

# Comparison of COVID-19 Epidemiology, Pathophysiology, and Impact on Vulnerable Populations in Two States within the USA

Joseph A. Elengickal, Jennifer R. Morris, Kush S. Patel, Dr. Rodger D. MacArthur  
Medical College of Georgia, Augusta University, Augusta, Georgia

## INTRODUCTION

The current COVID-19 pandemic has passed over 19 million cases in the United States with over 300 thousand deaths as of December 2020. Since the pandemic began in the United States in January 2020, the country has exhibited a spectrum of coronavirus impacts and responses across individual states. On June 30, 2020, Georgia and Michigan had roughly similar number of positive COVID-19 cases, however Michigan showed a significantly elevated number of deaths and case fatality rate as shown in the table below.

### COVID-19 Cases and Deaths in Both States:

State/City	Cases	Cases/100,000	Deaths	Deaths/100,000	CFR (%)
Georgia	81,291	766	2,805	26	3.45
Atlanta-Sandy Springs-Alpharetta MSA	38,469	639	1,400	23	3.64
Metro Augusta	1,695	413	71	17	4.19
Albany MSA	2,831	1,827	225	145	7.95
Michigan	70,728	708	6,193	62	8.76
Detroit-Warren-Dearborn MSA	43,565	1,009	4,836	112	11.10
Grand Rapids-Kentwood MSA	6,519	605	190	18	2.91
Flint MSA	2,734	674	288	71	10.53

To explore the differences between these states, this study explored pathophysiological, sociodemographic, and environmental factors that may have contributed to the difference in epidemiology of COVID-19 between Georgia and Michigan.

## METHODS

Using the COVID-19 case rates and death rates provided by the Johns Hopkins University Coronavirus Resource Center, Georgia and Michigan were found to have similar COVID-19 case rates but drastically different COVID-19 death rates. Additional COVID-19 statistics were collected for the most populous and highly impacted cities in each state. Epidemiologic data, including various risk factors, were identified via news reports and studies, government databases, and Centers for Disease Control data sets.

## RESULTS

Measurement	Georgia	Michigan
2019 Population	10,617,423	9,986,857
People 65 Years of Age and Older (%)	14.3	17.7
Income per Capita (USD)	29,523	30,336
Black (%)	32.6	14.1
White (%)	60.2	79.2

**State Demographics:** The table to the left shows some basic demographic differences between the states of Michigan and Georgia.

## RESULTS

Measurement	Atlanta	Detroit
Population Density (ppl/mi <sup>2</sup> )	719 (MSA) 3,740 (city)	1,104 (MSA) 4,831 (city)
Income per Capita (USD)	52,473 (MSA) 43,468 (city)	53,086 (MSA) 17,338 (city)
Black (%)	34.3 (MSA) 51.8 (city)	22.3 (MSA) 78.6 (city)
White (%)	52.8 (MSA) 40.3 (city)	69.2 (MSA) 14.6 (city)
Population over 25 with at least a High School Diploma (%)	90.1 (MSA) 90.3 (city)	90.2 (MSA) 80.0 (city)
Average Low Temperature (°C) in Coldest Month	1.3	-6.6
PM <sub>2.5</sub> 24-h 98 <sup>th</sup> Percentile (µg/m <sup>3</sup> )	24 (Gwinnett)	31 (Wayne)

### City Demographics and Climate:

The table to the left shows general demographic and climate differences between the most populous cities in Georgia and Michigan, Atlanta and Detroit.

**Health System and COVID-19 Policy:** The table below shows health system and COVID-19 policy differences between the two states.

