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

Date: 12/15/21

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 12/15/21 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.

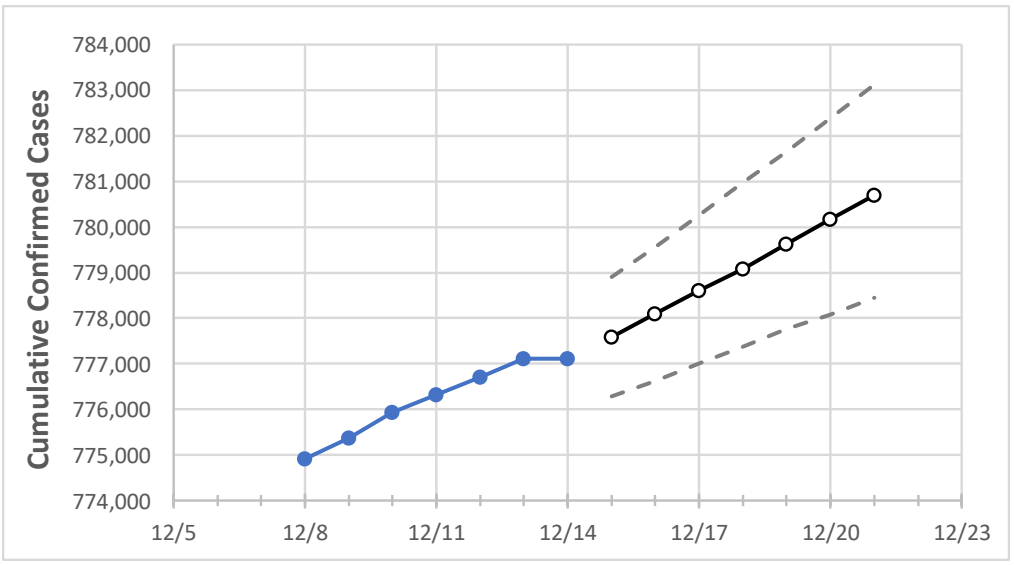
IEM's Modeling Lead

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:						
	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21
Louisiana	776,325	776,716	777,106	777,106	777,594	778,089	778,599	779,087	779,626	780,161	780,687

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:						
	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21
Ascension Parish	22,212	22,228	22,244	22,244	22,263	22,281	22,300	22,319	22,340	22,361	22,383
Bossier Parish	22,290	22,302	22,314	22,314	22,328	22,341	22,355	22,368	22,381	22,394	22,408
Caddo Parish	40,412	40,426	40,441	40,441	40,469	40,496	40,523	40,550	40,578	40,607	40,635
Calcasieu Parish	35,152	35,167	35,182	35,182	35,201	35,221	35,241	35,262	35,283	35,304	35,325
East Baton Rouge Parish	64,959	64,981	65,004	65,004	65,034	65,063	65,093	65,121	65,153	65,183	65,213
Jefferson Parish	70,780	70,819	70,858	70,858	70,902	70,946	70,990	71,036	71,084	71,133	71,184
Lafayette Parish	39,858	39,876	39,894	39,894	39,920	39,945	39,968	39,995	40,021	40,048	40,073
Lafourche Parish	18,300	18,306	18,312	18,312	18,320	18,327	18,334	18,342	18,348	18,356	18,363
Orleans Parish	47,919	47,988	48,056	48,056	48,120	48,188	48,259	48,335	48,413	48,499	48,589
Ouachita Parish	32,487	32,503	32,520	32,520	32,545	32,569	32,593	32,617	32,642	32,665	32,690
Rapides Parish	21,677	21,683	21,690	21,690	21,700	21,710	21,720	21,729	21,739	21,749	21,759
St. Bernard Parish	7,077	7,080	7,083	7,083	7,087	7,091	7,094	7,098	7,102	7,106	7,110
St. Charles Parish	9,058	9,071	9,084	9,084	9,098	9,113	9,129	9,146	9,164	9,184	9,204
St. James Parish	3,559	3,559	3,559	3,559	3,560	3,560	3,561	3,561	3,562	3,562	3,563
St. John the Baptist Parish	6,421	6,425	6,428	6,428	6,430	6,433	6,435	6,437	6,439	6,442	6,444
St. Tammany Parish	44,642	44,665	44,687	44,687	44,715	44,740	44,768	44,795	44,822	44,849	44,877

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:		
	12/11	12/12	12/13	12/14	12/16	12/18	12/20
Ascension Parish	22,212	22,228	22,244	22,244	22,281 (4,456) [1,069] {535}	22,319 (4,464) [1,071] {536}	22,361 (4,472) [1,073] {537}
Bossier Parish	22,290	22,302	22,314	22,314	22,341 (4,468) [1,072] {536}	22,368 (4,474) [1,074] {537}	22,394 (4,479) [1,075] {537}
Caddo Parish	40,412	40,426	40,441	40,441	40,496 (8,099) [1,944] {972}	40,550 (8,110) [1,946] {973}	40,607 (8,121) [1,949] {975}
Calcasieu Parish	35,152	35,167	35,182	35,182	35,221 (7,044) [1,691] {845}	35,262 (7,052) [1,693] {846}	35,304 (7,061) [1,695] {847}
East Baton Rouge Parish	64,959	64,981	65,004	65,004	65,063 (13,013) [3,123] {1,562}	65,121 (13,024) [3,126] {1,563}	65,183 (13,037) [3,129] {1,564}
Jefferson Parish	70,780	70,819	70,858	70,858	70,946 (14,189) [3,405] {1,703}	71,036 (14,207) [3,410] {1,705}	71,133 (14,227) [3,414] {1,707}
Lafayette Parish	39,858	39,876	39,894	39,894	39,945 (7,989) [1,917] {959}	39,995 (7,999) [1,920] {960}	40,048 (8,010) [1,922] {961}
Lafourche Parish	18,300	18,306	18,312	18,312	18,327 (3,665) [880] {440}	18,342 (3,668) [880] {440}	18,356 (3,671) [881] {441}
Orleans Parish	47,919	47,988	48,056	48,056	48,188 (9,638) [2,313] {1,157}	48,335 (9,667) [2,320] {1,160}	48,499 (9,700) [2,328] {1,164}
Ouachita Parish	32,487	32,503	32,520	32,520	32,569 (6,514) [1,563] {782}	32,617 (6,523) [1,566] {783}	32,665 (6,533) [1,568] {784}
Rapides Parish	21,677	21,683	21,690	21,690	21,710 (4,342) [1,042] {521}	21,729 (4,346) [1,043] {522}	21,749 (4,350) [1,044] {522}
St. Bernard Parish	7,077	7,080	7,083	7,083	7,091 (1,418) [340] {170}	7,098 (1,420) [341] {170}	7,106 (1,421) [341] {171}
St. Charles Parish	9,058	9,071	9,084	9,084	9,113 (1,823) [437] {219}	9,146 (1,829) [439] {219}	9,184 (1,837) [441] {220}
St. James Parish	3,559	3,559	3,559	3,559	3,560 (712) [171] {85}	3,561 (712) [171] {85}	3,562 (712) [171] {85}
St. John the Baptist Parish	6,421	6,425	6,428	6,428	6,433 (1,287) [309] {154}	6,437 (1,287) [309] {154}	6,442 (1,288) [309] {155}
St. Tammany Parish	44,642	44,665	44,687	44,687	44,740 (8,948) [2,148] {1,074}	44,795 (8,959) [2,150] {1,075}	44,849 (8,970) [2,153] {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.