IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/7/21

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 5/7/21 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
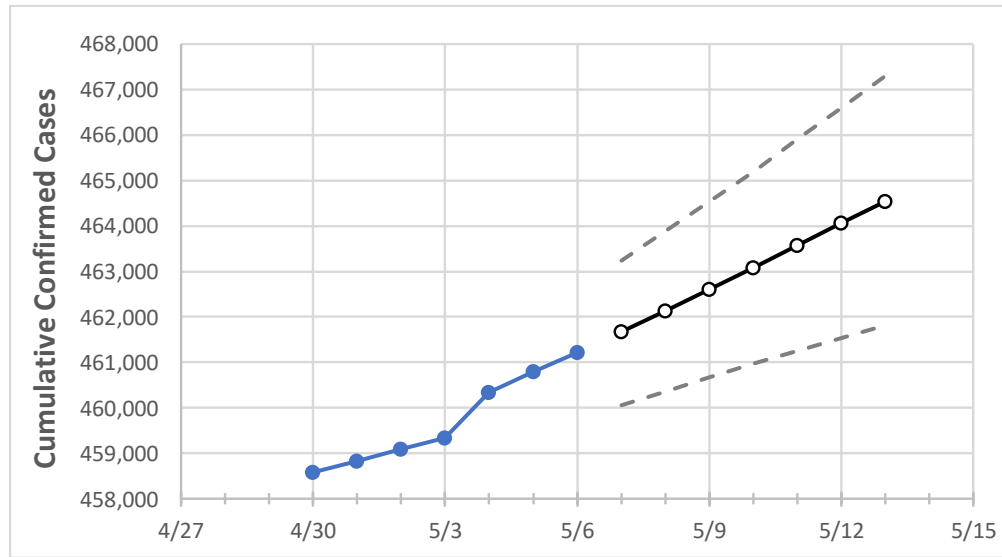
	Actual Confirmed Cases On:				Projected Cases For:						
	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13
Louisiana	459,340	460,337	460,803	461,210	461,673	462,133	462,608	463,086	463,569	464,061	464,543

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:						
	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13
Ascension Parish	12,097	12,138	12,137	12,167	12,190	12,212	12,235	12,259	12,282	12,306	12,330
Bossier Parish	13,785	13,794	13,817	13,836	13,853	13,869	13,886	13,904	13,920	13,937	13,955
Caddo Parish	25,871	25,936	25,977	26,000	26,029	26,057	26,088	26,119	26,149	26,181	26,214
Calcasieu Parish	22,372	22,422	22,449	22,466	22,487	22,506	22,525	22,544	22,563	22,581	22,599
East Baton Rouge Parish	39,168	39,324	39,380	39,408	39,462	39,518	39,570	39,621	39,676	39,734	39,791
Jefferson Parish	45,974	46,025	46,053	46,078	46,108	46,138	46,169	46,201	46,232	46,264	46,297
Lafayette Parish	23,278	23,393	23,405	23,429	23,454	23,479	23,504	23,528	23,553	23,578	23,602
Lafourche Parish	9,552	9,571	9,580	9,588	9,601	9,615	9,630	9,645	9,660	9,677	9,694
Orleans Parish	29,916	29,965	29,974	30,002	30,025	30,048	30,071	30,095	30,119	30,143	30,167
Ouachita Parish	18,313	18,359	18,381	18,395	18,414	18,435	18,455	18,477	18,498	18,521	18,543
Rapides Parish	11,999	12,035	12,045	12,062	12,078	12,094	12,110	12,127	12,143	12,161	12,179
St. Bernard Parish	4,009	4,013	4,017	4,016	4,019	4,023	4,026	4,029	4,033	4,037	4,040
St. Charles Parish	5,392	5,397	5,401	5,402	5,407	5,412	5,417	5,422	5,427	5,432	5,437
St. James Parish	1,952	1,954	1,958	1,962	1,966	1,969	1,973	1,977	1,981	1,985	1,989
St. John the Baptist Parish	3,705	3,715	3,716	3,716	3,720	3,725	3,729	3,733	3,737	3,742	3,747
St. Tammany Parish	25,594	25,619	25,653	25,667	25,686	25,705	25,724	25,744	25,763	25,783	25,802

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:		
	5/3	5/4	5/5	5/6	5/8	5/10	5/12
Ascension Parish	12,097	12,138	12,137	12,167	12,212 (2,442) [586] {293}	12,259 (2,452) [588] {294}	12,306 (2,461) [591] {295}
Bossier Parish	13,785	13,794	13,817	13,836	13,869 (2,774) [666] {333}	13,904 (2,781) [667] {334}	13,937 (2,787) [669] {334}
Caddo Parish	25,871	25,936	25,977	26,000	26,057 (5,211) [1,251] {625}	26,119 (5,224) [1,254] {627}	26,181 (5,236) [1,257] {628}
Calcasieu Parish	22,372	22,422	22,449	22,466	22,506 (4,501) [1,080] {540}	22,544 (4,509) [1,082] {541}	22,581 (4,516) [1,084] {542}
East Baton Rouge Parish	39,168	39,324	39,380	39,408	39,518 (7,904) [1,897] {948}	39,621 (7,924) [1,902] {951}	39,734 (7,947) [1,907] {954}
Jefferson Parish	45,974	46,025	46,053	46,078	46,138 (9,228) [2,215] {1,107}	46,201 (9,240) [2,218] {1,109}	46,264 (9,253) [2,221] {1,110}
Lafayette Parish	23,278	23,393	23,405	23,429	23,479 (4,696) [1,127] {563}	23,528 (4,706) [1,129] {565}	23,578 (4,716) [1,132] {566}
Lafourche Parish	9,552	9,571	9,580	9,588	9,615 (1,923) [462] {231}	9,645 (1,929) [463] {231}	9,677 (1,935) [464] {232}
Orleans Parish	29,916	29,965	29,974	30,002	30,048 (6,010) [1,442] {721}	30,095 (6,019) [1,445] {722}	30,143 (6,029) [1,447] {723}
Ouachita Parish	18,313	18,359	18,381	18,395	18,435 (3,687) [885] {442}	18,477 (3,695) [887] {443}	18,521 (3,704) [889] {444}
Rapides Parish	11,999	12,035	12,045	12,062	12,094 (2,419) [581] {290}	12,127 (2,425) [582] {291}	12,161 (2,432) [584] {292}
St. Bernard Parish	4,009	4,013	4,017	4,016	4,023 (805) [193] {97}	4,029 (806) [193] {97}	4,037 (807) [194] {97}
St. Charles Parish	5,392	5,397	5,401	5,402	5,412 (1,082) [260] {130}	5,422 (1,084) [260] {130}	5,432 (1,086) [261] {130}
St. James Parish	1,952	1,954	1,958	1,962	1,969 (394) [95] {47}	1,977 (395) [95] {47}	1,985 (397) [95] {48}
St. John the Baptist Parish	3,705	3,715	3,716	3,716	3,725 (745) [179] {89}	3,733 (747) [179] {90}	3,742 (748) [180] {90}
St. Tammany Parish	25,594	25,619	25,653	25,667	25,705 (5,141) [1,234] {617}	25,744 (5,149) [1,236] {618}	25,783 (5,157) [1,238] {619}

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.