IEM's AI Modeling: Short-term COVID-19 Projections

Date: 5/11/21

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 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 5/11/21 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.

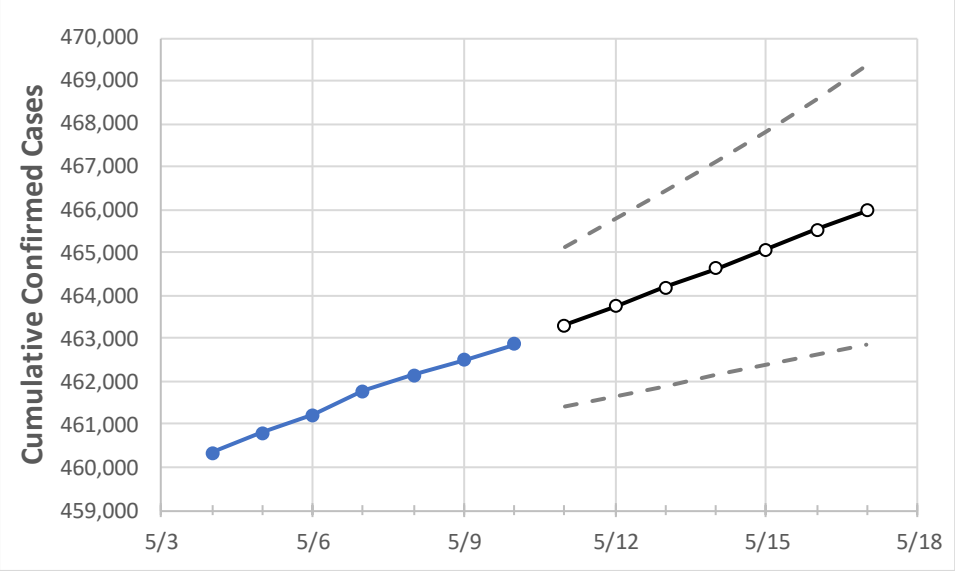
IEM's Modeling Lead

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:						
	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Louisiana	461,773	462,138	462,503	462,868	463,312	463,752	464,188	464,636	465,084	465,530	465,973

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:						
	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Ascension Parish	12,172	12,201	12,230	12,259	12,282	12,306	12,331	12,358	12,385	12,414	12,443
Bossier Parish	13,847	13,863	13,878	13,894	13,909	13,923	13,938	13,952	13,967	13,981	13,996
Caddo Parish	26,022	26,046	26,071	26,095	26,119	26,144	26,168	26,193	26,216	26,241	26,266
Calcasieu Parish	22,484	22,502	22,520	22,538	22,555	22,571	22,587	22,603	22,619	22,634	22,649
East Baton Rouge Parish	39,453	39,503	39,552	39,602	39,647	39,690	39,734	39,779	39,821	39,864	39,904
Jefferson Parish	46,124	46,149	46,175	46,200	46,231	46,261	46,293	46,324	46,354	46,387	46,419
Lafayette Parish	23,460	23,487	23,515	23,542	23,566	23,591	23,615	23,638	23,661	23,684	23,707
Lafourche Parish	9,594	9,601	9,607	9,614	9,625	9,636	9,648	9,659	9,671	9,683	9,696
Orleans Parish	30,025	30,049	30,074	30,098	30,122	30,146	30,171	30,196	30,222	30,249	30,276
Ouachita Parish	18,424	18,431	18,439	18,446	18,462	18,478	18,493	18,509	18,526	18,542	18,559
Rapides Parish	12,086	12,104	12,121	12,139	12,159	12,178	12,198	12,218	12,240	12,262	12,283
St. Bernard Parish	4,022	4,024	4,026	4,028	4,031	4,034	4,038	4,041	4,044	4,047	4,051
St. Charles Parish	5,405	5,411	5,418	5,424	5,429	5,435	5,440	5,446	5,452	5,458	5,464
St. James Parish	1,964	1,966	1,967	1,969	1,972	1,975	1,978	1,981	1,984	1,987	1,990
St. John the Baptist Parish	3,721	3,722	3,724	3,725	3,727	3,730	3,732	3,734	3,737	3,739	3,741
St. Tammany Parish	25,677	25,688	25,700	25,711	25,724	25,737	25,750	25,763	25,775	25,787	25,799

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:		
	5/7	5/8	5/9	5/10	5/12	5/14	5/16
Ascension Parish	12,172	12,201	12,230	12,259	12,306 (2,461) [591] {295}	12,358 (2,472) [593] {297}	12,414 (2,483) [596] {298}
Bossier Parish	13,847	13,863	13,878	13,894	13,923 (2,785) [668] {334}	13,952 (2,790) [670] {335}	13,981 (2,796) [671] {336}
Caddo Parish	26,022	26,046	26,071	26,095	26,144 (5,229) [1,255] {627}	26,193 (5,239) [1,257] {629}	26,241 (5,248) [1,260] {630}
Calcasieu Parish	22,484	22,502	22,520	22,538	22,571 (4,514) [1,083] {542}	22,603 (4,521) [1,085] {542}	22,634 (4,527) [1,086] {543}
East Baton Rouge Parish	39,453	39,503	39,552	39,602	39,690 (7,938) [1,905] {953}	39,779 (7,956) [1,909] {955}	39,864 (7,973) [1,913] {957}
Jefferson Parish	46,124	46,149	46,175	46,200	46,261 (9,252) [2,221] {1,110}	46,324 (9,265) [2,224] {1,112}	46,387 (9,277) [2,227] {1,113}
Lafayette Parish	23,460	23,487	23,515	23,542	23,591 (4,718) [1,132] {566}	23,638 (4,728) [1,135] {567}	23,684 (4,737) [1,137] {568}
Lafourche Parish	9,594	9,601	9,607	9,614	9,636 (1,927) [463] {231}	9,659 (1,932) [464] {232}	9,683 (1,937) [465] {232}
Orleans Parish	30,025	30,049	30,074	30,098	30,146 (6,029) [1,447] {724}	30,196 (6,039) [1,449] {725}	30,249 (6,050) [1,452] {726}
Ouachita Parish	18,424	18,431	18,439	18,446	18,478 (3,696) [887] {443}	18,509 (3,702) [888] {444}	18,542 (3,708) [890] {445}
Rapides Parish	12,086	12,104	12,121	12,139	12,178 (2,436) [585] {292}	12,218 (2,444) [586] {293}	12,262 (2,452) [589] {294}
St. Bernard Parish	4,022	4,024	4,026	4,028	4,034 (807) [194] {97}	4,041 (808) [194] {97}	4,047 (809) [194] {97}
St. Charles Parish	5,405	5,411	5,418	5,424	5,435 (1,087) [261] {130}	5,446 (1,089) [261] {131}	5,458 (1,092) [262] {131}
St. James Parish	1,964	1,966	1,967	1,969	1,975 (395) [95] {47}	1,981 (396) [95] {48}	1,987 (397) [95] {48}
St. John the Baptist Parish	3,721	3,722	3,724	3,725	3,730 (746) [179] {90}	3,734 (747) [179] {90}	3,739 (748) [179] {90}
St. Tammany Parish	25,677	25,688	25,700	25,711	25,737 (5,147) [1,235] {618}	25,763 (5,153) [1,237] {618}	25,787 (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.