IEM's AI Modeling: Short-term COVID-19 Projections

Date: 8/4/21

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/4/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

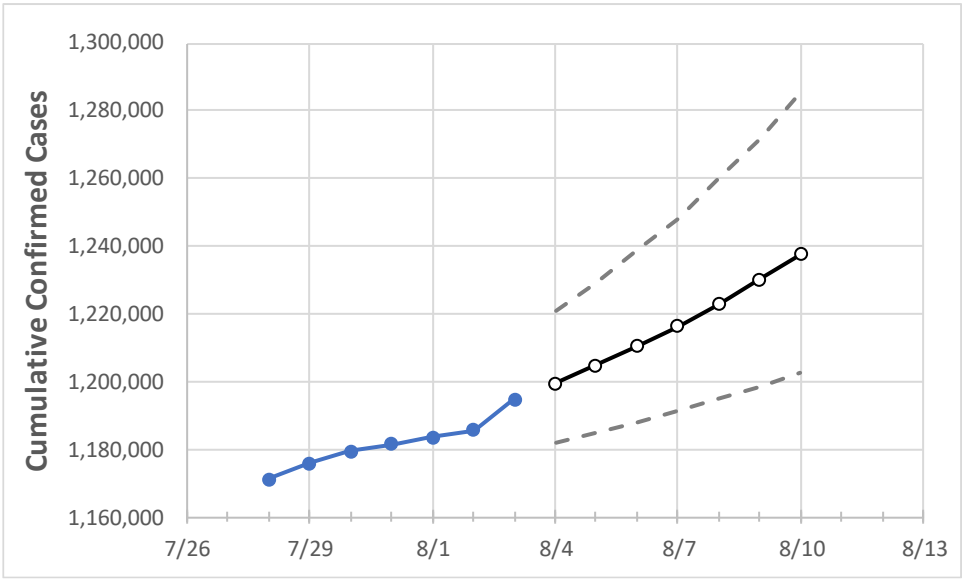
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Georgia State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Georgia	1,181,497	1,183,546	1,185,594	1,194,768	1,199,544	1,204,797	1,210,408	1,216,392	1,222,965	1,230,089	1,237,649

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Bartow	15,455	15,473	15,491	15,544	15,580	15,618	15,658	15,700	15,744	15,789	15,837
Carroll	12,074	12,098	12,123	12,250	12,319	12,394	12,477	12,568	12,668	12,778	12,898
Cherokee	32,537	32,591	32,645	32,808	32,925	33,053	33,191	33,343	33,509	33,688	33,882
Clarke	15,606	15,625	15,643	15,739	15,788	15,841	15,899	15,964	16,034	16,110	16,193
Clayton	28,749	28,791	28,834	29,094	29,218	29,355	29,501	29,660	29,834	30,023	30,226
Cobb	83,155	83,269	83,384	83,966	84,270	84,594	84,947	85,334	85,747	86,194	86,664
DeKalb	69,718	69,835	69,952	70,473	70,773	71,103	71,464	71,861	72,290	72,758	73,269
Dougherty	8,030	8,058	8,085	8,163	8,214	8,268	8,330	8,399	8,477	8,563	8,661
Douglas	16,305	16,336	16,368	16,493	16,568	16,652	16,741	16,840	16,948	17,061	17,182
Fulton	103,271	103,449	103,626	104,433	104,884	105,370	105,898	106,471	107,093	107,771	108,503
Gwinnett	106,066	106,162	106,259	106,738	106,991	107,259	107,542	107,850	108,178	108,523	108,896
Hall	28,516	28,550	28,583	28,684	28,753	28,828	28,909	28,995	29,088	29,189	29,295
Henry	27,312	27,356	27,401	27,619	27,746	27,882	28,026	28,185	28,347	28,525	28,717
Lee	2,969	2,981	2,993	3,029	3,055	3,084	3,116	3,151	3,189	3,231	3,277

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- *Beds: For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report (MMWR, March 18, 2020) and state reports of COVID-19 cases.*
- *ICU: The CDC report found that 24% of hospitalized cases require ICU care.*
- *Ventilators: Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.*

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

*The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.*

Georgia Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	7/31	8/1	8/2	8/3	8/5	8/7	8/9
Bartow	15,455	15,473	15,491	15,544	15,618 (3,124) [750] {375}	15,700 (3,140) [754] {377}	15,789 (3,158) [758] {379}
Carroll	12,074	12,098	12,123	12,250	12,394 (2,479) [595] {297}	12,568 (2,514) [603] {302}	12,778 (2,556) [613] {307}
Cherokee	32,537	32,591	32,645	32,808	33,053 (6,611) [1,587] {793}	33,343 (6,669) [1,600] {800}	33,688 (6,738) [1,617] {809}
Clarke	15,606	15,625	15,643	15,739	15,841 (3,168) [760] {380}	15,964 (3,193) [766] {383}	16,110 (3,222) [773] {387}
Clayton	28,749	28,791	28,834	29,094	29,355 (5,871) [1,409] {705}	29,660 (5,932) [1,424] {712}	30,023 (6,005) [1,441] {721}
Cobb	83,155	83,269	83,384	83,966	84,594 (16,919) [4,061] {2,030}	85,334 (17,067) [4,096] {2,048}	86,194 (17,239) [4,137] {2,069}
DeKalb	69,718	69,835	69,952	70,473	71,103 (14,221) [3,413] {1,706}	71,861 (14,372) [3,449] {1,725}	72,758 (14,552) [3,492] {1,746}
Dougherty	8,030	8,058	8,085	8,163	8,268 (1,654) [397] {198}	8,399 (1,680) [403] {202}	8,563 (1,713) [411] {206}
Douglas	16,305	16,336	16,368	16,493	16,652 (3,330) [799] {400}	16,840 (3,368) [808] {404}	17,061 (3,412) [819] {409}
Fulton	103,271	103,449	103,626	104,433	105,370 (21,074) [5,058] {2,529}	106,471 (21,294) [5,111] {2,555}	107,771 (21,554) [5,173] {2,587}
Gwinnett	106,066	106,162	106,259	106,738	107,259 (21,452) [5,148] {2,574}	107,850 (21,570) [5,177] {2,588}	108,523 (21,705) [5,209] {2,605}
Hall	28,516	28,550	28,583	28,684	28,828 (5,766) [1,384] {692}	28,995 (5,799) [1,392] {696}	29,189 (5,838) [1,401] {701}
Henry	27,312	27,356	27,401	27,619	27,882 (5,576) [1,338] {669}	28,185 (5,637) [1,353] {676}	28,525 (5,705) [1,369] {685}
Lee	2,969	2,981	2,993	3,029	3,084 (617) [148] {74}	3,151 (630) [151] {76}	3,231 (646) [155] {78}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.