COVID-19 Epi Updates: Testing Considerations

June 1, 2020

CDC diagnostic testing recommendations (as of 5/3/20)

(Nucleic Acid or Antigen)

- **High Priority**
  - Hospitalized patients **with** symptoms
  - Healthcare facility workers, workers in congregate living settings, and first responders **with** symptoms
  - Residents in long-term care facilities or other congregate living settings, including prisons and shelters, **with** symptoms
- **Priority**
  - Persons **with** symptoms of potential COVID-19 infection, including: fever, cough, shortness of breath, chills, muscle pain, new loss of taste or smell, vomiting or diarrhea, and/or sore throat.
  - Persons **without** symptoms who are prioritized by health departments or clinicians, for any reason, including but not limited to: public health monitoring, sentinel surveillance, or screening of other asymptomatic individuals according to state and local plans.

CDC serologic testing recommendations (updates 5/17 /20 & 5/25/20)

CDC Seroprevalence Survey Types

CDC is collaborating with public health and private partners on a variety of surveys of different sizes, locations, populations studied, and purposes.

Large-scale Geographic Seroprevalence Surveys

Community-level Seroprevalence Surveys

Special Populations Seroprevalence Surveys

Objectives of Surveillance of U.S. Serology Testing

- To provide a more complete estimate of how common COVID-19 is (or the incidence of infection)
- To guide control measures, such as social distancing

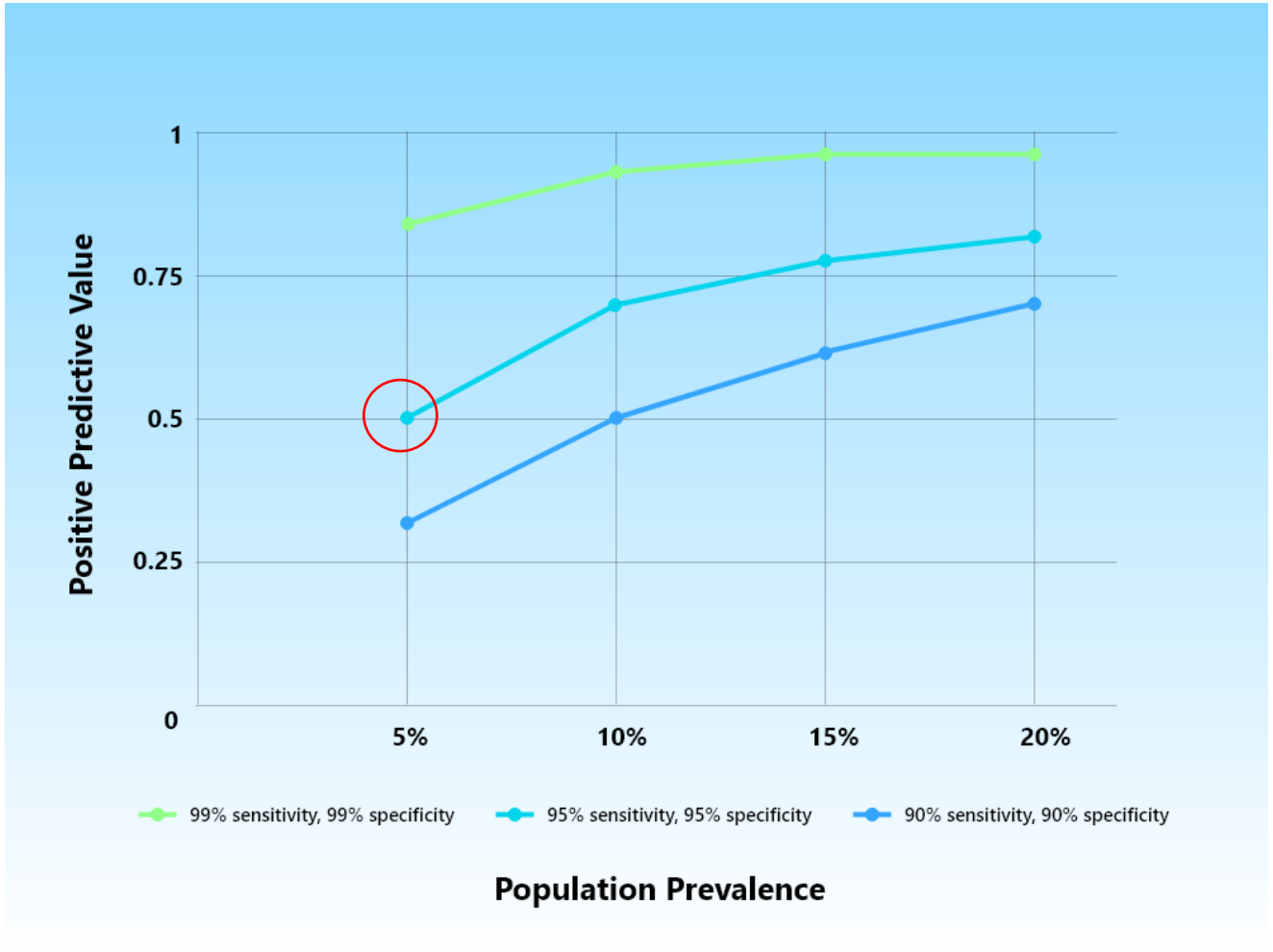
Smart testing for COVID-19 virus and antibodies—the CIDRAP Viewpoint 5/20/20

