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

Date: 3/24/21

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 3/24/21 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.

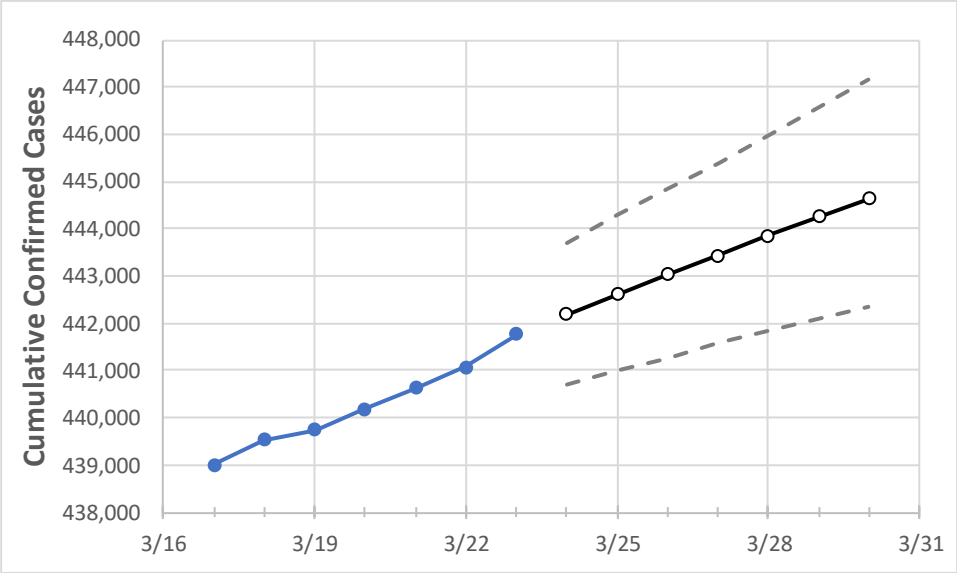
IEM's Modeling Lead

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:						
	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30
Louisiana	440,180	440,623	441,066	441,771	442,192	442,606	443,031	443,441	443,850	444,261	444,646

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:						
	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30
Ascension Parish	11,367	11,382	11,398	11,431	11,457	11,484	11,510	11,538	11,566	11,594	11,622
Bossier Parish	13,187	13,190	13,192	13,207	13,216	13,224	13,233	13,241	13,249	13,257	13,265
Caddo Parish	24,988	25,002	25,017	25,018	25,027	25,035	25,043	25,051	25,058	25,066	25,073
Calcasieu Parish	20,745	20,801	20,857	20,945	21,011	21,076	21,147	21,216	21,291	21,363	21,432
East Baton Rouge Parish	36,794	36,850	36,906	36,985	37,038	37,092	37,145	37,197	37,249	37,303	37,354
Jefferson Parish	44,715	44,746	44,777	44,822	44,850	44,878	44,904	44,929	44,953	44,976	44,999
Lafayette Parish	22,053	22,074	22,096	22,106	22,127	22,147	22,167	22,188	22,208	22,229	22,249
Lafourche Parish	9,310	9,312	9,313	9,331	9,336	9,341	9,346	9,351	9,356	9,360	9,364
Orleans Parish	29,037	29,049	29,061	29,091	29,107	29,123	29,138	29,153	29,167	29,181	29,195
Ouachita Parish	17,817	17,822	17,826	17,838	17,844	17,851	17,857	17,864	17,870	17,876	17,883
Rapides Parish	11,461	11,489	11,517	11,533	11,552	11,571	11,592	11,612	11,634	11,656	11,679
St. Bernard Parish	3,889	3,892	3,895	3,901	3,905	3,909	3,914	3,917	3,921	3,925	3,928
St. Charles Parish	5,240	5,244	5,247	5,251	5,256	5,261	5,266	5,271	5,277	5,281	5,286
St. James Parish	1,886	1,888	1,889	1,885	1,887	1,889	1,890	1,892	1,894	1,896	1,897
St. John the Baptist Parish	3,585	3,588	3,591	3,597	3,600	3,602	3,605	3,608	3,610	3,613	3,616
St. Tammany Parish	24,758	24,774	24,790	24,877	24,895	24,913	24,929	24,946	24,961	24,975	24,989

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:		
	3/20	3/21	3/22	3/23	3/25	3/27	3/29
Ascension Parish	11,367	11,382	11,398	11,431	11,484 (2,297) [551] {276}	11,538 (2,308) [554] {277}	11,594 (2,319) [557] {278}
Bossier Parish	13,187	13,190	13,192	13,207	13,224 (2,645) [635] {317}	13,241 (2,648) [636] {318}	13,257 (2,651) [636] {318}
Caddo Parish	24,988	25,002	25,017	25,018	25,035 (5,007) [1,202] {601}	25,051 (5,010) [1,202] {601}	25,066 (5,013) [1,203] {602}
Calcasieu Parish	20,745	20,801	20,857	20,945	21,076 (4,215) [1,012] {506}	21,216 (4,243) [1,018] {509}	21,363 (4,273) [1,025] {513}
East Baton Rouge Parish	36,794	36,850	36,906	36,985	37,092 (7,418) [1,780] {890}	37,197 (7,439) [1,785] {893}	37,303 (7,461) [1,791] {895}
Jefferson Parish	44,715	44,746	44,777	44,822	44,878 (8,976) [2,154] {1,077}	44,929 (8,986) [2,157] {1,078}	44,976 (8,995) [2,159] {1,079}
Lafayette Parish	22,053	22,074	22,096	22,106	22,147 (4,429) [1,063] {532}	22,188 (4,438) [1,065] {533}	22,229 (4,446) [1,067] {533}
Lafourche Parish	9,310	9,312	9,313	9,331	9,341 (1,868) [448] {224}	9,351 (1,870) [449] {224}	9,360 (1,872) [449] {225}
Orleans Parish	29,037	29,049	29,061	29,091	29,123 (5,825) [1,398] {699}	29,153 (5,831) [1,399] {700}	29,181 (5,836) [1,401] {700}
Ouachita Parish	17,817	17,822	17,826	17,838	17,851 (3,570) [857] {428}	17,864 (3,573) [857] {429}	17,876 (3,575) [858] {429}
Rapides Parish	11,461	11,489	11,517	11,533	11,571 (2,314) [555] {278}	11,612 (2,322) [557] {279}	11,656 (2,331) [559] {280}
St. Bernard Parish	3,889	3,892	3,895	3,901	3,909 (782) [188] {94}	3,917 (783) [188] {94}	3,925 (785) [188] {94}
St. Charles Parish	5,240	5,244	5,247	5,251	5,261 (1,052) [253] {126}	5,271 (1,054) [253] {127}	5,281 (1,056) [253] {127}
St. James Parish	1,886	1,888	1,889	1,885	1,889 (378) [91] {45}	1,892 (378) [91] {45}	1,896 (379) [91] {45}
St. John the Baptist Parish	3,585	3,588	3,591	3,597	3,602 (720) [173] {86}	3,608 (722) [173] {87}	3,613 (723) [173] {87}
St. Tammany Parish	24,758	24,774	24,790	24,877	24,913 (4,983) [1,196] {598}	24,946 (4,989) [1,197] {599}	24,975 (4,995) [1,199] {599}

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.