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

Date: 5/13/21

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 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 5/13/21 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.

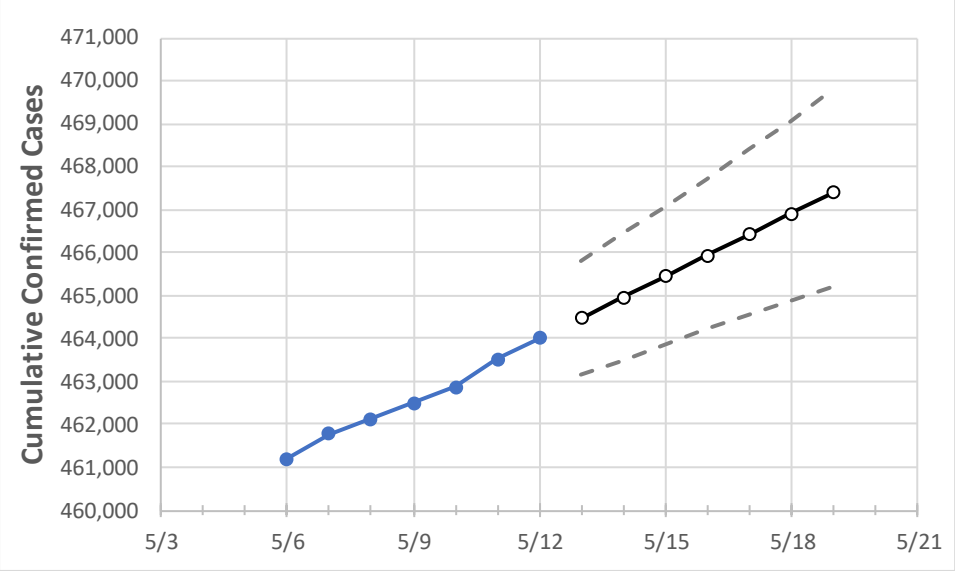
IEM's Modeling Lead

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:						
	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Louisiana	462,503	462,868	463,517	463,997	464,472	464,955	465,444	465,940	466,421	466,915	467,401

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:						
	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Ascension Parish	12,230	12,259	12,289	12,312	12,337	12,364	12,393	12,424	12,453	12,485	12,517
Bossier Parish	13,878	13,894	13,904	13,934	13,950	13,966	13,982	13,997	14,013	14,029	14,046
Caddo Parish	26,071	26,095	26,142	26,174	26,203	26,232	26,261	26,291	26,322	26,353	26,384
Calcasieu Parish	22,520	22,538	22,582	22,592	22,611	22,629	22,648	22,667	22,685	22,703	22,720
East Baton Rouge Parish	39,552	39,602	39,663	39,717	39,769	39,821	39,874	39,925	39,974	40,026	40,079
Jefferson Parish	46,175	46,200	46,232	46,268	46,300	46,333	46,366	46,398	46,431	46,463	46,496
Lafayette Parish	23,515	23,542	23,584	23,623	23,653	23,683	23,713	23,744	23,774	23,804	23,835
Lafourche Parish	9,607	9,614	9,646	9,648	9,661	9,675	9,688	9,703	9,717	9,732	9,748
Orleans Parish	30,074	30,098	30,146	30,173	30,200	30,228	30,258	30,288	30,318	30,349	30,380
Ouachita Parish	18,439	18,446	18,470	18,488	18,504	18,520	18,536	18,553	18,570	18,587	18,605
Rapides Parish	12,121	12,139	12,152	12,195	12,218	12,242	12,267	12,292	12,319	12,347	12,375
St. Bernard Parish	4,026	4,028	4,030	4,034	4,037	4,040	4,043	4,046	4,050	4,053	4,056
St. Charles Parish	5,418	5,424	5,425	5,426	5,430	5,434	5,438	5,443	5,447	5,451	5,455
St. James Parish	1,967	1,969	1,975	1,976	1,979	1,982	1,985	1,988	1,990	1,994	1,997
St. John the Baptist Parish	3,724	3,725	3,730	3,735	3,738	3,741	3,744	3,747	3,750	3,753	3,756
St. Tammany Parish	25,700	25,711	25,730	25,752	25,766	25,781	25,795	25,809	25,823	25,836	25,851

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:		
	5/9	5/10	5/11	5/12	5/14	5/16	5/18
Ascension Parish	12,230	12,259	12,289	12,312	12,364 (2,473) [593] {297}	12,424 (2,485) [596] {298}	12,485 (2,497) [599] {300}
Bossier Parish	13,878	13,894	13,904	13,934	13,966 (2,793) [670] {335}	13,997 (2,799) [672] {336}	14,029 (2,806) [673] {337}
Caddo Parish	26,071	26,095	26,142	26,174	26,232 (5,246) [1,259] {630}	26,291 (5,258) [1,262] {631}	26,353 (5,271) [1,265] {632}
Calcasieu Parish	22,520	22,538	22,582	22,592	22,629 (4,526) [1,086] {543}	22,667 (4,533) [1,088] {544}	22,703 (4,541) [1,090] {545}
East Baton Rouge Parish	39,552	39,602	39,663	39,717	39,821 (7,964) [1,911] {956}	39,925 (7,985) [1,916] {958}	40,026 (8,005) [1,921] {961}
Jefferson Parish	46,175	46,200	46,232	46,268	46,333 (9,267) [2,224] {1,112}	46,398 (9,280) [2,227] {1,114}	46,463 (9,293) [2,230] {1,115}
Lafayette Parish	23,515	23,542	23,584	23,623	23,683 (4,737) [1,137] {568}	23,744 (4,749) [1,140] {570}	23,804 (4,761) [1,143] {571}
Lafourche Parish	9,607	9,614	9,646	9,648	9,675 (1,935) [464] {232}	9,703 (1,941) [466] {233}	9,732 (1,946) [467] {234}
Orleans Parish	30,074	30,098	30,146	30,173	30,228 (6,046) [1,451] {725}	30,288 (6,058) [1,454] {727}	30,349 (6,070) [1,457] {728}
Ouachita Parish	18,439	18,446	18,470	18,488	18,520 (3,704) [889] {444}	18,553 (3,711) [891] {445}	18,587 (3,717) [892] {446}
Rapides Parish	12,121	12,139	12,152	12,195	12,242 (2,448) [588] {294}	12,292 (2,458) [590] {295}	12,347 (2,469) [593] {296}
St. Bernard Parish	4,026	4,028	4,030	4,034	4,040 (808) [194] {97}	4,046 (809) [194] {97}	4,053 (811) [195] {97}
St. Charles Parish	5,418	5,424	5,425	5,426	5,434 (1,087) [261] {130}	5,443 (1,089) [261] {131}	5,451 (1,090) [262] {131}
St. James Parish	1,967	1,969	1,975	1,976	1,982 (396) [95] {48}	1,988 (398) [95] {48}	1,994 (399) [96] {48}
St. John the Baptist Parish	3,724	3,725	3,730	3,735	3,741 (748) [180] {90}	3,747 (749) [180] {90}	3,753 (751) [180] {90}
St. Tammany Parish	25,700	25,711	25,730	25,752	25,781 (5,156) [1,237] {619}	25,809 (5,162) [1,239] {619}	25,836 (5,167) [1,240] {620}

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.