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

Date: 12/29/21

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 12/29/21 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.

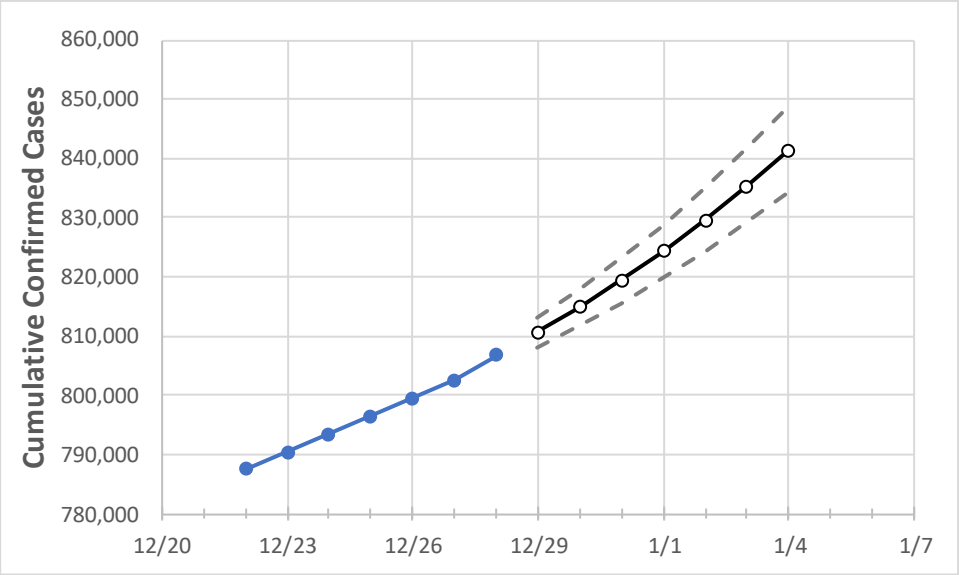
IEM's Modeling Lead

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Louisiana	796,455	799,496	802,537	806,850	810,719	814,921	819,414	824,315	829,592	835,305	841,455

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Ascension Parish	22,694	22,753	22,811	22,952	23,034	23,121	23,214	23,314	23,420	23,532	23,653
Bossier Parish	22,781	22,861	22,941	23,100	23,202	23,310	23,424	23,547	23,681	23,828	23,980
Caddo Parish	41,803	42,044	42,285	42,782	43,141	43,530	43,952	44,420	44,932	45,482	46,098
Calcasieu Parish	35,812	35,910	36,008	36,180	36,307	36,448	36,599	36,761	36,935	37,123	37,323
East Baton Rouge Parish	66,500	66,733	66,967	67,471	67,827	68,216	68,642	69,111	69,618	70,187	70,791
Jefferson Parish	73,818	74,351	74,885	75,466	76,162	76,918	77,762	78,688	79,718	80,845	82,094
Lafayette Parish	40,576	40,686	40,796	40,937	41,069	41,211	41,363	41,528	41,704	41,893	42,098
Lafourche Parish	18,611	18,647	18,683	18,734	18,776	18,819	18,866	18,915	18,966	19,021	19,078
Orleans Parish	52,079	52,701	53,322	53,919	54,704	55,564	56,491	57,509	58,626	59,840	61,166
Ouachita Parish	32,996	33,060	33,124	33,212	33,279	33,349	33,421	33,498	33,578	33,660	33,748
Rapides Parish	22,078	22,136	22,193	22,293	22,371	22,456	22,547	22,645	22,752	22,865	22,988
St. Bernard Parish	7,348	7,395	7,441	7,505	7,568	7,638	7,714	7,797	7,888	7,988	8,098
St. Charles Parish	9,382	9,426	9,470	9,529	9,586	9,648	9,714	9,786	9,862	9,946	10,035
St. James Parish	3,640	3,653	3,665	3,674	3,690	3,707	3,726	3,746	3,769	3,794	3,821
St. John the Baptist Parish	6,646	6,686	6,727	6,752	6,800	6,853	6,911	6,975	7,045	7,122	7,206
St. Tammany Parish	45,902	46,091	46,280	46,615	46,869	47,141	47,437	47,759	48,100	48,480	48,879

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:		
	12/25	12/26	12/27	12/28	12/30	1/1	1/3
Ascension Parish	22,694	22,753	22,811	22,952	23,121 (4,624) [1,110] {555}	23,314 (4,663) [1,119] {560}	23,532 (4,706) [1,130] {565}
Bossier Parish	22,781	22,861	22,941	23,100	23,310 (4,662) [1,119] {559}	23,547 (4,709) [1,130] {565}	23,828 (4,766) [1,144] {572}
Caddo Parish	41,803	42,044	42,285	42,782	43,530 (8,706) [2,089] {1,045}	44,420 (8,884) [2,132] {1,066}	45,482 (9,096) [2,183] {1,092}
Calcasieu Parish	35,812	35,910	36,008	36,180	36,448 (7,290) [1,749] {875}	36,761 (7,352) [1,765] {882}	37,123 (7,425) [1,782] {891}
East Baton Rouge Parish	66,500	66,733	66,967	67,471	68,216 (13,643) [3,274] {1,637}	69,111 (13,822) [3,317] {1,659}	70,187 (14,037) [3,369] {1,684}
Jefferson Parish	73,818	74,351	74,885	75,466	76,918 (15,384) [3,692] {1,846}	78,688 (15,738) [3,777] {1,889}	80,845 (16,169) [3,881] {1,940}
Lafayette Parish	40,576	40,686	40,796	40,937	41,211 (8,242) [1,978] {989}	41,528 (8,306) [1,993] {997}	41,893 (8,379) [2,011] {1,005}
Lafourche Parish	18,611	18,647	18,683	18,734	18,819 (3,764) [903] {452}	18,915 (3,783) [908] {454}	19,021 (3,804) [913] {456}
Orleans Parish	52,079	52,701	53,322	53,919	55,564 (11,113) [2,667] {1,334}	57,509 (11,502) [2,760] {1,380}	59,840 (11,968) [2,872] {1,436}
Ouachita Parish	32,996	33,060	33,124	33,212	33,349 (6,670) [1,601] {800}	33,498 (6,700) [1,608] {804}	33,660 (6,732) [1,616] {808}
Rapides Parish	22,078	22,136	22,193	22,293	22,456 (4,491) [1,078] {539}	22,645 (4,529) [1,087] {543}	22,865 (4,573) [1,098] {549}
St. Bernard Parish	7,348	7,395	7,441	7,505	7,638 (1,528) [367] {183}	7,797 (1,559) [374] {187}	7,988 (1,598) [383] {192}
St. Charles Parish	9,382	9,426	9,470	9,529	9,648 (1,930) [463] {232}	9,786 (1,957) [470] {235}	9,946 (1,989) [477] {239}
St. James Parish	3,640	3,653	3,665	3,674	3,707 (741) [178] {89}	3,746 (749) [180] {90}	3,794 (759) [182] {91}
St. John the Baptist Parish	6,646	6,686	6,727	6,752	6,853 (1,371) [329] {164}	6,975 (1,395) [335] {167}	7,122 (1,424) [342] {171}
St. Tammany Parish	45,902	46,091	46,280	46,615	47,141 (9,428) [2,263] {1,131}	47,759 (9,552) [2,292] {1,146}	48,480 (9,696) [2,327] {1,164}

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.