IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/13/21

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 9/13/21 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
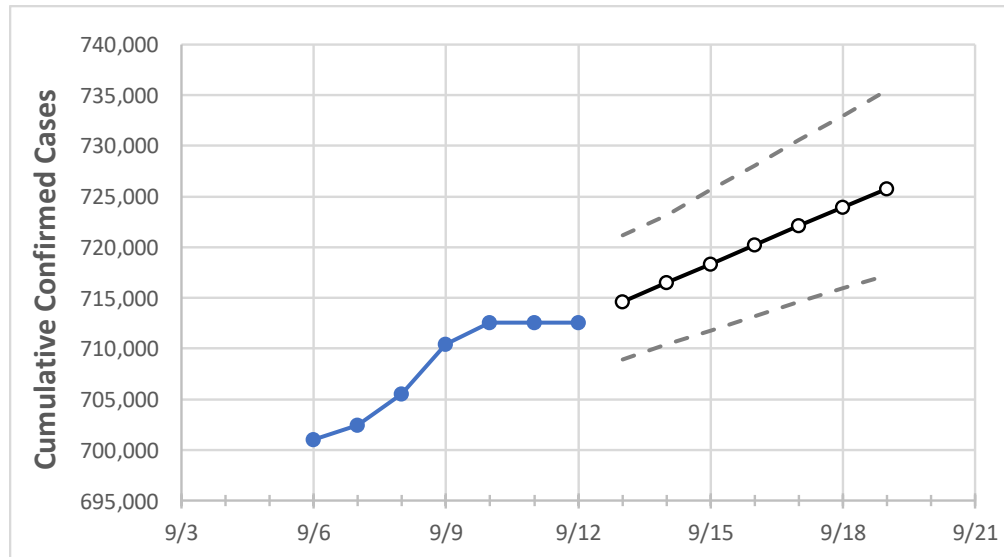
	Actual Confirmed Cases On:				Projected Cases For:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Louisiana	710,401	712,574	712,574	712,574	714,607	716,483	718,368	720,253	722,139	723,925	725,797

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Ascension Parish	20,699	20,747	20,747	20,747	20,790	20,834	20,884	20,923	20,968	21,010	21,052
Bossier Parish	20,134	20,195	20,195	20,195	20,268	20,340	20,410	20,480	20,551	20,619	20,686
Caddo Parish	36,614	36,741	36,741	36,741	36,842	36,939	37,035	37,131	37,223	37,313	37,406
Calcasieu Parish	32,009	32,113	32,113	32,113	32,258	32,406	32,545	32,691	32,833	32,985	33,126
East Baton Rouge Parish	60,609	60,736	60,736	60,736	60,879	61,020	61,148	61,281	61,414	61,538	61,661
Jefferson Parish	66,672	66,764	66,764	66,764	66,830	66,892	66,954	67,008	67,063	67,116	67,168
Lafayette Parish	36,501	36,583	36,583	36,583	36,691	36,802	36,901	37,002	37,107	37,212	37,310
Lafourche Parish	16,837	16,933	16,933	16,933	16,963	16,992	17,023	17,052	17,080	17,108	17,131
Orleans Parish	44,383	44,464	44,464	44,464	44,518	44,572	44,621	44,672	44,718	44,766	44,805
Ouachita Parish	28,522	28,681	28,681	28,681	28,821	28,965	29,097	29,235	29,369	29,513	29,645
Rapides Parish	19,846	19,900	19,900	19,900	19,982	20,072	20,157	20,244	20,320	20,412	20,492
St. Bernard Parish	6,538	6,547	6,547	6,547	6,555	6,563	6,571	6,578	6,585	6,591	6,598
St. Charles Parish	8,487	8,507	8,507	8,507	8,518	8,528	8,538	8,548	8,557	8,566	8,575
St. James Parish	3,253	3,257	3,257	3,257	3,269	3,280	3,293	3,302	3,313	3,324	3,335
St. John the Baptist Parish	6,002	6,018	6,018	6,018	6,028	6,037	6,046	6,056	6,064	6,073	6,080
St. Tammany Parish	40,968	41,120	41,120	41,120	41,196	41,268	41,338	41,401	41,471	41,533	41,594

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:		
	9/9	9/10	9/11	9/12	9/14	9/16	9/18
Ascension Parish	20,699	20,747	20,747	20,747	20,834 (4,167) [1,000] {500}	20,923 (4,185) [1,004] {502}	21,010 (4,202) [1,009] {504}
Bossier Parish	20,134	20,195	20,195	20,195	20,340 (4,068) [976] {488}	20,480 (4,096) [983] {492}	20,619 (4,124) [990] {495}
Caddo Parish	36,614	36,741	36,741	36,741	36,939 (7,388) [1,773] {887}	37,131 (7,426) [1,782] {891}	37,313 (7,463) [1,791] {896}
Calcasieu Parish	32,009	32,113	32,113	32,113	32,406 (6,481) [1,555] {778}	32,691 (6,538) [1,569] {785}	32,985 (6,597) [1,583] {792}
East Baton Rouge Parish	60,609	60,736	60,736	60,736	61,020 (12,204) [2,929] {1,464}	61,281 (12,256) [2,941] {1,471}	61,538 (12,308) [2,954] {1,477}
Jefferson Parish	66,672	66,764	66,764	66,764	66,892 (13,378) [3,211] {1,605}	67,008 (13,402) [3,216] {1,608}	67,116 (13,423) [3,222] {1,611}
Lafayette Parish	36,501	36,583	36,583	36,583	36,802 (7,360) [1,766] {883}	37,002 (7,400) [1,776] {888}	37,212 (7,442) [1,786] {893}
Lafourche Parish	16,837	16,933	16,933	16,933	16,992 (3,398) [816] {408}	17,052 (3,410) [818] {409}	17,108 (3,422) [821] {411}
Orleans Parish	44,383	44,464	44,464	44,464	44,572 (8,914) [2,139] {1,070}	44,672 (8,934) [2,144] {1,072}	44,766 (8,953) [2,149] {1,074}
Ouachita Parish	28,522	28,681	28,681	28,681	28,965 (5,793) [1,390] {695}	29,235 (5,847) [1,403] {702}	29,513 (5,903) [1,417] {708}
Rapides Parish	19,846	19,900	19,900	19,900	20,072 (4,014) [963] {482}	20,244 (4,049) [972] {486}	20,412 (4,082) [980] {490}
St. Bernard Parish	6,538	6,547	6,547	6,547	6,563 (1,313) [315] {158}	6,578 (1,316) [316] {158}	6,591 (1,318) [316] {158}
St. Charles Parish	8,487	8,507	8,507	8,507	8,528 (1,706) [409] {205}	8,548 (1,710) [410] {205}	8,566 (1,713) [411] {206}
St. James Parish	3,253	3,257	3,257	3,257	3,280 (656) [157] {79}	3,302 (660) [159] {79}	3,324 (665) [160] {80}
St. John the Baptist Parish	6,002	6,018	6,018	6,018	6,037 (1,207) [290] {145}	6,056 (1,211) [291] {145}	6,073 (1,215) [291] {146}
St. Tammany Parish	40,968	41,120	41,120	41,120	41,268 (8,254) [1,981] {990}	41,401 (8,280) [1,987] {994}	41,533 (8,307) [1,994] {997}

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.