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

Date: 1/21/21

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 1/21/21 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.

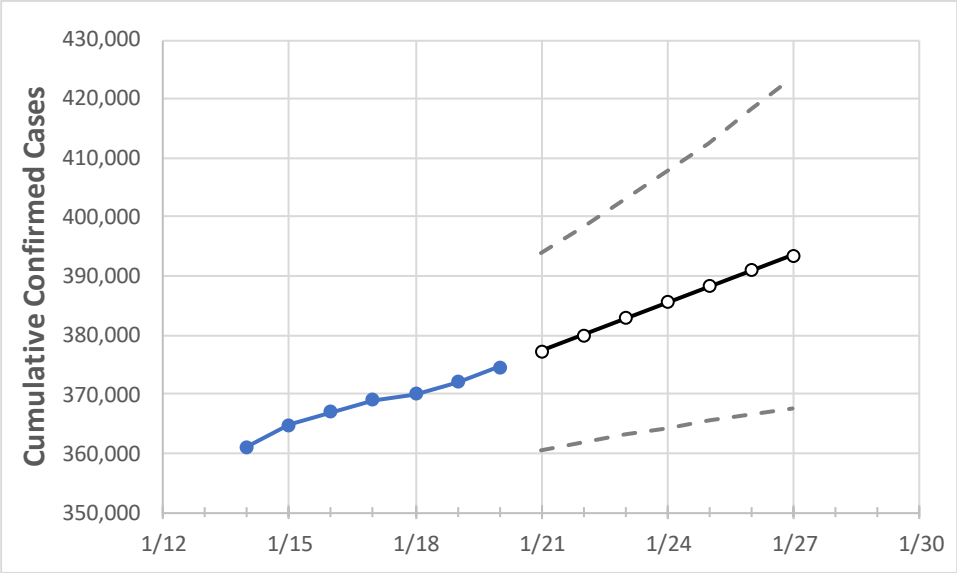
IEM's Modeling Lead

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:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Louisiana	368,980	369,951	372,089	374,582	377,357	380,070	382,778	385,531	388,293	390,919	393,500

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:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Ascension Parish	9,469	9,498	9,570	9,607	9,694	9,783	9,869	9,957	10,048	10,134	10,223
Bossier Parish	10,648	10,662	10,712	10,826	10,906	10,987	11,066	11,146	11,222	11,301	11,376
Caddo Parish	20,934	21,035	21,115	21,265	21,415	21,565	21,707	21,850	21,992	22,133	22,270
Calcasieu Parish	16,156	16,176	16,266	16,456	16,575	16,691	16,813	16,927	17,038	17,152	17,276
East Baton Rouge Parish	30,192	30,265	30,414	30,494	30,762	31,032	31,303	31,571	31,852	32,126	32,410
Jefferson Parish	37,684	37,813	38,037	38,283	38,595	38,903	39,217	39,521	39,820	40,122	40,413
Lafayette Parish	19,293	19,315	19,427	19,507	19,607	19,699	19,796	19,885	19,974	20,057	20,141
Lafourche Parish	7,378	7,416	7,480	7,570	7,638	7,710	7,784	7,857	7,930	8,000	8,073
Orleans Parish	24,476	24,571	24,703	24,844	25,010	25,172	25,332	25,491	25,655	25,807	25,958
Ouachita Parish	16,035	16,082	16,181	16,252	16,334	16,419	16,501	16,580	16,654	16,731	16,807
Rapides Parish	9,847	9,865	9,987	10,022	10,096	10,167	10,237	10,306	10,373	10,443	10,523
St. Bernard Parish	2,912	2,923	2,941	2,993	3,022	3,049	3,079	3,106	3,135	3,163	3,192
St. Charles Parish	4,399	4,418	4,438	4,492	4,537	4,584	4,630	4,675	4,722	4,769	4,818
St. James Parish	1,594	1,598	1,617	1,636	1,651	1,666	1,681	1,696	1,712	1,727	1,741
St. John the Baptist Parish	3,032	3,045	3,053	3,090	3,108	3,126	3,142	3,160	3,177	3,195	3,211
St. Tammany Parish	19,309	19,404	19,538	19,676	19,896	20,126	20,364	20,588	20,833	21,074	21,333

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:		
	1/17	1/18	1/19	1/20	1/22	1/24	1/26
Ascension Parish	9,469	9,498	9,570	9,607	9,783 (1,957) [470] {235}	9,957 (1,991) [478] {239}	10,134 (2,027) [486] {243}
Bossier Parish	10,648	10,662	10,712	10,826	10,987 (2,197) [527] {264}	11,146 (2,229) [535] {268}	11,301 (2,260) [542] {271}
Caddo Parish	20,934	21,035	21,115	21,265	21,565 (4,313) [1,035] {518}	21,850 (4,370) [1,049] {524}	22,133 (4,427) [1,062] {531}
Calcasieu Parish	16,156	16,176	16,266	16,456	16,691 (3,338) [801] {401}	16,927 (3,385) [812] {406}	17,152 (3,430) [823] {412}
East Baton Rouge Parish	30,192	30,265	30,414	30,494	31,032 (6,206) [1,490] {745}	31,571 (6,314) [1,515] {758}	32,126 (6,425) [1,542] {771}
Jefferson Parish	37,684	37,813	38,037	38,283	38,903 (7,781) [1,867] {934}	39,521 (7,904) [1,897] {949}	40,122 (8,024) [1,926] {963}
Lafayette Parish	19,293	19,315	19,427	19,507	19,699 (3,940) [946] {473}	19,885 (3,977) [954] {477}	20,057 (4,011) [963] {481}
Lafourche Parish	7,378	7,416	7,480	7,570	7,710 (1,542) [370] {185}	7,857 (1,571) [377] {189}	8,000 (1,600) [384] {192}
Orleans Parish	24,476	24,571	24,703	24,844	25,172 (5,034) [1,208] {604}	25,491 (5,098) [1,224] {612}	25,807 (5,161) [1,239] {619}
Ouachita Parish	16,035	16,082	16,181	16,252	16,419 (3,284) [788] {394}	16,580 (3,316) [796] {398}	16,731 (3,346) [803] {402}
Rapides Parish	9,847	9,865	9,987	10,022	10,167 (2,033) [488] {244}	10,306 (2,061) [495] {247}	10,443 (2,089) [501] {251}
St. Bernard Parish	2,912	2,923	2,941	2,993	3,049 (610) [146] {73}	3,106 (621) [149] {75}	3,163 (633) [152] {76}
St. Charles Parish	4,399	4,418	4,438	4,492	4,584 (917) [220] {110}	4,675 (935) [224] {112}	4,769 (954) [229] {114}
St. James Parish	1,594	1,598	1,617	1,636	1,666 (333) [80] {40}	1,696 (339) [81] {41}	1,727 (345) [83] {41}
St. John the Baptist Parish	3,032	3,045	3,053	3,090	3,126 (625) [150] {75}	3,160 (632) [152] {76}	3,195 (639) [153] {77}
St. Tammany Parish	19,309	19,404	19,538	19,676	20,126 (4,025) [966] {483}	20,588 (4,118) [988] {494}	21,074 (4,215) [1,012] {506}

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.