Recommendations:

- Establish national guidelines for both virus (diagnostic) and antibody detection (serology) testing.
- Draft a strategy for how testing should be used to monitor COVID19 hotspots.
- Determine steps needed to create a streamlined national laboratory testing reporting system and defined reporting standards .
- Develop protocols for rapid review of new testing technologies and modalities.

https://www.cidrap.umn.edu/sites/default/files/public/downloads/cidrap-covid19-viewpoint-part3.pdf

Relationship between prevalence & positive predictive value with differing sensitivity/specificity



- If a patient in a community with 5% prevalence receives a positive antibody test result with a test that has 95% sensitivity and 95% specificity, the positive predictive value of this test is 50%. This means that 50% of the positive results would not be true-positives

Sample calculation: sensitivity, specificity and positive predictive value

Next click the **Test** button.

	Disease				
Test	**Present**	**n**	**Absent**	**n**	**Total**
Positive	True Positive	a= 100	False Positive	c= 1	a + c = **101**
Negative	False Negative	b= 1	True Negative	d= 100	b + d = **101**
Total		a + b = **101**		c + d = **101**	

Disease prevalence

If the ratio of cases in the Disease Present and Disease Absent groups does not reflect the disease prevalence, enter:

disease prevalence (%): 2

Test

Results

Statistic	Value	95% CI
Sensitivity	99.01%	94.61%–99.97%
Specificity	99.01%	94.61%–99.97%
Positive Likelihood Ration	100	14.22–703.13
Negative Likelihood Ratio	0.01	0.00–0.07
Disease Prevalence	2.00%	
Positive Predictive Value	67.11%	22.50%–93.49%
Negative Predictive Value	99.96%	99.86%–100.00%
Accuracy	99.01%	96.47%–99.88%

https://www.medcalc.org/calc/diagnostic_test.php

FDA Emergency Use Authorization

- Allowed test manufacturers to create own RT-PCR tests and to distribute test collection kits prior to EUA as long as submitted WUEA application to FDA within 15 days
- Allowed manufacturers to create and market serology test without FDA EUA initially
  - Pathway “D” notification to FDA
  - Without FDA EUA, tests must be done in “high-complexity” lab per CMS
  - Now must submit for EUA within 10 days from validation

Detection of SARS-CoV-2 in people **with** symptoms

- For clinical care, including case isolation (recommended)
- For disease surveillance and contact tracing (recommended)
- For potentially exposed healthcare personnel, including first responders, with mild signs and symptoms (recommended)

"The question of who should be tested for SARS-CoV-2 should be guided by the local epidemiology of COVID-19 and by test resource availability. The decision of which tests are appropriate for which populations should be driven by the epidemiologic context and by the risk—to both the individual and the public—of false-positive and false-negative results."

- CIDRAP, May 2020

Detection of SARS-CoV-2 in people **without** symptoms

- For contacts identified through contact tracing (recommended with caveats).
- Epidemiologic or public health research (recommended).
- Congregate settings (recommended in certain situations)

"**Asymptomatic shedding** of the virus may be detected with a molecular test or an antigen test. It is not yet clear where, when, and how asymptomatic individuals should be tested. The collection source—such as saliva, throat, nose, or nasopharyngeal sampling—with the highest yield for presymptomatic or asymptomatic people is not yet defined."

- CIDRAP, May 2020

Detection of SARS-CoV-2 in people **without** symptoms

- Universal testing in hospital settings (**not** recommended)
  - High likelihood of false positive if low prevalence
  - Consider if recent exposure or immunocompromised
- Workplace testing (**not** recommended except in certain circumstances)
  - Consider if congregate setting or outbreak-related
- Testing in schools or other low-risk settings (**not** recommended)
  - Consider if outbreak or cluster situations
- Widespread community-based testing (**not** recommended)

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- CIDRAP, May 2020

Detection of SARS-CoV-2 antibody (**serology**)

- For convalescent plasma donor identification (recommended)
- For clinical management to confirm recent infection (recommended in certain situations)
- For testing of healthcare workers to determine immune status (recommendation unclear)
- For workplace testing, other than healthcare settings, to determine immune status (not recommended)
- For issuing immunity “passports” (not recommended)
- Public health surveillance and research (recommended with rationale and caveats)

