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

Date: 8/4/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/4/20 12 p.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.

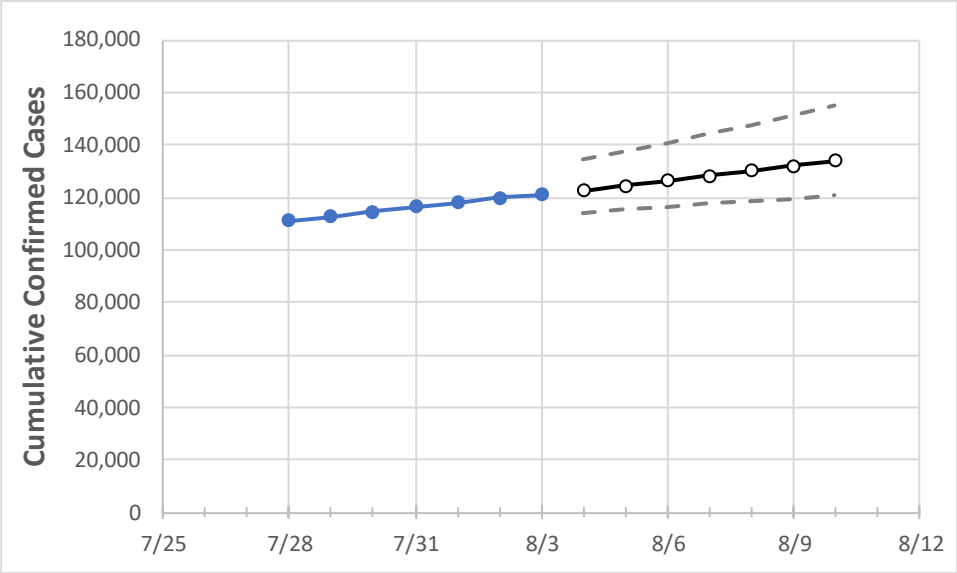
IEM's Modeling Lead

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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Louisiana	116,280	118,013	119,746	120,846	122,644	124,462	126,301	128,161	130,041	131,942	133,864

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 20%, and are often within 10%, of actual confirmed cases.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Ascension Parish	2,458	2,534	2,609	2,643	2,687	2,732	2,777	2,824	2,872	2,921	2,972
Bossier Parish	2,054	2,083	2,111	2,118	2,147	2,177	2,206	2,236	2,266	2,296	2,327
Caddo Parish	6,144	6,203	6,261	6,299	6,384	6,470	6,557	6,646	6,736	6,828	6,921
Calcasieu Parish	6,278	6,359	6,440	6,527	6,656	6,787	6,920	7,056	7,193	7,333	7,474
East Baton Rouge Parish	10,690	10,930	11,169	11,263	11,451	11,642	11,838	12,038	12,242	12,451	12,663
Jefferson Parish	14,155	14,304	14,453	14,533	14,673	14,814	14,957	15,101	15,247	15,394	15,543
Lafayette Parish	6,155	6,253	6,350	6,423	6,506	6,589	6,672	6,755	6,839	6,922	7,006
Lafourche Parish	2,516	2,544	2,572	2,589	2,623	2,658	2,693	2,728	2,764	2,800	2,837
Orleans Parish	10,255	10,320	10,384	10,426	10,497	10,569	10,641	10,715	10,789	10,865	10,941
Ouachita Parish	4,372	4,423	4,474	4,509	4,564	4,620	4,676	4,733	4,790	4,848	4,906
Rapides Parish	2,945	2,991	3,037	3,068	3,116	3,166	3,216	3,268	3,321	3,375	3,431
St. Bernard Parish	1,001	1,015	1,028	1,037	1,050	1,062	1,076	1,089	1,103	1,118	1,133
St. Charles Parish	1,340	1,354	1,367	1,375	1,400	1,417	1,433	1,451	1,468	1,486	1,503
St. James Parish	624	635	645	649	657	666	675	684	693	703	713
St. John the Baptist Parish	1,334	1,341	1,348	1,355	1,366	1,378	1,390	1,402	1,414	1,427	1,440
St. Tammany Parish	4,621	4,690	4,759	4,808	4,880	4,953	5,027	5,102	5,179	5,256	5,334

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:		
	7/31	8/1	8/2	8/3	8/5	8/7	8/9
Ascension Parish	2,458	2,534	2,609	2,643	2,732 (546) [131] {66}	2,824 (565) [136] {68}	2,921 (584) [140] {70}
Bossier Parish	2,054	2,083	2,111	2,118	2,177 (435) [104] {52}	2,236 (447) [107] {54}	2,296 (459) [110] {55}
Caddo Parish	6,144	6,203	6,261	6,299	6,470 (1,294) [311] {155}	6,646 (1,329) [319] {159}	6,828 (1,366) [328] {164}
Calcasieu Parish	6,278	6,359	6,440	6,527	6,787 (1,357) [326] {163}	7,056 (1,411) [339] {169}	7,333 (1,467) [352] {176}
East Baton Rouge Parish	10,690	10,930	11,169	11,263	11,642 (2,328) [559] {279}	12,038 (2,408) [578] {289}	12,451 (2,490) [598] {299}
Jefferson Parish	14,155	14,304	14,453	14,533	14,814 (2,963) [711] {356}	15,101 (3,020) [725] {362}	15,394 (3,079) [739] {369}
Lafayette Parish	6,155	6,253	6,350	6,423	6,589 (1,318) [316] {158}	6,755 (1,351) [324] {162}	6,922 (1,384) [332] {166}
Lafourche Parish	2,516	2,544	2,572	2,589	2,658 (532) [128] {64}	2,728 (546) [131] {65}	2,800 (560) [134] {67}
Orleans Parish	10,255	10,320	10,384	10,426	10,569 (2,114) [507] {254}	10,715 (2,143) [514] {257}	10,865 (2,173) [522] {261}
Ouachita Parish	4,372	4,423	4,474	4,509	4,620 (924) [222] {111}	4,733 (947) [227] {114}	4,848 (970) [233] {116}
Rapides Parish	2,945	2,991	3,037	3,068	3,166 (633) [152] {76}	3,268 (654) [157] {78}	3,375 (675) [162] {81}
St. Bernard Parish	1,001	1,015	1,028	1,037	1,062 (212) [51] {25}	1,089 (218) [52] {26}	1,118 (224) [54] {27}
St. Charles Parish	1,340	1,354	1,367	1,375	1,417 (283) [68] {34}	1,451 (290) [70] {35}	1,486 (297) [71] {36}
St. James Parish	624	635	645	649	666 (133) [32] {16}	684 (137) [33] {16}	703 (141) [34] {17}
St. John the Baptist Parish	1,334	1,341	1,348	1,355	1,378 (276) [66] {33}	1,402 (280) [67] {34}	1,427 (285) [68] {34}
St. Tammany Parish	4,621	4,690	4,759	4,808	4,953 (991) [238] {119}	5,102 (1,020) [245] {122}	5,256 (1,051) [252] {126}

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.