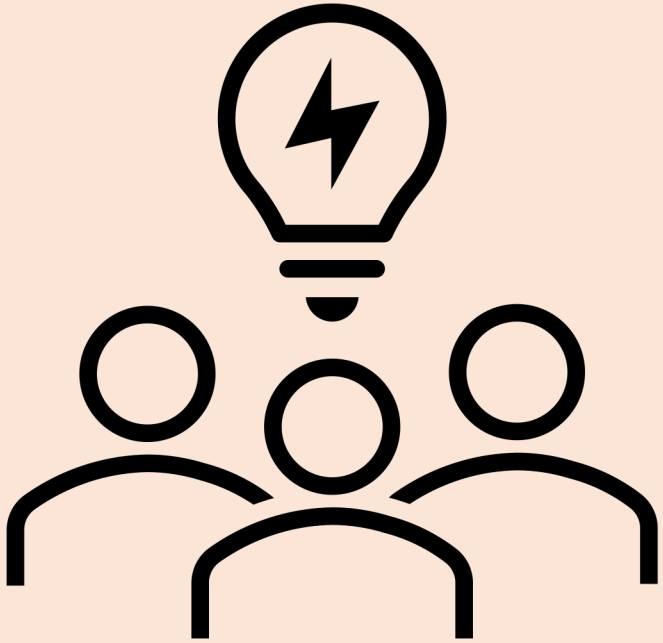
Available tests for COVID-19

- tests aiming to detect the virus or particles of it
- viral RNA – mostly RT-PCR tests
- antigen tests
- tests detecting the immune response of the host
- antibody tests



Sethuraman, N., Jeremiah, S. S., & Ryo, A. (2020). Interpreting diagnostic tests for SARS-CoV-2. Jama.

