

IE 479 Spring 2022
Pandemic Logistics: Covid-19 Testing Centers
Project 1 - Due Date: April 1, 17:00

1 Introduction

The COVID-19 pandemic is a current pandemic of the disease provoked by SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2). The first case of COVID-19 emerged in Wuhan, China, in December 2019. The spread of the virus was recognized as a pandemic on 11 March 2020 by the World Health Organization.

There are various methods to detect infections in an attempt to restrict the COVID-19 outbreak. Antibody testing can be used for diagnosing past infections. Antigen and viral tests are utilized to identify ongoing infections; the former is convenient and fast but is not sensitive compared to the latter. The gold standard test to confirm the infection is polymerase chain reaction (PCR) testing.

The high contagion of the virus has caused the outbreak to become a global issue. The time interval during which an infected person may spread the virus is 1 to 14 days. As it takes time to obtain the results from viral tests, a potentially sick person is at risk of infecting others in that time interval. To prevent the virus from spreading, early detection of the infection is crucial to isolate infected individuals from public areas and to decrease mortality by monitoring and treating the patients in the early stages of the disease.

Due to the need for early recognition of the disease and to increase the reach of testing, the authorities determined to open new testing facilities. Those new testing facilities are called as local test sites or walk-through sites. There are local test sites (walk-through sites) in common areas such as campuses, and parking lots that require no prior booking for PCR testing. The walk-through sites are intended to increase the availability of testing by reaching disadvantaged areas. The new system aims to enhance the availability of testing while also increasing the total sample collection and alleviating the testing responsibility of the traditional testing centers.

2 Problem Definition

The system is especially crucial for people in vulnerable part of the communities. In this system, people who would like to get Covid-19 testing services will visit a local test site. The system allows the local test centers to be located at certain points near health centers and hospitals, such as parking spots. In order to visit a local test site, the test site should be within a walking distance so that people in disadvantaged areas can have easier access to the test sites and this is the only logistics requirement. The authorities especially would like increase access to the given vulnerable areas and have determined some candidate locations for the local test sites.

Hence, the new system aims to enhance the availability of testing while also increasing the total sample collection and alleviating the testing responsibility of the traditional testing centers. You are given three distances:

- District-to-District

- Test Site-to-Test Site
- Test Site-to-District

3 Case Questions

Considering the logistics requirements, you are expected to find the best locations for the local test sites and do sensitivity analysis.

Question 1: Try to cover every vulnerable district within a coverage radius while minimizing the number of local test sites. Analyze system based on coverage radius values including 2km, 3km, 4km, 5km and 6km. Where should you place the local test sites for each coverage radius?

Question 2: Try to cover as many people as you can within a coverage radius if you have a certain budget to open local test sites. Analyze system based on coverage radius values including 2km, 3km, 4km, 5km and 6km and assume that you can at most open 4 local test sites. Where should you place the local test sites for each coverage radius?

Question 3: If each district has to be reached within a coverage radius and you want to minimize total distance between the districts & the local test sites, where should you place the local test sites? Analyze system based on coverage radius values including 3km, 4km, 5km and 6km and assume that you can at most open 4 local test sites.

About Grading:

- Report Format: 20%
 - Executive summary
 - Overall explanation and language
 - Clarity
- Quality of workmanship: 40%
 - Stating the assumptions if any
 - Explanation of methodology and technique
- Quality of the solution: 40%
 - Correctness
 - Objective values