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

Date: 6/17/21

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 6/17/21 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.

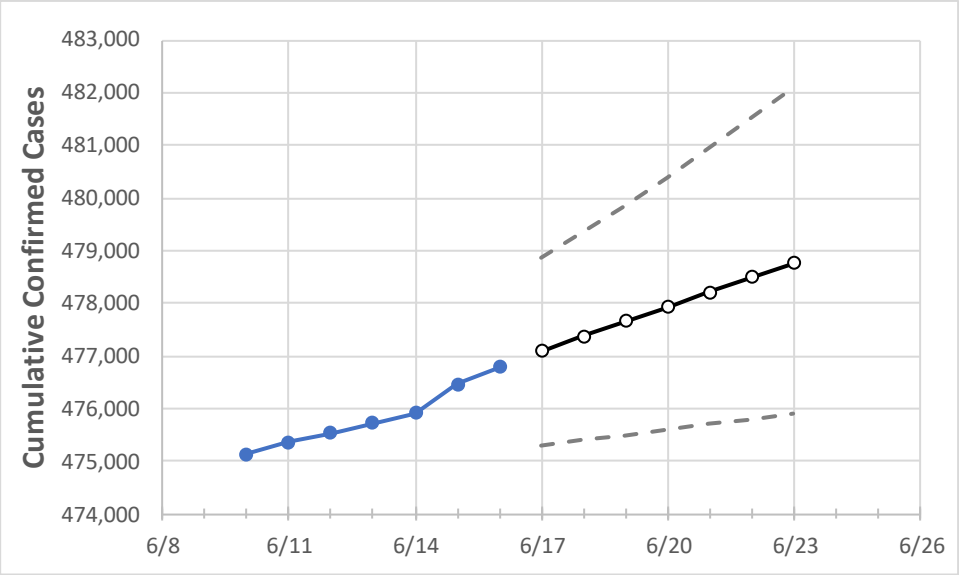
IEM's Modeling Lead

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Louisiana	475,723	475,908	476,467	476,792	477,087	477,368	477,651	477,929	478,212	478,495	478,766

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Ascension Parish	12,727	12,735	12,749	12,775	12,786	12,798	12,810	12,821	12,832	12,844	12,855
Bossier Parish	14,311	14,316	14,336	14,351	14,358	14,365	14,371	14,378	14,384	14,390	14,396
Caddo Parish	26,963	26,972	27,023	27,041	27,061	27,081	27,101	27,122	27,142	27,161	27,180
Calcasieu Parish	22,982	22,991	23,015	23,037	23,055	23,073	23,091	23,110	23,130	23,152	23,173
East Baton Rouge Parish	40,620	40,635	40,656	40,699	40,717	40,735	40,752	40,769	40,786	40,803	40,819
Jefferson Parish	47,200	47,212	47,257	47,289	47,315	47,342	47,368	47,396	47,421	47,447	47,472
Lafayette Parish	24,289	24,301	24,299	24,314	24,326	24,337	24,348	24,360	24,372	24,383	24,393
Lafourche Parish	9,951	9,959	9,980	9,991	10,001	10,011	10,021	10,031	10,042	10,053	10,064
Orleans Parish	30,851	30,861	30,876	30,889	30,900	30,911	30,920	30,930	30,940	30,948	30,957
Ouachita Parish	18,884	18,889	18,936	18,948	18,962	18,975	18,989	19,004	19,018	19,033	19,048
Rapides Parish	12,616	12,622	12,633	12,640	12,646	12,651	12,655	12,660	12,664	12,669	12,672
St. Bernard Parish	4,108	4,109	4,111	4,114	4,116	4,118	4,120	4,123	4,125	4,127	4,129
St. Charles Parish	5,583	5,586	5,591	5,594	5,597	5,600	5,602	5,605	5,608	5,610	5,612
St. James Parish	2,017	2,017	2,022	2,023	2,024	2,025	2,026	2,028	2,029	2,030	2,031
St. John the Baptist Parish	3,828	3,831	3,836	3,839	3,843	3,846	3,849	3,853	3,856	3,860	3,863
St. Tammany Parish	26,160	26,169	26,189	26,201	26,212	26,224	26,235	26,246	26,256	26,267	26,277

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:		
	6/13	6/14	6/15	6/16	6/18	6/20	6/22
Ascension Parish	12,727	12,735	12,749	12,775	12,798 (2,560) [614] {307}	12,821 (2,564) [615] {308}	12,844 (2,569) [617] {308}
Bossier Parish	14,311	14,316	14,336	14,351	14,365 (2,873) [690] {345}	14,378 (2,876) [690] {345}	14,390 (2,878) [691] {345}
Caddo Parish	26,963	26,972	27,023	27,041	27,081 (5,416) [1,300] {650}	27,122 (5,424) [1,302] {651}	27,161 (5,432) [1,304] {652}
Calcasieu Parish	22,982	22,991	23,015	23,037	23,073 (4,615) [1,108] {554}	23,110 (4,622) [1,109] {555}	23,152 (4,630) [1,111] {556}
East Baton Rouge Parish	40,620	40,635	40,656	40,699	40,735 (8,147) [1,955] {978}	40,769 (8,154) [1,957] {978}	40,803 (8,161) [1,959] {979}
Jefferson Parish	47,200	47,212	47,257	47,289	47,342 (9,468) [2,272] {1,136}	47,396 (9,479) [2,275] {1,137}	47,447 (9,489) [2,277] {1,139}
Lafayette Parish	24,289	24,301	24,299	24,314	24,337 (4,867) [1,168] {584}	24,360 (4,872) [1,169] {585}	24,383 (4,877) [1,170] {585}
Lafourche Parish	9,951	9,959	9,980	9,991	10,011 (2,002) [481] {240}	10,031 (2,006) [482] {241}	10,053 (2,011) [483] {241}
Orleans Parish	30,851	30,861	30,876	30,889	30,911 (6,182) [1,484] {742}	30,930 (6,186) [1,485] {742}	30,948 (6,190) [1,486] {743}
Ouachita Parish	18,884	18,889	18,936	18,948	18,975 (3,795) [911] {455}	19,004 (3,801) [912] {456}	19,033 (3,807) [914] {457}
Rapides Parish	12,616	12,622	12,633	12,640	12,651 (2,530) [607] {304}	12,660 (2,532) [608] {304}	12,669 (2,534) [608] {304}
St. Bernard Parish	4,108	4,109	4,111	4,114	4,118 (824) [198] {99}	4,123 (825) [198] {99}	4,127 (825) [198] {99}
St. Charles Parish	5,583	5,586	5,591	5,594	5,600 (1,120) [269] {134}	5,605 (1,121) [269] {135}	5,610 (1,122) [269] {135}
St. James Parish	2,017	2,017	2,022	2,023	2,025 (405) [97] {49}	2,028 (406) [97] {49}	2,030 (406) [97] {49}
St. John the Baptist Parish	3,828	3,831	3,836	3,839	3,846 (769) [185] {92}	3,853 (771) [185] {92}	3,860 (772) [185] {93}
St. Tammany Parish	26,160	26,169	26,189	26,201	26,224 (5,245) [1,259] {629}	26,246 (5,249) [1,260] {630}	26,267 (5,253) [1,261] {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.