Modeling Local COVID-19 Disease for the Southwest Georgia Public Health District: Brief Report

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Executive Summary

Overview

The purpose of this document is to provide information regarding current and potential future COVID-19 disease prevalence, as well as estimates of overall hospital burden to prepare as effectively as possible for the community health effects of COVID-19. This report uses publicly-available data from March, April, and May 2020 for Georgia's 14 county Southwest Public Health District (SPHD). The models presented here have been calibrated to fit the population size; date of the first confirmed case; likely number of exposed but not infectious persons; and infectious persons in the community from when the first case was reported. The simulations reported below, which are calibrated using these data, predict the number of future cases through June 5. It is impossible to predict the number of confirmed cases given the shifting public health and public policy landscapes in this region, and the unknown level of adherence to Shelter-In-Place (SIP) policies. For this reason, we present models based on a set of assumptions which allow us to introduce varying levels of SIP implementation and adherence.

Main Findings

Findings are presented for modeling results based on partial SIP and no SIP in Tables 1 and 2, respectively. For planning purposes, it is recommended that area hospital systems prepare for greater, rather than fewer, cumulative cases and hospitalizations in order to be as prepared as possible. As of May 8th, the cumulative case count has exceeded the model prediction, however, there has also been a significant increase in testing activity in recent weeks. Prior rationing of tests across the state severely inhibited accurate case counts. This context is important for the community, hospital, and government preparedness efforts.

Regionally, the cumulative hospitalziation rate has been between 17.1% and 17.7% of those who test positive, with an average of 17.5%. We have used this 17.5% to predict the cumulative and weekly increases in hospitalizations in the SPHD. This number does not account for hospitalization discharges. We do not estimate the number of patients or cases that might require intensive care services (including ventilator support). There is substantial variation in the data and reports that have been generated on the fraction of inpatient cases that then need to be admitted to the ICU. The latest World Health Organization publication that provides data on this topic estimates that 5% of cumulative

cases will need such support.[1] The University of Washington's Institute for Health Metrics and Evaluation suggests that 15% of patients will require an ICU bed.[2]

Table 1. Estimated Weekly Cases and Hospitalizations Based on Partial Social Distancing and a 17.5% Hospitalization Rate Through June 5, 2020.

	Estimated Cumulative Case Count	Estimated Weekly Case Increase	Estimated Weekly Hospitalization Increase
May 15, 2020	3684	146	26
May 22, 2020	3845	161	29
May 29, 2020	4047	202	36
June 5, 2020	4270	223	40

Table 2. Estimated Weekly Cases and Hospitalizations Based on No Social Distancing and a 17.5% Hospitalization Rate Through June 5, 2020.

	Estimated Cumulative Case Count	Estimated Weekly Case Increase	Estimated Weekly Hospitalization Increase
May 15, 2020	3816	242	43
May 22, 2020	4234	418	74
May 29, 2020	4982	748	131
June 5, 2020	6307	1325	232

[1] https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected
[2] https://covid19.healthdata.org/projections

Limitations

The information presented here summarizes the results of a mathematical model. Like all such models, the one used here is based on simplifying assumptions. Experts in the field have labeled these assumptions plausible, and the predictions made using these assumptions match well with what we know about the epidemic so far. In spite of this, the assumptions underlying this model are necessarily imperfect. Predictions based on these assumptions are subject to uncertainty that cannot be characterized within the framework of the model itself. Moreover, the data that are input into the model, including the number of confirmed cases, are imperfectly measured, which adds another element of uncertainty that cannot easily be quantified.

