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

Date: 7/14/21

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 7/14/21 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.

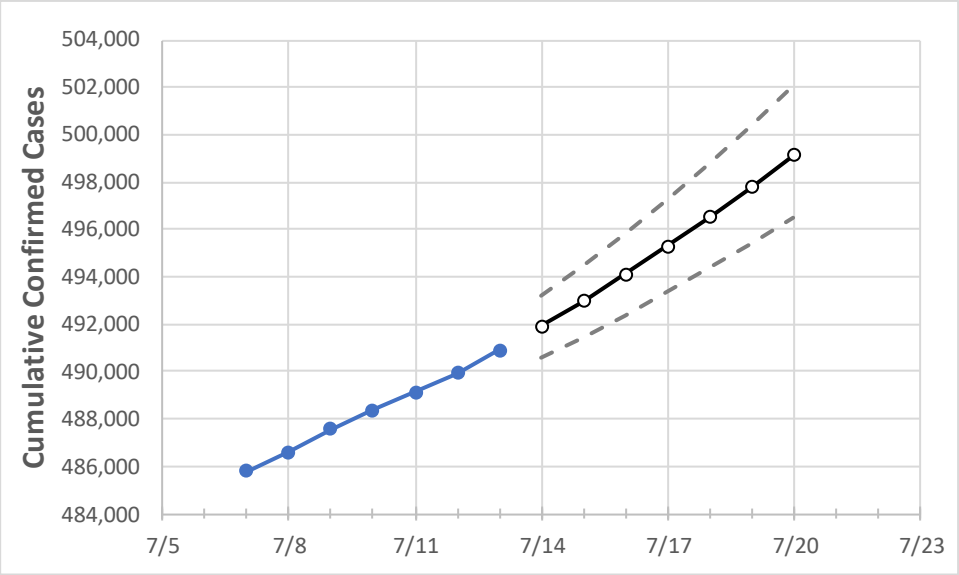
IEM's Modeling Lead

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Louisiana	488,356	489,153	489,951	490,904	491,912	492,985	494,099	495,281	496,508	497,786	499,142

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Ascension Parish	13,190	13,227	13,264	13,293	13,335	13,380	13,426	13,475	13,526	13,582	13,640
Bossier Parish	14,630	14,651	14,671	14,728	14,756	14,786	14,818	14,850	14,886	14,923	14,964
Caddo Parish	27,446	27,469	27,491	27,536	27,564	27,594	27,624	27,656	27,689	27,724	27,760
Calcasieu Parish	23,443	23,459	23,476	23,497	23,517	23,536	23,557	23,578	23,598	23,620	23,641
East Baton Rouge Parish	41,832	41,922	42,012	42,091	42,191	42,296	42,408	42,524	42,647	42,778	42,916
Jefferson Parish	48,044	48,093	48,142	48,212	48,276	48,343	48,414	48,488	48,566	48,646	48,731
Lafayette Parish	24,935	24,984	25,032	25,074	25,128	25,184	25,243	25,304	25,370	25,438	25,509
Lafourche Parish	10,421	10,447	10,472	10,554	10,593	10,634	10,677	10,725	10,775	10,826	10,881
Orleans Parish	31,422	31,472	31,521	31,597	31,657	31,722	31,791	31,865	31,944	32,028	32,119
Ouachita Parish	19,272	19,293	19,314	19,331	19,352	19,373	19,396	19,419	19,442	19,466	19,491
Rapides Parish	12,912	12,930	12,947	12,972	12,997	13,023	13,050	13,079	13,110	13,143	13,178
St. Bernard Parish	4,205	4,211	4,217	4,225	4,234	4,243	4,252	4,262	4,273	4,284	4,296
St. Charles Parish	5,776	5,795	5,813	5,829	5,851	5,876	5,902	5,930	5,961	5,993	6,029
St. James Parish	2,066	2,067	2,067	2,070	2,072	2,074	2,076	2,079	2,081	2,083	2,086
St. John the Baptist Parish	3,937	3,943	3,949	3,954	3,960	3,966	3,972	3,978	3,985	3,991	3,998
St. Tammany Parish	27,009	27,065	27,122	27,195	27,279	27,370	27,469	27,572	27,683	27,800	27,926

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:		
	7/10	7/11	7/12	7/13	7/15	7/17	7/19
Ascension Parish	13,190	13,227	13,264	13,293	13,380 (2,676) [642] {321}	13,475 (2,695) [647] {323}	13,582 (2,716) [652] {326}
Bossier Parish	14,630	14,651	14,671	14,728	14,786 (2,957) [710] {355}	14,850 (2,970) [713] {356}	14,923 (2,985) [716] {358}
Caddo Parish	27,446	27,469	27,491	27,536	27,594 (5,519) [1,325] {662}	27,656 (5,531) [1,327] {664}	27,724 (5,545) [1,331] {665}
Calcasieu Parish	23,443	23,459	23,476	23,497	23,536 (4,707) [1,130] {565}	23,578 (4,716) [1,132] {566}	23,620 (4,724) [1,134] {567}
East Baton Rouge Parish	41,832	41,922	42,012	42,091	42,296 (8,459) [2,030] {1,015}	42,524 (8,505) [2,041] {1,021}	42,778 (8,556) [2,053] {1,027}
Jefferson Parish	48,044	48,093	48,142	48,212	48,343 (9,669) [2,320] {1,160}	48,488 (9,698) [2,327] {1,164}	48,646 (9,729) [2,335] {1,168}
Lafayette Parish	24,935	24,984	25,032	25,074	25,184 (5,037) [1,209] {604}	25,304 (5,061) [1,215] {607}	25,438 (5,088) [1,221] {611}
Lafourche Parish	10,421	10,447	10,472	10,554	10,634 (2,127) [510] {255}	10,725 (2,145) [515] {257}	10,826 (2,165) [520] {260}
Orleans Parish	31,422	31,472	31,521	31,597	31,722 (6,344) [1,523] {761}	31,865 (6,373) [1,530] {765}	32,028 (6,406) [1,537] {769}
Ouachita Parish	19,272	19,293	19,314	19,331	19,373 (3,875) [930] {465}	19,419 (3,884) [932] {466}	19,466 (3,893) [934] {467}
Rapides Parish	12,912	12,930	12,947	12,972	13,023 (2,605) [625] {313}	13,079 (2,616) [628] {314}	13,143 (2,629) [631] {315}
St. Bernard Parish	4,205	4,211	4,217	4,225	4,243 (849) [204] {102}	4,262 (852) [205] {102}	4,284 (857) [206] {103}
St. Charles Parish	5,776	5,795	5,813	5,829	5,876 (1,175) [282] {141}	5,930 (1,186) [285] {142}	5,993 (1,199) [288] {144}
St. James Parish	2,066	2,067	2,067	2,070	2,074 (415) [100] {50}	2,079 (416) [100] {50}	2,083 (417) [100] {50}
St. John the Baptist Parish	3,937	3,943	3,949	3,954	3,966 (793) [190] {95}	3,978 (796) [191] {95}	3,991 (798) [192] {96}
St. Tammany Parish	27,009	27,065	27,122	27,195	27,370 (5,474) [1,314] {657}	27,572 (5,514) [1,323] {662}	27,800 (5,560) [1,334] {667}

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.