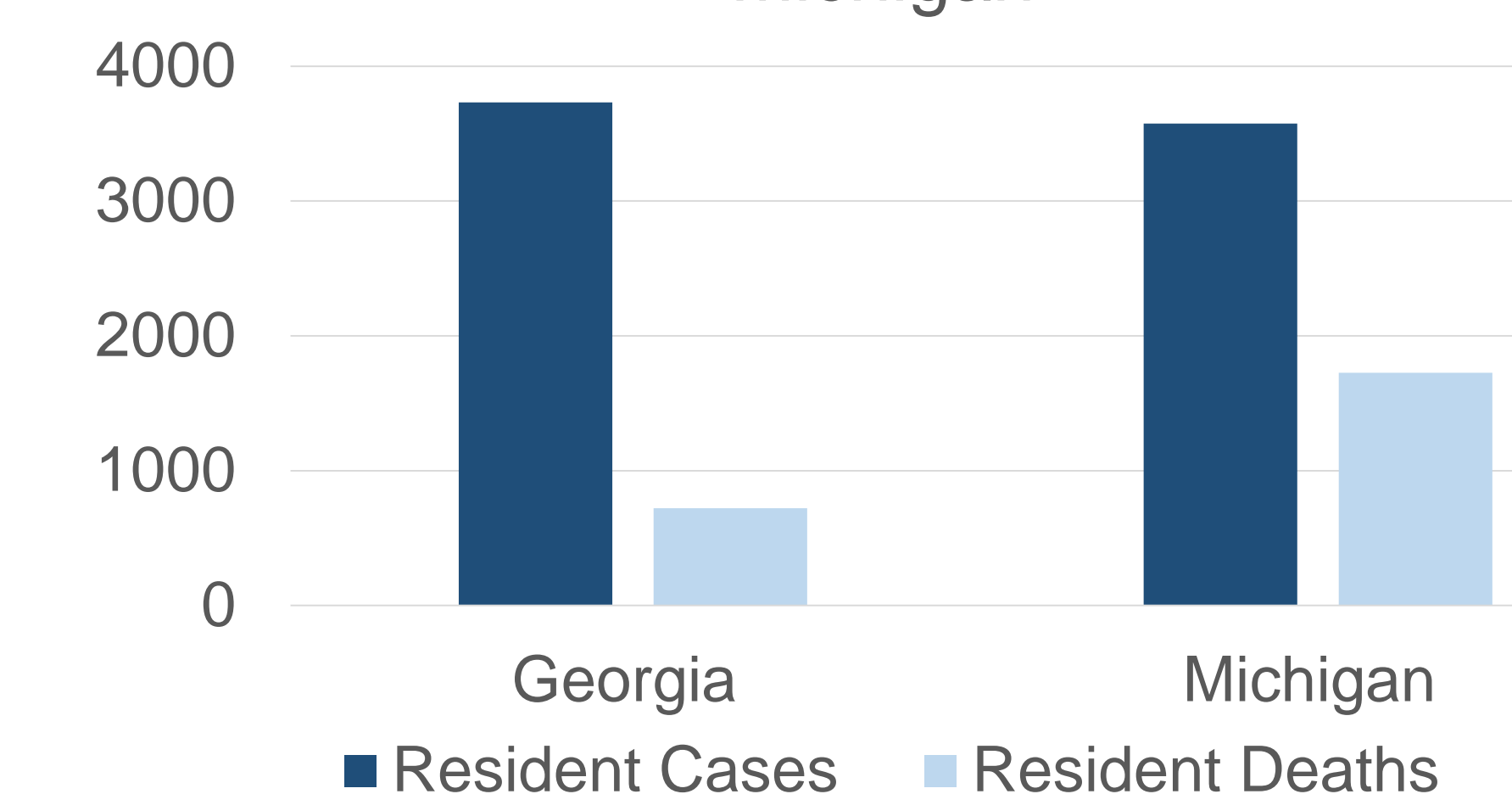
	Georgia	Michigan
Health System	<ul style="list-style-type: none"> <li>Age-Adjusted Mortality Rate per 100k:                             <ul style="list-style-type: none"> <li>Statewide = 790.2</li> <li>Atlanta = 611.8</li> <li>Albany = 948.9</li> </ul> </li> <li>Percent Uninsured:                             <ul style="list-style-type: none"> <li>Statewide = 13.7%</li> <li>Atlanta = 12.4%</li> <li>Albany = 20.1%</li> </ul> </li> <li>Infant Mortality Rate per 1000:                             <ul style="list-style-type: none"> <li>Statewide = 7.18</li> <li>Atlanta counties = Fulton 5.46, DeKalb 8.14, Gwinnett 6.03</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Age-Adjusted Mortality Rate per 100k:                             <ul style="list-style-type: none"> <li>Statewide = 782.3</li> <li>Detroit = 790.3</li> </ul> </li> <li>Percent Uninsured:                             <ul style="list-style-type: none"> <li>Statewide = 5.4%</li> <li>Detroit = 11.1%</li> </ul> </li> <li>Infant Mortality Rate per 1000:                             <ul style="list-style-type: none"> <li>Statewide = 6.78</li> <li>Detroit counties = Wayne 10.44</li> </ul> </li> </ul>
COVID-19 Policies	<ul style="list-style-type: none"> <li>Mask Mandates:                             <ul style="list-style-type: none"> <li>04/13/20 = Governor executive order; masks legal for COVID-19 protection</li> <li>04/23/20 - 06/29/20 = 5 executive orders encouraging face masks</li> </ul> </li> <li>Testing:                             <ul style="list-style-type: none"> <li>Free, available to all regardless of symptoms with GA DPH</li> <li>Free at select local pharmacies and convenience stores</li> </ul> </li> <li>Case Reporting:                             <ul style="list-style-type: none"> <li>No distinction between confirmed vs probable cases (possible underestimation of total case/death counts)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Mask Mandates:                             <ul style="list-style-type: none"> <li>04/24/20 = Governor executive order; masks required in public unless medically unable</li> </ul> </li> <li>Testing:                             <ul style="list-style-type: none"> <li>More stringent criteria for testing by MI DHHS</li> <li>Free at select local pharmacies and convenience stores</li> </ul> </li> <li>Case Reporting:                             <ul style="list-style-type: none"> <li>Classifies confirmed vs probable cases</li> <li>Faster reporting/filing of COVID-19 deaths required by emergency order</li> </ul> </li> </ul>

