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

Date: 1/29/21

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 1/29/21 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.

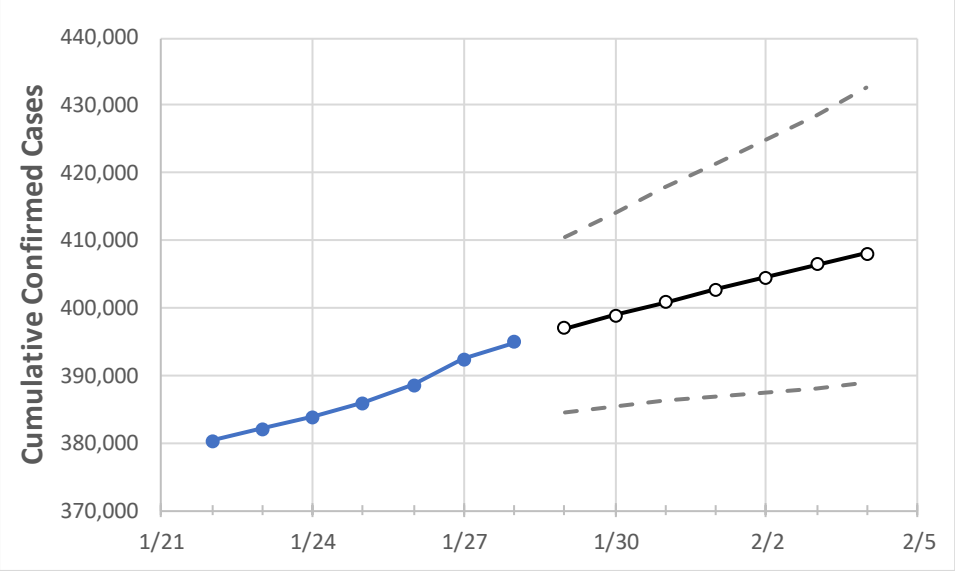
IEM's Modeling Lead

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Louisiana	385,942	388,562	392,416	394,909	396,930	398,893	400,818	402,695	404,528	406,358	408,048

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Ascension Parish	9,874	9,922	10,107	10,153	10,202	10,253	10,303	10,350	10,396	10,439	10,484
Bossier Parish	11,278	11,383	11,514	11,600	11,692	11,786	11,881	11,978	12,074	12,176	12,276
Caddo Parish	22,074	22,197	22,380	22,539	22,678	22,812	22,948	23,079	23,211	23,345	23,476
Calcasieu Parish	16,970	17,076	17,385	17,525	17,644	17,762	17,884	18,004	18,125	18,244	18,358
East Baton Rouge Parish	31,369	31,505	31,914	32,101	32,242	32,373	32,496	32,621	32,745	32,854	32,966
Jefferson Parish	39,564	39,845	40,200	40,450	40,661	40,869	41,069	41,266	41,460	41,645	41,830
Lafayette Parish	20,020	20,094	20,287	20,386	20,465	20,544	20,625	20,709	20,784	20,859	20,930
Lafourche Parish	7,848	7,966	8,059	8,120	8,192	8,265	8,338	8,411	8,488	8,566	8,646
Orleans Parish	25,559	25,754	25,893	26,039	26,153	26,265	26,377	26,480	26,582	26,680	26,775
Ouachita Parish	16,639	16,729	16,838	16,935	17,015	17,091	17,167	17,241	17,316	17,392	17,466
Rapides Parish	10,317	10,368	10,566	10,602	10,666	10,730	10,797	10,860	10,926	10,992	11,056
St. Bernard Parish	3,107	3,142	3,189	3,214	3,240	3,265	3,292	3,316	3,341	3,365	3,389
St. Charles Parish	4,629	4,658	4,691	4,720	4,744	4,766	4,789	4,812	4,831	4,850	4,869
St. James Parish	1,670	1,684	1,697	1,700	1,707	1,714	1,721	1,727	1,734	1,740	1,746
St. John the Baptist Parish	3,190	3,202	3,222	3,246	3,263	3,279	3,296	3,313	3,329	3,345	3,361
St. Tammany Parish	20,484	20,736	20,888	21,126	21,277	21,435	21,572	21,716	21,866	22,005	22,143

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:		
	1/25	1/26	1/27	1/28	1/30	2/1	2/3
Ascension Parish	9,874	9,922	10,107	10,153	10,253 (2,051) [492] {246}	10,350 (2,070) [497] {248}	10,439 (2,088) [501] {251}
Bossier Parish	11,278	11,383	11,514	11,600	11,786 (2,357) [566] {283}	11,978 (2,396) [575] {287}	12,176 (2,435) [584] {292}
Caddo Parish	22,074	22,197	22,380	22,539	22,812 (4,562) [1,095] {547}	23,079 (4,616) [1,108] {554}	23,345 (4,669) [1,121] {560}
Calcasieu Parish	16,970	17,076	17,385	17,525	17,762 (3,552) [853] {426}	18,004 (3,601) [864] {432}	18,244 (3,649) [876] {438}
East Baton Rouge Parish	31,369	31,505	31,914	32,101	32,373 (6,475) [1,554] {777}	32,621 (6,524) [1,566] {783}	32,854 (6,571) [1,577] {789}
Jefferson Parish	39,564	39,845	40,200	40,450	40,869 (8,174) [1,962] {981}	41,266 (8,253) [1,981] {990}	41,645 (8,329) [1,999] {999}
Lafayette Parish	20,020	20,094	20,287	20,386	20,544 (4,109) [986] {493}	20,709 (4,142) [994] {497}	20,859 (4,172) [1,001] {501}
Lafourche Parish	7,848	7,966	8,059	8,120	8,265 (1,653) [397] {198}	8,411 (1,682) [404] {202}	8,566 (1,713) [411] {206}
Orleans Parish	25,559	25,754	25,893	26,039	26,265 (5,253) [1,261] {630}	26,480 (5,296) [1,271] {636}	26,680 (5,336) [1,281] {640}
Ouachita Parish	16,639	16,729	16,838	16,935	17,091 (3,418) [820] {410}	17,241 (3,448) [828] {414}	17,392 (3,478) [835] {417}
Rapides Parish	10,317	10,368	10,566	10,602	10,730 (2,146) [515] {258}	10,860 (2,172) [521] {261}	10,992 (2,198) [528] {264}
St. Bernard Parish	3,107	3,142	3,189	3,214	3,265 (653) [157] {78}	3,316 (663) [159] {80}	3,365 (673) [162] {81}
St. Charles Parish	4,629	4,658	4,691	4,720	4,766 (953) [229] {114}	4,812 (962) [231] {115}	4,850 (970) [233] {116}
St. James Parish	1,670	1,684	1,697	1,700	1,714 (343) [82] {41}	1,727 (345) [83] {41}	1,740 (348) [84] {42}
St. John the Baptist Parish	3,190	3,202	3,222	3,246	3,279 (656) [157] {79}	3,313 (663) [159] {80}	3,345 (669) [161] {80}
St. Tammany Parish	20,484	20,736	20,888	21,126	21,435 (4,287) [1,029] {514}	21,716 (4,343) [1,042] {521}	22,005 (4,401) [1,056] {528}

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.