IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/28/21

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 7/28/21 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
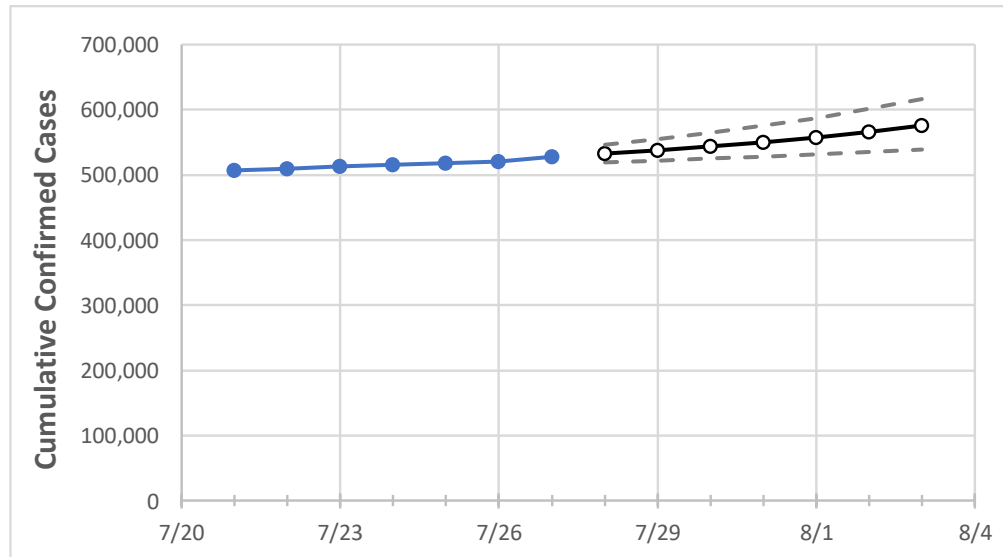
	Actual Confirmed Cases On:				Projected Cases For:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Louisiana	515,374	517,904	520,435	527,253	532,153	537,577	543,586	550,317	557,717	566,068	575,141

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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Ascension Parish	14,408	14,493	14,577	15,048	15,268	15,519	15,798	16,105	16,448	16,808	17,222
Bossier Parish	15,222	15,266	15,309	15,412	15,487	15,567	15,650	15,744	15,842	15,948	16,063
Caddo Parish	28,337	28,421	28,505	28,699	28,848	29,012	29,195	29,394	29,615	29,862	30,130
Calcasieu Parish	24,115	24,163	24,210	24,471	24,566	24,672	24,785	24,904	25,033	25,169	25,326
East Baton Rouge Parish	44,530	44,759	44,989	45,927	46,324	46,757	47,250	47,784	48,396	49,053	49,795
Jefferson Parish	50,389	50,695	51,000	51,515	52,030	52,606	53,256	53,999	54,832	55,782	56,861
Lafayette Parish	26,252	26,368	26,484	26,882	27,108	27,355	27,624	27,926	28,264	28,631	29,034
Lafourche Parish	11,403	11,470	11,537	11,776	11,925	12,086	12,262	12,457	12,669	12,897	13,157
Orleans Parish	33,368	33,598	33,827	34,116	34,460	34,839	35,257	35,719	36,230	36,795	37,421
Ouachita Parish	20,086	20,161	20,236	20,437	20,604	20,793	21,006	21,247	21,514	21,813	22,149
Rapides Parish	13,571	13,611	13,652	13,890	13,982	14,087	14,201	14,335	14,476	14,627	14,794
St. Bernard Parish	4,517	4,553	4,588	4,623	4,674	4,731	4,796	4,866	4,944	5,029	5,121
St. Charles Parish	6,188	6,234	6,280	6,359	6,424	6,494	6,570	6,653	6,742	6,839	6,941
St. James Parish	2,179	2,192	2,206	2,230	2,253	2,278	2,306	2,337	2,371	2,410	2,454
St. John the Baptist Parish	4,239	4,272	4,306	4,349	4,405	4,466	4,534	4,610	4,695	4,790	4,895
St. Tammany Parish	29,119	29,323	29,527	29,757	30,038	30,338	30,660	31,000	31,364	31,750	32,169

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:		
	7/24	7/25	7/26	7/27	7/29	7/31	8/2
Ascension Parish	14,408	14,493	14,577	15,048	15,519 (3,104) [745] {372}	16,105 (3,221) [773] {387}	16,808 (3,362) [807] {403}
Bossier Parish	15,222	15,266	15,309	15,412	15,567 (3,113) [747] {374}	15,744 (3,149) [756] {378}	15,948 (3,190) [766] {383}
Caddo Parish	28,337	28,421	28,505	28,699	29,012 (5,802) [1,393] {696}	29,394 (5,879) [1,411] {705}	29,862 (5,972) [1,433] {717}
Calcasieu Parish	24,115	24,163	24,210	24,471	24,672 (4,934) [1,184] {592}	24,904 (4,981) [1,195] {598}	25,169 (5,034) [1,208] {604}
East Baton Rouge Parish	44,530	44,759	44,989	45,927	46,757 (9,351) [2,244] {1,122}	47,784 (9,557) [2,294] {1,147}	49,053 (9,811) [2,355] {1,177}
Jefferson Parish	50,389	50,695	51,000	51,515	52,606 (10,521) [2,525] {1,263}	53,999 (10,800) [2,592] {1,296}	55,782 (11,156) [2,678] {1,339}
Lafayette Parish	26,252	26,368	26,484	26,882	27,355 (5,471) [1,313] {657}	27,926 (5,585) [1,340] {670}	28,631 (5,726) [1,374] {687}
Lafourche Parish	11,403	11,470	11,537	11,776	12,086 (2,417) [580] {290}	12,457 (2,491) [598] {299}	12,897 (2,579) [619] {310}
Orleans Parish	33,368	33,598	33,827	34,116	34,839 (6,968) [1,672] {836}	35,719 (7,144) [1,714] {857}	36,795 (7,359) [1,766] {883}
Ouachita Parish	20,086	20,161	20,236	20,437	20,793 (4,159) [998] {499}	21,247 (4,249) [1,020] {510}	21,813 (4,363) [1,047] {524}
Rapides Parish	13,571	13,611	13,652	13,890	14,087 (2,817) [676] {338}	14,335 (2,867) [688] {344}	14,627 (2,925) [702] {351}
St. Bernard Parish	4,517	4,553	4,588	4,623	4,731 (946) [227] {114}	4,866 (973) [234] {117}	5,029 (1,006) [241] {121}
St. Charles Parish	6,188	6,234	6,280	6,359	6,494 (1,299) [312] {156}	6,653 (1,331) [319] {160}	6,839 (1,368) [328] {164}
St. James Parish	2,179	2,192	2,206	2,230	2,278 (456) [109] {55}	2,337 (467) [112] {56}	2,410 (482) [116] {58}
St. John the Baptist Parish	4,239	4,272	4,306	4,349	4,466 (893) [214] {107}	4,610 (922) [221] {111}	4,790 (958) [230] {115}
St. Tammany Parish	29,119	29,323	29,527	29,757	30,338 (6,068) [1,456] {728}	31,000 (6,200) [1,488] {744}	31,750 (6,350) [1,524] {762}

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.