IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/8/21

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 2/8/21 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
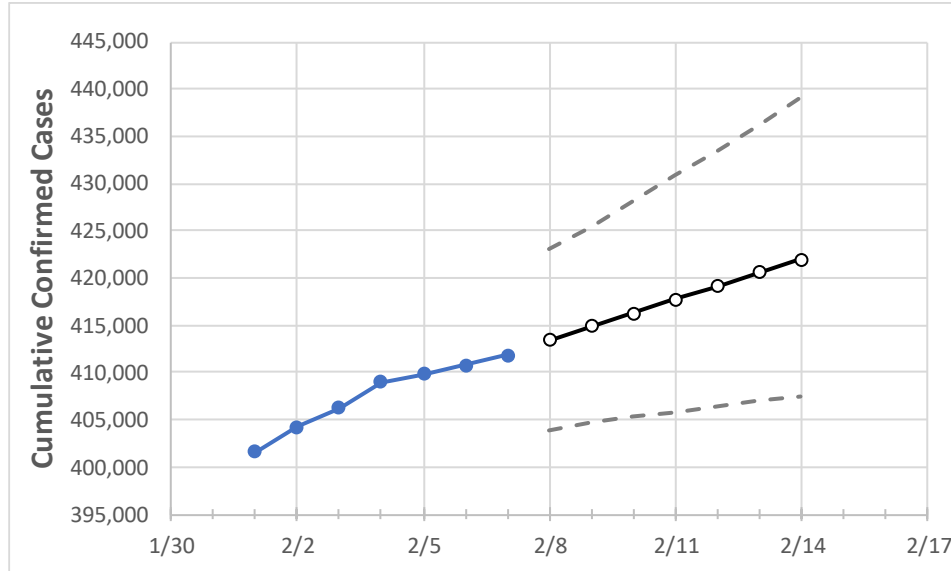
	Actual Confirmed Cases On:			Projected Cases For:						
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14
Louisiana	408,995	409,861	410,837	411,812	413,380	414,882	416,326	417,748	419,122	420,607	421,955

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:						
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14
Ascension Parish	10,543	10,573	10,587	10,601	10,643	10,684	10,725	10,766	10,803	10,843	10,883
Bossier Parish	12,385	12,422	12,456	12,489	12,580	12,674	12,767	12,860	12,955	13,051	13,148
Caddo Parish	23,803	23,845	23,900	23,954	24,101	24,250	24,399	24,548	24,697	24,849	24,999
Calcasieu Parish	18,169	18,186	18,239	18,292	18,370	18,448	18,529	18,601	18,676	18,747	18,817
East Baton Rouge Parish	33,576	33,720	33,801	33,882	34,032	34,182	34,337	34,489	34,637	34,785	34,926
Jefferson Parish	41,824	41,893	41,999	42,104	42,257	42,403	42,543	42,676	42,807	42,937	43,059
Lafayette Parish	20,827	20,873	20,947	21,020	21,081	21,140	21,196	21,250	21,301	21,355	21,408
Lafourche Parish	8,538	8,554	8,583	8,611	8,656	8,699	8,741	8,783	8,823	8,861	8,901
Orleans Parish	27,001	27,060	27,109	27,158	27,258	27,357	27,453	27,549	27,641	27,728	27,811
Ouachita Parish	17,282	17,300	17,324	17,347	17,387	17,426	17,463	17,497	17,532	17,563	17,594
Rapides Parish	10,861	10,888	10,910	10,931	10,964	10,994	11,023	11,053	11,081	11,106	11,132
St. Bernard Parish	3,349	3,360	3,377	3,394	3,411	3,428	3,446	3,463	3,479	3,495	3,510
St. Charles Parish	4,858	4,859	4,869	4,878	4,891	4,903	4,915	4,926	4,937	4,947	4,957
St. James Parish	1,753	1,756	1,763	1,770	1,776	1,781	1,786	1,791	1,796	1,801	1,806
St. John the Baptist Parish	3,360	3,365	3,369	3,373	3,385	3,395	3,406	3,416	3,427	3,437	3,447
St. Tammany Parish	22,150	22,201	22,257	22,312	22,416	22,515	22,614	22,706	22,798	22,886	22,973

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:		
	2/4	2/5	2/6	2/7	2/9	2/11	2/13
Ascension Parish	10,543	10,573	10,587	10,601	10,684 (2,137) [513] {256}	10,766 (2,153) [517] {258}	10,843 (2,169) [520] {260}
Bossier Parish	12,385	12,422	12,456	12,489	12,674 (2,535) [608] {304}	12,860 (2,572) [617] {309}	13,051 (2,610) [626] {313}
Caddo Parish	23,803	23,845	23,900	23,954	24,250 (4,850) [1,164] {582}	24,548 (4,910) [1,178] {589}	24,849 (4,970) [1,193] {596}
Calcasieu Parish	18,169	18,186	18,239	18,292	18,448 (3,690) [886] {443}	18,601 (3,720) [893] {446}	18,747 (3,749) [900] {450}
East Baton Rouge Parish	33,576	33,720	33,801	33,882	34,182 (6,836) [1,641] {820}	34,489 (6,898) [1,655] {828}	34,785 (6,957) [1,670] {835}
Jefferson Parish	41,824	41,893	41,999	42,104	42,403 (8,481) [2,035] {1,018}	42,676 (8,535) [2,048] {1,024}	42,937 (8,587) [2,061] {1,030}
Lafayette Parish	20,827	20,873	20,947	21,020	21,140 (4,228) [1,015] {507}	21,250 (4,250) [1,020] {510}	21,355 (4,271) [1,025] {513}
Lafourche Parish	8,538	8,554	8,583	8,611	8,699 (1,740) [418] {209}	8,783 (1,757) [422] {211}	8,861 (1,772) [425] {213}
Orleans Parish	27,001	27,060	27,109	27,158	27,357 (5,471) [1,313] {657}	27,549 (5,510) [1,322] {661}	27,728 (5,546) [1,331] {665}
Ouachita Parish	17,282	17,300	17,324	17,347	17,426 (3,485) [836] {418}	17,497 (3,499) [840] {420}	17,563 (3,513) [843] {422}
Rapides Parish	10,861	10,888	10,910	10,931	10,994 (2,199) [528] {264}	11,053 (2,211) [531] {265}	11,106 (2,221) [533] {267}
St. Bernard Parish	3,349	3,360	3,377	3,394	3,428 (686) [165] {82}	3,463 (693) [166] {83}	3,495 (699) [168] {84}
St. Charles Parish	4,858	4,859	4,869	4,878	4,903 (981) [235] {118}	4,926 (985) [236] {118}	4,947 (989) [237] {119}
St. James Parish	1,753	1,756	1,763	1,770	1,781 (356) [85] {43}	1,791 (358) [86] {43}	1,801 (360) [86] {43}
St. John the Baptist Parish	3,360	3,365	3,369	3,373	3,395 (679) [163] {81}	3,416 (683) [164] {82}	3,437 (687) [165] {82}
St. Tammany Parish	22,150	22,201	22,257	22,312	22,515 (4,503) [1,081] {540}	22,706 (4,541) [1,090] {545}	22,886 (4,577) [1,099] {549}

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.