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

Date: 3/25/21

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 3/25/21 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.

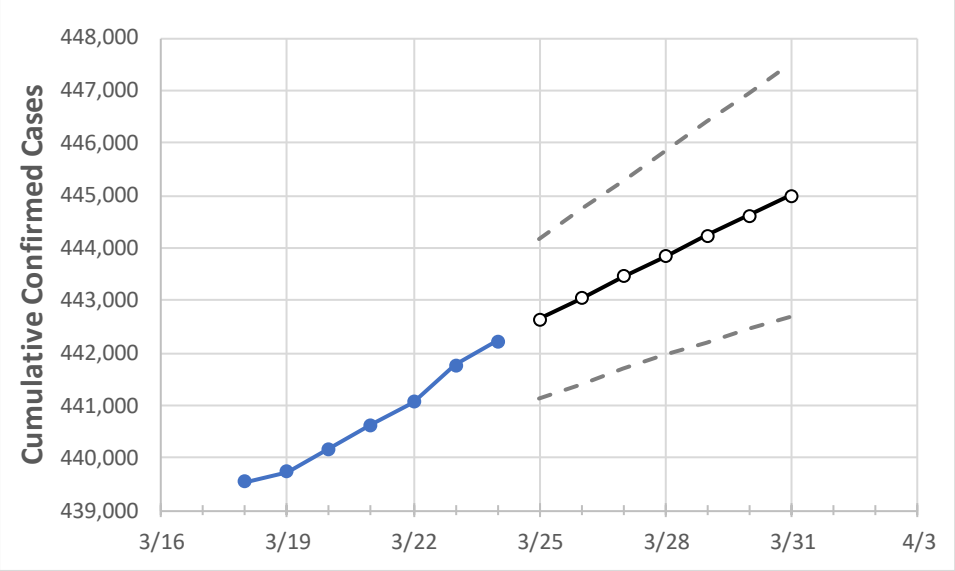
IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Louisiana	440,623	441,066	441,771	442,221	442,634	443,045	443,450	443,841	444,235	444,608	444,987

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Ascension Parish	11,382	11,398	11,431	11,444	11,468	11,492	11,517	11,542	11,567	11,593	11,618
Bossier Parish	13,190	13,192	13,207	13,212	13,220	13,227	13,234	13,241	13,248	13,254	13,261
Caddo Parish	25,002	25,017	25,018	25,041	25,051	25,061	25,071	25,080	25,089	25,098	25,107
Calcasieu Parish	20,801	20,857	20,945	20,919	20,986	21,059	21,133	21,206	21,280	21,354	21,431
East Baton Rouge Parish	36,850	36,906	36,985	37,043	37,097	37,151	37,206	37,261	37,314	37,366	37,420
Jefferson Parish	44,746	44,777	44,822	44,860	44,889	44,917	44,944	44,971	44,998	45,024	45,049
Lafayette Parish	22,074	22,096	22,106	22,155	22,180	22,204	22,228	22,252	22,277	22,302	22,326
Lafourche Parish	9,312	9,313	9,331	9,331	9,336	9,341	9,346	9,351	9,356	9,360	9,364
Orleans Parish	29,049	29,061	29,091	29,108	29,124	29,138	29,153	29,167	29,180	29,193	29,205
Ouachita Parish	17,822	17,826	17,838	17,847	17,854	17,861	17,869	17,876	17,883	17,889	17,896
Rapides Parish	11,489	11,517	11,533	11,548	11,567	11,586	11,606	11,627	11,648	11,671	11,693
St. Bernard Parish	3,892	3,895	3,901	3,912	3,917	3,921	3,926	3,931	3,935	3,939	3,943
St. Charles Parish	5,244	5,247	5,251	5,273	5,280	5,288	5,295	5,303	5,310	5,317	5,324
St. James Parish	1,888	1,889	1,885	1,888	1,890	1,892	1,894	1,895	1,897	1,899	1,901
St. John the Baptist Parish	3,588	3,591	3,597	3,598	3,600	3,603	3,606	3,608	3,610	3,613	3,615
St. Tammany Parish	24,774	24,790	24,877	24,903	24,922	24,941	24,959	24,976	24,993	25,008	25,024

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:		
	3/21	3/22	3/23	3/24	3/26	3/28	3/30
Ascension Parish	11,382	11,398	11,431	11,444	11,492 (2,298) [552] {276}	11,542 (2,308) [554] {277}	11,593 (2,319) [556] {278}
Bossier Parish	13,190	13,192	13,207	13,212	13,227 (2,645) [635] {317}	13,241 (2,648) [636] {318}	13,254 (2,651) [636] {318}
Caddo Parish	25,002	25,017	25,018	25,041	25,061 (5,012) [1,203] {601}	25,080 (5,016) [1,204] {602}	25,098 (5,020) [1,205] {602}
Calcasieu Parish	20,801	20,857	20,945	20,919	21,059 (4,212) [1,011] {505}	21,206 (4,241) [1,018] {509}	21,354 (4,271) [1,025] {512}
East Baton Rouge Parish	36,850	36,906	36,985	37,043	37,151 (7,430) [1,783] {892}	37,261 (7,452) [1,789] {894}	37,366 (7,473) [1,794] {897}
Jefferson Parish	44,746	44,777	44,822	44,860	44,917 (8,983) [2,156] {1,078}	44,971 (8,994) [2,159] {1,079}	45,024 (9,005) [2,161] {1,081}
Lafayette Parish	22,074	22,096	22,106	22,155	22,204 (4,441) [1,066] {533}	22,252 (4,450) [1,068] {534}	22,302 (4,460) [1,070] {535}
Lafourche Parish	9,312	9,313	9,331	9,331	9,341 (1,868) [448] {224}	9,351 (1,870) [449] {224}	9,360 (1,872) [449] {225}
Orleans Parish	29,049	29,061	29,091	29,108	29,138 (5,828) [1,399] {699}	29,167 (5,833) [1,400] {700}	29,193 (5,839) [1,401] {701}
Ouachita Parish	17,822	17,826	17,838	17,847	17,861 (3,572) [857] {429}	17,876 (3,575) [858] {429}	17,889 (3,578) [859] {429}
Rapides Parish	11,489	11,517	11,533	11,548	11,586 (2,317) [556] {278}	11,627 (2,325) [558] {279}	11,671 (2,334) [560] {280}
St. Bernard Parish	3,892	3,895	3,901	3,912	3,921 (784) [188] {94}	3,931 (786) [189] {94}	3,939 (788) [189] {95}
St. Charles Parish	5,244	5,247	5,251	5,273	5,288 (1,058) [254] {127}	5,303 (1,061) [255] {127}	5,317 (1,063) [255] {128}
St. James Parish	1,888	1,889	1,885	1,888	1,892 (378) [91] {45}	1,895 (379) [91] {45}	1,899 (380) [91] {46}
St. John the Baptist Parish	3,588	3,591	3,597	3,598	3,603 (721) [173] {86}	3,608 (722) [173] {87}	3,613 (723) [173] {87}
St. Tammany Parish	24,774	24,790	24,877	24,903	24,941 (4,988) [1,197] {599}	24,976 (4,995) [1,199] {599}	25,008 (5,002) [1,200] {600}

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.