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

Date: 11/12/21

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 11/12/21 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.

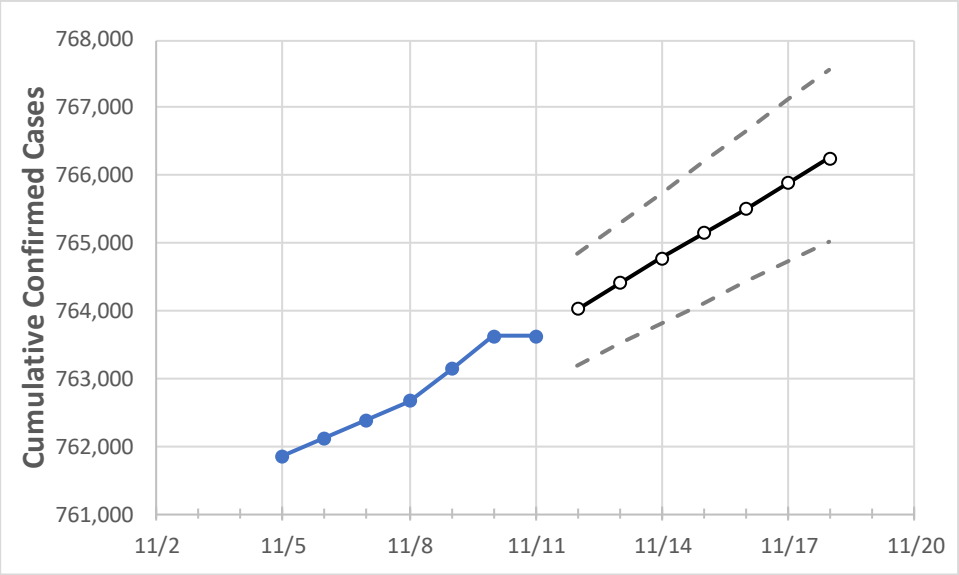
IEM's Modeling Lead

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:						
	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18
Louisiana	762,659	763,133	763,628	763,628	764,021	764,403	764,775	765,140	765,505	765,887	766,258

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:						
	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18
Ascension Parish	21,864	21,881	21,891	21,891	21,900	21,908	21,916	21,924	21,933	21,942	21,950
Bossier Parish	21,818	21,833	21,850	21,850	21,861	21,871	21,882	21,892	21,902	21,912	21,923
Caddo Parish	39,616	39,632	39,662	39,662	39,681	39,699	39,717	39,736	39,753	39,771	39,789
Calcasieu Parish	34,598	34,620	34,644	34,644	34,657	34,670	34,682	34,694	34,707	34,719	34,730
East Baton Rouge Parish	64,070	64,109	64,132	64,132	64,152	64,173	64,193	64,213	64,234	64,252	64,272
Jefferson Parish	69,876	69,897	69,915	69,915	69,946	69,977	70,004	70,035	70,065	70,099	70,130
Lafayette Parish	39,193	39,225	39,246	39,246	39,273	39,298	39,326	39,349	39,373	39,399	39,426
Lafourche Parish	18,009	18,024	18,033	18,033	18,044	18,056	18,067	18,079	18,091	18,104	18,114
Orleans Parish	47,049	47,077	47,104	47,104	47,130	47,156	47,180	47,206	47,230	47,256	47,280
Ouachita Parish	31,648	31,695	31,721	31,721	31,735	31,750	31,764	31,779	31,793	31,808	31,821
Rapides Parish	21,326	21,342	21,359	21,359	21,369	21,380	21,390	21,401	21,410	21,421	21,431
St. Bernard Parish	6,930	6,933	6,935	6,935	6,938	6,941	6,943	6,946	6,949	6,952	6,954
St. Charles Parish	8,910	8,911	8,911	8,911	8,914	8,916	8,918	8,921	8,923	8,926	8,928
St. James Parish	3,536	3,537	3,539	3,539	3,541	3,542	3,544	3,545	3,547	3,549	3,550
St. John the Baptist Parish	6,330	6,332	6,332	6,332	6,334	6,336	6,338	6,340	6,342	6,344	6,346
St. Tammany Parish	43,810	43,840	43,870	43,870	43,893	43,916	43,939	43,962	43,986	44,011	44,033

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:		
	11/8	11/9	11/10	11/11	11/13	11/15	11/17
Ascension Parish	21,864	21,881	21,891	21,891	21,908 (4,382) [1,052] {526}	21,924 (4,385) [1,052] {526}	21,942 (4,388) [1,053] {527}
Bossier Parish	21,818	21,833	21,850	21,850	21,871 (4,374) [1,050] {525}	21,892 (4,378) [1,051] {525}	21,912 (4,382) [1,052] {526}
Caddo Parish	39,616	39,632	39,662	39,662	39,699 (7,940) [1,906] {953}	39,736 (7,947) [1,907] {954}	39,771 (7,954) [1,909] {955}
Calcasieu Parish	34,598	34,620	34,644	34,644	34,670 (6,934) [1,664] {832}	34,694 (6,939) [1,665] {833}	34,719 (6,944) [1,666] {833}
East Baton Rouge Parish	64,070	64,109	64,132	64,132	64,173 (12,835) [3,080] {1,540}	64,213 (12,843) [3,082] {1,541}	64,252 (12,850) [3,084] {1,542}
Jefferson Parish	69,876	69,897	69,915	69,915	69,977 (13,995) [3,359] {1,679}	70,035 (14,007) [3,362] {1,681}	70,099 (14,020) [3,365] {1,682}
Lafayette Parish	39,193	39,225	39,246	39,246	39,298 (7,860) [1,886] {943}	39,349 (7,870) [1,889] {944}	39,399 (7,880) [1,891] {946}
Lafourche Parish	18,009	18,024	18,033	18,033	18,056 (3,611) [867] {433}	18,079 (3,616) [868] {434}	18,104 (3,621) [869] {434}
Orleans Parish	47,049	47,077	47,104	47,104	47,156 (9,431) [2,263] {1,132}	47,206 (9,441) [2,266] {1,133}	47,256 (9,451) [2,268] {1,134}
Ouachita Parish	31,648	31,695	31,721	31,721	31,750 (6,350) [1,524] {762}	31,779 (6,356) [1,525] {763}	31,808 (6,362) [1,527] {763}
Rapides Parish	21,326	21,342	21,359	21,359	21,380 (4,276) [1,026] {513}	21,401 (4,280) [1,027] {514}	21,421 (4,284) [1,028] {514}
St. Bernard Parish	6,930	6,933	6,935	6,935	6,941 (1,388) [333] {167}	6,946 (1,389) [333] {167}	6,952 (1,390) [334] {167}
St. Charles Parish	8,910	8,911	8,911	8,911	8,916 (1,783) [428] {214}	8,921 (1,784) [428] {214}	8,926 (1,785) [428] {214}
St. James Parish	3,536	3,537	3,539	3,539	3,542 (708) [170] {85}	3,545 (709) [170] {85}	3,549 (710) [170] {85}
St. John the Baptist Parish	6,330	6,332	6,332	6,332	6,336 (1,267) [304] {152}	6,340 (1,268) [304] {152}	6,344 (1,269) [304] {152}
St. Tammany Parish	43,810	43,840	43,870	43,870	43,916 (8,783) [2,108] {1,054}	43,962 (8,792) [2,110] {1,055}	44,011 (8,802) [2,113] {1,056}

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.