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

Date: 2/2/21

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 2/2/21 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.

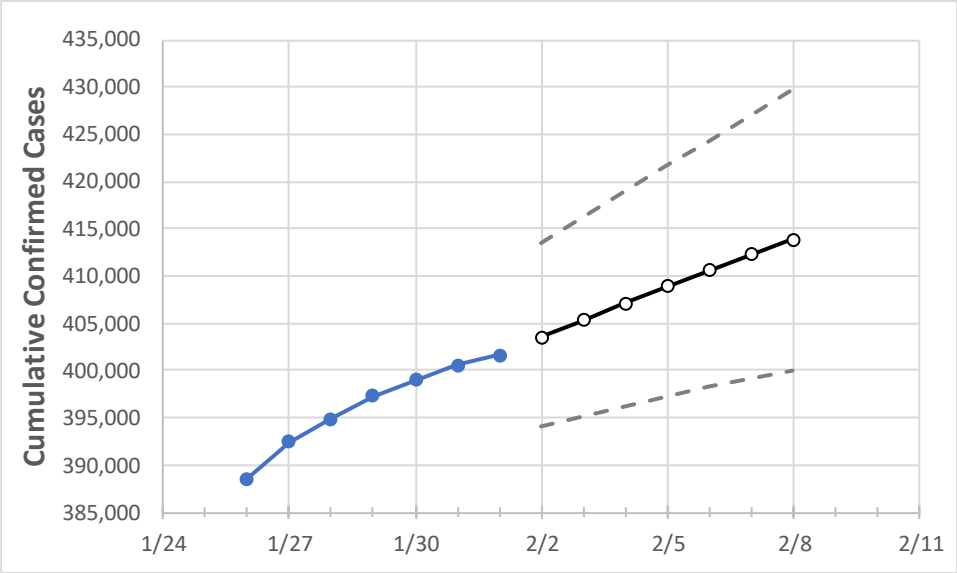
IEM's Modeling Lead

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:						
	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8
Louisiana	397,276	398,951	400,626	401,591	403,520	405,320	407,154	408,934	410,594	412,262	413,885

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:						
	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8
Ascension Parish	10,205	10,256	10,307	10,325	10,374	10,421	10,469	10,515	10,559	10,602	10,645
Bossier Parish	11,695	11,764	11,833	11,865	11,941	12,018	12,098	12,176	12,252	12,330	12,404
Caddo Parish	22,644	22,764	22,883	22,924	23,034	23,142	23,246	23,348	23,449	23,543	23,635
Calcasieu Parish	17,614	17,700	17,786	17,809	17,910	18,011	18,103	18,199	18,293	18,385	18,474
East Baton Rouge Parish	32,307	32,476	32,644	32,718	32,876	33,035	33,192	33,347	33,500	33,652	33,800
Jefferson Parish	40,755	40,955	41,155	41,278	41,481	41,690	41,889	42,077	42,268	42,453	42,635
Lafayette Parish	20,457	20,531	20,605	20,679	20,757	20,835	20,908	20,980	21,052	21,124	21,195
Lafourche Parish	8,218	8,261	8,303	8,322	8,383	8,444	8,505	8,566	8,624	8,685	8,746
Orleans Parish	26,177	26,318	26,458	26,540	26,648	26,759	26,872	26,975	27,075	27,175	27,270
Ouachita Parish	16,992	17,033	17,074	17,104	17,159	17,213	17,265	17,314	17,362	17,411	17,453
Rapides Parish	10,648	10,679	10,710	10,728	10,776	10,824	10,873	10,918	10,962	11,006	11,049
St. Bernard Parish	3,226	3,248	3,270	3,282	3,303	3,323	3,344	3,364	3,384	3,402	3,422
St. Charles Parish	4,752	4,767	4,782	4,788	4,807	4,826	4,844	4,861	4,879	4,895	4,911
St. James Parish	1,709	1,717	1,724	1,738	1,746	1,753	1,760	1,766	1,773	1,780	1,786
St. John the Baptist Parish	3,270	3,279	3,287	3,297	3,313	3,329	3,345	3,360	3,375	3,390	3,405
St. Tammany Parish	21,444	21,532	21,620	21,688	21,827	21,964	22,098	22,232	22,363	22,491	22,617

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:		
	1/29	1/30	1/31	2/1	2/3	2/5	2/7
Ascension Parish	10,205	10,256	10,307	10,325	10,421 (2,084) [500] {250}	10,515 (2,103) [505] {252}	10,602 (2,120) [509] {254}
Bossier Parish	11,695	11,764	11,833	11,865	12,018 (2,404) [577] {288}	12,176 (2,435) [584] {292}	12,330 (2,466) [592] {296}
Caddo Parish	22,644	22,764	22,883	22,924	23,142 (4,628) [1,111] {555}	23,348 (4,670) [1,121] {560}	23,543 (4,709) [1,130] {565}
Calcasieu Parish	17,614	17,700	17,786	17,809	18,011 (3,602) [865] {432}	18,199 (3,640) [874] {437}	18,385 (3,677) [882] {441}
East Baton Rouge Parish	32,307	32,476	32,644	32,718	33,035 (6,607) [1,586] {793}	33,347 (6,669) [1,601] {800}	33,652 (6,730) [1,615] {808}
Jefferson Parish	40,755	40,955	41,155	41,278	41,690 (8,338) [2,001] {1,001}	42,077 (8,415) [2,020] {1,010}	42,453 (8,491) [2,038] {1,019}
Lafayette Parish	20,457	20,531	20,605	20,679	20,835 (4,167) [1,000] {500}	20,980 (4,196) [1,007] {504}	21,124 (4,225) [1,014] {507}
Lafourche Parish	8,218	8,261	8,303	8,322	8,444 (1,689) [405] {203}	8,566 (1,713) [411] {206}	8,685 (1,737) [417] {208}
Orleans Parish	26,177	26,318	26,458	26,540	26,759 (5,352) [1,284] {642}	26,975 (5,395) [1,295] {647}	27,175 (5,435) [1,304] {652}
Ouachita Parish	16,992	17,033	17,074	17,104	17,213 (3,443) [826] {413}	17,314 (3,463) [831] {416}	17,411 (3,482) [836] {418}
Rapides Parish	10,648	10,679	10,710	10,728	10,824 (2,165) [520] {260}	10,918 (2,184) [524] {262}	11,006 (2,201) [528] {264}
St. Bernard Parish	3,226	3,248	3,270	3,282	3,323 (665) [160] {80}	3,364 (673) [161] {81}	3,402 (680) [163] {82}
St. Charles Parish	4,752	4,767	4,782	4,788	4,826 (965) [232] {116}	4,861 (972) [233] {117}	4,895 (979) [235] {117}
St. James Parish	1,709	1,717	1,724	1,738	1,753 (351) [84] {42}	1,766 (353) [85] {42}	1,780 (356) [85] {43}
St. John the Baptist Parish	3,270	3,279	3,287	3,297	3,329 (666) [160] {80}	3,360 (672) [161] {81}	3,390 (678) [163] {81}
St. Tammany Parish	21,444	21,532	21,620	21,688	21,964 (4,393) [1,054] {527}	22,232 (4,446) [1,067] {534}	22,491 (4,498) [1,080] {540}

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.