Test & Cut-off selection depending on context & purpose

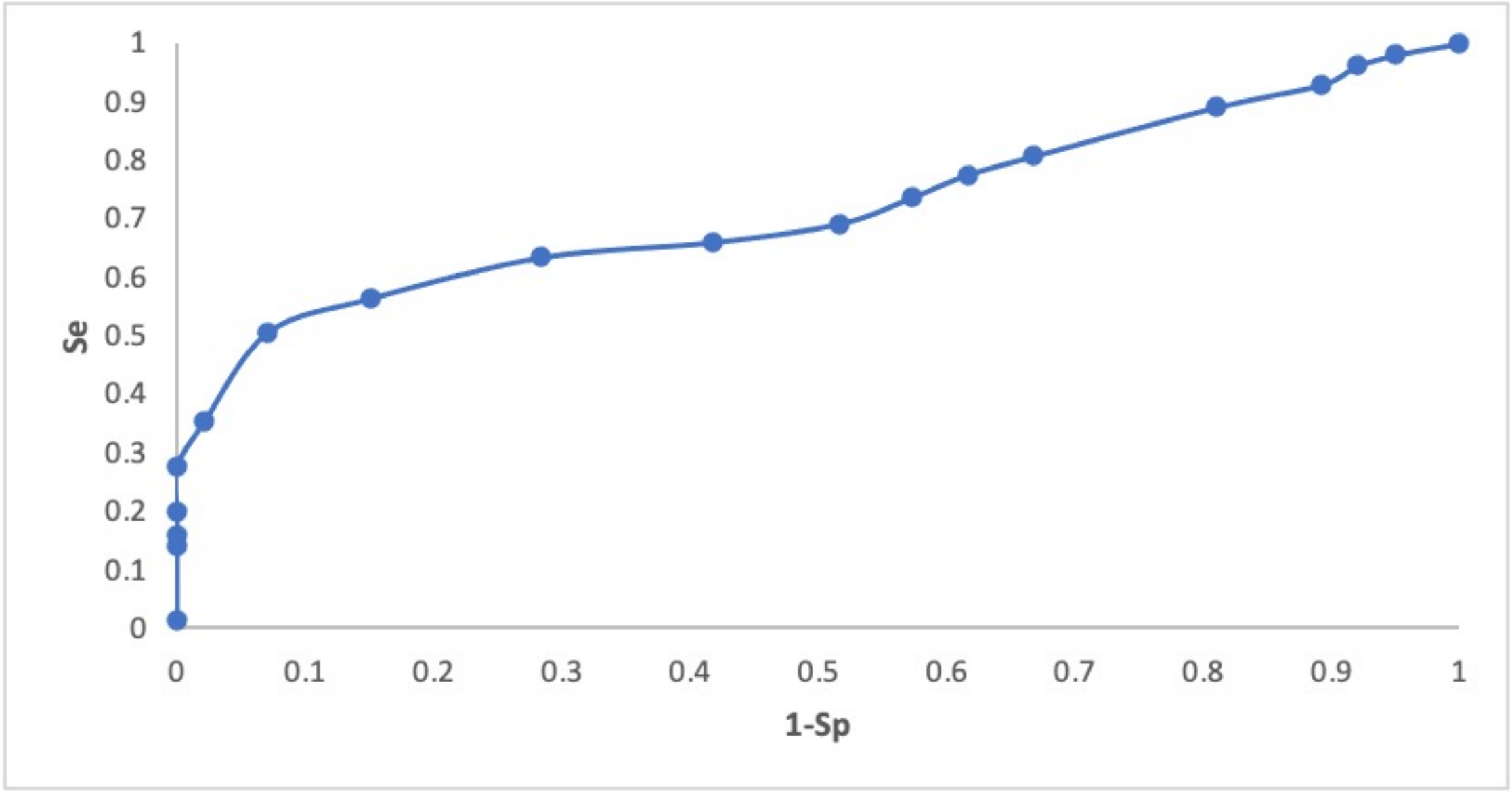


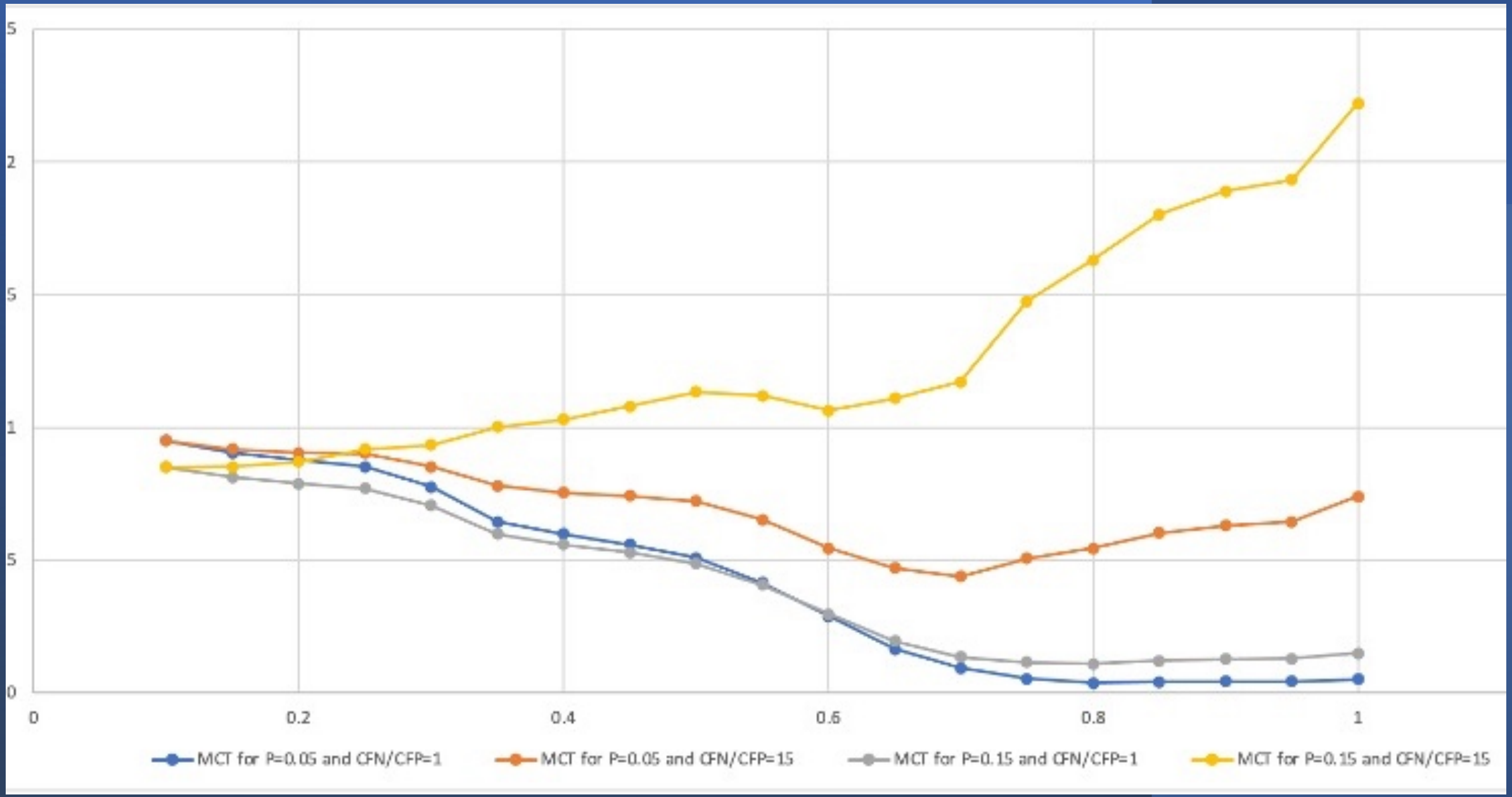
Test Strategies for COVID-19

- Should depend on the purpose of testing
- Testing to control the spread
  - early identification of infectious individuals
    - active surveillance scheme
    - repeated testing scheme to increase Se
- Testing to estimate the prevalence
  - random sampling scheme
    - Representativeness
    - Overall reduction of misclassification rates

Cut-off selection depending on the purpose of testing

- **Not** have a fixed cut-off
- Cost-benefit analysis to define the optimal cut-off
  - MTC – relative cost of false negatives (CFN) and false positives (CFP) and the prevalence in the target population


Se
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1-Sp


5
2
5
1
5
0
0
0.2
0.4
0.6
0.8
1
MCT for P=0.05 and CFN/CFP=1
MCT for P=0.05 and CFN/CFP=15
MCT for P=0.15 and CFN/CFP=1
MCT for P=0.15 and CFN/CFP=15

Sampling to estimate COVID-19 prevalence

- Passive surveillance
  - Nonresponse, selection bias and non-probability sampling
- Need for population surveys that will be based on a representative sample

Estimation of COVID-19 true prevalence

- Adjust for the Se and Sp of the diagnostic process
- Se and Sp are population-specific
  - depend on the distribution of the infection stages
- Se and Sp estimates from a clinical setting are not relevant to the Se and Sp estimates of the same tests in the general (and mainly asymptomatic) population

Thank you