IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/12/21

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 <u>not</u> 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 2/12/21 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
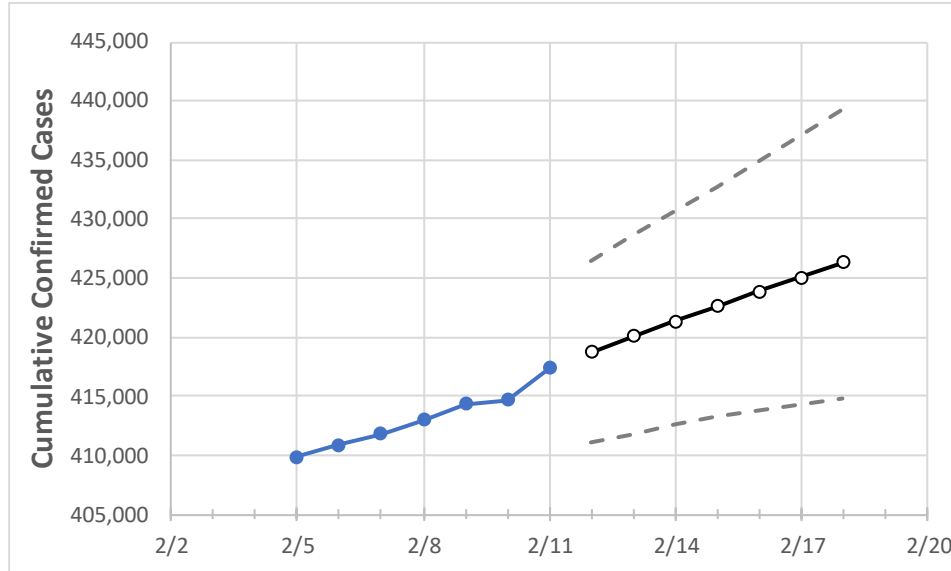
	Actual Confirmed Cases On:				Projected Cases For:						
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18
Louisiana	412,989	414,354	414,687	417,415	418,756	420,098	421,379	422,633	423,892	425,093	426,315

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:						
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18
Ascension Parish	10,624	10,665	10,687	10,708	10,741	10,771	10,800	10,829	10,856	10,882	10,908
Bossier Parish	12,547	12,604	12,608	12,702	12,776	12,850	12,924	12,997	13,066	13,137	13,210
Caddo Parish	24,031	24,100	24,115	24,245	24,354	24,462	24,565	24,668	24,771	24,874	24,973
Calcasieu Parish	18,327	18,436	18,443	18,589	18,651	18,708	18,770	18,828	18,886	18,941	18,998
East Baton Rouge Parish	33,958	34,088	34,096	34,357	34,493	34,626	34,761	34,883	35,007	35,130	35,248
Jefferson Parish	42,213	42,339	42,408	42,647	42,763	42,873	42,980	43,082	43,180	43,274	43,361
Lafayette Parish	21,078	21,106	21,133	21,200	21,247	21,291	21,335	21,375	21,414	21,452	21,490
Lafourche Parish	8,655	8,702	8,708	8,795	8,836	8,876	8,916	8,956	8,993	9,030	9,067
Orleans Parish	27,245	27,375	27,408	27,544	27,629	27,712	27,792	27,870	27,948	28,021	28,094
Ouachita Parish	17,382	17,406	17,401	17,499	17,534	17,567	17,600	17,632	17,663	17,692	17,720
Rapides Parish	10,951	10,988	10,998	11,073	11,099	11,126	11,151	11,176	11,201	11,225	11,247
St. Bernard Parish	3,408	3,431	3,441	3,486	3,503	3,519	3,536	3,553	3,569	3,585	3,602
St. Charles Parish	4,901	4,915	4,923	4,949	4,962	4,974	4,986	4,998	5,009	5,020	5,031
St. James Parish	1,774	1,786	1,783	1,792	1,798	1,804	1,810	1,815	1,821	1,826	1,832
St. John the Baptist Parish	3,385	3,394	3,397	3,415	3,425	3,434	3,443	3,452	3,460	3,468	3,477
St. Tammany Parish	22,423	22,507	22,543	22,767	22,855	22,939	23,021	23,098	23,178	23,254	23,326

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](link)) 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:		
	2/8	2/9	2/10	2/11	2/13	2/15	2/17
Ascension Parish	10,624	10,665	10,687	10,708	10,771 (2,154) [517] {258}	10,829 (2,166) [520] {260}	10,882 (2,176) [522] {261}
Bossier Parish	12,547	12,604	12,608	12,702	12,850 (2,570) [617] {308}	12,997 (2,599) [624] {312}	13,137 (2,627) [631] {315}
Caddo Parish	24,031	24,100	24,115	24,245	24,462 (4,892) [1,174] {587}	24,668 (4,934) [1,184] {592}	24,874 (4,975) [1,194] {597}
Calcasieu Parish	18,327	18,436	18,443	18,589	18,708 (3,742) [898] {449}	18,828 (3,766) [904] {452}	18,941 (3,788) [909] {455}
East Baton Rouge Parish	33,958	34,088	34,096	34,357	34,626 (6,925) [1,662] {831}	34,883 (6,977) [1,674] {837}	35,130 (7,026) [1,686] {843}
Jefferson Parish	42,213	42,339	42,408	42,647	42,873 (8,575) [2,058] {1,029}	43,082 (8,616) [2,068] {1,034}	43,274 (8,655) [2,077] {1,039}
Lafayette Parish	21,078	21,106	21,133	21,200	21,291 (4,258) [1,022] {511}	21,375 (4,275) [1,026] {513}	21,452 (4,290) [1,030] {515}
Lafourche Parish	8,655	8,702	8,708	8,795	8,876 (1,775) [426] {213}	8,956 (1,791) [430] {215}	9,030 (1,806) [433] {217}
Orleans Parish	27,245	27,375	27,408	27,544	27,712 (5,542) [1,330] {665}	27,870 (5,574) [1,338] {669}	28,021 (5,604) [1,345] {673}
Ouachita Parish	17,382	17,406	17,401	17,499	17,567 (3,513) [843] {422}	17,632 (3,526) [846] {423}	17,692 (3,538) [849] {425}
Rapides Parish	10,951	10,988	10,998	11,073	11,126 (2,225) [534] {267}	11,176 (2,235) [536] {268}	11,225 (2,245) [539] {269}
St. Bernard Parish	3,408	3,431	3,441	3,486	3,519 (704) [169] {84}	3,553 (711) [171] {85}	3,585 (717) [172] {86}
St. Charles Parish	4,901	4,915	4,923	4,949	4,974 (995) [239] {119}	4,998 (1,000) [240] {120}	5,020 (1,004) [241] {120}
St. James Parish	1,774	1,786	1,783	1,792	1,804 (361) [87] {43}	1,815 (363) [87] {44}	1,826 (365) [88] {44}
St. John the Baptist Parish	3,385	3,394	3,397	3,415	3,434 (687) [165] {82}	3,452 (690) [166] {83}	3,468 (694) [166] {83}
St. Tammany Parish	22,423	22,507	22,543	22,767	22,939 (4,588) [1,101] {551}	23,098 (4,620) [1,109] {554}	23,254 (4,651) [1,116] {558}

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.