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

Date: 4/21/21

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 4/21/21 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.

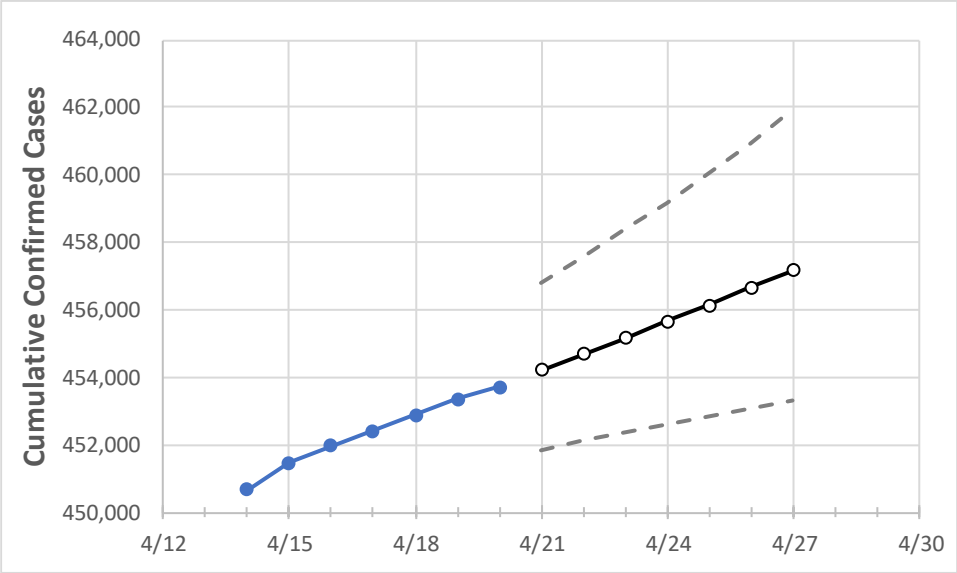
IEM's Modeling Lead

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:						
	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27
Louisiana	452,420	452,886	453,351	453,711	454,203	454,672	455,158	455,654	456,136	456,652	457,169

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:						
	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27
Ascension Parish	11,835	11,840	11,846	11,858	11,872	11,887	11,901	11,916	11,930	11,945	11,959
Bossier Parish	13,540	13,557	13,573	13,571	13,590	13,609	13,629	13,650	13,671	13,694	13,717
Caddo Parish	25,474	25,498	25,522	25,558	25,591	25,626	25,663	25,702	25,742	25,784	25,828
Calcasieu Parish	21,982	22,007	22,033	22,057	22,092	22,129	22,164	22,200	22,235	22,269	22,301
East Baton Rouge Parish	38,309	38,375	38,442	38,478	38,531	38,589	38,646	38,702	38,755	38,816	38,877
Jefferson Parish	45,512	45,530	45,549	45,556	45,582	45,608	45,634	45,659	45,685	45,710	45,736
Lafayette Parish	22,774	22,809	22,844	22,859	22,893	22,929	22,963	23,000	23,039	23,078	23,118
Lafourche Parish	9,439	9,443	9,446	9,454	9,458	9,463	9,467	9,472	9,476	9,481	9,485
Orleans Parish	29,600	29,617	29,633	29,652	29,669	29,685	29,702	29,719	29,736	29,753	29,769
Ouachita Parish	18,066	18,077	18,089	18,106	18,121	18,137	18,152	18,168	18,185	18,202	18,220
Rapides Parish	11,785	11,789	11,792	11,815	11,827	11,839	11,852	11,864	11,877	11,890	11,903
St. Bernard Parish	3,973	3,974	3,974	3,976	3,978	3,979	3,981	3,982	3,983	3,985	3,986
St. Charles Parish	5,334	5,336	5,337	5,347	5,350	5,354	5,358	5,361	5,365	5,368	5,372
St. James Parish	1,936	1,937	1,938	1,939	1,941	1,942	1,944	1,946	1,948	1,949	1,951
St. John the Baptist Parish	3,658	3,659	3,661	3,668	3,671	3,675	3,678	3,682	3,685	3,689	3,693
St. Tammany Parish	25,291	25,311	25,332	25,343	25,362	25,380	25,400	25,419	25,438	25,458	25,477

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:		
	4/17	4/18	4/19	4/20	4/22	4/24	4/26
Ascension Parish	11,835	11,840	11,846	11,858	11,887 (2,377) [571] {285}	11,916 (2,383) [572] {286}	11,945 (2,389) [573] {287}
Bossier Parish	13,540	13,557	13,573	13,571	13,609 (2,722) [653] {327}	13,650 (2,730) [655] {328}	13,694 (2,739) [657] {329}
Caddo Parish	25,474	25,498	25,522	25,558	25,626 (5,125) [1,230] {615}	25,702 (5,140) [1,234] {617}	25,784 (5,157) [1,238] {619}
Calcasieu Parish	21,982	22,007	22,033	22,057	22,129 (4,426) [1,062] {531}	22,200 (4,440) [1,066] {533}	22,269 (4,454) [1,069] {534}
East Baton Rouge Parish	38,309	38,375	38,442	38,478	38,589 (7,718) [1,852] {926}	38,702 (7,740) [1,858] {929}	38,816 (7,763) [1,863] {932}
Jefferson Parish	45,512	45,530	45,549	45,556	45,608 (9,122) [2,189] {1,095}	45,659 (9,132) [2,192] {1,096}	45,710 (9,142) [2,194] {1,097}
Lafayette Parish	22,774	22,809	22,844	22,859	22,929 (4,586) [1,101] {550}	23,000 (4,600) [1,104] {552}	23,078 (4,616) [1,108] {554}
Lafourche Parish	9,439	9,443	9,446	9,454	9,463 (1,893) [454] {227}	9,472 (1,894) [455] {227}	9,481 (1,896) [455] {228}
Orleans Parish	29,600	29,617	29,633	29,652	29,685 (5,937) [1,425] {712}	29,719 (5,944) [1,427] {713}	29,753 (5,951) [1,428] {714}
Ouachita Parish	18,066	18,077	18,089	18,106	18,137 (3,627) [871] {435}	18,168 (3,634) [872] {436}	18,202 (3,640) [874] {437}
Rapides Parish	11,785	11,789	11,792	11,815	11,839 (2,368) [568] {284}	11,864 (2,373) [569] {285}	11,890 (2,378) [571] {285}
St. Bernard Parish	3,973	3,974	3,974	3,976	3,979 (796) [191] {95}	3,982 (796) [191] {96}	3,985 (797) [191] {96}
St. Charles Parish	5,334	5,336	5,337	5,347	5,354 (1,071) [257] {128}	5,361 (1,072) [257] {129}	5,368 (1,074) [258] {129}
St. James Parish	1,936	1,937	1,938	1,939	1,942 (388) [93] {47}	1,946 (389) [93] {47}	1,949 (390) [94] {47}
St. John the Baptist Parish	3,658	3,659	3,661	3,668	3,675 (735) [176] {88}	3,682 (736) [177] {88}	3,689 (738) [177] {89}
St. Tammany Parish	25,291	25,311	25,332	25,343	25,380 (5,076) [1,218] {609}	25,419 (5,084) [1,220] {610}	25,458 (5,092) [1,222] {611}

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.