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

Date: 8/30/21

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 8/30/21 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.

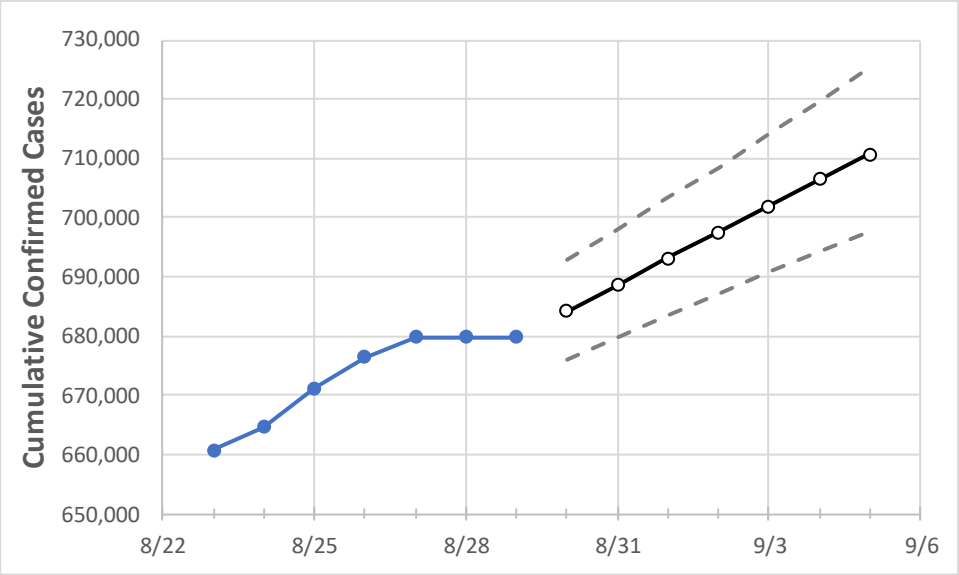
IEM's Modeling Lead

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:						
	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Louisiana	676,368	679,796	679,796	679,796	684,268	688,665	693,130	697,529	701,925	706,497	710,633

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:						
	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Ascension Parish	19,856	19,952	19,952	19,952	20,070	20,191	20,306	20,419	20,533	20,652	20,758
Bossier Parish	18,865	19,020	19,020	19,020	19,166	19,323	19,466	19,626	19,785	19,938	20,098
Caddo Parish	34,939	35,084	35,084	35,084	35,272	35,456	35,640	35,820	36,002	36,183	36,364
Calcasieu Parish	29,890	30,036	30,036	30,036	30,241	30,438	30,624	30,828	31,020	31,228	31,431
East Baton Rouge Parish	58,123	58,416	58,416	58,416	58,755	59,107	59,444	59,789	60,130	60,479	60,803
Jefferson Parish	64,996	65,340	65,340	65,340	65,702	66,057	66,405	66,755	67,099	67,448	67,786
Lafayette Parish	34,745	34,858	34,858	34,858	35,030	35,206	35,371	35,543	35,705	35,874	36,030
Lafourche Parish	16,330	16,391	16,391	16,391	16,500	16,619	16,724	16,836	16,948	17,060	17,168
Orleans Parish	43,140	43,361	43,361	43,361	43,592	43,815	44,041	44,264	44,483	44,706	44,922
Ouachita Parish	26,510	26,682	26,682	26,682	26,876	27,065	27,256	27,446	27,638	27,830	28,014
Rapides Parish	18,482	18,539	18,539	18,539	18,732	18,904	19,093	19,263	19,458	19,651	19,837
St. Bernard Parish	6,316	6,351	6,351	6,351	6,413	6,474	6,537	6,600	6,662	6,729	6,790
St. Charles Parish	8,245	8,289	8,289	8,289	8,331	8,373	8,415	8,456	8,495	8,536	8,575
St. James Parish	3,027	3,041	3,041	3,041	3,065	3,089	3,112	3,136	3,161	3,185	3,208
St. John the Baptist Parish	5,780	5,816	5,816	5,816	5,862	5,908	5,955	6,001	6,048	6,095	6,141
St. Tammany Parish	39,541	39,777	39,777	39,777	40,057	40,335	40,607	40,879	41,148	41,415	41,686

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:		
	8/26	8/27	8/28	8/29	8/31	9/2	9/4
Ascension Parish	19,856	19,952	19,952	19,952	20,191 (4,038) [969] {485}	20,419 (4,084) [980] {490}	20,652 (4,130) [991] {496}
Bossier Parish	18,865	19,020	19,020	19,020	19,323 (3,865) [928] {464}	19,626 (3,925) [942] {471}	19,938 (3,988) [957] {479}
Caddo Parish	34,939	35,084	35,084	35,084	35,456 (7,091) [1,702] {851}	35,820 (7,164) [1,719] {860}	36,183 (7,237) [1,737] {868}
Calcasieu Parish	29,890	30,036	30,036	30,036	30,438 (6,088) [1,461] {731}	30,828 (6,166) [1,480] {740}	31,228 (6,246) [1,499] {749}
East Baton Rouge Parish	58,123	58,416	58,416	58,416	59,107 (11,821) [2,837] {1,419}	59,789 (11,958) [2,870] {1,435}	60,479 (12,096) [2,903] {1,451}
Jefferson Parish	64,996	65,340	65,340	65,340	66,057 (13,211) [3,171] {1,585}	66,755 (13,351) [3,204] {1,602}	67,448 (13,490) [3,238] {1,619}
Lafayette Parish	34,745	34,858	34,858	34,858	35,206 (7,041) [1,690] {845}	35,543 (7,109) [1,706] {853}	35,874 (7,175) [1,722] {861}
Lafourche Parish	16,330	16,391	16,391	16,391	16,619 (3,324) [798] {399}	16,836 (3,367) [808] {404}	17,060 (3,412) [819] {409}
Orleans Parish	43,140	43,361	43,361	43,361	43,815 (8,763) [2,103] {1,052}	44,264 (8,853) [2,125] {1,062}	44,706 (8,941) [2,146] {1,073}
Ouachita Parish	26,510	26,682	26,682	26,682	27,065 (5,413) [1,299] {650}	27,446 (5,489) [1,317] {659}	27,830 (5,566) [1,336] {668}
Rapides Parish	18,482	18,539	18,539	18,539	18,904 (3,781) [907] {454}	19,263 (3,853) [925] {462}	19,651 (3,930) [943] {472}
St. Bernard Parish	6,316	6,351	6,351	6,351	6,474 (1,295) [311] {155}	6,600 (1,320) [317] {158}	6,729 (1,346) [323] {161}
St. Charles Parish	8,245	8,289	8,289	8,289	8,373 (1,675) [402] {201}	8,456 (1,691) [406] {203}	8,536 (1,707) [410] {205}
St. James Parish	3,027	3,041	3,041	3,041	3,089 (618) [148] {74}	3,136 (627) [151] {75}	3,185 (637) [153] {76}
St. John the Baptist Parish	5,780	5,816	5,816	5,816	5,908 (1,182) [284] {142}	6,001 (1,200) [288] {144}	6,095 (1,219) [293] {146}
St. Tammany Parish	39,541	39,777	39,777	39,777	40,335 (8,067) [1,936] {968}	40,879 (8,176) [1,962] {981}	41,415 (8,283) [1,988] {994}

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.