SOCIOECONOMIC AND POLITICAL DIMENSIONS OF COVID-19 DISPERSION

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ABSTRACT

This study aims to provide an understanding of how certain factors lead to the formation of clusters of areas of COVID-19 dispersion to guide policy decisions and government actions. It utilized an ecological study design that analyzes data at the population or group level. The units of observation are the barangays in Cebu City. These barangays are the nodes in the network and the edge considered is the presence of areas of convergence. In order to identify the nodes for this study, data mining was done to get the number of reported COVID-19 cases in Cebu City from the Cebu City Health Office as of May 23, 2020. Only thirty-nine (39) barangays with COVID-19 cases were included in the study. Results revealed that although public and private transportation is controlled during the implementation of Enhanced Community Quarantine, it is assumed that the spread started prior to the implementation of strict prohibitions which led to the rise of cases later on. Even at the time of the strict community quarantine restrictions, economic activities related to basic necessities were still allowed. For instance, public markets were open with prohibitions related to schedules only. This implies that people are still mobile at certain times despite the presence of restrictions. People still converge in areas where economic activities are present.

KEYWORDS

COVID-19, Community Quarantine, Restrictions, Socioeconomic dimensions, Political Dimensions, Network, Convergence

INTRODUCTION

Infectious diseases present enormous challenges to the public health of the human population. The World Health Organization (WHO) has suggested that the most important measure for controlling infectious disease is a timely response with the implementation of effective interventions. This requires the establishment of the investigation of tempo-spatial disease transmission patterns [1, 2]. Community-based interventions such as school dismissals, event cancellations, social distancing, and creating employee plans to work remotely can help slow the spread of COVID-19. More so, individuals can practice everyday prevention measures like frequent hand washing, staying home when sick, and covering coughs and sneezes [3].

In the early years of scientific medicine, most clinicians and researchers thought only in terms of single causes: specific agents that cause a specific disease. Researchers have shown that the transmission of an infectious disease can be affected by various interactive factors at or across different scales, which makes it very difficult to predict when, where, and how the disease will spread. The natural transmission of an infectious disease depends on the presence of and the interrelationships among three types of epidemiological entities: the disease, the host, and the transmission agent.

Generally speaking, disease transmission is determined by both the transmission properties of each type of entity and the complex ways in which the three types of entities interact with each other [1, 2]. However, current research discoveries highlight the relationships between health and behavioral, psychological, and social variables [4]. Less widely recognized, however, is the association between socioeconomic status and health, or the influence of social networks, current or anticipated employment status, and personal beliefs [5, 6]. These are factors most of the time not considered in disease spread prevention efforts.

Decisions about the implementation of community measures are made by local and state officials, in consultation with other officials as appropriate, and based on the scope of the outbreak and the severity of illness. Implementation will require extensive community engagement, with ongoing and transparent public health communications [3]. WHO was successful in working closely with various stakeholders to promptly generate understanding of the SARS CoV-2, to track the spread and virulence of the virus, and to continuously provide advice to countries and individuals on measures to protect health and prevent the spread of this outbreak. Thus, this study aims to provide an understanding of how certain factors such as policies on the mobility of residents to access goods and services (convergence in public places and transportation) lead to the formation of clusters of areas of COVID-19 dispersion to guide policy decisions and government actions.

THEORETICAL FRAMEWORK

The focus of the study is on the dispersion of the COVID19 cases, specifically looking into the modularity of the COVID19 cases in Cebu City. Modularity refers to the clustering of cases based on the presence of areas of convergence and the availability of the means of transportation from one barangay to another. A barangay is the smallest political unit in the country [7]. The barangays will serve as the nodes and the areas of convergence and means of mobility are considered as the edge. It is assumed that these factors determine the incidence of COVID19 cases.

There is a direct relationship between the areas of convergence and means of mobility and the number of cases in certain barangays. It is further assumed that the weight (extent of) of the interaction has a direct relationship with the areas of convergence and means of mobility between barangays. To further strengthen the relevance of the analysis of the study, the social, behavioral, and political factors of every barangay are to be considered in the analysis. The social and behavioral factors pertain to congregational behavior and recreation activities [6]. Furthermore, these involve the mobility of people to areas that allows them to access their basic need as permitted by local leaders. These areas are the major sources of economic activities such as markets, malls, and groceries. Political factor refers to the practices within the locale which pertain to a policy implemented related to household monitoring, transfers, and migrant residents in the barangays and the precautionary measures [7]. These involve issuances enforced that regulate the movement of people across barangays. These factors provide the qualitative parameters in the visual analysis of the modules derived in this study.

