Quest Diagnostics®

COVID-19 Surveillance
Linking Statistics and Testing Policy

? How many SARS-CoV-2 tests are needed for public health surveillance?

Policy makers need accurate public health surveillance data to effectively manage COVID-19 in the community. These data can help answer questions, such as

→ How many people currently have the virus? How many people had the virus?

→ What are the effects of policy decisions, such as relaxing shelter-at-home orders or reopening schools?

Testing for public health surveillance has different goals than testing for individual healthcare or contact tracing. Tests performed for these purposes cannot be used for public health surveillance.

Testing for public health surveillance
- Carefully designed, random samples; collected over a short period
- Accurately measures infection and death rates
- **Number of tests needed is not well understood**

Testing for individual healthcare or contact tracing
- Not random samples; ongoing
- Does not accurately measure infection and death rates
- Number of tests needed is large (millions)

A statistical approach can help determine the number of tests needed

Estimated prevalence
Desired precision
Population size
Test performance
→ Statistical calculation → Number of tests

Typically, thousands (not millions) of tests are needed for public health surveillance
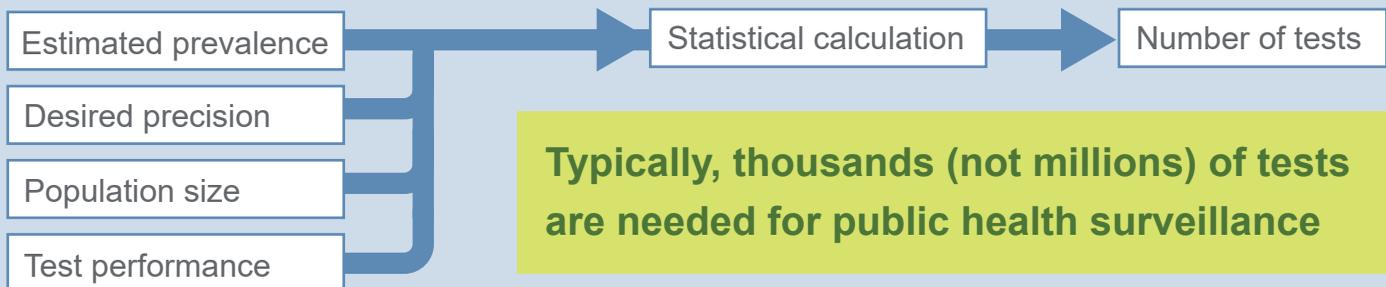
→ Public health surveillance can be done with thousands of SARS-CoV-2 tests, which the current testing infrastructure can handle.

For more information about Quest Diagnostics publications, please visit the Clinical Education Center at Education.Questdiagnostics.com/publications.

COVID-19 Surveillance
Linking Statistics and Testing Policy

Article Title: "Linking Statistics With Testing Policy to Manage COVID-19 in the Community"

Lee H Hilborne,[1,2,3] Zachary Wagner,[1,4] Irineo Cabreros,[1] Robert H Brook[1,2]
[1] RAND, Santa Monica, CA, USA; [2] University of California Los Angeles, Los Angeles, CA, USA; [3] Quest Diagnostics, Secaucus, NJ, USA; [4] Pardee RAND Graduate School, Santa Monica, CA, USA

Background

- By the end of May 2020, more than 14 million diagnostic tests for SARS-CoV-2 infection had been performed in the United States, with calls for increased testing as the pandemic entered its 6th month.[1]
- Current testing capacity, which continues to grow, is sufficient for the tens of thousands of daily tests that are performed for individual health management. However, additional testing for public health purposes is needed to manage COVID-19 in the community. Millions of tests per day may be needed for effective contact tracing.
- The number of tests needed for public health surveillance, which includes monitoring the prevalence of acute infections and seroprevalence, has received less attention.
- **Objective:** In this report, the authors describe an approach to help determine the numbers of diagnostic tests needed for public health surveillance of COVID-19.

Methods

- A standard statistical model was used to determine 1) volume of molecular testing to monitor active infection, and 2) volume of serology testing needed to monitor seroprevalence.
- The model takes into account 1) estimated disease prevalence; 2) desired precision; 3) population size; and 4) test performance (standard values of sensitivity and specificity were assumed).
- Online calculators were developed from a statistical model to provide testing volumes needed to estimate 1) prevalence for population surveillance (https://covid-testing-calculators.shinyapps.io/calculator/) or 2) a change in prevalence that occurs after a policy change (eg, opening public venues) (https://covid-testing-calculators.shinyapps.io/calculator2/).

Results

- Using the statistical model described above, the authors found that, for most populations or subpopulations, monitoring active infection (molecular testing) or seroprevalence (serology testing) requires a testing volume in the thousands.
  - Example for molecular testing: In Los Angeles County, modeling indicates that approximately 8,728 people should be tested given a prevalence of active infection in the range of 0.5% to 0.9%.
  - Example for serology testing: In Los Angeles County, modeling indicates that approximately 2,337 people should be tested given a seroprevalence of 4.6%.
  - Example of surveillance over time: If a school is reopening and will need to close again if prevalence increases, the second calculator can help determine how many tests are needed.
- The authors also point out an important characteristic of this statistical approach: because of random sampling, large populations do not necessarily require larger numbers of tests.

Conclusions

- COVID-19 public health surveillance typically requires testing volumes in the thousands, not tens of thousands or millions, for any given population or subpopulation.
- The laboratory testing infrastructure currently in place can accommodate testing needed for public health surveillance. However, public health surveillance requires testing programs that are carefully designed to support randomized testing.

Reference
1. Centers for Disease Control and Prevention. Coronavirus disease 2019 (COVID-19): testing data in the US. Accessed May 26, 2020. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/testing-in-us.html