IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/12/21

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 3/12/21 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
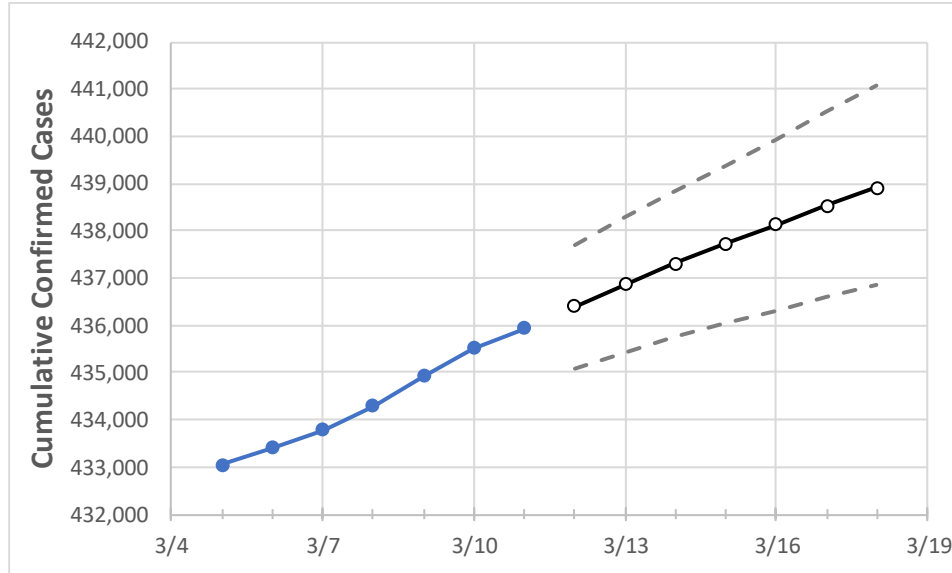
	Actual Confirmed Cases On:				Projected Cases For:						
	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18
Louisiana	434,289	434,926	435,514	435,935	436,399	436,861	437,307	437,725	438,138	438,539	438,921

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:						
	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18
Ascension Parish	11,088	11,098	11,122	11,134	11,148	11,162	11,175	11,189	11,203	11,216	11,229
Bossier Parish	13,084	13,094	13,110	13,112	13,118	13,124	13,129	13,134	13,139	13,144	13,148
Caddo Parish	24,862	24,877	24,891	24,907	24,921	24,934	24,947	24,960	24,971	24,983	24,993
Calcasieu Parish	19,882	20,060	20,126	20,174	20,248	20,326	20,402	20,475	20,553	20,635	20,715
East Baton Rouge Parish	36,115	36,176	36,232	36,267	36,318	36,367	36,415	36,463	36,509	36,553	36,595
Jefferson Parish	44,282	44,305	44,364	44,419	44,461	44,501	44,539	44,578	44,614	44,650	44,684
Lafayette Parish	21,735	21,774	21,805	21,827	21,847	21,867	21,887	21,907	21,927	21,947	21,966
Lafourche Parish	9,233	9,235	9,250	9,266	9,276	9,285	9,294	9,303	9,311	9,319	9,327
Orleans Parish	28,744	28,782	28,802	28,821	28,847	28,872	28,896	28,918	28,939	28,960	28,980
Ouachita Parish	17,731	17,750	17,749	17,748	17,753	17,758	17,763	17,767	17,771	17,775	17,779
Rapides Parish	11,339	11,337	11,347	11,356	11,365	11,374	11,383	11,392	11,400	11,409	11,417
St. Bernard Parish	3,799	3,815	3,825	3,828	3,835	3,841	3,848	3,854	3,860	3,866	3,871
St. Charles Parish	5,160	5,173	5,175	5,183	5,189	5,196	5,202	5,207	5,213	5,218	5,223
St. James Parish	1,863	1,862	1,869	1,869	1,871	1,872	1,874	1,876	1,877	1,879	1,880
St. John the Baptist Parish	3,557	3,562	3,567	3,571	3,574	3,577	3,580	3,583	3,586	3,588	3,591
St. Tammany Parish	24,454	24,501	24,555	24,587	24,629	24,669	24,707	24,744	24,780	24,815	24,848

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:		
	3/8	3/9	3/10	3/11	3/13	3/15	3/17
Ascension Parish	11,088	11,098	11,122	11,134	11,162 (2,232) [536] {268}	11,189 (2,238) [537] {269}	11,216 (2,243) [538] {269}
Bossier Parish	13,084	13,094	13,110	13,112	13,124 (2,625) [630] {315}	13,134 (2,627) [630] {315}	13,144 (2,629) [631] {315}
Caddo Parish	24,862	24,877	24,891	24,907	24,934 (4,987) [1,197] {598}	24,960 (4,992) [1,198] {599}	24,983 (4,997) [1,199] {600}
Calcasieu Parish	19,882	20,060	20,126	20,174	20,326 (4,065) [976] {488}	20,475 (4,095) [983] {491}	20,635 (4,127) [990] {495}
East Baton Rouge Parish	36,115	36,176	36,232	36,267	36,367 (7,273) [1,746] {873}	36,463 (7,293) [1,750] {875}	36,553 (7,311) [1,755] {877}
Jefferson Parish	44,282	44,305	44,364	44,419	44,501 (8,900) [2,136] {1,068}	44,578 (8,916) [2,140] {1,070}	44,650 (8,930) [2,143] {1,072}
Lafayette Parish	21,735	21,774	21,805	21,827	21,867 (4,373) [1,050] {525}	21,907 (4,381) [1,052] {526}	21,947 (4,389) [1,053] {527}
Lafourche Parish	9,233	9,235	9,250	9,266	9,285 (1,857) [446] {223}	9,303 (1,861) [447] {223}	9,319 (1,864) [447] {224}
Orleans Parish	28,744	28,782	28,802	28,821	28,872 (5,774) [1,386] {693}	28,918 (5,784) [1,388] {694}	28,960 (5,792) [1,390] {695}
Ouachita Parish	17,731	17,750	17,749	17,748	17,758 (3,552) [852] {426}	17,767 (3,553) [853] {426}	17,775 (3,555) [853] {427}
Rapides Parish	11,339	11,337	11,347	11,356	11,374 (2,275) [546] {273}	11,392 (2,278) [547] {273}	11,409 (2,282) [548] {274}
St. Bernard Parish	3,799	3,815	3,825	3,828	3,841 (768) [184] {92}	3,854 (771) [185] {92}	3,866 (773) [186] {93}
St. Charles Parish	5,160	5,173	5,175	5,183	5,196 (1,039) [249] {125}	5,207 (1,041) [250] {125}	5,218 (1,044) [250] {125}
St. James Parish	1,863	1,862	1,869	1,869	1,872 (374) [90] {45}	1,876 (375) [90] {45}	1,879 (376) [90] {45}
St. John the Baptist Parish	3,557	3,562	3,567	3,571	3,577 (715) [172] {86}	3,583 (717) [172] {86}	3,588 (718) [172] {86}
St. Tammany Parish	24,454	24,501	24,555	24,587	24,669 (4,934) [1,184] {592}	24,744 (4,949) [1,188] {594}	24,815 (4,963) [1,191] {596}

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.