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

Date: 7/30/21

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 7/30/21 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.

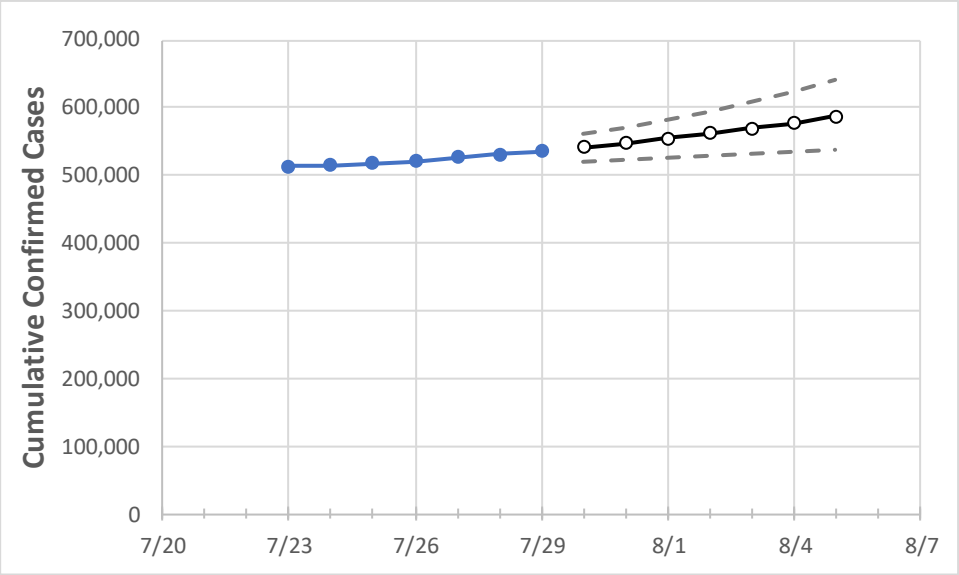
IEM's Modeling Lead

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:						
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5
Louisiana	520,435	527,253	531,952	536,366	541,715	547,682	554,309	561,520	569,255	577,743	587,227

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:						
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5
Ascension Parish	14,577	15,048	15,214	15,360	15,538	15,747	15,963	16,202	16,462	16,733	17,049
Bossier Parish	15,309	15,412	15,473	15,549	15,631	15,716	15,809	15,907	16,006	16,119	16,233
Caddo Parish	28,505	28,699	28,850	29,005	29,188	29,389	29,607	29,850	30,119	30,408	30,726
Calcasieu Parish	24,210	24,471	24,580	24,679	24,810	24,955	25,112	25,286	25,469	25,678	25,903
East Baton Rouge Parish	44,989	45,927	46,378	46,806	47,331	47,913	48,559	49,288	50,087	50,988	51,976
Jefferson Parish	51,000	51,515	51,904	52,348	52,920	53,566	54,283	55,098	56,011	57,026	58,152
Lafayette Parish	26,484	26,882	27,176	27,382	27,665	27,975	28,323	28,701	29,118	29,583	30,079
Lafourche Parish	11,537	11,776	11,881	12,055	12,223	12,415	12,620	12,842	13,084	13,349	13,642
Orleans Parish	33,827	34,116	34,407	34,716	35,098	35,521	35,979	36,489	37,044	37,653	38,321
Ouachita Parish	20,236	20,437	20,603	20,747	20,939	21,151	21,394	21,664	21,968	22,304	22,682
Rapides Parish	13,652	13,890	13,993	14,111	14,214	14,330	14,455	14,594	14,746	14,911	15,095
St. Bernard Parish	4,588	4,623	4,688	4,753	4,824	4,902	4,989	5,085	5,194	5,313	5,444
St. Charles Parish	6,280	6,359	6,437	6,534	6,626	6,727	6,838	6,961	7,095	7,242	7,404
St. James Parish	2,206	2,230	2,279	2,301	2,337	2,377	2,423	2,476	2,536	2,603	2,679
St. John the Baptist Parish	4,306	4,349	4,404	4,454	4,518	4,590	4,670	4,757	4,854	4,961	5,081
St. Tammany Parish	29,527	29,757	30,071	30,397	30,738	31,105	31,494	31,922	32,378	32,864	33,384

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:		
	7/26	7/27	7/28	7/29	7/31	8/2	8/4
Ascension Parish	14,577	15,048	15,214	15,360	15,747 (3,149) [756] {378}	16,202 (3,240) [778] {389}	16,733 (3,347) [803] {402}
Bossier Parish	15,309	15,412	15,473	15,549	15,716 (3,143) [754] {377}	15,907 (3,181) [764] {382}	16,119 (3,224) [774] {387}
Caddo Parish	28,505	28,699	28,850	29,005	29,389 (5,878) [1,411] {705}	29,850 (5,970) [1,433] {716}	30,408 (6,082) [1,460] {730}
Calcasieu Parish	24,210	24,471	24,580	24,679	24,955 (4,991) [1,198] {599}	25,286 (5,057) [1,214] {607}	25,678 (5,136) [1,233] {616}
East Baton Rouge Parish	44,989	45,927	46,378	46,806	47,913 (9,583) [2,300] {1,150}	49,288 (9,858) [2,366] {1,183}	50,988 (10,198) [2,447] {1,224}
Jefferson Parish	51,000	51,515	51,904	52,348	53,566 (10,713) [2,571] {1,286}	55,098 (11,020) [2,645] {1,322}	57,026 (11,405) [2,737] {1,369}
Lafayette Parish	26,484	26,882	27,176	27,382	27,975 (5,595) [1,343] {671}	28,701 (5,740) [1,378] {689}	29,583 (5,917) [1,420] {710}
Lafourche Parish	11,537	11,776	11,881	12,055	12,415 (2,483) [596] {298}	12,842 (2,568) [616] {308}	13,349 (2,670) [641] {320}
Orleans Parish	33,827	34,116	34,407	34,716	35,521 (7,104) [1,705] {852}	36,489 (7,298) [1,751] {876}	37,653 (7,531) [1,807] {904}
Ouachita Parish	20,236	20,437	20,603	20,747	21,151 (4,230) [1,015] {508}	21,664 (4,333) [1,040] {520}	22,304 (4,461) [1,071] {535}
Rapides Parish	13,652	13,890	13,993	14,111	14,330 (2,866) [688] {344}	14,594 (2,919) [701] {350}	14,911 (2,982) [716] {358}
St. Bernard Parish	4,588	4,623	4,688	4,753	4,902 (980) [235] {118}	5,085 (1,017) [244] {122}	5,313 (1,063) [255] {128}
St. Charles Parish	6,280	6,359	6,437	6,534	6,727 (1,345) [323] {161}	6,961 (1,392) [334] {167}	7,242 (1,448) [348] {174}
St. James Parish	2,206	2,230	2,279	2,301	2,377 (475) [114] {57}	2,476 (495) [119] {59}	2,603 (521) [125] {62}
St. John the Baptist Parish	4,306	4,349	4,404	4,454	4,590 (918) [220] {110}	4,757 (951) [228] {114}	4,961 (992) [238] {119}
St. Tammany Parish	29,527	29,757	30,071	30,397	31,105 (6,221) [1,493] {747}	31,922 (6,384) [1,532] {766}	32,864 (6,573) [1,577] {789}

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.