IEM's AI Modeling: Short-term COVID-19 Projections
Date: 12/21/20

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 12/21/20 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
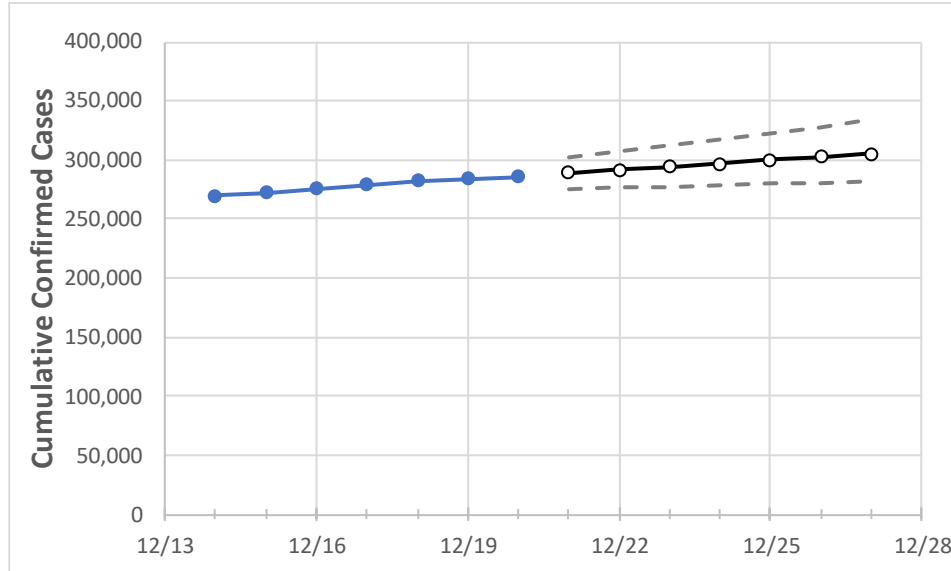
	Actual Confirmed Cases On:				Projected Cases For:						
	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27
Louisiana	279,321	282,434	284,290	286,145	288,799	291,491	294,219	296,985	299,785	302,621	305,492

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:						
	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27
Ascension Parish	6,991	7,048	7,094	7,140	7,199	7,259	7,317	7,376	7,434	7,491	7,548
Bossier Parish	7,712	7,801	7,896	7,991	8,086	8,184	8,284	8,387	8,492	8,599	8,709
Caddo Parish	15,768	15,909	16,035	16,160	16,282	16,405	16,529	16,654	16,779	16,905	17,032
Calcasieu Parish	12,244	12,400	12,481	12,562	12,682	12,805	12,930	13,058	13,190	13,323	13,460
East Baton Rouge Parish	23,189	23,427	23,563	23,698	23,887	24,078	24,273	24,470	24,670	24,873	25,079
Jefferson Parish	27,741	28,045	28,238	28,431	28,694	28,960	29,229	29,501	29,776	30,053	30,333
Lafayette Parish	14,838	15,040	15,130	15,219	15,383	15,550	15,719	15,890	16,063	16,239	16,416
Lafourche Parish	5,587	5,638	5,685	5,731	5,778	5,826	5,874	5,923	5,972	6,021	6,071
Orleans Parish	18,498	18,682	18,813	18,944	19,098	19,255	19,414	19,575	19,740	19,907	20,076
Ouachita Parish	12,274	12,444	12,535	12,626	12,772	12,920	13,072	13,227	13,385	13,546	13,710
Rapides Parish	7,348	7,396	7,436	7,476	7,531	7,586	7,641	7,697	7,753	7,809	7,865
St. Bernard Parish	2,085	2,101	2,111	2,121	2,132	2,144	2,155	2,166	2,177	2,188	2,199
St. Charles Parish	3,157	3,224	3,251	3,277	3,311	3,345	3,381	3,417	3,453	3,491	3,529
St. James Parish	1,176	1,196	1,200	1,204	1,213	1,221	1,229	1,238	1,246	1,255	1,263
St. John the Baptist Parish	2,324	2,346	2,367	2,388	2,413	2,439	2,465	2,493	2,522	2,552	2,583
St. Tammany Parish	13,106	13,258	13,351	13,443	13,600	13,759	13,922	14,086	14,254	14,424	14,596

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:		
	12/17	12/18	12/19	12/20	12/22	12/24	12/26
Ascension Parish	6,991	7,048	7,094	7,140	7,259 (1,452) [348] {174}	7,376 (1,475) [354] {177}	7,491 (1,498) [360] {180}
Bossier Parish	7,712	7,801	7,896	7,991	8,184 (1,637) [393] {196}	8,387 (1,677) [403] {201}	8,599 (1,720) [413] {206}
Caddo Parish	15,768	15,909	16,035	16,160	16,405 (3,281) [787] {394}	16,654 (3,331) [799] {400}	16,905 (3,381) [811] {406}
Calcasieu Parish	12,244	12,400	12,481	12,562	12,805 (2,561) [615] {307}	13,058 (2,612) [627] {313}	13,323 (2,665) [640] {320}
East Baton Rouge Parish	23,189	23,427	23,563	23,698	24,078 (4,816) [1,156] {578}	24,470 (4,894) [1,175] {587}	24,873 (4,975) [1,194] {597}
Jefferson Parish	27,741	28,045	28,238	28,431	28,960 (5,792) [1,390] {695}	29,501 (5,900) [1,416] {708}	30,053 (6,011) [1,443] {721}
Lafayette Parish	14,838	15,040	15,130	15,219	15,550 (3,110) [746] {373}	15,890 (3,178) [763] {381}	16,239 (3,248) [779] {390}
Lafourche Parish	5,587	5,638	5,685	5,731	5,826 (1,165) [280] {140}	5,923 (1,185) [284] {142}	6,021 (1,204) [289] {145}
Orleans Parish	18,498	18,682	18,813	18,944	19,255 (3,851) [924] {462}	19,575 (3,915) [940] {470}	19,907 (3,981) [956] {478}
Ouachita Parish	12,274	12,444	12,535	12,626	12,920 (2,584) [620] {310}	13,227 (2,645) [635] {317}	13,546 (2,709) [650] {325}
Rapides Parish	7,348	7,396	7,436	7,476	7,586 (1,517) [364] {182}	7,697 (1,539) [369] {185}	7,809 (1,562) [375] {187}
St. Bernard Parish	2,085	2,101	2,111	2,121	2,144 (429) [103] {51}	2,166 (433) [104] {52}	2,188 (438) [105] {53}
St. Charles Parish	3,157	3,224	3,251	3,277	3,345 (669) [161] {80}	3,417 (683) [164] {82}	3,491 (698) [168] {84}
St. James Parish	1,176	1,196	1,200	1,204	1,221 (244) [59] {29}	1,238 (248) [59] {30}	1,255 (251) [60] {30}
St. John the Baptist Parish	2,324	2,346	2,367	2,388	2,439 (488) [117] {59}	2,493 (499) [120] {60}	2,552 (510) [122] {61}
St. Tammany Parish	13,106	13,258	13,351	13,443	13,759 (2,752) [660] {330}	14,086 (2,817) [676] {338}	14,424 (2,885) [692] {346}

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.