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

Date: 6/4/21

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 6/4/21 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.

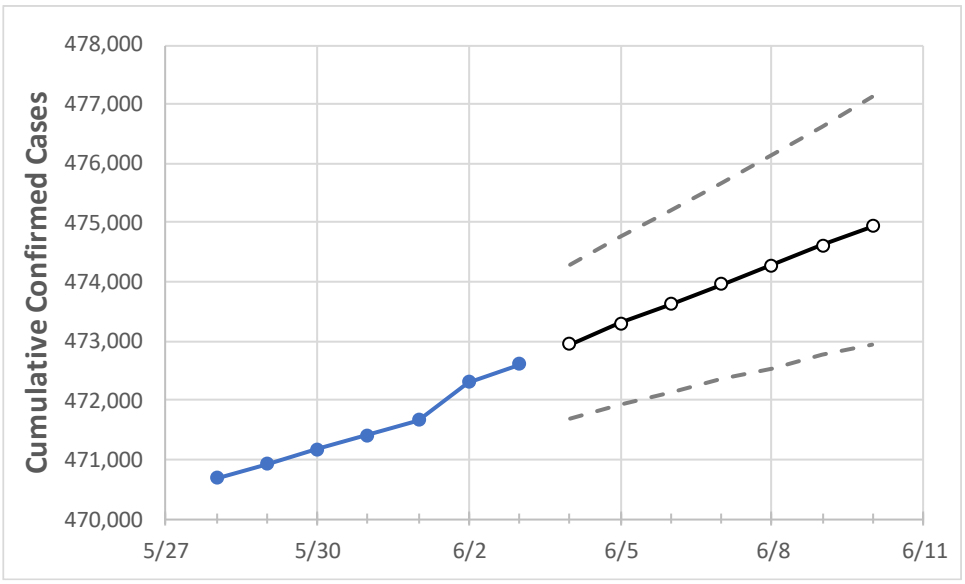
IEM's Modeling Lead

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:						
	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10
Louisiana	471,419	471,663	472,304	472,617	472,956	473,294	473,627	473,955	474,282	474,616	474,933

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:						
	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10
Ascension Parish	12,593	12,600	12,621	12,631	12,643	12,654	12,666	12,678	12,690	12,702	12,713
Bossier Parish	14,188	14,209	14,218	14,241	14,257	14,274	14,290	14,307	14,324	14,341	14,358
Caddo Parish	26,686	26,708	26,744	26,733	26,756	26,781	26,806	26,829	26,853	26,877	26,899
Calcasieu Parish	22,835	22,837	22,851	22,836	22,845	22,853	22,862	22,870	22,878	22,885	22,892
East Baton Rouge Parish	40,350	40,358	40,416	40,403	40,429	40,455	40,478	40,505	40,528	40,552	40,574
Jefferson Parish	46,813	46,830	46,894	46,926	46,951	46,977	47,003	47,028	47,052	47,079	47,105
Lafayette Parish	24,058	24,069	24,091	24,097	24,114	24,131	24,148	24,164	24,180	24,196	24,212
Lafourche Parish	9,831	9,839	9,864	9,874	9,885	9,897	9,910	9,921	9,933	9,945	9,958
Orleans Parish	30,612	30,630	30,651	30,675	30,693	30,711	30,729	30,747	30,764	30,782	30,801
Ouachita Parish	18,791	18,797	18,806	18,807	18,817	18,827	18,836	18,845	18,854	18,863	18,871
Rapides Parish	12,508	12,509	12,530	12,544	12,558	12,570	12,583	12,595	12,608	12,620	12,633
St. Bernard Parish	4,072	4,073	4,078	4,084	4,086	4,089	4,091	4,094	4,096	4,099	4,101
St. Charles Parish	5,534	5,537	5,552	5,544	5,551	5,558	5,565	5,572	5,579	5,587	5,594
St. James Parish	2,004	2,004	2,010	2,008	2,010	2,011	2,013	2,015	2,016	2,018	2,020
St. John the Baptist Parish	3,797	3,800	3,796	3,793	3,797	3,801	3,804	3,808	3,812	3,817	3,821
St. Tammany Parish	25,958	25,960	26,023	26,036	26,049	26,062	26,075	26,088	26,101	26,114	26,127

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:		
	5/31	6/1	6/2	6/3	6/5	6/7	6/9
Ascension Parish	12,593	12,600	12,621	12,631	12,654 (2,531) [607] {304}	12,678 (2,536) [609] {304}	12,702 (2,540) [610] {305}
Bossier Parish	14,188	14,209	14,218	14,241	14,274 (2,855) [685] {343}	14,307 (2,861) [687] {343}	14,341 (2,868) [688] {344}
Caddo Parish	26,686	26,708	26,744	26,733	26,781 (5,356) [1,286] {643}	26,829 (5,366) [1,288] {644}	26,877 (5,375) [1,290] {645}
Calcasieu Parish	22,835	22,837	22,851	22,836	22,853 (4,571) [1,097] {548}	22,870 (4,574) [1,098] {549}	22,885 (4,577) [1,098] {549}
East Baton Rouge Parish	40,350	40,358	40,416	40,403	40,455 (8,091) [1,942] {971}	40,505 (8,101) [1,944] {972}	40,552 (8,110) [1,946] {973}
Jefferson Parish	46,813	46,830	46,894	46,926	46,977 (9,395) [2,255] {1,127}	47,028 (9,406) [2,257] {1,129}	47,079 (9,416) [2,260] {1,130}
Lafayette Parish	24,058	24,069	24,091	24,097	24,131 (4,826) [1,158] {579}	24,164 (4,833) [1,160] {580}	24,196 (4,839) [1,161] {581}
Lafourche Parish	9,831	9,839	9,864	9,874	9,897 (1,979) [475] {238}	9,921 (1,984) [476] {238}	9,945 (1,989) [477] {239}
Orleans Parish	30,612	30,630	30,651	30,675	30,711 (6,142) [1,474] {737}	30,747 (6,149) [1,476] {738}	30,782 (6,156) [1,478] {739}
Ouachita Parish	18,791	18,797	18,806	18,807	18,827 (3,765) [904] {452}	18,845 (3,769) [905] {452}	18,863 (3,773) [905] {453}
Rapides Parish	12,508	12,509	12,530	12,544	12,570 (2,514) [603] {302}	12,595 (2,519) [605] {302}	12,620 (2,524) [606] {303}
St. Bernard Parish	4,072	4,073	4,078	4,084	4,089 (818) [196] {98}	4,094 (819) [197] {98}	4,099 (820) [197] {98}
St. Charles Parish	5,534	5,537	5,552	5,544	5,558 (1,112) [267] {133}	5,572 (1,114) [267] {134}	5,587 (1,117) [268] {134}
St. James Parish	2,004	2,004	2,010	2,008	2,011 (402) [97] {48}	2,015 (403) [97] {48}	2,018 (404) [97] {48}
St. John the Baptist Parish	3,797	3,800	3,796	3,793	3,801 (760) [182] {91}	3,808 (762) [183] {91}	3,817 (763) [183] {92}
St. Tammany Parish	25,958	25,960	26,023	26,036	26,062 (5,212) [1,251] {625}	26,088 (5,218) [1,252] {626}	26,114 (5,223) [1,253] {627}

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.