Discussion & Summation of Findings

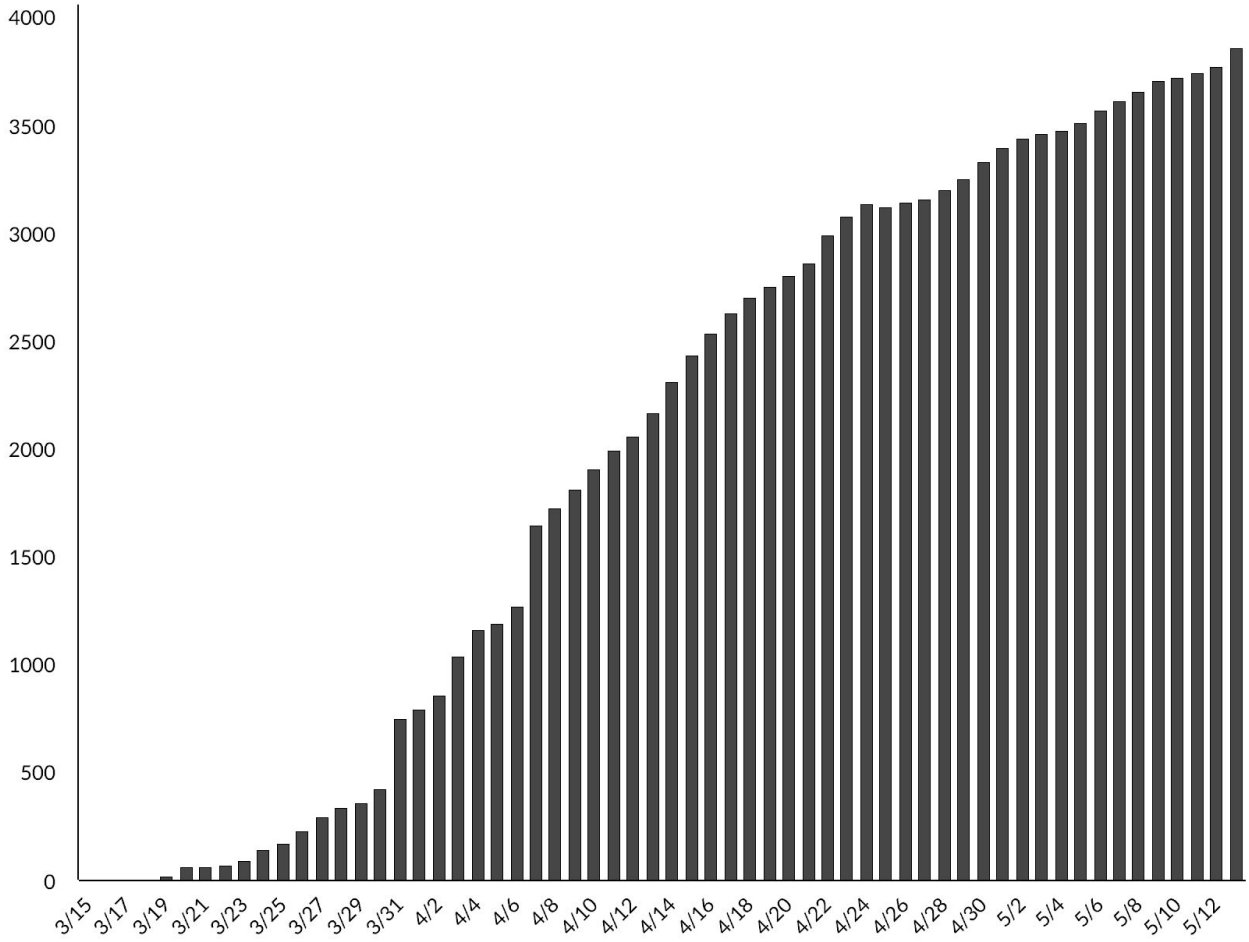
Georgia's statewide Shelter-In-Place (SIP) ordinance went into effect on April 3rd and was incrementally revoked, starting on April 24th. Several counties within the region enacted either partial or full SIP ordinances prior to April 3rd. Residents' adherence to the mandate can have a significant impact on the number of COVID-19 cases, hospitalizations, and, ultimately, deaths.

Taken together, the estimates and models in this document provide a range of estimates. For planning purposes, it is suggested to prepare for the scenario that will allow for an adequate amount of Personal Protective Equipment (PPE) and enough healthcare providers, among other resources that might be needed, should confirmed cases follow the time trend of the larger estimates presented.

Section I. Epidemic Curve

Figure 1 below shows the current epidemic curve for the fourteen county Southwest Public Health District region. See Appendix A for a regional map and county details. **As of May 12th, the Georgia Department of Public Health daily brief reported that there have been 3,864 cases, 683 hospitalizations and 304 deaths related from COVID-19 in the southwest region defined in Appendix A. This represents 11.6% of cases, 11.1% of hospitalizations and 20.7% deaths in Georgia, while the regional population accounts for just 3% of the state's total population**.

Figure 1. Epidemic Curve of Actual Cases through May 12, 2020.



Section II: Modeling Predictions of Confirmed Cases

In order to predict the total number of confirmed cases expected in the Southwest Public Health District, we modified a simulation model developed by Dr. John Drake (infectious disease ecologist) and Dr. Andreas Handel (epidemiologist) and colleagues at the University of Georgia. This model was originally designed to simulate the number of aggregate cases from the original outbreak in Wuhan, China and was then adapted to predict cases across the state of Georgia. Dr. Drake, Dr. Handel and colleagues shared data, programming, and output to assist and expedite the process of local modeling. Details regarding their Georgia state-level analysis may be found here.

