IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/10/21

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 <u>not</u> 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 2/10/21 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
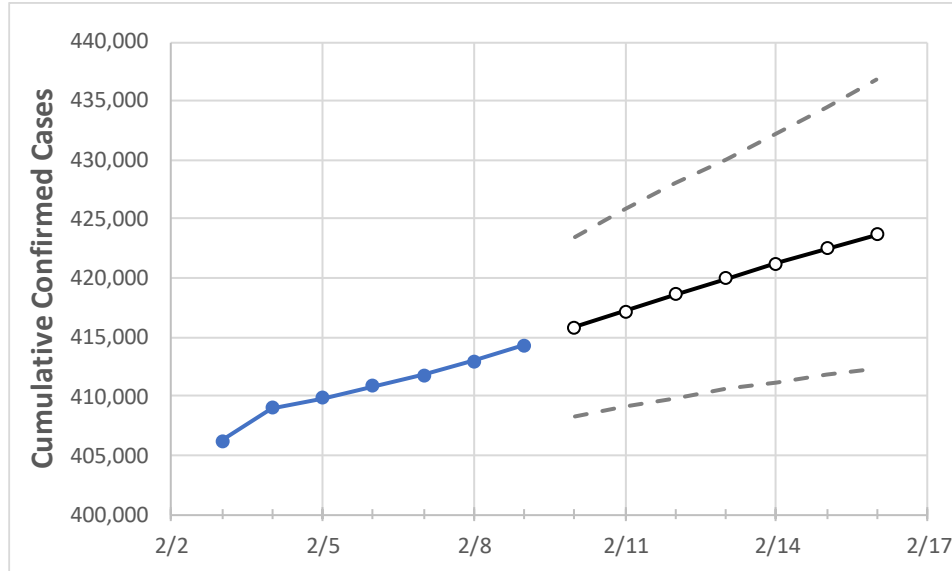
	Actual Confirmed Cases On:				Projected Cases For:						
	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16
Louisiana	410,837	411,812	412,989	414,354	415,812	417,212	418,611	419,963	421,234	422,481	423,720

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:						
	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16
Ascension Parish	10,587	10,601	10,624	10,665	10,703	10,741	10,778	10,811	10,844	10,876	10,907
Bossier Parish	12,456	12,489	12,547	12,604	12,687	12,772	12,855	12,939	13,024	13,106	13,186
Caddo Parish	23,900	23,954	24,031	24,100	24,222	24,342	24,462	24,577	24,694	24,812	24,927
Calcasieu Parish	18,239	18,292	18,327	18,436	18,510	18,579	18,649	18,718	18,788	18,855	18,921
East Baton Rouge Parish	33,801	33,882	33,958	34,088	34,236	34,383	34,525	34,669	34,810	34,952	35,093
Jefferson Parish	41,999	42,104	42,213	42,339	42,465	42,584	42,698	42,805	42,907	43,004	43,096
Lafayette Parish	20,947	21,020	21,078	21,106	21,158	21,207	21,257	21,303	21,348	21,391	21,432
Lafourche Parish	8,583	8,611	8,655	8,702	8,745	8,787	8,827	8,868	8,907	8,946	8,984
Orleans Parish	27,109	27,158	27,245	27,375	27,467	27,555	27,642	27,727	27,806	27,882	27,962
Ouachita Parish	17,324	17,347	17,382	17,406	17,439	17,469	17,497	17,526	17,553	17,578	17,602
Rapides Parish	10,910	10,931	10,951	10,988	11,016	11,043	11,070	11,094	11,117	11,140	11,161
St. Bernard Parish	3,377	3,394	3,408	3,431	3,447	3,464	3,479	3,494	3,509	3,525	3,539
St. Charles Parish	4,869	4,878	4,901	4,915	4,927	4,940	4,951	4,962	4,973	4,984	4,993
St. James Parish	1,763	1,770	1,774	1,786	1,792	1,797	1,802	1,808	1,813	1,818	1,823
St. John the Baptist Parish	3,369	3,373	3,385	3,394	3,405	3,416	3,426	3,436	3,445	3,455	3,464
St. Tammany Parish	22,257	22,312	22,423	22,507	22,604	22,696	22,783	22,869	22,952	23,031	23,106

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:		
	2/6	2/7	2/8	2/9	2/11	2/13	2/15
Ascension Parish	10,587	10,601	10,624	10,665	10,741 (2,148) [516] {258}	10,811 (2,162) [519] {259}	10,876 (2,175) [522] {261}
Bossier Parish	12,456	12,489	12,547	12,604	12,772 (2,554) [613] {307}	12,939 (2,588) [621] {311}	13,106 (2,621) [629] {315}
Caddo Parish	23,900	23,954	24,031	24,100	24,342 (4,868) [1,168] {584}	24,577 (4,915) [1,180] {590}	24,812 (4,962) [1,191] {595}
Calcasieu Parish	18,239	18,292	18,327	18,436	18,579 (3,716) [892] {446}	18,718 (3,744) [898] {449}	18,855 (3,771) [905] {453}
East Baton Rouge Parish	33,801	33,882	33,958	34,088	34,383 (6,877) [1,650] {825}	34,669 (6,934) [1,664] {832}	34,952 (6,990) [1,678] {839}
Jefferson Parish	41,999	42,104	42,213	42,339	42,584 (8,517) [2,044] {1,022}	42,805 (8,561) [2,055] {1,027}	43,004 (8,601) [2,064] {1,032}
Lafayette Parish	20,947	21,020	21,078	21,106	21,207 (4,241) [1,018] {509}	21,303 (4,261) [1,023] {511}	21,391 (4,278) [1,027] {513}
Lafourche Parish	8,583	8,611	8,655	8,702	8,787 (1,757) [422] {211}	8,868 (1,774) [426] {213}	8,946 (1,789) [429] {215}
Orleans Parish	27,109	27,158	27,245	27,375	27,555 (5,511) [1,323] {661}	27,727 (5,545) [1,331] {665}	27,882 (5,576) [1,338] {669}
Ouachita Parish	17,324	17,347	17,382	17,406	17,469 (3,494) [839] {419}	17,526 (3,505) [841] {421}	17,578 (3,516) [844] {422}
Rapides Parish	10,910	10,931	10,951	10,988	11,043 (2,209) [530] {265}	11,094 (2,219) [533] {266}	11,140 (2,228) [535] {267}
St. Bernard Parish	3,377	3,394	3,408	3,431	3,464 (693) [166] {83}	3,494 (699) [168] {84}	3,525 (705) [169] {85}
St. Charles Parish	4,869	4,878	4,901	4,915	4,940 (988) [237] {119}	4,962 (992) [238] {119}	4,984 (997) [239] {120}
St. James Parish	1,763	1,770	1,774	1,786	1,797 (359) [86] {43}	1,808 (362) [87] {43}	1,818 (364) [87] {44}
St. John the Baptist Parish	3,369	3,373	3,385	3,394	3,416 (683) [164] {82}	3,436 (687) [165] {82}	3,455 (691) [166] {83}
St. Tammany Parish	22,257	22,312	22,423	22,507	22,696 (4,539) [1,089] {545}	22,869 (4,574) [1,098] {549}	23,031 (4,606) [1,105] {553}

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.