METHODOLOGY

The study utilized an ecological study design that analyzes data at the population or group level [8]. It is an observational study often used to study rare diseases such as COVID-19 and measure their incidence and prevalence in a particular group of people. In this study, the units of observation are the barangays in Cebu City. These barangays are the nodes in the network and the edge considered is the presence of areas of convergence. In order to identify the nodes for this study, data mining was done to get the number of reported COVID-19 cases in Cebu City from the Cebu City Health Office as of May 23, 2020. Only thirty-nine (39) barangays with COVID-19 cases were included in the study. The connectedness between the nodes was established based on three (3) reference barangays with the highest number of cases. Further, to establish the weights for the edges, an additional attribute was used which is the means of mobility. Codes were utilized for the assigning of weights namely: two (2) if both criteria - area of convergence and means of mobility is present; one (1) if either of the criteria is present; and zero (0) if both are absent. An undirected network perspective was utilized in which the edges indicate a two-way relationship and that each edge can be traversed in both directions. All data gathered were entered in Gephi to come up with a network graph for analysis. Yifan hu layout was utilized to get an overview of the network structure and betweenness centrality was considered to identify influential nodes. Finally, the researchers looked into the

formations of clusters as presented in the network graph and explained the data through the actual observations and reports on the socio-economic and political activities of the barangays involved.

RESULTS

Data taken from the City Health Department posting of Cebu City COVID-19 cases were used to identify the hot zones of the spread of infection and were used as a basis for the identification of nodes. The edges that connect the nodes were dependent on the presence of a common area of convergence. The weights of the edges were determined by an additional attribute variable - the means of transportation. Three barangays were identified as sources and are considered to be hotspots of COVID-19 cases.

FIGURE 1. NETWORK ANALYSIS OF COVID-19 SPREAD IN CEBU CITY
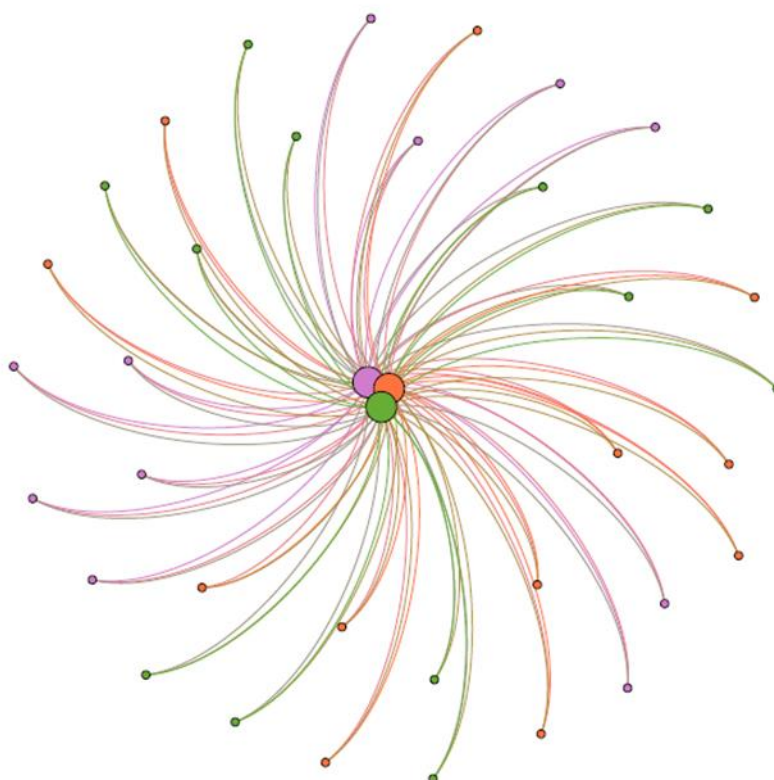
The figure above shows a single main cluster composed of 39 nodes and 108 edges. At the center of the cluster are 3 larger nodes which correspond to barangays Mambaling, Luz, and Labangon respectively. Each of this barangay is connected to the other barangays with COVID-19 cases in varying path lengths and weights as shown by the lines that connect one node to another. The differences in path lengths can be seen by how far a node is from the larger central node. On the other hand, the lines that connect these nodes vary in weight which signifies that one or more barangays are more closely linked to the central node.

There are also three different colors in the figure that represent specific modularity classes. One cluster is in purple color with Barangay Mambaling as the central node. The lines that connect barangay Mambaling to the other nodes are also in the same color. Another cluster is in orange with Barangay Luz as the central node. In the same way, all lines that connect barangay Luz to the other nodes are in a similar hue. Lastly, the green color represents another cluster with Barangay Labangon as the central node and the lines that connect it with the rest of the barangays are of the same color.

Moreover, the figure reveals an overlapping of the three clusters with three nodes having more connections than the rest of the nodes as it appears to be larger in diameter. The smaller nodes are situated around the larger nodes and are connected in lines of varying weights. Also, the three larger nodes are linked to one another.

Despite the source of infection coming from different barangays in the city, the figure reveals a cluster of nodes with connections to the other nodes or barangays. The connections are of varying weights which corresponds to the presence of an area of convergence and means of mobility. COVID-19 infection spreads to other areas since people from different barangays meet at a certain place to satisfy their basic necessities. Further, the pattern of spread may also be attributed to the means of transportation and the areas covered by specific vehicle routes. Cases spread in areas where there are travel routes or are along the routes of transportation towards points of convergence.

