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

Date: 1/25/21

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 1/25/21 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.

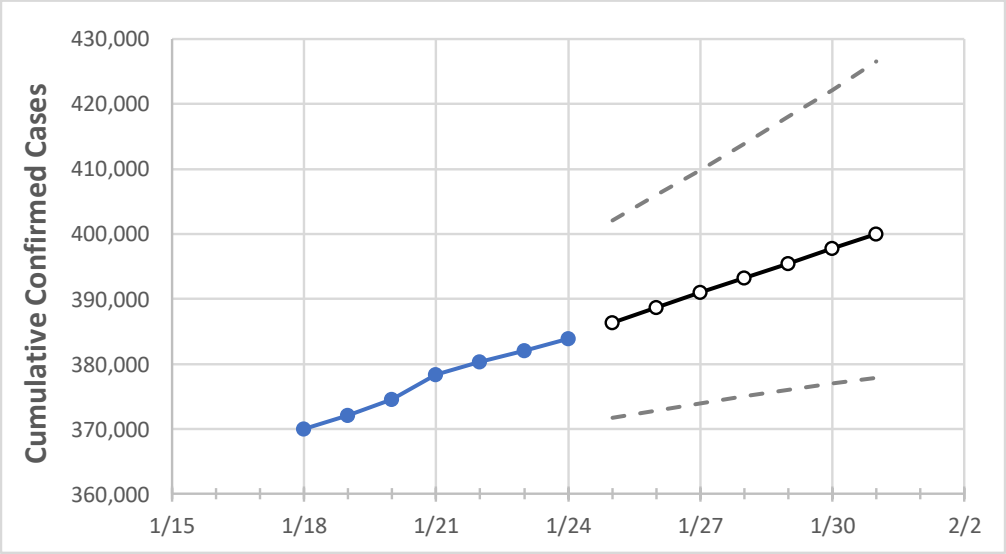
IEM's Modeling Lead

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:						
	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31
Louisiana	378,318	380,255	382,059	383,862	386,283	388,633	390,955	393,206	395,477	397,805	399,975

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:						
	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31
Ascension Parish	9,711	9,741	9,785	9,829	9,897	9,966	10,035	10,102	10,167	10,234	10,298
Bossier Parish	10,953	11,031	11,131	11,230	11,310	11,392	11,474	11,557	11,640	11,721	11,799
Caddo Parish	21,545	21,669	21,793	21,916	22,056	22,198	22,343	22,485	22,624	22,762	22,903
Calcasieu Parish	16,676	16,736	16,832	16,928	17,045	17,161	17,279	17,393	17,517	17,636	17,748
East Baton Rouge Parish	30,727	30,908	31,044	31,179	31,397	31,613	31,845	32,072	32,297	32,517	32,741
Jefferson Parish	38,677	38,873	39,071	39,268	39,537	39,803	40,062	40,312	40,572	40,825	41,068
Lafayette Parish	19,686	19,824	19,884	19,943	20,038	20,129	20,221	20,307	20,393	20,472	20,558
Lafourche Parish	7,671	7,700	7,747	7,794	7,858	7,920	7,982	8,045	8,109	8,172	8,234
Orleans Parish	25,047	25,178	25,268	25,358	25,490	25,622	25,750	25,879	25,998	26,121	26,241
Ouachita Parish	16,405	16,469	16,516	16,563	16,635	16,706	16,776	16,849	16,917	16,982	17,047
Rapides Parish	10,140	10,193	10,237	10,280	10,341	10,404	10,464	10,524	10,587	10,647	10,706
St. Bernard Parish	3,028	3,050	3,071	3,092	3,118	3,142	3,166	3,191	3,214	3,238	3,263
St. Charles Parish	4,566	4,577	4,593	4,608	4,644	4,679	4,712	4,748	4,782	4,818	4,853
St. James Parish	1,637	1,648	1,657	1,666	1,678	1,689	1,699	1,710	1,721	1,733	1,744
St. John the Baptist Parish	3,120	3,130	3,142	3,153	3,169	3,184	3,198	3,213	3,228	3,243	3,258
St. Tammany Parish	19,917	20,085	20,175	20,264	20,465	20,672	20,881	21,081	21,294	21,506	21,720

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:		
	1/21	1/22	1/23	1/24	1/26	1/28	1/30
Ascension Parish	9,711	9,741	9,785	9,829	9,966 (1,993) [478] {239}	10,102 (2,020) [485] {242}	10,234 (2,047) [491] {246}
Bossier Parish	10,953	11,031	11,131	11,230	11,392 (2,278) [547] {273}	11,557 (2,311) [555] {277}	11,721 (2,344) [563] {281}
Caddo Parish	21,545	21,669	21,793	21,916	22,198 (4,440) [1,066] {533}	22,485 (4,497) [1,079] {540}	22,762 (4,552) [1,093] {546}
Calcasieu Parish	16,676	16,736	16,832	16,928	17,161 (3,432) [824] {412}	17,393 (3,479) [835] {417}	17,636 (3,527) [847] {423}
East Baton Rouge Parish	30,727	30,908	31,044	31,179	31,613 (6,323) [1,517] {759}	32,072 (6,414) [1,539] {770}	32,517 (6,503) [1,561] {780}
Jefferson Parish	38,677	38,873	39,071	39,268	39,803 (7,961) [1,911] {955}	40,312 (8,062) [1,935] {967}	40,825 (8,165) [1,960] {980}
Lafayette Parish	19,686	19,824	19,884	19,943	20,129 (4,026) [966] {483}	20,307 (4,061) [975] {487}	20,472 (4,094) [983] {491}
Lafourche Parish	7,671	7,700	7,747	7,794	7,920 (1,584) [380] {190}	8,045 (1,609) [386] {193}	8,172 (1,634) [392] {196}
Orleans Parish	25,047	25,178	25,268	25,358	25,622 (5,124) [1,230] {615}	25,879 (5,176) [1,242] {621}	26,121 (5,224) [1,254] {627}
Ouachita Parish	16,405	16,469	16,516	16,563	16,706 (3,341) [802] {401}	16,849 (3,370) [809] {404}	16,982 (3,396) [815] {408}
Rapides Parish	10,140	10,193	10,237	10,280	10,404 (2,081) [499] {250}	10,524 (2,105) [505] {253}	10,647 (2,129) [511] {256}
St. Bernard Parish	3,028	3,050	3,071	3,092	3,142 (628) [151] {75}	3,191 (638) [153] {77}	3,238 (648) [155] {78}
St. Charles Parish	4,566	4,577	4,593	4,608	4,679 (936) [225] {112}	4,748 (950) [228] {114}	4,818 (964) [231] {116}
St. James Parish	1,637	1,648	1,657	1,666	1,689 (338) [81] {41}	1,710 (342) [82] {41}	1,733 (347) [83] {42}
St. John the Baptist Parish	3,120	3,130	3,142	3,153	3,184 (637) [153] {76}	3,213 (643) [154] {77}	3,243 (649) [156] {78}
St. Tammany Parish	19,917	20,085	20,175	20,264	20,672 (4,134) [992] {496}	21,081 (4,216) [1,012] {506}	21,506 (4,301) [1,032] {516}

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.