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CSH Policy Brief

Pooling corona tests could boost test efficiency by a factor of 10

According to calculations by the Complexity Science Hub Vienna (CSH), significantly more people could be tested for SARS-CoV-19 with the tests currently available if several samples were combined into one test [1]. The method presented here indicates the optimal pooling size. With 10,000 actually infected persons in Austria, about 45,000 people could be tested with 3,000 tests available daily. If the number of infected persons is 100,000, about 15,000 people could be tested daily. Pooling could thus help to significantly alleviate bottlenecks in testing.

Background

Many countries, including Austria, face a shortage of tests for the SARS-CoV-2 virus. Pooling strategies for testing potentially infected persons are a practically free way of multiplying the efficiency of the tests while the level of infection of the population is still low.

In the simplest version of pooling, samples from several people are given together and tested with a single test. If the test is negative, all the people tested are negative. If the test is positive, all persons are tested individually. If the infection level of the population is low, this can lead to considerable increases in testing efficiency.

The method

In pooling strategies, samples from several people are combined and evaluated in one test. In this way, the effective number of people measured per test can be increased massively. The quality of the method depends on the number of infections in the population. With an infection rate of 0.1 percent, up to 15 persons can be measured per test, i.e. the same number of tests can test 15 times more persons. At an infection rate of 1 percent, 5 people can be tested per test. With 10 percent infected, the effectiveness of the method drops to under 2 persons per test.

Results in detail

The proposed method is a formula which, on the one hand, indicates how many people can be pooled, i.e. how many samples are to be measured together in one test. On the other hand, it estimates the degree of efficiency: i.e. how many people can be effectively tested with one test.

The results are shown in Figure 1 (blue curve). The x-axis shows the infection level of the population, the y-axis the optimal pooling size (see figure 1 (a)).

Figure 1 (b) shows the number of people that can be measured with one test.

Figure 1 (c) shows the expected error rate ("false negatives") of the pooling method.

Pooling of SARS-CoV-2 samples

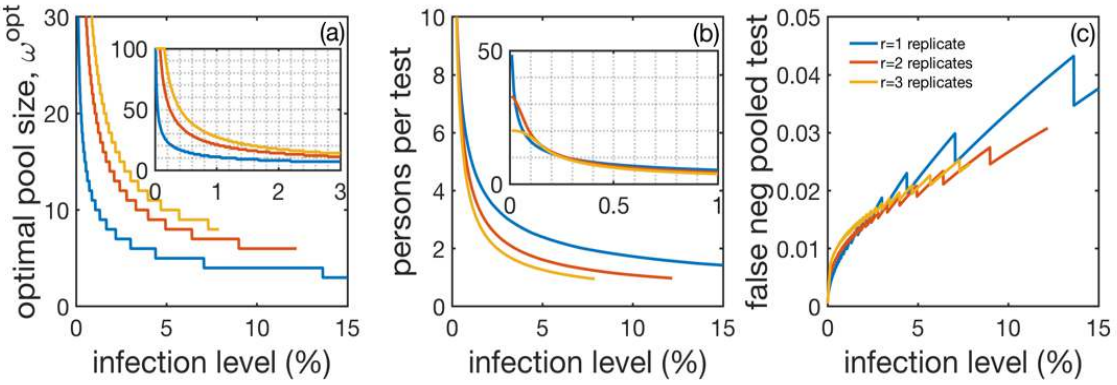

Fig. 1 (a) Optimal pooling size for a given infection level in the population. **(b)** Individuals that can be effectively measured by a test. The tables within the graphs show the situation for low levels of infection. **(c)** Error rates ("false negatives") of the pooling procedure.

Conclusion of the CSH

Assuming that there are currently 10,000 actually infected persons in Austria, the optimal pooling size is approximately 32 samples per test. In this case, with 3,000 tests available daily, about 45,000 people could be tested in Austria. If the number of infected persons is 100,000, the optimal pooling size is 11, which means that with 3,000 tests, 15,000 persons could be tested daily.

Assuming a number between 10,000 and 100,000 infected persons, **the optimal pooling size will be about 20 samples per test.** Here, it can be assumed that about 30,000 people can be tested daily. As the infection level of the population increases, the pooling size as shown in Fig. 1 (a) should be reduced.

It should be noted, however, that this proposal could be hampered by concrete problems in laboratories and test centers.

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[1] R Hanel, S Thurner, Boosting test efficiency by pooled testing strategies for SARS-CoV-2 , March 21, 2020

About the CSH

The Complexity Science Hub Vienna was founded with the aim of using Big Data for the benefit of society. Among other things, the CSH systematically and strategically prepares large data sets so that they can be used in agent-based models. These simulations allow the effects of decisions in complex situations to be tested in advance and systematically assessed. Thus, the CSH provides fact-based foundations for an evidence-based governance.

***CSH Policy Briefs** present socially relevant statements that can be derived from CSH research results.*

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