Although public and private transportation is controlled during the implementation of Enhanced Community Quarantine, it is assumed that the spread started prior to the implementation of strict prohibitions which led to the rise of cases later on. Even at the time of the strict community quarantine restrictions, economic activities related to basic necessities were still allowed. For instance, public markets were open with prohibitions related to schedules only. This implies that people are still mobile at certain times despite the presence of restrictions. People still converge in areas where economic activities are present.

DISCUSSIONS

With the COVID-19 pandemic still affecting the globe and a considerable number of new cases appearing every day, the choice to move around, dine out, or join other social gatherings is complicated. While some still underestimate the capacity of the virus to hit people plays a part in some of these decisions, even people who acknowledge the danger of contracting the coronavirus keep risking social interactions. The innate characteristic of humans to interact with one another compels people to be social may be to blame. Preventing them to socialize means depriving people of their human nature [8].

During the pandemic, the coronavirus has hinged on the dependence on social interactions to spread the disease. But within that same human drive lies a possible key to making social distancing easier. It is in the nature of humans to develop a penchant for altruism and protecting one another. However, this need to protect one other also includes the responsibility of looking for food for family members which can only be done if work continues and if there are means to move around the city. Thus, forcing people to go out despite the threat of being infected [8].

The increasing spread of the coronavirus across countries has prompted many governments to introduce unprecedented measures to contain the epidemic. These are priority measures that are imposed by a sanitary situation, which leave little room for other options as health should remain the primary concern. These measures have led to many businesses being shut down temporarily, widespread restrictions on travel and mobility, financial market turmoil, an erosion of confidence, and heightened uncertainty [9]. As state and local officials pleaded for residents to stay at home in the midst of the coronavirus pandemic, many included a caveat: people can still enjoy the outdoors, as long as they can maintain a safe social distance, and if going out is for essential activities only [10].

People are supposed to only visit stores selling household essentials in person when they absolutely need to and stay at least 6 feet away from others who are not from your household while shopping and in lines [11]. However, noticeably, people still chose to go to marketplaces that provide affordable products despite the chances of getting infected. This is due to the fact that the pandemic has severely impacted the financial status of the majority of the citizens. Furthermore, the pandemic raised the unemployment rate in the country. Strict quarantine measures have forcefully closed small and big businesses leading to either temporary or permanent loss of jobs. Losing income at this point in time cripples one's purchasing power. This means that people are drawn to areas that offer lower prices for basic commodities. They are inclined to converge in places such as public markets to satisfy their physiological needs. Going to flea markets is not only for cultural reasons, but also to maximize the meager finances left from the savings after not being able to gain income for months.

Another important consideration is mobility and transportation. The role public transportation plays in the spatial transmission of COVID-19 is significant. It was found

out that there is an association between the spread of the infection and the travel of people through the public transportation system [9]. Public transit can put you in close contact with others. However, the majority of the people rely on the public transportation system to move around, especially for work and school. Before strict prohibitions on mobility have been implemented, people move around through public vehicles. supposedly, when going out in public, it is important to stay at least 6 feet away from other people and wear a mask to slow the spread of COVID-19. Before going out, people should know and follow the guidance from local public health authorities in the locality. It is important to consider social distancing options to travel safely when running errands or commuting to and from work, whether walking, bicycling, wheelchair rolling, or using public transit, rideshares, or taxis [11].

The COVID-19 experiences of different local government units have initiated different responses on how to address the spread of infection. This health problem has affected different sectors of governance and created the challenge of how this can be mitigated or controlled. The type and time of response to control the spread of infection are critical points to consider in any area with threats of an epidemic. Common initial responses from local government units would be less significant and most often focused on an immediate resolution once some cases are observed. However, when the unprecedented increase of cases is reported, the political will is challenged and forces leaders to address the concerns. It is only then that the strict quarantine measures were enforced and tracing of cases are implemented. When the onset of a threat is observed immediate quarantine measures were implemented, mobility restrictions would reduce the spread of the virus from one carrier to another. An appropriate tracking system of symptomatic and asymptomatic cases and their contacts will further control the transmission of the infection.

A clear example is reported in Cebu City. The strict implementation of the quarantine pass, suspension of public transportation, curfew and mobility limitations for the young and old population, enforcement of work from home arrangements, among other measures at the height of the rising cases of COVID19 led to a gradual reduction of cases after a few months. These measures demonstrate how control of people's convergence in the same places limits infectious transmission given the spatial picture of how the spread intensified.

CONCLUSION

As the government chooses policies to follow in response to the pandemic, it is imperative to understand precisely how both the pandemic and potential government interventions will impact everyone. Maintaining public and political will for extending social distancing measures and keeping people housed depend on easing financial pressure on people who have been forced to stop working or have otherwise lost income from jobs or businesses. In addressing both the public health crisis and the economic crisis, timely data can help policymakers assess and improve relief efforts so that everyone can afford basic needs until the crisis lifts. To further understand the emergence of cases, it may help to do a network analysis before and after the implementation of measures to suggest that there may be an association between implementation measures and the reduction of cases.

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