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

Date: 6/9/21

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 6/9/21 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.

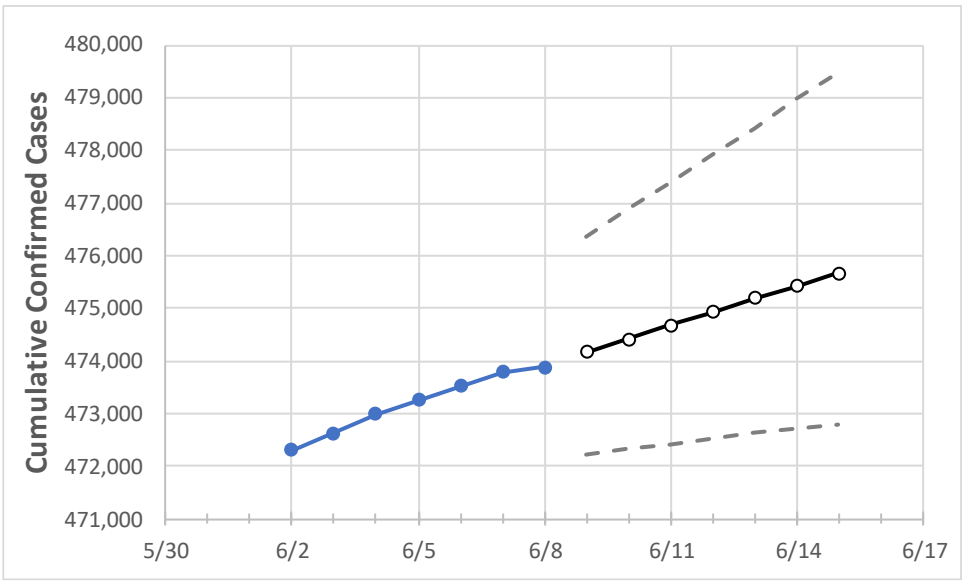
IEM's Modeling Lead

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:						
	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15
Louisiana	473,246	473,512	473,777	473,879	474,156	474,420	474,679	474,928	475,182	475,426	475,665

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:						
	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15
Ascension Parish	12,655	12,659	12,664	12,682	12,691	12,699	12,707	12,715	12,723	12,731	12,738
Bossier Parish	14,258	14,262	14,267	14,268	14,278	14,289	14,299	14,309	14,320	14,329	14,339
Caddo Parish	26,777	26,797	26,818	26,848	26,871	26,894	26,916	26,939	26,962	26,984	27,006
Calcasieu Parish	22,852	22,856	22,859	22,899	22,907	22,914	22,921	22,928	22,935	22,942	22,948
East Baton Rouge Parish	40,447	40,460	40,473	40,433	40,450	40,466	40,484	40,499	40,514	40,530	40,545
Jefferson Parish	46,975	46,999	47,023	47,063	47,092	47,120	47,151	47,179	47,209	47,239	47,269
Lafayette Parish	24,132	24,149	24,165	24,142	24,156	24,168	24,181	24,193	24,204	24,215	24,227
Lafourche Parish	9,894	9,901	9,907	9,918	9,928	9,937	9,946	9,955	9,965	9,975	9,985
Orleans Parish	30,713	30,735	30,757	30,698	30,718	30,737	30,756	30,775	30,795	30,813	30,833
Ouachita Parish	18,827	18,832	18,838	18,830	18,836	18,841	18,847	18,852	18,857	18,862	18,866
Rapides Parish	12,566	12,574	12,583	12,584	12,592	12,599	12,606	12,614	12,620	12,627	12,634
St. Bernard Parish	4,089	4,091	4,093	4,092	4,094	4,097	4,099	4,101	4,104	4,106	4,108
St. Charles Parish	5,552	5,553	5,555	5,561	5,565	5,570	5,575	5,579	5,583	5,588	5,593
St. James Parish	2,011	2,013	2,014	2,013	2,014	2,016	2,017	2,019	2,020	2,022	2,023
St. John the Baptist Parish	3,801	3,802	3,804	3,806	3,809	3,811	3,814	3,817	3,819	3,822	3,824
St. Tammany Parish	26,055	26,061	26,067	26,090	26,103	26,116	26,130	26,144	26,157	26,172	26,185

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:		
	6/5	6/6	6/7	6/8	6/10	6/12	6/14
Ascension Parish	12,655	12,659	12,664	12,682	12,699 (2,540) [610] {305}	12,715 (2,543) [610] {305}	12,731 (2,546) [611] {306}
Bossier Parish	14,258	14,262	14,267	14,268	14,289 (2,858) [686] {343}	14,309 (2,862) [687] {343}	14,329 (2,866) [688] {344}
Caddo Parish	26,777	26,797	26,818	26,848	26,894 (5,379) [1,291] {645}	26,939 (5,388) [1,293] {647}	26,984 (5,397) [1,295] {648}
Calcasieu Parish	22,852	22,856	22,859	22,899	22,914 (4,583) [1,100] {550}	22,928 (4,586) [1,101] {550}	22,942 (4,588) [1,101] {551}
East Baton Rouge Parish	40,447	40,460	40,473	40,433	40,466 (8,093) [1,942] {971}	40,499 (8,100) [1,944] {972}	40,530 (8,106) [1,945] {973}
Jefferson Parish	46,975	46,999	47,023	47,063	47,120 (9,424) [2,262] {1,131}	47,179 (9,436) [2,265] {1,132}	47,239 (9,448) [2,267] {1,134}
Lafayette Parish	24,132	24,149	24,165	24,142	24,168 (4,834) [1,160] {580}	24,193 (4,839) [1,161] {581}	24,215 (4,843) [1,162] {581}
Lafourche Parish	9,894	9,901	9,907	9,918	9,937 (1,987) [477] {238}	9,955 (1,991) [478] {239}	9,975 (1,995) [479] {239}
Orleans Parish	30,713	30,735	30,757	30,698	30,737 (6,147) [1,475] {738}	30,775 (6,155) [1,477] {739}	30,813 (6,163) [1,479] {740}
Ouachita Parish	18,827	18,832	18,838	18,830	18,841 (3,768) [904] {452}	18,852 (3,770) [905] {452}	18,862 (3,772) [905] {453}
Rapides Parish	12,566	12,574	12,583	12,584	12,599 (2,520) [605] {302}	12,614 (2,523) [605] {303}	12,627 (2,525) [606] {303}
St. Bernard Parish	4,089	4,091	4,093	4,092	4,097 (819) [197] {98}	4,101 (820) [197] {98}	4,106 (821) [197] {99}
St. Charles Parish	5,552	5,553	5,555	5,561	5,570 (1,114) [267] {134}	5,579 (1,116) [268] {134}	5,588 (1,118) [268] {134}
St. James Parish	2,011	2,013	2,014	2,013	2,016 (403) [97] {48}	2,019 (404) [97] {48}	2,022 (404) [97] {49}
St. John the Baptist Parish	3,801	3,802	3,804	3,806	3,811 (762) [183] {91}	3,817 (763) [183] {92}	3,822 (764) [183] {92}
St. Tammany Parish	26,055	26,061	26,067	26,090	26,116 (5,223) [1,254] {627}	26,144 (5,229) [1,255] {627}	26,172 (5,234) [1,256] {628}

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.