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

Date: 6/15/21

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 6/15/21 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.

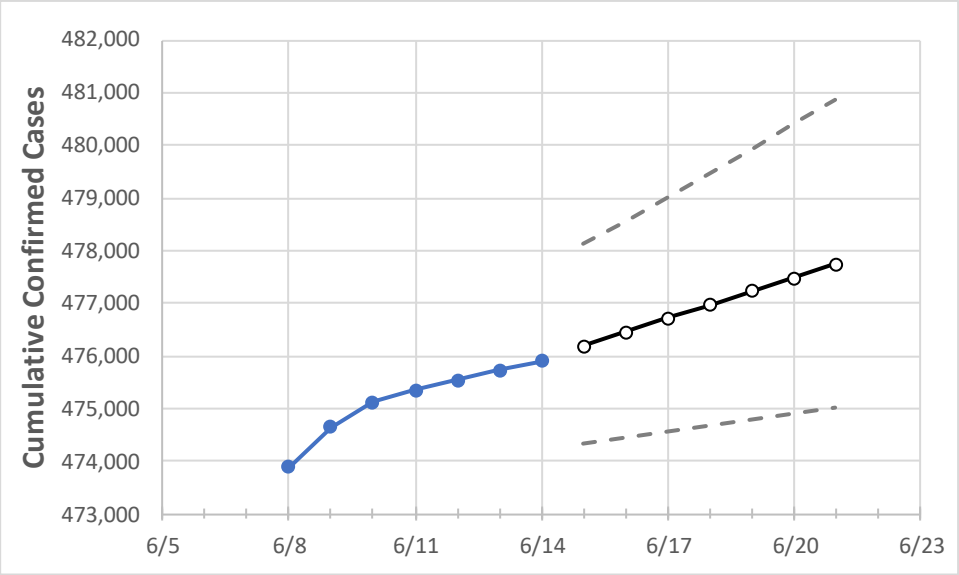
IEM's Modeling Lead

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:						
	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21
Louisiana	475,354	475,539	475,723	475,908	476,176	476,444	476,710	476,964	477,225	477,482	477,740

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:						
	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21
Ascension Parish	12,712	12,720	12,727	12,735	12,743	12,751	12,759	12,767	12,775	12,782	12,790
Bossier Parish	14,301	14,306	14,311	14,316	14,323	14,330	14,337	14,343	14,350	14,356	14,362
Caddo Parish	26,944	26,953	26,963	26,972	26,992	27,012	27,032	27,052	27,071	27,091	27,109
Calcasieu Parish	22,965	22,974	22,982	22,991	23,003	23,014	23,027	23,039	23,051	23,064	23,076
East Baton Rouge Parish	40,591	40,606	40,620	40,635	40,650	40,665	40,681	40,695	40,709	40,723	40,736
Jefferson Parish	47,175	47,187	47,200	47,212	47,238	47,264	47,290	47,315	47,341	47,366	47,391
Lafayette Parish	24,265	24,277	24,289	24,301	24,313	24,325	24,337	24,349	24,360	24,371	24,383
Lafourche Parish	9,936	9,944	9,951	9,959	9,968	9,978	9,987	9,996	10,005	10,014	10,023
Orleans Parish	30,830	30,840	30,851	30,861	30,875	30,888	30,901	30,914	30,926	30,938	30,950
Ouachita Parish	18,875	18,880	18,884	18,889	18,896	18,903	18,909	18,915	18,921	18,926	18,932
Rapides Parish	12,603	12,609	12,616	12,622	12,628	12,634	12,640	12,646	12,651	12,656	12,661
St. Bernard Parish	4,106	4,107	4,108	4,109	4,112	4,114	4,117	4,120	4,123	4,126	4,128
St. Charles Parish	5,576	5,579	5,583	5,586	5,590	5,594	5,599	5,603	5,607	5,611	5,615
St. James Parish	2,016	2,016	2,017	2,017	2,018	2,020	2,021	2,022	2,024	2,025	2,026
St. John the Baptist Parish	3,821	3,824	3,828	3,831	3,834	3,838	3,841	3,844	3,848	3,851	3,854
St. Tammany Parish	26,143	26,152	26,160	26,169	26,183	26,198	26,212	26,227	26,242	26,257	26,272

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:		
	6/11	6/12	6/13	6/14	6/16	6/18	6/20
Ascension Parish	12,712	12,720	12,727	12,735	12,751 (2,550) [612] {306}	12,767 (2,553) [613] {306}	12,782 (2,556) [614] {307}
Bossier Parish	14,301	14,306	14,311	14,316	14,330 (2,866) [688] {344}	14,343 (2,869) [688] {344}	14,356 (2,871) [689] {345}
Caddo Parish	26,944	26,953	26,963	26,972	27,012 (5,402) [1,297] {648}	27,052 (5,410) [1,299] {649}	27,091 (5,418) [1,300] {650}
Calcasieu Parish	22,965	22,974	22,982	22,991	23,014 (4,603) [1,105] {552}	23,039 (4,608) [1,106] {553}	23,064 (4,613) [1,107] {554}
East Baton Rouge Parish	40,591	40,606	40,620	40,635	40,665 (8,133) [1,952] {976}	40,695 (8,139) [1,953] {977}	40,723 (8,145) [1,955] {977}
Jefferson Parish	47,175	47,187	47,200	47,212	47,264 (9,453) [2,269] {1,134}	47,315 (9,463) [2,271] {1,136}	47,366 (9,473) [2,274] {1,137}
Lafayette Parish	24,265	24,277	24,289	24,301	24,325 (4,865) [1,168] {584}	24,349 (4,870) [1,169] {584}	24,371 (4,874) [1,170] {585}
Lafourche Parish	9,936	9,944	9,951	9,959	9,978 (1,996) [479] {239}	9,996 (1,999) [480] {240}	10,014 (2,003) [481] {240}
Orleans Parish	30,830	30,840	30,851	30,861	30,888 (6,178) [1,483] {741}	30,914 (6,183) [1,484] {742}	30,938 (6,188) [1,485] {743}
Ouachita Parish	18,875	18,880	18,884	18,889	18,903 (3,781) [907] {454}	18,915 (3,783) [908] {454}	18,926 (3,785) [908] {454}
Rapides Parish	12,603	12,609	12,616	12,622	12,634 (2,527) [606] {303}	12,646 (2,529) [607] {303}	12,656 (2,531) [607] {304}
St. Bernard Parish	4,106	4,107	4,108	4,109	4,114 (823) [197] {99}	4,120 (824) [198] {99}	4,126 (825) [198] {99}
St. Charles Parish	5,576	5,579	5,583	5,586	5,594 (1,119) [269] {134}	5,603 (1,121) [269] {134}	5,611 (1,122) [269] {135}
St. James Parish	2,016	2,016	2,017	2,017	2,020 (404) [97] {48}	2,022 (404) [97] {49}	2,025 (405) [97] {49}
St. John the Baptist Parish	3,821	3,824	3,828	3,831	3,838 (768) [184] {92}	3,844 (769) [185] {92}	3,851 (770) [185] {92}
St. Tammany Parish	26,143	26,152	26,160	26,169	26,198 (5,240) [1,257] {629}	26,227 (5,245) [1,259] {629}	26,257 (5,251) [1,260] {630}

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.