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

Date: 2/23/21

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 2/23/21 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.

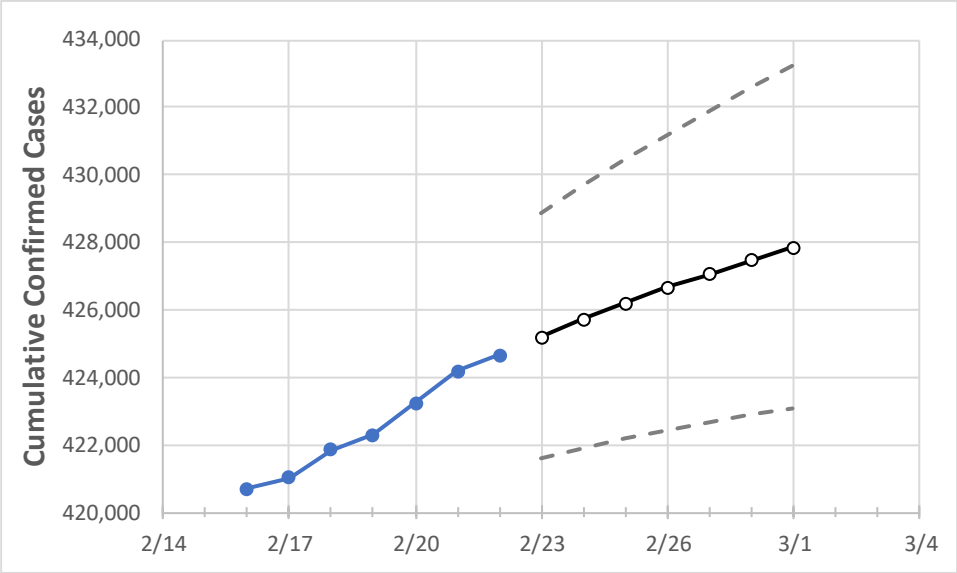
IEM's Modeling Lead

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.

Louisiana State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Louisiana	422,287	423,232	424,176	424,644	425,200	425,710	426,203	426,671	427,059	427,456	427,857

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.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Ascension Parish	10,812	10,828	10,843	10,846	10,855	10,863	10,871	10,878	10,885	10,891	10,897
Bossier Parish	12,852	12,867	12,881	12,869	12,886	12,902	12,916	12,929	12,943	12,956	12,968
Caddo Parish	24,410	24,449	24,488	24,500	24,518	24,536	24,551	24,566	24,579	24,592	24,602
Calcasieu Parish	18,778	18,849	18,919	18,923	18,955	18,986	19,018	19,047	19,076	19,104	19,132
East Baton Rouge Parish	34,823	34,976	35,128	35,158	35,219	35,276	35,333	35,390	35,440	35,492	35,540
Jefferson Parish	43,233	43,304	43,375	43,419	43,475	43,525	43,573	43,621	43,664	43,703	43,744
Lafayette Parish	21,355	21,387	21,418	21,446	21,463	21,479	21,494	21,508	21,521	21,533	21,544
Lafourche Parish	8,921	8,953	8,985	8,996	9,012	9,027	9,042	9,056	9,069	9,082	9,093
Orleans Parish	27,942	27,993	28,044	28,075	28,113	28,148	28,182	28,215	28,244	28,275	28,304
Ouachita Parish	17,592	17,602	17,612	17,627	17,638	17,648	17,658	17,667	17,676	17,683	17,691
Rapides Parish	11,140	11,157	11,174	11,175	11,185	11,194	11,203	11,211	11,219	11,226	11,232
St. Bernard Parish	3,571	3,600	3,628	3,642	3,656	3,670	3,684	3,698	3,711	3,724	3,737
St. Charles Parish	5,023	5,035	5,047	5,052	5,062	5,072	5,081	5,091	5,099	5,108	5,116
St. James Parish	1,817	1,823	1,828	1,836	1,841	1,845	1,850	1,855	1,859	1,864	1,868
St. John the Baptist Parish	3,478	3,482	3,485	3,487	3,492	3,497	3,501	3,505	3,509	3,514	3,518
St. Tammany Parish	23,223	23,316	23,409	23,454	23,509	23,561	23,613	23,661	23,708	23,754	23,796

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.*

Louisiana Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	2/19	2/20	2/21	2/22	2/24	2/26	2/28
Ascension Parish	10,812	10,828	10,843	10,846	10,863 (2,173) [521] {261}	10,878 (2,176) [522] {261}	10,891 (2,178) [523] {261}
Bossier Parish	12,852	12,867	12,881	12,869	12,902 (2,580) [619] {310}	12,929 (2,586) [621] {310}	12,956 (2,591) [622] {311}
Caddo Parish	24,410	24,449	24,488	24,500	24,536 (4,907) [1,178] {589}	24,566 (4,913) [1,179] {590}	24,592 (4,918) [1,180] {590}
Calcasieu Parish	18,778	18,849	18,919	18,923	18,986 (3,797) [911] {456}	19,047 (3,809) [914] {457}	19,104 (3,821) [917] {458}
East Baton Rouge Parish	34,823	34,976	35,128	35,158	35,276 (7,055) [1,693] {847}	35,390 (7,078) [1,699] {849}	35,492 (7,098) [1,704] {852}
Jefferson Parish	43,233	43,304	43,375	43,419	43,525 (8,705) [2,089] {1,045}	43,621 (8,724) [2,094] {1,047}	43,703 (8,741) [2,098] {1,049}
Lafayette Parish	21,355	21,387	21,418	21,446	21,479 (4,296) [1,031] {515}	21,508 (4,302) [1,032] {516}	21,533 (4,307) [1,034] {517}
Lafourche Parish	8,921	8,953	8,985	8,996	9,027 (1,805) [433] {217}	9,056 (1,811) [435] {217}	9,082 (1,816) [436] {218}
Orleans Parish	27,942	27,993	28,044	28,075	28,148 (5,630) [1,351] {676}	28,215 (5,643) [1,354] {677}	28,275 (5,655) [1,357] {679}
Ouachita Parish	17,592	17,602	17,612	17,627	17,648 (3,530) [847] {424}	17,667 (3,533) [848] {424}	17,683 (3,537) [849] {424}
Rapides Parish	11,140	11,157	11,174	11,175	11,194 (2,239) [537] {269}	11,211 (2,242) [538] {269}	11,226 (2,245) [539] {269}
St. Bernard Parish	3,571	3,600	3,628	3,642	3,670 (734) [176] {88}	3,698 (740) [178] {89}	3,724 (745) [179] {89}
St. Charles Parish	5,023	5,035	5,047	5,052	5,072 (1,014) [243] {122}	5,091 (1,018) [244] {122}	5,108 (1,022) [245] {123}
St. James Parish	1,817	1,823	1,828	1,836	1,845 (369) [89] {44}	1,855 (371) [89] {45}	1,864 (373) [89] {45}
St. John the Baptist Parish	3,478	3,482	3,485	3,487	3,497 (699) [168] {84}	3,505 (701) [168] {84}	3,514 (703) [169] {84}
St. Tammany Parish	23,223	23,316	23,409	23,454	23,561 (4,712) [1,131] {565}	23,661 (4,732) [1,136] {568}	23,754 (4,751) [1,140] {570}

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.