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

Date: 2/25/22

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 2/25/22 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.

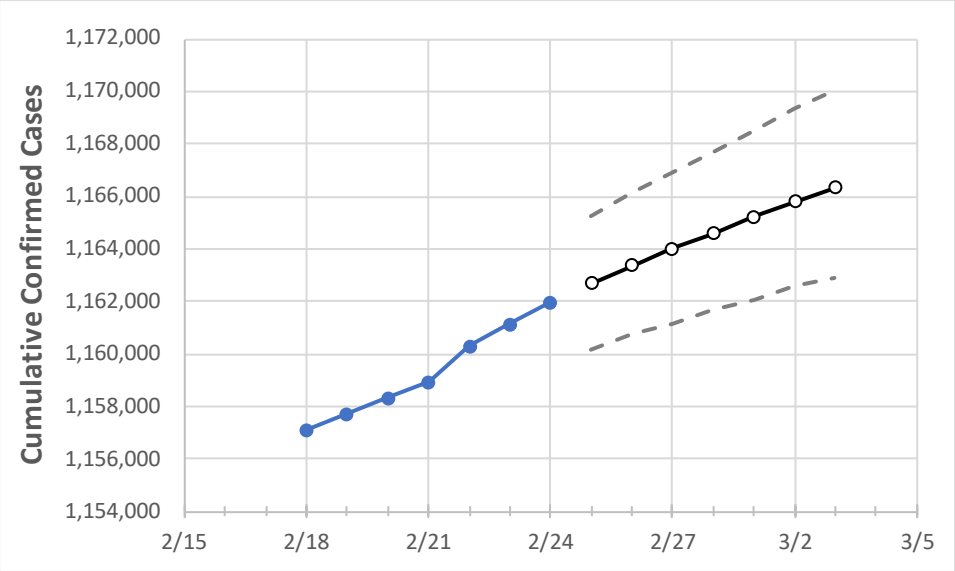
IEM's Modeling Lead

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Louisiana	1,158,918	1,160,293	1,161,126	1,161,957	1,162,672	1,163,353	1,164,013	1,164,593	1,165,215	1,165,800	1,166,321

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Ascension Parish	32,879	32,959	32,966	32,984	33,004	33,023	33,039	33,052	33,070	33,085	33,098
Bossier Parish	35,074	35,094	35,112	35,129	35,146	35,161	35,175	35,188	35,203	35,214	35,227
Caddo Parish	62,972	62,992	63,013	63,049	63,074	63,100	63,122	63,145	63,166	63,187	63,206
Calcasieu Parish	51,388	51,479	51,508	51,525	51,554	51,578	51,603	51,623	51,647	51,669	51,689
East Baton Rouge Parish	104,537	104,727	104,790	104,858	104,921	104,984	105,037	105,091	105,145	105,195	105,246
Jefferson Parish	107,290	107,356	107,507	107,673	107,741	107,803	107,866	107,928	107,990	108,046	108,099
Lafayette Parish	58,834	58,947	58,991	59,019	59,064	59,108	59,151	59,190	59,226	59,268	59,302
Lafourche Parish	26,017	26,057	26,076	26,089	26,106	26,123	26,137	26,151	26,166	26,180	26,192
Orleans Parish	82,496	82,555	82,610	82,707	82,760	82,811	82,860	82,905	82,951	82,994	83,034
Ouachita Parish	46,955	47,000	47,025	47,042	47,065	47,085	47,104	47,122	47,139	47,156	47,173
Rapides Parish	30,692	30,752	30,762	30,775	30,795	30,811	30,828	30,842	30,857	30,872	30,884
St. Bernard Parish	10,641	10,646	10,649	10,655	10,660	10,664	10,668	10,672	10,676	10,679	10,682
St. Charles Parish	13,081	13,091	13,100	13,106	13,112	13,118	13,124	13,129	13,134	13,139	13,144
St. James Parish	5,415	5,419	5,427	5,435	5,439	5,442	5,446	5,449	5,452	5,456	5,458
St. John the Baptist Parish	9,968	9,973	9,977	9,980	9,984	9,988	9,991	9,994	9,998	10,001	10,003
St. Tammany Parish	67,744	67,790	67,824	67,872	67,903	67,934	67,962	67,988	68,013	68,038	68,060

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:		
	2/21	2/22	2/23	2/24	2/26	2/28	3/2
Ascension Parish	32,879	32,959	32,966	32,984	33,023 (6,605) [1,585] {793}	33,052 (6,610) [1,586] {793}	33,085 (6,617) [1,588] {794}
Bossier Parish	35,074	35,094	35,112	35,129	35,161 (7,032) [1,688] {844}	35,188 (7,038) [1,689] {845}	35,214 (7,043) [1,690] {845}
Caddo Parish	62,972	62,992	63,013	63,049	63,100 (12,620) [3,029] {1,514}	63,145 (12,629) [3,031] {1,515}	63,187 (12,637) [3,033] {1,516}
Calcasieu Parish	51,388	51,479	51,508	51,525	51,578 (10,316) [2,476] {1,238}	51,623 (10,325) [2,478] {1,239}	51,669 (10,334) [2,480] {1,240}
East Baton Rouge Parish	104,537	104,727	104,790	104,858	104,984 (20,997) [5,039] {2,520}	105,091 (21,018) [5,044] {2,522}	105,195 (21,039) [5,049] {2,525}
Jefferson Parish	107,290	107,356	107,507	107,673	107,803 (21,561) [5,175] {2,587}	107,928 (21,586) [5,181] {2,590}	108,046 (21,609) [5,186] {2,593}
Lafayette Parish	58,834	58,947	58,991	59,019	59,108 (11,822) [2,837] {1,419}	59,190 (11,838) [2,841] {1,421}	59,268 (11,854) [2,845] {1,422}
Lafourche Parish	26,017	26,057	26,076	26,089	26,123 (5,225) [1,254] {627}	26,151 (5,230) [1,255] {628}	26,180 (5,236) [1,257] {628}
Orleans Parish	82,496	82,555	82,610	82,707	82,811 (16,562) [3,975] {1,987}	82,905 (16,581) [3,979] {1,990}	82,994 (16,599) [3,984] {1,992}
Ouachita Parish	46,955	47,000	47,025	47,042	47,085 (9,417) [2,260] {1,130}	47,122 (9,424) [2,262] {1,131}	47,156 (9,431) [2,263] {1,132}
Rapides Parish	30,692	30,752	30,762	30,775	30,811 (6,162) [1,479] {739}	30,842 (6,168) [1,480] {740}	30,872 (6,174) [1,482] {741}
St. Bernard Parish	10,641	10,646	10,649	10,655	10,664 (2,133) [512] {256}	10,672 (2,134) [512] {256}	10,679 (2,136) [513] {256}
St. Charles Parish	13,081	13,091	13,100	13,106	13,118 (2,624) [630] {315}	13,129 (2,626) [630] {315}	13,139 (2,628) [631] {315}
St. James Parish	5,415	5,419	5,427	5,435	5,442 (1,088) [261] {131}	5,449 (1,090) [262] {131}	5,456 (1,091) [262] {131}
St. John the Baptist Parish	9,968	9,973	9,977	9,980	9,988 (1,998) [479] {240}	9,994 (1,999) [480] {240}	10,001 (2,000) [480] {240}
St. Tammany Parish	67,744	67,790	67,824	67,872	67,934 (13,587) [3,261] {1,630}	67,988 (13,598) [3,263] {1,632}	68,038 (13,608) [3,266] {1,633}

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.