**Disease Burden:** The table below highlights the differences in prevalence of certain comorbidities linked to poorer outcomes of COVID-19.

Disease	Georgia	Michigan
Obesity	<ul style="list-style-type: none"> <li>Nonhispanic White Adults: 30.1%</li> <li>Hispanic Adults: 30.1%</li> <li>Non-Hispanic Black Adults: 38.3%</li> </ul>	<ul style="list-style-type: none"> <li>Nonhispanic White Adults: 31.8%</li> <li>Hispanic Adults: 36.9%</li> <li>Non-Hispanic Black Adults: 39.9%</li> </ul>
Hypertension	<ul style="list-style-type: none"> <li>Nonhispanic White Adults: 35.2%</li> <li>Hispanic Adults: 20.3%</li> <li>Non-Hispanic Black Adults: 34.7%</li> <li>Non-Hispanic Asian: 14.2%</li> <li>Other: 32.1%</li> </ul>	<ul style="list-style-type: none"> <li>Nonhispanic White Adults: 34.2%</li> <li>Hispanic Adults: 23.9%</li> <li>Non-Hispanic Black Adults: 44.2%</li> <li>Non-Hispanic Asian: 13.6%</li> <li>Other: 34.7%</li> </ul>
Diabetes	Prevalence in Atlanta: 6.7%	Prevalence in Detroit: 7.7%
Chronic Kidney Disease	On dialysis: 1497 patients per million ESRD: 2003 per million	On dialysis: 1022 patients per million ESRD: 2204 per million 1/7 adults estimated to have CKD
Smoking/Chronic Respiratory Diseases	<ul style="list-style-type: none"> <li>COPD: 7.0%</li> <li>Current Asthma: 8.9%</li> <li>Lifetime Asthma: 13.5%</li> <li>Smoking: 17.5%</li> <li>Tobacco-use: 14%</li> </ul>	<ul style="list-style-type: none"> <li>COPD: 7.8%</li> <li>Current Asthma: 11.2%</li> <li>Lifetime Asthma: 16%</li> <li>Smoking: 19.3%</li> <li>Tobacco-use: 22.6%</li> </ul>
Cancer	<ul style="list-style-type: none"> <li>Annual incidence: 55,190</li> <li>Annual cancer mortality: 152.4 per 100,000</li> </ul>	<ul style="list-style-type: none"> <li>Annual Incidence: 61,770</li> <li>Annual cancer mortality: 161.1 per 100,000</li> </ul>
Heart Disease	Prevalence: 4.6% Mortality: 175.3 per 100,000	Prevalence: 5.0% Mortality: 195.0 per 100,000

