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

Date: 11/22/21

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 11/22/21 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.

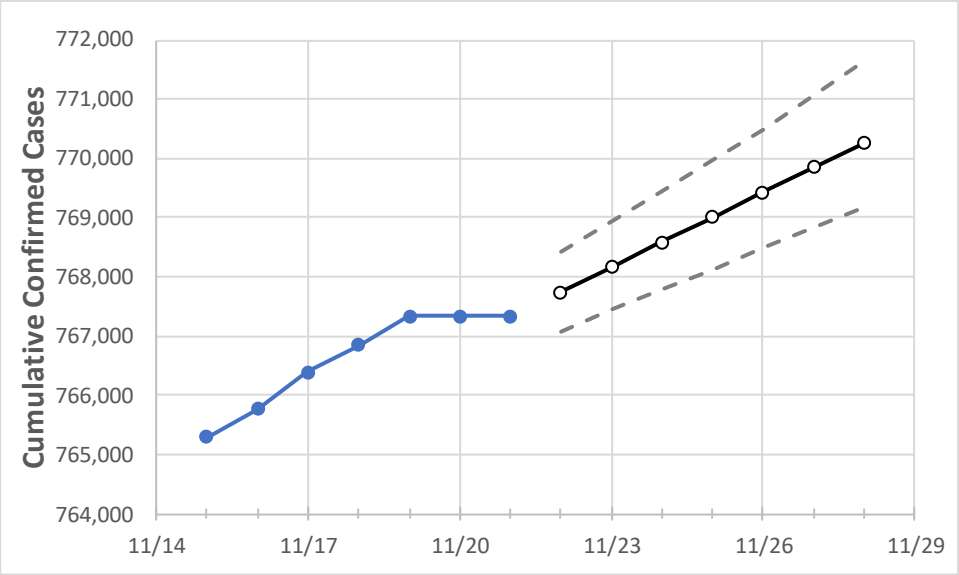
IEM's Modeling Lead

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Louisiana	766,849	767,330	767,330	767,330	767,748	768,164	768,583	769,010	769,427	769,845	770,262

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Ascension Parish	21,966	21,974	21,974	21,974	21,984	21,993	22,003	22,013	22,022	22,032	22,041
Bossier Parish	21,951	21,967	21,967	21,967	21,981	21,995	22,010	22,024	22,039	22,054	22,069
Caddo Parish	39,896	39,923	39,923	39,923	39,951	39,980	40,005	40,035	40,062	40,092	40,121
Calcasieu Parish	34,780	34,803	34,803	34,803	34,822	34,842	34,862	34,881	34,901	34,922	34,942
East Baton Rouge Parish	64,362	64,394	64,394	64,394	64,427	64,460	64,493	64,526	64,560	64,595	64,630
Jefferson Parish	70,127	70,155	70,155	70,155	70,184	70,214	70,244	70,274	70,305	70,336	70,367
Lafayette Parish	39,399	39,415	39,415	39,415	39,431	39,447	39,462	39,478	39,493	39,508	39,523
Lafourche Parish	18,087	18,093	18,093	18,093	18,100	18,106	18,112	18,118	18,124	18,130	18,136
Orleans Parish	47,307	47,348	47,348	47,348	47,376	47,405	47,433	47,462	47,492	47,521	47,550
Ouachita Parish	31,929	31,954	31,954	31,954	31,983	32,012	32,043	32,074	32,106	32,138	32,171
Rapides Parish	21,441	21,446	21,446	21,446	21,456	21,466	21,475	21,485	21,495	21,505	21,515
St. Bernard Parish	6,992	6,996	6,996	6,996	7,003	7,011	7,018	7,026	7,033	7,041	7,050
St. Charles Parish	8,933	8,933	8,933	8,933	8,935	8,937	8,939	8,941	8,943	8,945	8,947
St. James Parish	3,542	3,543	3,543	3,543	3,543	3,544	3,544	3,545	3,545	3,545	3,546
St. John the Baptist Parish	6,359	6,360	6,360	6,360	6,363	6,365	6,368	6,371	6,374	6,377	6,380
St. Tammany Parish	44,049	44,074	44,074	44,074	44,097	44,120	44,142	44,164	44,188	44,211	44,234

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:		
	11/18	11/19	11/20	11/21	11/23	11/25	11/27
Ascension Parish	21,966	21,974	21,974	21,974	21,993 (4,399) [1,056] {528}	22,013 (4,403) [1,057] {528}	22,032 (4,406) [1,058] {529}
Bossier Parish	21,951	21,967	21,967	21,967	21,995 (4,399) [1,056] {528}	22,024 (4,405) [1,057] {529}	22,054 (4,411) [1,059] {529}
Caddo Parish	39,896	39,923	39,923	39,923	39,980 (7,996) [1,919] {960}	40,035 (8,007) [1,922] {961}	40,092 (8,018) [1,924] {962}
Calcasieu Parish	34,780	34,803	34,803	34,803	34,842 (6,968) [1,672] {836}	34,881 (6,976) [1,674] {837}	34,922 (6,984) [1,676] {838}
East Baton Rouge Parish	64,362	64,394	64,394	64,394	64,460 (12,892) [3,094] {1,547}	64,526 (12,905) [3,097] {1,549}	64,595 (12,919) [3,101] {1,550}
Jefferson Parish	70,127	70,155	70,155	70,155	70,214 (14,043) [3,370] {1,685}	70,274 (14,055) [3,373] {1,687}	70,336 (14,067) [3,376] {1,688}
Lafayette Parish	39,399	39,415	39,415	39,415	39,447 (7,889) [1,893] {947}	39,478 (7,896) [1,895] {947}	39,508 (7,902) [1,896] {948}
Lafourche Parish	18,087	18,093	18,093	18,093	18,106 (3,621) [869] {435}	18,118 (3,624) [870] {435}	18,130 (3,626) [870] {435}
Orleans Parish	47,307	47,348	47,348	47,348	47,405 (9,481) [2,275] {1,138}	47,462 (9,492) [2,278] {1,139}	47,521 (9,504) [2,281] {1,141}
Ouachita Parish	31,929	31,954	31,954	31,954	32,012 (6,402) [1,537] {768}	32,074 (6,415) [1,540] {770}	32,138 (6,428) [1,543] {771}
Rapides Parish	21,441	21,446	21,446	21,446	21,466 (4,293) [1,030] {515}	21,485 (4,297) [1,031] {516}	21,505 (4,301) [1,032] {516}
St. Bernard Parish	6,992	6,996	6,996	6,996	7,011 (1,402) [337] {168}	7,026 (1,405) [337] {169}	7,041 (1,408) [338] {169}
St. Charles Parish	8,933	8,933	8,933	8,933	8,937 (1,787) [429] {214}	8,941 (1,788) [429] {215}	8,945 (1,789) [429] {215}
St. James Parish	3,542	3,543	3,543	3,543	3,544 (709) [170] {85}	3,545 (709) [170] {85}	3,545 (709) [170] {85}
St. John the Baptist Parish	6,359	6,360	6,360	6,360	6,365 (1,273) [306] {153}	6,371 (1,274) [306] {153}	6,377 (1,275) [306] {153}
St. Tammany Parish	44,049	44,074	44,074	44,074	44,120 (8,824) [2,118] {1,059}	44,164 (8,833) [2,120] {1,060}	44,211 (8,842) [2,122] {1,061}

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.