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

Date: 6/10/21

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 6/10/21 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.

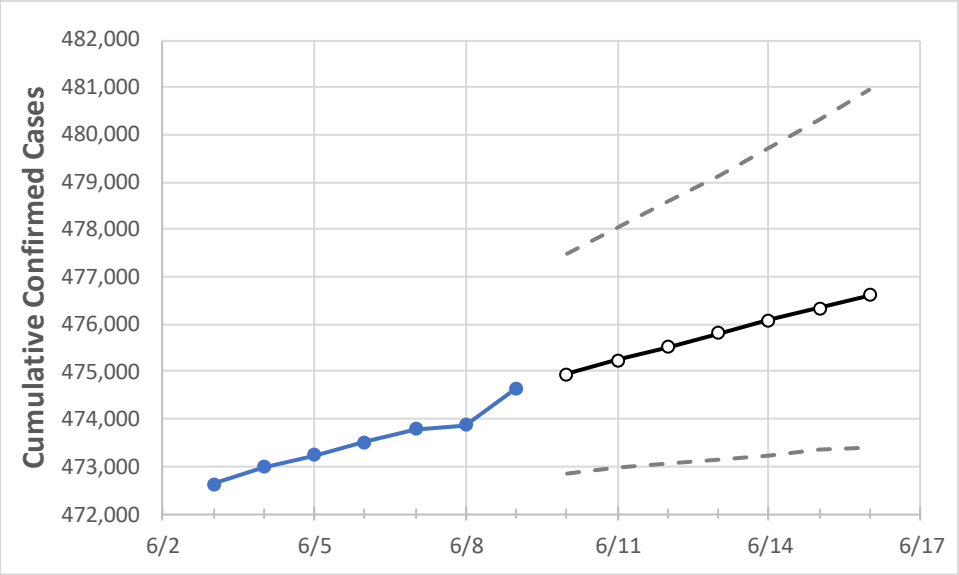
IEM's Modeling Lead

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:						
	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16
Louisiana	473,512	473,777	473,879	474,653	474,943	475,238	475,527	475,806	476,085	476,350	476,617

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:						
	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16
Ascension Parish	12,659	12,664	12,682	12,696	12,704	12,713	12,722	12,730	12,738	12,745	12,753
Bossier Parish	14,262	14,267	14,268	14,276	14,285	14,294	14,303	14,312	14,321	14,329	14,337
Caddo Parish	26,797	26,818	26,848	26,887	26,911	26,936	26,962	26,987	27,012	27,037	27,063
Calcasieu Parish	22,856	22,859	22,899	22,925	22,936	22,947	22,957	22,969	22,980	22,991	23,002
East Baton Rouge Parish	40,460	40,473	40,433	40,559	40,587	40,618	40,647	40,677	40,706	40,734	40,763
Jefferson Parish	46,999	47,023	47,063	47,108	47,140	47,173	47,205	47,239	47,273	47,308	47,344
Lafayette Parish	24,149	24,165	24,142	24,234	24,258	24,280	24,302	24,323	24,346	24,369	24,392
Lafourche Parish	9,901	9,907	9,918	9,916	9,926	9,936	9,946	9,957	9,967	9,977	9,987
Orleans Parish	30,735	30,757	30,698	30,807	30,828	30,849	30,870	30,892	30,915	30,936	30,958
Ouachita Parish	18,832	18,838	18,830	18,857	18,864	18,872	18,879	18,886	18,893	18,900	18,907
Rapides Parish	12,574	12,583	12,584	12,590	12,597	12,603	12,609	12,615	12,621	12,627	12,633
St. Bernard Parish	4,091	4,093	4,092	4,096	4,098	4,101	4,103	4,106	4,108	4,111	4,113
St. Charles Parish	5,553	5,555	5,561	5,570	5,575	5,581	5,586	5,591	5,596	5,602	5,607
St. James Parish	2,013	2,014	2,013	2,012	2,014	2,016	2,017	2,019	2,021	2,023	2,025
St. John the Baptist Parish	3,802	3,804	3,806	3,814	3,818	3,821	3,825	3,829	3,832	3,836	3,840
St. Tammany Parish	26,061	26,067	26,090	26,115	26,130	26,147	26,163	26,180	26,196	26,214	26,232

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:		
	6/6	6/7	6/8	6/9	6/11	6/13	6/15
Ascension Parish	12,659	12,664	12,682	12,696	12,713 (2,543) [610] {305}	12,730 (2,546) [611] {306}	12,745 (2,549) [612] {306}
Bossier Parish	14,262	14,267	14,268	14,276	14,294 (2,859) [686] {343}	14,312 (2,862) [687] {343}	14,329 (2,866) [688] {344}
Caddo Parish	26,797	26,818	26,848	26,887	26,936 (5,387) [1,293] {646}	26,987 (5,397) [1,295] {648}	27,037 (5,407) [1,298] {649}
Calcasieu Parish	22,856	22,859	22,899	22,925	22,947 (4,589) [1,101] {551}	22,969 (4,594) [1,102] {551}	22,991 (4,598) [1,104] {552}
East Baton Rouge Parish	40,460	40,473	40,433	40,559	40,618 (8,124) [1,950] {975}	40,677 (8,135) [1,953] {976}	40,734 (8,147) [1,955] {978}
Jefferson Parish	46,999	47,023	47,063	47,108	47,173 (9,435) [2,264] {1,132}	47,239 (9,448) [2,267] {1,134}	47,308 (9,462) [2,271] {1,135}
Lafayette Parish	24,149	24,165	24,142	24,234	24,280 (4,856) [1,165] {583}	24,323 (4,865) [1,168] {584}	24,369 (4,874) [1,170] {585}
Lafourche Parish	9,901	9,907	9,918	9,916	9,936 (1,987) [477] {238}	9,957 (1,991) [478] {239}	9,977 (1,995) [479] {239}
Orleans Parish	30,735	30,757	30,698	30,807	30,849 (6,170) [1,481] {740}	30,892 (6,178) [1,483] {741}	30,936 (6,187) [1,485] {742}
Ouachita Parish	18,832	18,838	18,830	18,857	18,872 (3,774) [906] {453}	18,886 (3,777) [907] {453}	18,900 (3,780) [907] {454}
Rapides Parish	12,574	12,583	12,584	12,590	12,603 (2,521) [605] {302}	12,615 (2,523) [606] {303}	12,627 (2,525) [606] {303}
St. Bernard Parish	4,091	4,093	4,092	4,096	4,101 (820) [197] {98}	4,106 (821) [197] {99}	4,111 (822) [197] {99}
St. Charles Parish	5,553	5,555	5,561	5,570	5,581 (1,116) [268] {134}	5,591 (1,118) [268] {134}	5,602 (1,120) [269] {134}
St. James Parish	2,013	2,014	2,013	2,012	2,016 (403) [97] {48}	2,019 (404) [97] {48}	2,023 (405) [97] {49}
St. John the Baptist Parish	3,802	3,804	3,806	3,814	3,821 (764) [183] {92}	3,829 (766) [184] {92}	3,836 (767) [184] {92}
St. Tammany Parish	26,061	26,067	26,090	26,115	26,147 (5,229) [1,255] {628}	26,180 (5,236) [1,257] {628}	26,214 (5,243) [1,258] {629}

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.