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

Date: 12/3/21

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 12/3/21 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.

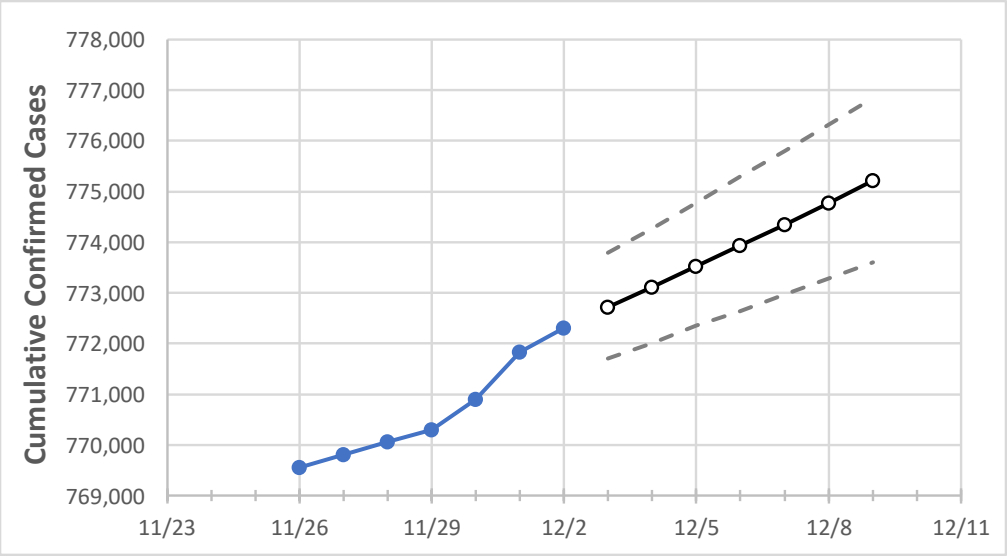
IEM's Modeling Lead

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:						
	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9
Louisiana	770,305	770,894	771,837	772,310	772,713	773,114	773,528	773,927	774,349	774,779	775,209

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:						
	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9
Ascension Parish	22,046	22,053	22,094	22,104	22,114	22,124	22,133	22,143	22,154	22,164	22,174
Bossier Parish	22,096	22,122	22,155	22,163	22,180	22,197	22,214	22,232	22,250	22,269	22,288
Caddo Parish	40,068	40,100	40,147	40,176	40,199	40,221	40,244	40,266	40,289	40,313	40,336
Calcasieu Parish	34,942	34,953	34,981	34,988	35,003	35,018	35,032	35,046	35,061	35,076	35,091
East Baton Rouge Parish	64,581	64,608	64,687	64,720	64,746	64,773	64,800	64,828	64,857	64,884	64,913
Jefferson Parish	70,320	70,373	70,427	70,469	70,495	70,519	70,543	70,569	70,595	70,620	70,645
Lafayette Parish	39,552	39,566	39,633	39,646	39,663	39,679	39,696	39,710	39,726	39,743	39,759
Lafourche Parish	18,188	18,196	18,217	18,222	18,231	18,240	18,250	18,259	18,268	18,278	18,287
Orleans Parish	47,528	47,557	47,583	47,618	47,640	47,661	47,681	47,701	47,723	47,744	47,764
Ouachita Parish	32,149	32,192	32,240	32,265	32,292	32,319	32,344	32,370	32,399	32,427	32,455
Rapides Parish	21,524	21,549	21,575	21,585	21,596	21,607	21,617	21,628	21,638	21,649	21,659
St. Bernard Parish	7,022	7,035	7,042	7,045	7,049	7,053	7,057	7,061	7,066	7,070	7,074
St. Charles Parish	8,967	8,987	8,992	8,996	9,001	9,006	9,012	9,017	9,023	9,028	9,034
St. James Parish	3,547	3,551	3,552	3,552	3,553	3,553	3,554	3,554	3,555	3,555	3,556
St. John the Baptist Parish	6,373	6,398	6,399	6,401	6,405	6,408	6,411	6,415	6,418	6,422	6,426
St. Tammany Parish	44,242	44,307	44,372	44,408	44,435	44,461	44,488	44,515	44,542	44,572	44,602

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:		
	11/29	11/30	12/1	12/2	12/4	12/6	12/8
Ascension Parish	22,046	22,053	22,094	22,104	22,124 (4,425) [1,062] {531}	22,143 (4,429) [1,063] {531}	22,164 (4,433) [1,064] {532}
Bossier Parish	22,096	22,122	22,155	22,163	22,197 (4,439) [1,065] {533}	22,232 (4,446) [1,067] {534}	22,269 (4,454) [1,069] {534}
Caddo Parish	40,068	40,100	40,147	40,176	40,221 (8,044) [1,931] {965}	40,266 (8,053) [1,933] {966}	40,313 (8,063) [1,935] {968}
Calcasieu Parish	34,942	34,953	34,981	34,988	35,018 (7,004) [1,681] {840}	35,046 (7,009) [1,682] {841}	35,076 (7,015) [1,684] {842}
East Baton Rouge Parish	64,581	64,608	64,687	64,720	64,773 (12,955) [3,109] {1,555}	64,828 (12,966) [3,112] {1,556}	64,884 (12,977) [3,114] {1,557}
Jefferson Parish	70,320	70,373	70,427	70,469	70,519 (14,104) [3,385] {1,692}	70,569 (14,114) [3,387] {1,694}	70,620 (14,124) [3,390] {1,695}
Lafayette Parish	39,552	39,566	39,633	39,646	39,679 (7,936) [1,905] {952}	39,710 (7,942) [1,906] {953}	39,743 (7,949) [1,908] {954}
Lafourche Parish	18,188	18,196	18,217	18,222	18,240 (3,648) [876] {438}	18,259 (3,652) [876] {438}	18,278 (3,656) [877] {439}
Orleans Parish	47,528	47,557	47,583	47,618	47,661 (9,532) [2,288] {1,144}	47,701 (9,540) [2,290] {1,145}	47,744 (9,549) [2,292] {1,146}
Ouachita Parish	32,149	32,192	32,240	32,265	32,319 (6,464) [1,551] {776}	32,370 (6,474) [1,554] {777}	32,427 (6,485) [1,556] {778}
Rapides Parish	21,524	21,549	21,575	21,585	21,607 (4,321) [1,037] {519}	21,628 (4,326) [1,038] {519}	21,649 (4,330) [1,039] {520}
St. Bernard Parish	7,022	7,035	7,042	7,045	7,053 (1,411) [339] {169}	7,061 (1,412) [339] {169}	7,070 (1,414) [339] {170}
St. Charles Parish	8,967	8,987	8,992	8,996	9,006 (1,801) [432] {216}	9,017 (1,803) [433] {216}	9,028 (1,806) [433] {217}
St. James Parish	3,547	3,551	3,552	3,552	3,553 (711) [171] {85}	3,554 (711) [171] {85}	3,555 (711) [171] {85}
St. John the Baptist Parish	6,373	6,398	6,399	6,401	6,408 (1,282) [308] {154}	6,415 (1,283) [308] {154}	6,422 (1,284) [308] {154}
St. Tammany Parish	44,242	44,307	44,372	44,408	44,461 (8,892) [2,134] {1,067}	44,515 (8,903) [2,137] {1,068}	44,572 (8,914) [2,139] {1,070}

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.