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

Date: 12/13/21

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 12/13/21 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.

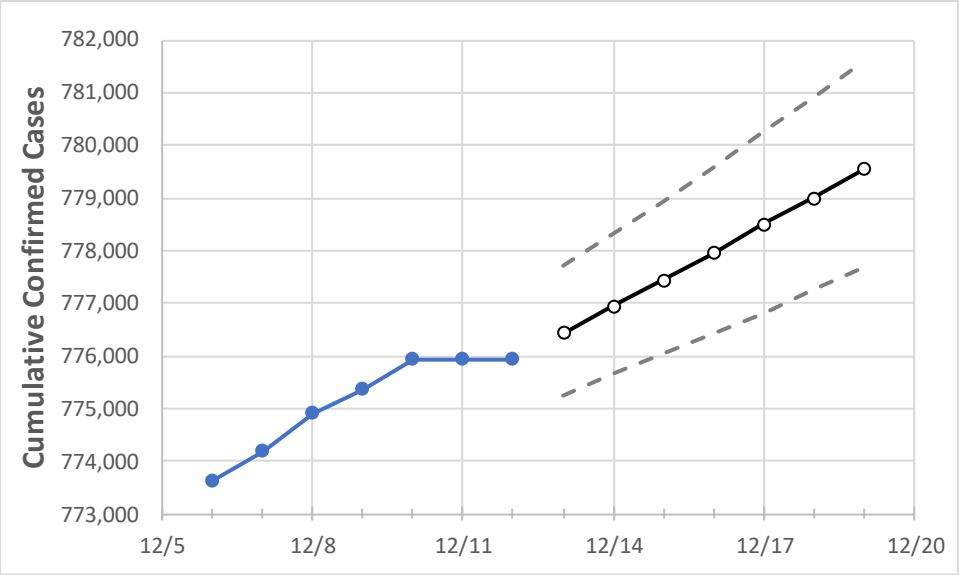
IEM's Modeling Lead

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:						
	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19
Louisiana	775,368	775,935	775,935	775,935	776,433	776,934	777,429	777,955	778,494	778,995	779,541

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:						
	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19
Ascension Parish	22,171	22,196	22,196	22,196	22,210	22,224	22,239	22,253	22,270	22,284	22,299
Bossier Parish	22,260	22,278	22,278	22,278	22,296	22,315	22,333	22,350	22,370	22,389	22,407
Caddo Parish	40,374	40,397	40,397	40,397	40,428	40,458	40,490	40,522	40,554	40,587	40,620
Calcasieu Parish	35,128	35,137	35,137	35,137	35,154	35,170	35,187	35,203	35,220	35,238	35,255
East Baton Rouge Parish	64,909	64,936	64,936	64,936	64,966	64,994	65,025	65,052	65,081	65,113	65,144
Jefferson Parish	70,701	70,741	70,741	70,741	70,779	70,819	70,857	70,897	70,939	70,982	71,025
Lafayette Parish	39,814	39,840	39,840	39,840	39,866	39,892	39,919	39,945	39,973	40,001	40,030
Lafourche Parish	18,285	18,294	18,294	18,294	18,304	18,315	18,326	18,336	18,347	18,358	18,370
Orleans Parish	47,799	47,851	47,851	47,851	47,881	47,911	47,942	47,973	48,004	48,038	48,070
Ouachita Parish	32,439	32,470	32,470	32,470	32,498	32,525	32,551	32,579	32,607	32,636	32,662
Rapides Parish	21,661	21,670	21,670	21,670	21,683	21,697	21,710	21,724	21,738	21,752	21,766
St. Bernard Parish	7,069	7,074	7,074	7,074	7,078	7,083	7,087	7,092	7,096	7,101	7,106
St. Charles Parish	9,035	9,045	9,045	9,045	9,055	9,063	9,073	9,083	9,094	9,104	9,116
St. James Parish	3,558	3,558	3,558	3,558	3,559	3,560	3,561	3,562	3,563	3,564	3,566
St. John the Baptist Parish	6,417	6,418	6,418	6,418	6,421	6,424	6,427	6,431	6,434	6,437	6,440
St. Tammany Parish	44,599	44,620	44,620	44,620	44,653	44,689	44,721	44,755	44,791	44,827	44,863

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:		
	12/9	12/10	12/11	12/12	12/14	12/16	12/18
Ascension Parish	22,171	22,196	22,196	22,196	22,224 (4,445) [1,067] {533}	22,253 (4,451) [1,068] {534}	22,284 (4,457) [1,070] {535}
Bossier Parish	22,260	22,278	22,278	22,278	22,315 (4,463) [1,071] {536}	22,350 (4,470) [1,073] {536}	22,389 (4,478) [1,075] {537}
Caddo Parish	40,374	40,397	40,397	40,397	40,458 (8,092) [1,942] {971}	40,522 (8,104) [1,945] {973}	40,587 (8,117) [1,948] {974}
Calcasieu Parish	35,128	35,137	35,137	35,137	35,170 (7,034) [1,688] {844}	35,203 (7,041) [1,690] {845}	35,238 (7,048) [1,691] {846}
East Baton Rouge Parish	64,909	64,936	64,936	64,936	64,994 (12,999) [3,120] {1,560}	65,052 (13,010) [3,123] {1,561}	65,113 (13,023) [3,125] {1,563}
Jefferson Parish	70,701	70,741	70,741	70,741	70,819 (14,164) [3,399] {1,700}	70,897 (14,179) [3,403] {1,702}	70,982 (14,196) [3,407] {1,704}
Lafayette Parish	39,814	39,840	39,840	39,840	39,892 (7,978) [1,915] {957}	39,945 (7,989) [1,917] {959}	40,001 (8,000) [1,920] {960}
Lafourche Parish	18,285	18,294	18,294	18,294	18,315 (3,663) [879] {440}	18,336 (3,667) [880] {440}	18,358 (3,672) [881] {441}
Orleans Parish	47,799	47,851	47,851	47,851	47,911 (9,582) [2,300] {1,150}	47,973 (9,595) [2,303] {1,151}	48,038 (9,608) [2,306] {1,153}
Ouachita Parish	32,439	32,470	32,470	32,470	32,525 (6,505) [1,561] {781}	32,579 (6,516) [1,564] {782}	32,636 (6,527) [1,567] {783}
Rapides Parish	21,661	21,670	21,670	21,670	21,697 (4,339) [1,041] {521}	21,724 (4,345) [1,043] {521}	21,752 (4,350) [1,044] {522}
St. Bernard Parish	7,069	7,074	7,074	7,074	7,083 (1,417) [340] {170}	7,092 (1,418) [340] {170}	7,101 (1,420) [341] {170}
St. Charles Parish	9,035	9,045	9,045	9,045	9,063 (1,813) [435] {218}	9,083 (1,817) [436] {218}	9,104 (1,821) [437] {219}
St. James Parish	3,558	3,558	3,558	3,558	3,560 (712) [171] {85}	3,562 (712) [171] {85}	3,564 (713) [171] {86}
St. John the Baptist Parish	6,417	6,418	6,418	6,418	6,424 (1,285) [308] {154}	6,431 (1,286) [309] {154}	6,437 (1,287) [309] {154}
St. Tammany Parish	44,599	44,620	44,620	44,620	44,689 (8,938) [2,145] {1,073}	44,755 (8,951) [2,148] {1,074}	44,827 (8,965) [2,152] {1,076}

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.