For the purposes of the local analyses presented in this report, the model was recalibrated to local conditions in the SPHD region, including placement of county and state-level SIP ordinances, as well as the removal of Georgia's state-wide SIP ordinance. The initial number of reported cases from the 14-county region was also included as a parameter in the models.

Modeling for partial and no SIP is presented in Figures 2 and 3, respectively. In each of these models, there are some implicit assumptions. For example, as a result of state and local policy changes and public health efforts, it is assumed that there is some reduction in transmission of the disease over time (*e.g.* isolation of symptomatic individuals that have been told by providers to quarantine at home).

Figure 2. Estimated Latent, Infectious, and Cumulative Cases Based on Partial Social Distancing

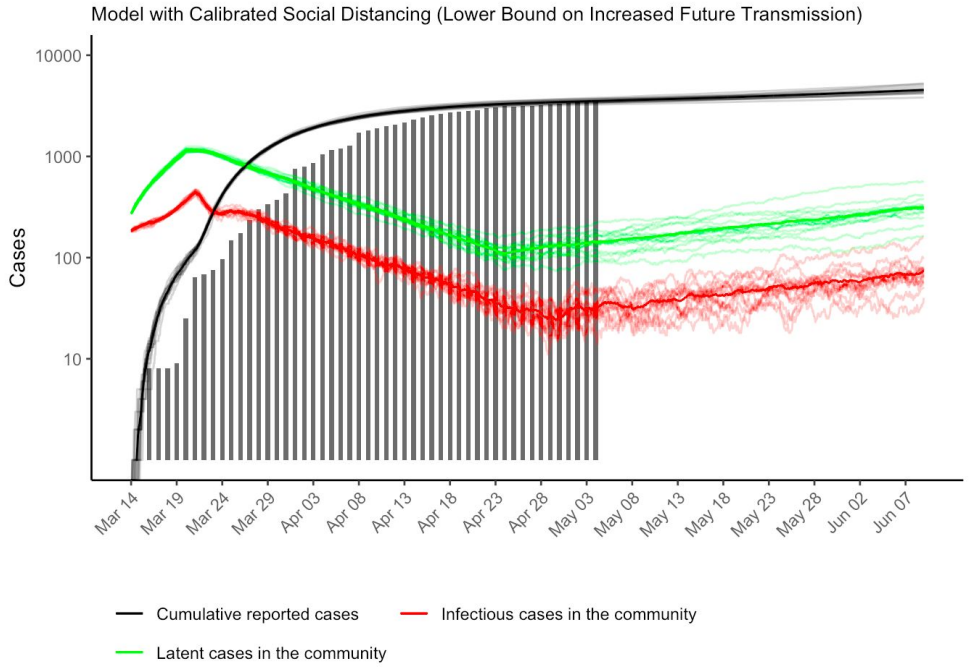
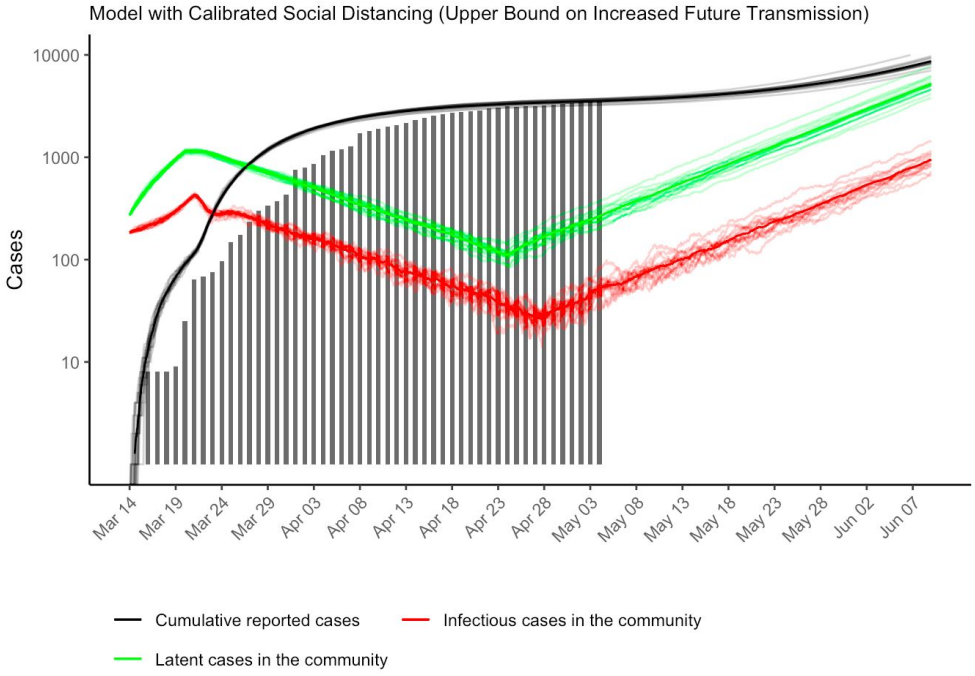


