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

Date: 2/19/21

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 2/19/21 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.

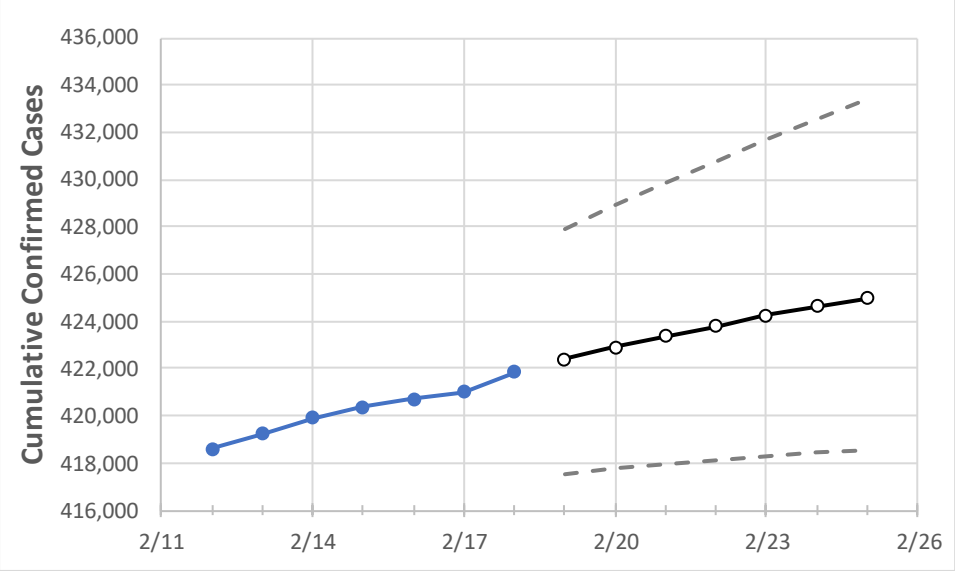
IEM's Modeling Lead

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:						
	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25
Louisiana	420,394	420,706	421,018	421,846	422,384	422,894	423,365	423,799	424,239	424,634	424,990

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:						
	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25
Ascension Parish	10,756	10,759	10,761	10,783	10,794	10,804	10,813	10,822	10,831	10,838	10,845
Bossier Parish	12,807	12,817	12,827	12,842	12,862	12,881	12,898	12,915	12,929	12,943	12,956
Caddo Parish	24,374	24,395	24,415	24,407	24,437	24,463	24,488	24,512	24,534	24,554	24,573
Calcasieu Parish	18,725	18,722	18,718	18,748	18,782	18,813	18,844	18,873	18,901	18,928	18,952
East Baton Rouge Parish	34,631	34,652	34,673	34,795	34,855	34,912	34,960	35,007	35,055	35,098	35,143
Jefferson Parish	42,947	43,001	43,055	43,172	43,237	43,296	43,351	43,404	43,454	43,503	43,550
Lafayette Parish	21,295	21,305	21,315	21,344	21,365	21,385	21,404	21,422	21,439	21,455	21,470
Lafourche Parish	8,861	8,884	8,906	8,915	8,933	8,949	8,964	8,979	8,994	9,007	9,020
Orleans Parish	27,744	27,774	27,803	27,875	27,915	27,952	27,988	28,022	28,054	28,086	28,112
Ouachita Parish	17,579	17,583	17,586	17,590	17,605	17,618	17,631	17,644	17,656	17,667	17,677
Rapides Parish	11,103	11,107	11,112	11,131	11,143	11,153	11,164	11,174	11,182	11,190	11,198
St. Bernard Parish	3,532	3,542	3,552	3,564	3,576	3,588	3,599	3,610	3,621	3,632	3,642
St. Charles Parish	4,998	5,007	5,015	5,011	5,022	5,032	5,042	5,052	5,063	5,072	5,081
St. James Parish	1,814	1,815	1,815	1,821	1,825	1,829	1,833	1,837	1,840	1,844	1,847
St. John the Baptist Parish	3,456	3,461	3,465	3,466	3,472	3,477	3,481	3,485	3,490	3,494	3,498
St. Tammany Parish	23,025	23,055	23,084	23,182	23,236	23,291	23,343	23,394	23,442	23,488	23,533

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:		
	2/15	2/16	2/17	2/18	2/20	2/22	2/24
Ascension Parish	10,756	10,759	10,761	10,783	10,804 (2,161) [519] {259}	10,822 (2,164) [519] {260}	10,838 (2,168) [520] {260}
Bossier Parish	12,807	12,817	12,827	12,842	12,881 (2,576) [618] {309}	12,915 (2,583) [620] {310}	12,943 (2,589) [621] {311}
Caddo Parish	24,374	24,395	24,415	24,407	24,463 (4,893) [1,174] {587}	24,512 (4,902) [1,177] {588}	24,554 (4,911) [1,179] {589}
Calcasieu Parish	18,725	18,722	18,718	18,748	18,813 (3,763) [903] {452}	18,873 (3,775) [906] {453}	18,928 (3,786) [909] {454}
East Baton Rouge Parish	34,631	34,652	34,673	34,795	34,912 (6,982) [1,676] {838}	35,007 (7,001) [1,680] {840}	35,098 (7,020) [1,685] {842}
Jefferson Parish	42,947	43,001	43,055	43,172	43,296 (8,659) [2,078] {1,039}	43,404 (8,681) [2,083] {1,042}	43,503 (8,701) [2,088] {1,044}
Lafayette Parish	21,295	21,305	21,315	21,344	21,385 (4,277) [1,026] {513}	21,422 (4,284) [1,028] {514}	21,455 (4,291) [1,030] {515}
Lafourche Parish	8,861	8,884	8,906	8,915	8,949 (1,790) [430] {215}	8,979 (1,796) [431] {215}	9,007 (1,801) [432] {216}
Orleans Parish	27,744	27,774	27,803	27,875	27,952 (5,590) [1,342] {671}	28,022 (5,604) [1,345] {673}	28,086 (5,617) [1,348] {674}
Ouachita Parish	17,579	17,583	17,586	17,590	17,618 (3,524) [846] {423}	17,644 (3,529) [847] {423}	17,667 (3,533) [848] {424}
Rapides Parish	11,103	11,107	11,112	11,131	11,153 (2,231) [535] {268}	11,174 (2,235) [536] {268}	11,190 (2,238) [537] {269}
St. Bernard Parish	3,532	3,542	3,552	3,564	3,588 (718) [172] {86}	3,610 (722) [173] {87}	3,632 (726) [174] {87}
St. Charles Parish	4,998	5,007	5,015	5,011	5,032 (1,006) [242] {121}	5,052 (1,010) [243] {121}	5,072 (1,014) [243] {122}
St. James Parish	1,814	1,815	1,815	1,821	1,829 (366) [88] {44}	1,837 (367) [88] {44}	1,844 (369) [88] {44}
St. John the Baptist Parish	3,456	3,461	3,465	3,466	3,477 (695) [167] {83}	3,485 (697) [167] {84}	3,494 (699) [168] {84}
St. Tammany Parish	23,025	23,055	23,084	23,182	23,291 (4,658) [1,118] {559}	23,394 (4,679) [1,123] {561}	23,488 (4,698) [1,127] {564}

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.