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

Date: 12/17/21

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 12/17/21 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.

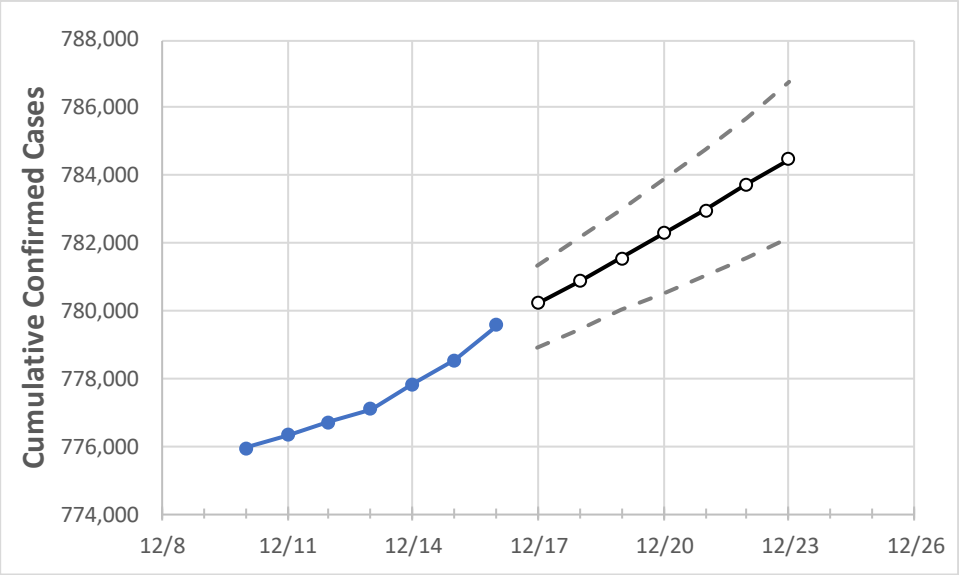
IEM's Modeling Lead

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:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
Louisiana	777,106	777,824	778,542	779,567	780,216	780,887	781,558	782,281	782,980	783,741	784,484

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:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
Ascension Parish	22,244	22,275	22,305	22,329	22,355	22,382	22,410	22,440	22,472	22,504	22,540
Bossier Parish	22,314	22,341	22,368	22,379	22,396	22,412	22,428	22,444	22,461	22,478	22,495
Caddo Parish	40,441	40,488	40,535	40,580	40,614	40,649	40,685	40,721	40,758	40,797	40,835
Calcasieu Parish	35,182	35,207	35,232	35,261	35,284	35,306	35,330	35,353	35,378	35,403	35,430
East Baton Rouge Parish	65,004	65,058	65,111	65,201	65,248	65,292	65,339	65,389	65,439	65,489	65,544
Jefferson Parish	70,858	70,919	70,980	71,086	71,149	71,216	71,285	71,357	71,433	71,511	71,591
Lafayette Parish	39,894	39,926	39,957	40,008	40,040	40,072	40,104	40,139	40,172	40,210	40,247
Lafourche Parish	18,312	18,335	18,357	18,381	18,393	18,406	18,419	18,432	18,445	18,458	18,472
Orleans Parish	48,056	48,160	48,264	48,478	48,598	48,722	48,856	49,009	49,161	49,335	49,516
Ouachita Parish	32,520	32,548	32,575	32,601	32,626	32,650	32,675	32,699	32,725	32,750	32,774
Rapides Parish	21,690	21,703	21,715	21,733	21,744	21,757	21,768	21,780	21,792	21,804	21,817
St. Bernard Parish	7,083	7,089	7,095	7,103	7,108	7,114	7,119	7,124	7,130	7,136	7,142
St. Charles Parish	9,084	9,093	9,102	9,113	9,126	9,139	9,152	9,167	9,182	9,198	9,215
St. James Parish	3,559	3,560	3,561	3,567	3,568	3,570	3,571	3,573	3,575	3,577	3,578
St. John the Baptist Parish	6,428	6,434	6,439	6,443	6,446	6,450	6,454	6,458	6,462	6,466	6,470
St. Tammany Parish	44,687	44,732	44,776	44,866	44,908	44,948	44,990	45,034	45,075	45,123	45,168

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:		
	12/13	12/14	12/15	12/16	12/18	12/20	12/22
Ascension Parish	22,244	22,275	22,305	22,329	22,382 (4,476) [1,074] {537}	22,440 (4,488) [1,077] {539}	22,504 (4,501) [1,080] {540}
Bossier Parish	22,314	22,341	22,368	22,379	22,412 (4,482) [1,076] {538}	22,444 (4,489) [1,077] {539}	22,478 (4,496) [1,079] {539}
Caddo Parish	40,441	40,488	40,535	40,580	40,649 (8,130) [1,951] {976}	40,721 (8,144) [1,955] {977}	40,797 (8,159) [1,958] {979}
Calcasieu Parish	35,182	35,207	35,232	35,261	35,306 (7,061) [1,695] {847}	35,353 (7,071) [1,697] {848}	35,403 (7,081) [1,699] {850}
East Baton Rouge Parish	65,004	65,058	65,111	65,201	65,292 (13,058) [3,134] {1,567}	65,389 (13,078) [3,139] {1,569}	65,489 (13,098) [3,143] {1,572}
Jefferson Parish	70,858	70,919	70,980	71,086	71,216 (14,243) [3,418] {1,709}	71,357 (14,271) [3,425] {1,713}	71,511 (14,302) [3,433] {1,716}
Lafayette Parish	39,894	39,926	39,957	40,008	40,072 (8,014) [1,923] {962}	40,139 (8,028) [1,927] {963}	40,210 (8,042) [1,930] {965}
Lafourche Parish	18,312	18,335	18,357	18,381	18,406 (3,681) [883] {442}	18,432 (3,686) [885] {442}	18,458 (3,692) [886] {443}
Orleans Parish	48,056	48,160	48,264	48,478	48,722 (9,744) [2,339] {1,169}	49,009 (9,802) [2,352] {1,176}	49,335 (9,867) [2,368] {1,184}
Ouachita Parish	32,520	32,548	32,575	32,601	32,650 (6,530) [1,567] {784}	32,699 (6,540) [1,570] {785}	32,750 (6,550) [1,572] {786}
Rapides Parish	21,690	21,703	21,715	21,733	21,757 (4,351) [1,044] {522}	21,780 (4,356) [1,045] {523}	21,804 (4,361) [1,047] {523}
St. Bernard Parish	7,083	7,089	7,095	7,103	7,114 (1,423) [341] {171}	7,124 (1,425) [342] {171}	7,136 (1,427) [343] {171}
St. Charles Parish	9,084	9,093	9,102	9,113	9,139 (1,828) [439] {219}	9,167 (1,833) [440] {220}	9,198 (1,840) [442] {221}
St. James Parish	3,559	3,560	3,561	3,567	3,570 (714) [171] {86}	3,573 (715) [172] {86}	3,577 (715) [172] {86}
St. John the Baptist Parish	6,428	6,434	6,439	6,443	6,450 (1,290) [310] {155}	6,458 (1,292) [310] {155}	6,466 (1,293) [310] {155}
St. Tammany Parish	44,687	44,732	44,776	44,866	44,948 (8,990) [2,158] {1,079}	45,034 (9,007) [2,162] {1,081}	45,123 (9,025) [2,166] {1,083}

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.