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

Date: 6/28/21

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 6/28/21 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.

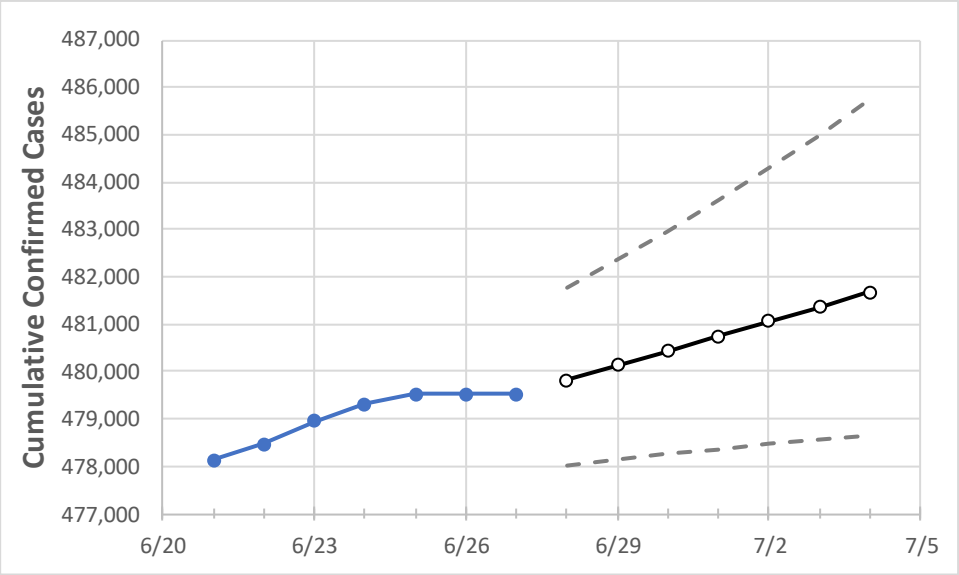
IEM's Modeling Lead

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:						
	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4
Louisiana	479,311	479,521	479,521	479,521	479,830	480,135	480,440	480,755	481,058	481,359	481,666

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:						
	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4
Ascension Parish	12,839	12,845	12,845	12,845	12,852	12,860	12,867	12,875	12,882	12,890	12,897
Bossier Parish	14,407	14,409	14,409	14,409	14,415	14,421	14,426	14,432	14,437	14,443	14,448
Caddo Parish	27,187	27,197	27,197	27,197	27,214	27,229	27,245	27,261	27,277	27,291	27,306
Calcasieu Parish	23,175	23,181	23,181	23,181	23,199	23,216	23,235	23,254	23,272	23,291	23,309
East Baton Rouge Parish	40,932	40,946	40,946	40,946	40,976	41,007	41,040	41,074	41,108	41,143	41,176
Jefferson Parish	47,444	47,459	47,459	47,459	47,477	47,496	47,513	47,531	47,548	47,565	47,581
Lafayette Parish	24,470	24,471	24,471	24,471	24,488	24,506	24,525	24,544	24,563	24,583	24,603
Lafourche Parish	10,113	10,122	10,122	10,122	10,140	10,158	10,177	10,196	10,217	10,238	10,259
Orleans Parish	30,978	30,996	30,996	30,996	31,006	31,016	31,026	31,036	31,047	31,056	31,065
Ouachita Parish	19,025	19,035	19,035	19,035	19,045	19,056	19,067	19,077	19,088	19,098	19,108
Rapides Parish	12,703	12,704	12,704	12,704	12,710	12,715	12,720	12,725	12,731	12,736	12,741
St. Bernard Parish	4,129	4,133	4,133	4,133	4,135	4,137	4,139	4,142	4,144	4,146	4,148
St. Charles Parish	5,617	5,622	5,622	5,622	5,625	5,627	5,630	5,633	5,635	5,638	5,640
St. James Parish	2,032	2,033	2,033	2,033	2,035	2,036	2,038	2,039	2,041	2,043	2,044
St. John the Baptist Parish	3,869	3,875	3,875	3,875	3,879	3,883	3,887	3,891	3,895	3,900	3,904
St. Tammany Parish	26,330	26,353	26,353	26,353	26,373	26,394	26,415	26,436	26,459	26,482	26,507

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:		
	6/24	6/25	6/26	6/27	6/29	7/1	7/3
Ascension Parish	12,839	12,845	12,845	12,845	12,860 (2,572) [617] {309}	12,875 (2,575) [618] {309}	12,890 (2,578) [619] {309}
Bossier Parish	14,407	14,409	14,409	14,409	14,421 (2,884) [692] {346}	14,432 (2,886) [693] {346}	14,443 (2,889) [693] {347}
Caddo Parish	27,187	27,197	27,197	27,197	27,229 (5,446) [1,307] {654}	27,261 (5,452) [1,309] {654}	27,291 (5,458) [1,310] {655}
Calcasieu Parish	23,175	23,181	23,181	23,181	23,216 (4,643) [1,114] {557}	23,254 (4,651) [1,116] {558}	23,291 (4,658) [1,118] {559}
East Baton Rouge Parish	40,932	40,946	40,946	40,946	41,007 (8,201) [1,968] {984}	41,074 (8,215) [1,972] {986}	41,143 (8,229) [1,975] {987}
Jefferson Parish	47,444	47,459	47,459	47,459	47,496 (9,499) [2,280] {1,140}	47,531 (9,506) [2,281] {1,141}	47,565 (9,513) [2,283] {1,142}
Lafayette Parish	24,470	24,471	24,471	24,471	24,506 (4,901) [1,176] {588}	24,544 (4,909) [1,178] {589}	24,583 (4,917) [1,180] {590}
Lafourche Parish	10,113	10,122	10,122	10,122	10,158 (2,032) [488] {244}	10,196 (2,039) [489] {245}	10,238 (2,048) [491] {246}
Orleans Parish	30,978	30,996	30,996	30,996	31,016 (6,203) [1,489] {744}	31,036 (6,207) [1,490] {745}	31,056 (6,211) [1,491] {745}
Ouachita Parish	19,025	19,035	19,035	19,035	19,056 (3,811) [915] {457}	19,077 (3,815) [916] {458}	19,098 (3,820) [917] {458}
Rapides Parish	12,703	12,704	12,704	12,704	12,715 (2,543) [610] {305}	12,725 (2,545) [611] {305}	12,736 (2,547) [611] {306}
St. Bernard Parish	4,129	4,133	4,133	4,133	4,137 (827) [199] {99}	4,142 (828) [199] {99}	4,146 (829) [199] {100}
St. Charles Parish	5,617	5,622	5,622	5,622	5,627 (1,125) [270] {135}	5,633 (1,127) [270] {135}	5,638 (1,128) [271] {135}
St. James Parish	2,032	2,033	2,033	2,033	2,036 (407) [98] {49}	2,039 (408) [98] {49}	2,043 (409) [98] {49}
St. John the Baptist Parish	3,869	3,875	3,875	3,875	3,883 (777) [186] {93}	3,891 (778) [187] {93}	3,900 (780) [187] {94}
St. Tammany Parish	26,330	26,353	26,353	26,353	26,394 (5,279) [1,267] {633}	26,436 (5,287) [1,269] {634}	26,482 (5,296) [1,271] {636}

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.