

1 Introduction

In those last years, the world has been through a financial crisis. Moreover, the uncertainty puts pressure on companies to reduce and optimize their costs. Beyond challenges in Health Care after Covid-19 there are financial challenges to providers. Shutting down hospitals, physician offices decreased capacity to provide care during Covid-19. Ambulatory practices and non-urgent surgeries were suspended to ensure staff and facilities avoid providers to access capital and other sources of liquidity[1].

Operations management focuses on health care systems focusing on improving the operational efficiency. This project addresses a healthcare facility's location, network, and planning capacity. Besides the combination of facilities and location-network design, the basic problem is optimally building a network that enables flows and satisfies some constraints[2] that is beneficial to consumers and minimizes the financial strain on them in an already expensive field.

Madison Healthcare network (MHN) provides many types of medical services across Wisconsin in the United States. The company is willing to provide an integrated health care network, the strategic goal is to present a plan to remain economically competitive and provide patient-centered care.

2 Data Explanation

The company provided current location and capacity for each medical specialty. If the patient decides to take an appointment in another place outside of the MHN network the cost of the appointment is between 10-15% more than MHN appointments. If the distance between the facility and patient's location is too large, some patients choose another facility outside of the network.

To be more specific, the means and variability in appointment for each specialty in each region allows to calculate demand for appointment in each region depending on medical specialty. The specialties are: Cardiology, dental, dermatology, mental health, neurological, gynecology, Orthopedics, Pediatric and Pulmonary. Also the data provides the cost of each specialty appointment and the cost for no-show that means the no presence of patients to the appointment.

Finally, the data provides distance between patient location and facilities, the location from L1 to L15 are defined through the zip code. The company is willing to know how the scenario for the next 5 years, if the population 5% annually, could respond to the demand or if they need to build new facilities.

3 Problem Description

The growth in the number of patients, the aging of population, increasing health care cost, technology shift and competition among service providers have affected health system [3]. Considering plan patient- centered , the provider should provide high quality healthcare services at the minimum cost and reduce the distance between patients and their network. However, capacity planning in health care system design could affect service quality. On the other hand, high capacity does not mean high demand. Thus, it is important to consider socioeconomic aspects, population, demand of services and costs.

This case in particular, the actual network is bringing consequences:

- When a hospital does not have enough capacity. Patients take a long time to receive care. This wait time leads to patients looking for an appointment in hospitals outside of the network.
- The hospitals by lacking point of view's optimization, they may not use resources properly. Services that are not being used or lack of demand are increasing total cost.
- Poor capacity and demand planning lead to a financial instability for no management of costs.
- The actual plan does not consider that there is a correlation between speciality appointments. For example patients that require neurology appointments there are 90% that they need mental health appointments.
- Finally being not able to provide care on time leads to patients leak providing poor outcomes.

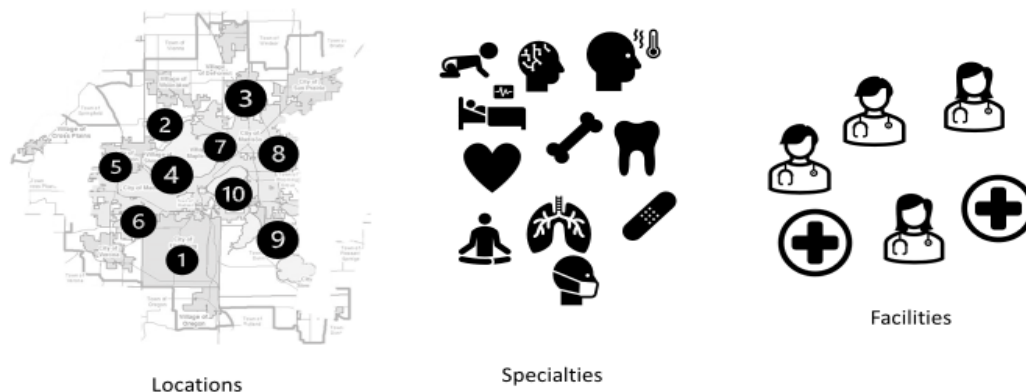


FIGURE 1 : The structure of the health service network.

4 Discussion

So far, the general format of data has been organized, the mathematical model, at least in theory, has been more or less ironed out to a point that all that is left to do is to apply it to Julia code. This process may make use rethink or reformat some of the mathematical model, but outside of the finalized report, this is the bulk of what remains to be done.

5 Issues, Concerns

The main issue is the complex nature of the data, in that there are many interlocking parts that may require some assumptions to get around, which will need to be highlighted in the final report. Outside of that, some additional constraints or variables may need to be implemented, as they do not exist in the dataset currently, but will be relatively easy to add.

[1] 0 Journal Article,A Michael L. Barnett,A Ateev Mehrotra,A Bruce E. Landon,T Covid-19 and the Upcoming Financial Crisis in Health Care,D 2020,J Catalyst non-issue content,P ,V 1,N 2,R doi:10.1056/CAT.20.0153,U <https://catalyst.nejm.org/doi/abs/10.1056/CAT.20.0153>.

[2] 0 Journal Article.A Davood Shishebori,A Mohammad Saeed Jabalameli,A Armin JabbarzadehT Facility Location-Network Design Problem: Reliability and Investment Budget Constraint,D 2014.J Journal of Urban Planning and Development.P 04014005,V 140,N 3

[3] M. Mousazadeh, S. Ali Torabi, M.S. Pishvae, F. Abolhassani, Accessible, stable, and equitable health service network redesign: A robust mixed possibilistic-flexible approach,.Transportation Research Part E: Logistics and Transportation Review,Volume 111,2018,Pages 113-129,ISSN 1366-5545,