## RESULTS

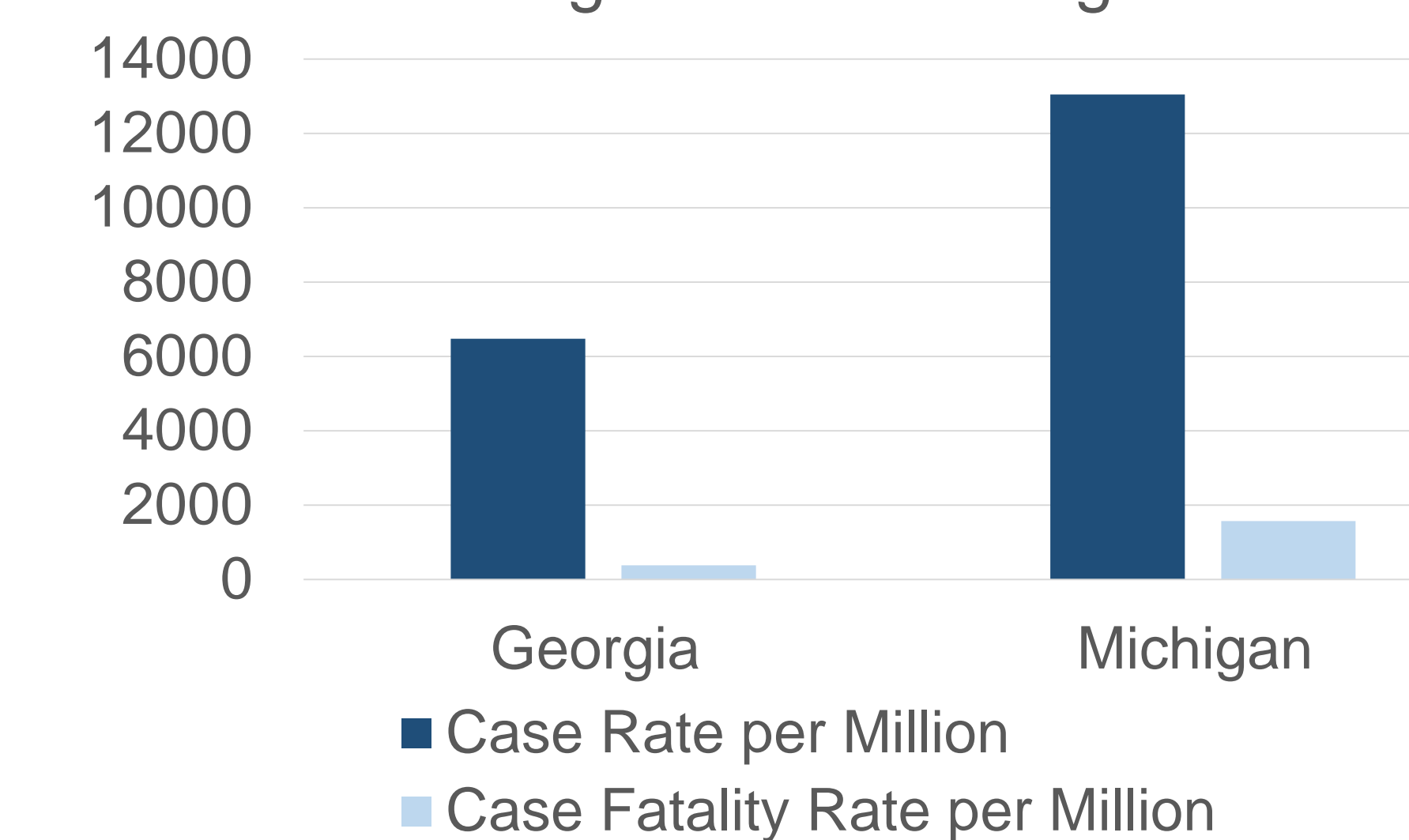
COVID-19 Cases and Deaths in Nursing Homes in Georgia versus Michigan



### Nursing Homes:

The graph shows COVID-19 cases and deaths in nursing homes in both Georgia and Michigan.

COVID-19 Case/Case Fatality Rate per Million in African Americans in Georgia versus Michigan



### African Americans:

The graph to the left shows the COVID-19 case and case fatality rates in African Americans in Georgia and Michigan.

Differences in COVID-19 effects in other vulnerable populations may have contributed to the difference between Georgia and Michigan and may be worth studying further.

## CONCLUSIONS

While cases were similar in Georgia and Michigan, the case fatality rates were significantly higher in Michigan than in Georgia in the early months of the pandemic.

Detroit's healthcare system may be less efficacious than Atlanta's, which could contribute to Michigan's poorer COVID-19 outcomes overall.

While there are slight differences in prevalence of disease between both states, a complete understanding of how these impacted COVID-19 outcomes is unknown.

Both nursing home residents and African Americans experienced a higher case fatality rate in Michigan than in Georgia.

With a better understanding of risk factors including environmental components, comorbidities, and vulnerable populations, and their impacts on the spread of COVID-19, communities and governments may take action to improve health outcomes.

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