IEM's AI Modeling: Short-term COVID-19 Projections
Date: 12/18/20

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 <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 12/18/20 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
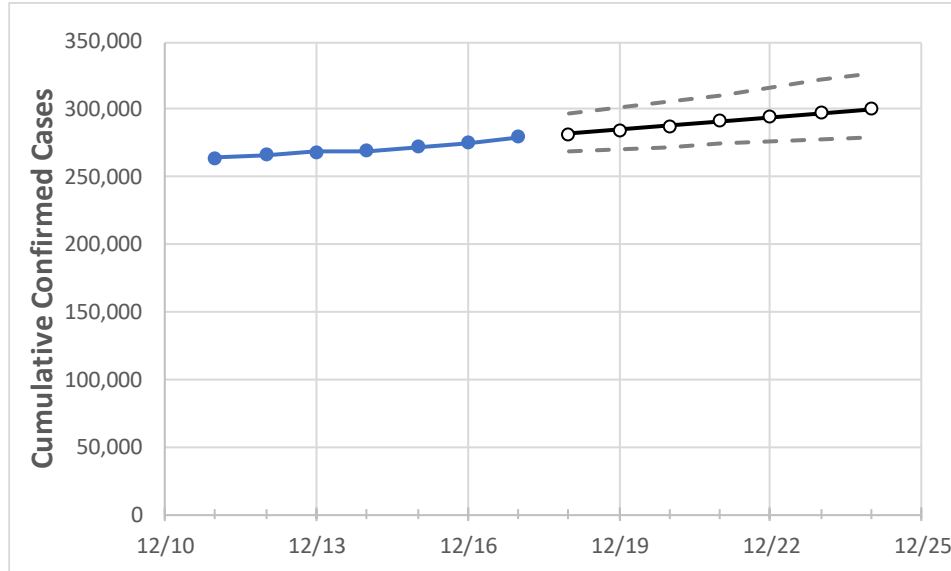
	Actual Confirmed Cases On:				Projected Cases For:						
	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24
Louisiana	269,643	272,276	275,545	279,321	282,170	285,083	288,061	291,104	294,213	297,386	300,625

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:						
	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24
Ascension Parish	6,761	6,786	6,885	6,991	7,069	7,148	7,229	7,312	7,396	7,481	7,568
Bossier Parish	7,394	7,455	7,569	7,712	7,793	7,874	7,957	8,040	8,125	8,210	8,295
Caddo Parish	15,280	15,359	15,532	15,768	15,890	16,013	16,138	16,263	16,389	16,516	16,645
Calcasieu Parish	11,868	11,934	12,121	12,244	12,349	12,456	12,565	12,676	12,788	12,902	13,018
East Baton Rouge Parish	22,545	22,604	22,865	23,189	23,388	23,592	23,801	24,014	24,233	24,456	24,684
Jefferson Parish	26,821	27,128	27,355	27,741	28,022	28,308	28,601	28,899	29,203	29,512	29,828
Lafayette Parish	14,269	14,432	14,660	14,838	15,018	15,203	15,391	15,584	15,782	15,983	16,189
Lafourche Parish	5,439	5,510	5,539	5,587	5,636	5,687	5,737	5,789	5,841	5,893	5,946
Orleans Parish	18,036	18,179	18,307	18,498	18,651	18,806	18,963	19,124	19,287	19,453	19,621
Ouachita Parish	11,682	11,779	11,907	12,274	12,414	12,558	12,705	12,856	13,011	13,169	13,331
Rapides Parish	7,108	7,186	7,302	7,348	7,410	7,473	7,536	7,600	7,665	7,731	7,798
St. Bernard Parish	2,045	2,065	2,074	2,085	2,097	2,109	2,122	2,134	2,146	2,158	2,170
St. Charles Parish	3,021	3,053	3,067	3,157	3,189	3,221	3,253	3,287	3,321	3,356	3,391
St. James Parish	1,137	1,152	1,164	1,176	1,188	1,200	1,212	1,225	1,238	1,251	1,264
St. John the Baptist Parish	2,244	2,276	2,297	2,324	2,346	2,369	2,392	2,416	2,441	2,466	2,492
St. Tammany Parish	12,334	12,622	12,904	13,106	13,295	13,491	13,694	13,903	14,119	14,341	14,570

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:		
	12/14	12/15	12/16	12/17	12/19	12/21	12/23
Ascension Parish	6,761	6,786	6,885	6,991	7,148 (1,430) [343] {172}	7,312 (1,462) [351] {175}	7,481 (1,496) [359] {180}
Bossier Parish	7,394	7,455	7,569	7,712	7,874 (1,575) [378] {189}	8,040 (1,608) [386] {193}	8,210 (1,642) [394] {197}
Caddo Parish	15,280	15,359	15,532	15,768	16,013 (3,203) [769] {384}	16,263 (3,253) [781] {390}	16,516 (3,303) [793] {396}
Calcasieu Parish	11,868	11,934	12,121	12,244	12,456 (2,491) [598] {299}	12,676 (2,535) [608] {304}	12,902 (2,580) [619] {310}
East Baton Rouge Parish	22,545	22,604	22,865	23,189	23,592 (4,718) [1,132] {566}	24,014 (4,803) [1,153] {576}	24,456 (4,891) [1,174] {587}
Jefferson Parish	26,821	27,128	27,355	27,741	28,308 (5,662) [1,359] {679}	28,899 (5,780) [1,387] {694}	29,512 (5,902) [1,417] {708}
Lafayette Parish	14,269	14,432	14,660	14,838	15,203 (3,041) [730] {365}	15,584 (3,117) [748] {374}	15,983 (3,197) [767] {384}
Lafourche Parish	5,439	5,510	5,539	5,587	5,687 (1,137) [273] {136}	5,789 (1,158) [278] {139}	5,893 (1,179) [283] {141}
Orleans Parish	18,036	18,179	18,307	18,498	18,806 (3,761) [903] {451}	19,124 (3,825) [918] {459}	19,453 (3,891) [934] {467}
Ouachita Parish	11,682	11,779	11,907	12,274	12,558 (2,512) [603] {301}	12,856 (2,571) [617] {309}	13,169 (2,634) [632] {316}
Rapides Parish	7,108	7,186	7,302	7,348	7,473 (1,495) [359] {179}	7,600 (1,520) [365] {182}	7,731 (1,546) [371] {186}
St. Bernard Parish	2,045	2,065	2,074	2,085	2,109 (422) [101] {51}	2,134 (427) [102] {51}	2,158 (432) [104] {52}
St. Charles Parish	3,021	3,053	3,067	3,157	3,221 (644) [155] {77}	3,287 (657) [158] {79}	3,356 (671) [161] {81}
St. James Parish	1,137	1,152	1,164	1,176	1,200 (240) [58] {29}	1,225 (245) [59] {29}	1,251 (250) [60] {30}
St. John the Baptist Parish	2,244	2,276	2,297	2,324	2,369 (474) [114] {57}	2,416 (483) [116] {58}	2,466 (493) [118] {59}
St. Tammany Parish	12,334	12,622	12,904	13,106	13,491 (2,698) [648] {324}	13,903 (2,781) [667] {334}	14,341 (2,868) [688] {344}

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.