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

Date: 11/24/21

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 11/24/21 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.

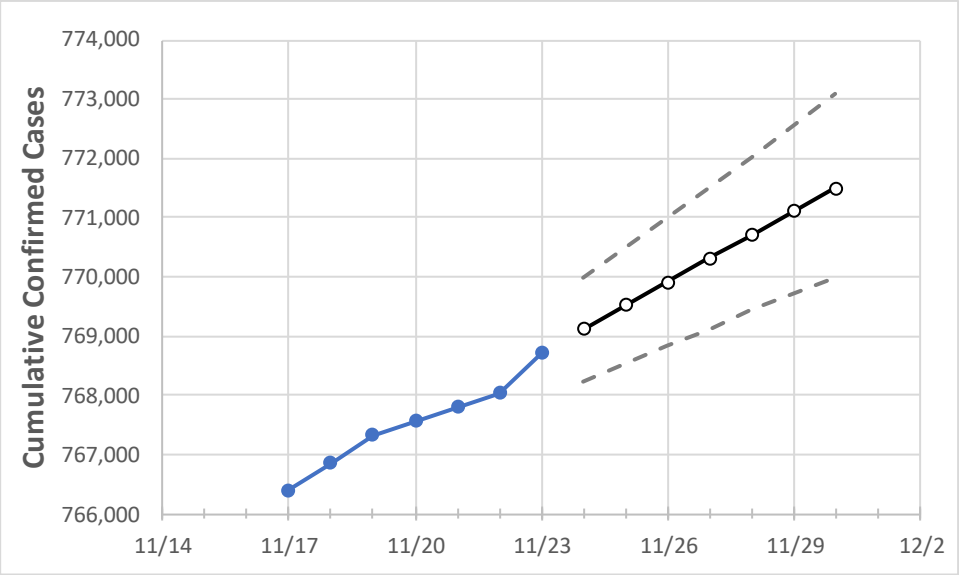
IEM's Modeling Lead

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Louisiana	767,567	767,804	768,041	768,714	769,121	769,527	769,913	770,320	770,706	771,113	771,503

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Ascension Parish	21,978	21,983	21,987	22,016	22,025	22,035	22,045	22,053	22,063	22,073	22,082
Bossier Parish	21,972	21,978	21,983	22,004	22,016	22,029	22,041	22,053	22,066	22,079	22,091
Caddo Parish	39,935	39,948	39,960	39,984	40,011	40,038	40,065	40,091	40,119	40,147	40,176
Calcasieu Parish	34,817	34,832	34,846	34,875	34,896	34,917	34,939	34,961	34,982	35,005	35,028
East Baton Rouge Parish	64,410	64,425	64,441	64,493	64,523	64,553	64,583	64,615	64,647	64,680	64,712
Jefferson Parish	70,173	70,190	70,208	70,233	70,257	70,281	70,305	70,330	70,354	70,379	70,403
Lafayette Parish	39,424	39,433	39,442	39,497	39,514	39,531	39,548	39,566	39,584	39,601	39,618
Lafourche Parish	18,098	18,104	18,109	18,127	18,133	18,139	18,145	18,150	18,156	18,162	18,167
Orleans Parish	47,367	47,386	47,405	47,445	47,470	47,496	47,521	47,546	47,571	47,598	47,623
Ouachita Parish	31,971	31,987	32,004	32,043	32,070	32,099	32,127	32,156	32,186	32,216	32,247
Rapides Parish	21,450	21,454	21,458	21,490	21,500	21,510	21,519	21,529	21,538	21,548	21,559
St. Bernard Parish	6,998	7,001	7,003	7,009	7,016	7,022	7,028	7,035	7,040	7,047	7,054
St. Charles Parish	8,937	8,939	8,941	8,941	8,943	8,945	8,947	8,949	8,950	8,952	8,954
St. James Parish	3,543	3,544	3,544	3,544	3,544	3,545	3,545	3,545	3,545	3,546	3,546
St. John the Baptist Parish	6,361	6,363	6,364	6,365	6,368	6,370	6,372	6,375	6,377	6,379	6,382
St. Tammany Parish	44,087	44,101	44,114	44,141	44,160	44,179	44,197	44,216	44,234	44,252	44,270

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:		
	11/20	11/21	11/22	11/23	11/25	11/27	11/29
Ascension Parish	21,978	21,983	21,987	22,016	22,035 (4,407) [1,058] {529}	22,053 (4,411) [1,059] {529}	22,073 (4,415) [1,059] {530}
Bossier Parish	21,972	21,978	21,983	22,004	22,029 (4,406) [1,057] {529}	22,053 (4,411) [1,059] {529}	22,079 (4,416) [1,060] {530}
Caddo Parish	39,935	39,948	39,960	39,984	40,038 (8,008) [1,922] {961}	40,091 (8,018) [1,924] {962}	40,147 (8,029) [1,927] {964}
Calcasieu Parish	34,817	34,832	34,846	34,875	34,917 (6,983) [1,676] {838}	34,961 (6,992) [1,678] {839}	35,005 (7,001) [1,680] {840}
East Baton Rouge Parish	64,410	64,425	64,441	64,493	64,553 (12,911) [3,099] {1,549}	64,615 (12,923) [3,102] {1,551}	64,680 (12,936) [3,105] {1,552}
Jefferson Parish	70,173	70,190	70,208	70,233	70,281 (14,056) [3,374] {1,687}	70,330 (14,066) [3,376] {1,688}	70,379 (14,076) [3,378] {1,689}
Lafayette Parish	39,424	39,433	39,442	39,497	39,531 (7,906) [1,897] {949}	39,566 (7,913) [1,899] {950}	39,601 (7,920) [1,901] {950}
Lafourche Parish	18,098	18,104	18,109	18,127	18,139 (3,628) [871] {435}	18,150 (3,630) [871] {436}	18,162 (3,632) [872] {436}
Orleans Parish	47,367	47,386	47,405	47,445	47,496 (9,499) [2,280] {1,140}	47,546 (9,509) [2,282] {1,141}	47,598 (9,520) [2,285] {1,142}
Ouachita Parish	31,971	31,987	32,004	32,043	32,099 (6,420) [1,541] {770}	32,156 (6,431) [1,544] {772}	32,216 (6,443) [1,546] {773}
Rapides Parish	21,450	21,454	21,458	21,490	21,510 (4,302) [1,032] {516}	21,529 (4,306) [1,033] {517}	21,548 (4,310) [1,034] {517}
St. Bernard Parish	6,998	7,001	7,003	7,009	7,022 (1,404) [337] {169}	7,035 (1,407) [338] {169}	7,047 (1,409) [338] {169}
St. Charles Parish	8,937	8,939	8,941	8,941	8,945 (1,789) [429] {215}	8,949 (1,790) [430] {215}	8,952 (1,790) [430] {215}
St. James Parish	3,543	3,544	3,544	3,544	3,545 (709) [170] {85}	3,545 (709) [170] {85}	3,546 (709) [170] {85}
St. John the Baptist Parish	6,361	6,363	6,364	6,365	6,370 (1,274) [306] {153}	6,375 (1,275) [306] {153}	6,379 (1,276) [306] {153}
St. Tammany Parish	44,087	44,101	44,114	44,141	44,179 (8,836) [2,121] {1,060}	44,216 (8,843) [2,122] {1,061}	44,252 (8,850) [2,124] {1,062}

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.