Example of using a serological test in case investigation

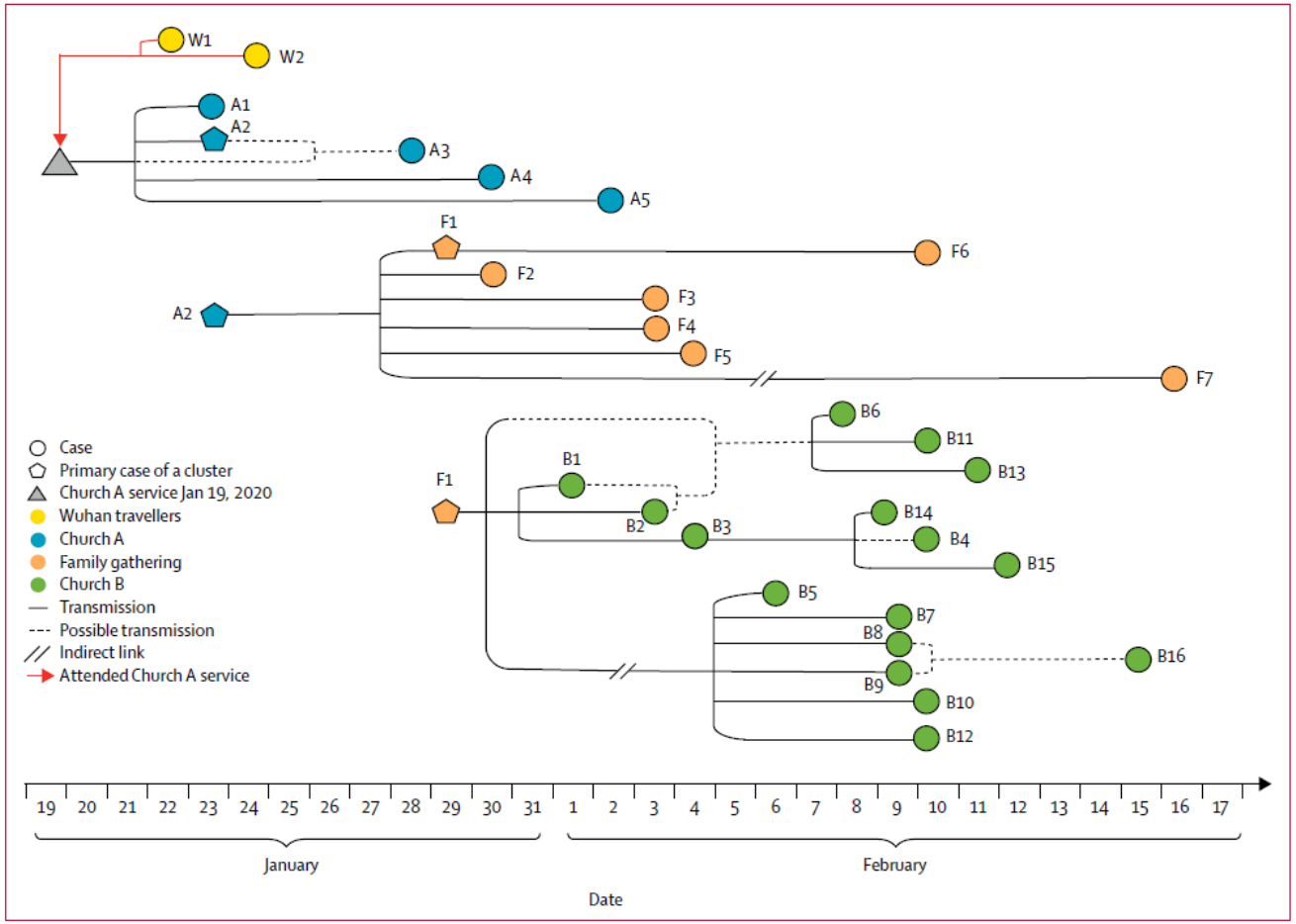

Figure 1: **Transmission map of COVID-19**
Map shows how COVID-19 was linked to two travellers from Wuhan, China, and two church clusters and a family gathering in Singapore. COVID-19=coronavirus disease 2019.

Connecting clusters of COVID-19: an epidemiological and serological investigation. *Lancet Infect Dis.* 2020; (published online April 21.) https://doi.org/10.1016/S1473-3099(20)30273-5

Resources

- https://www.cdc.gov/coronavirus/2019-ncov/testing/index.html
- https://www.cdc.gov/coronavirus/2019-ncov/covid-data/serology-surveillance/index.html
- The CIDRAP viewpoint, Part 3: Smart Testing for COVID-19 Virus and Antibodies: https://www.cidrap.umn.edu/sites/default/files/public/downloads/cidrap-covid19-viewpoint-part3.pdf
- Online sensitivity, specificity and predictive value positive calculator: https://www.medcalc.org/calc/diagnostic_test.php
- Connecting clusters of COVID-19: an epidemiological and serological investigation. *Lancet Infect Dis.* 2020; https://doi.org/10.1016/S1473-3099(20)30273-5