Figure 3. Estimated Latent, Infectious, and Cumulative Cases Based on No Social Distancing



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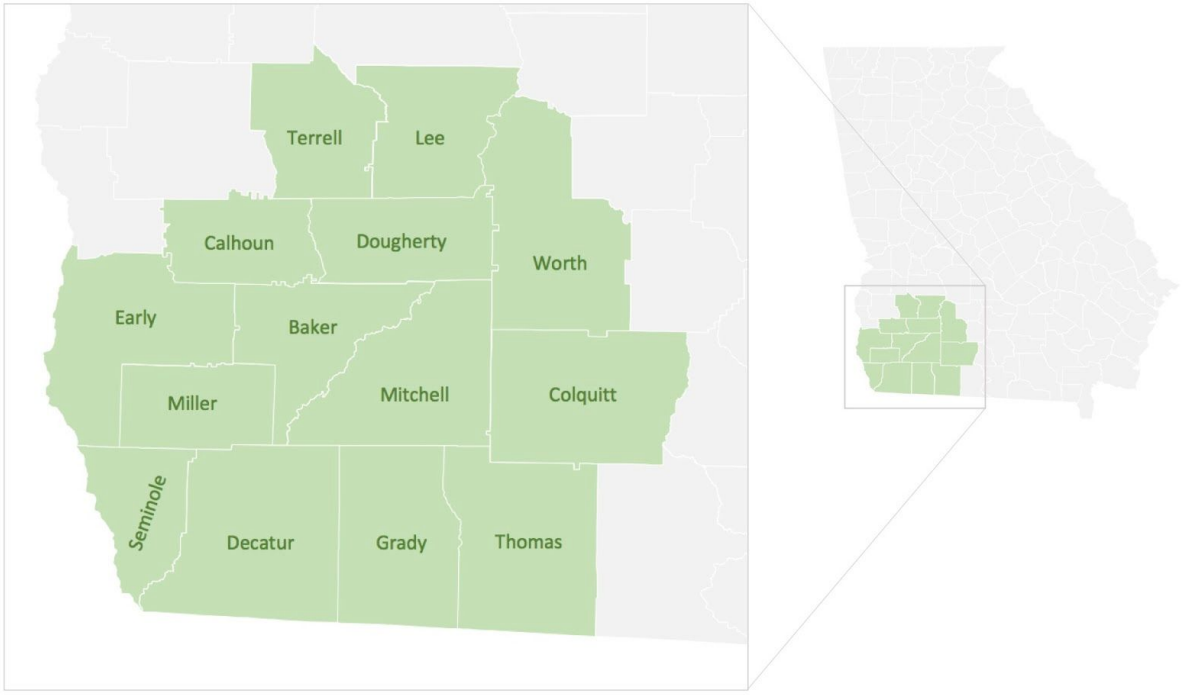
[3] Additional Contributors: Lewis Bartlett, Ana Bento, Rebecca Borchering, John Drake, Yang Ge, Andreas Handel, Drew Kramer, Culzean Kennedy, Brian McKay, Eric Marty, Rachel Mercaldo, Paige Miller, Tierney O'Sullivan, Chloe Parker, Robbie Richards, Trippe Ross, Kate Sabey, Liliana Salvador, Cecilia Sanchez, JP Schmidt, Patrick Stephens, Chao Song, Daniel Suh, Benjamin Taylor, David Vasquez, Joy Vaz, Jessica Wenclawiak, Anna Willoughby, Cali Wilson

Appendix A: Southwest Georgia Public Health District Summary



County	Population	Square Miles	Cumulative Case Count as of 4/15	Cumulative Hospitalization Count as of 5/10	Cumulative Death Count as of 5/10
Baker	3,038	341.94	34	11	2
Calhoun	6,189	280.37	117	10	5
Colquitt	45,600	544.15	221	16	11
Decatur	26,404	597.14	113	12	3
Dougherty	87,956	328.69	1643	337	129
Early	10,190	512.59	228	16	27
Grady	24,633	454.53	88	24	4
Lee	29,992	355.78	343	52	22
Miller	5,718	282.42	34	2	0
Mitchell	21,863	512.09	357	73	32
Seminole	8,090	235.23	36	8	2
Terrell	8,531	335.44	198	36	24
Thomas	44,451	544.6	264	51	26
Worth	20,247	570.7	188	35	17
REGION TOTAL	**342,902**	**5,895.67**	**3864**	**683**	**304**