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

Date: 4/28/21

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 4/28/21 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.

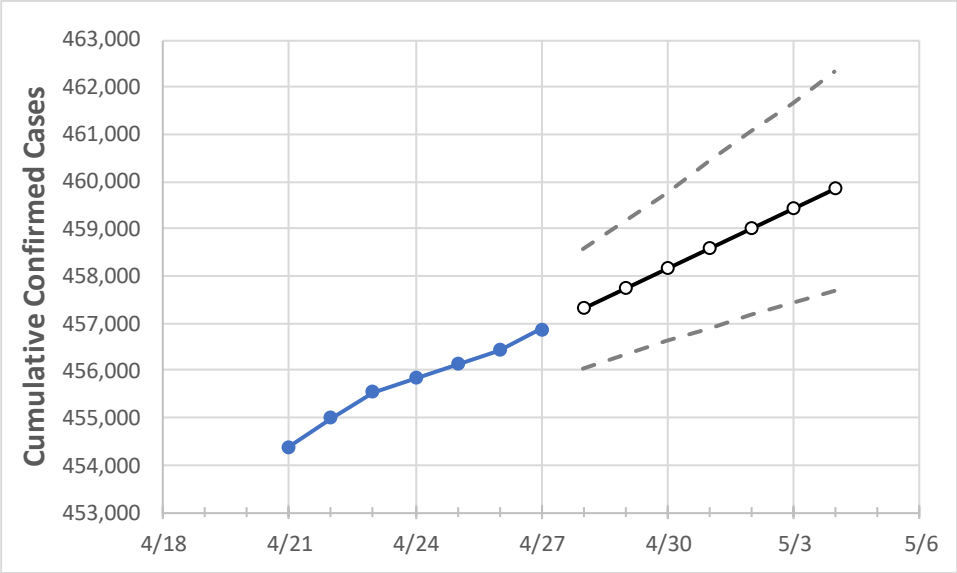
IEM's Modeling Lead

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:						
	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4
Louisiana	455,838	456,135	456,432	456,884	457,315	457,746	458,170	458,588	459,007	459,425	459,843

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:						
	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4
Ascension Parish	11,953	11,966	11,980	11,992	12,006	12,021	12,036	12,049	12,064	12,077	12,091
Bossier Parish	13,655	13,665	13,675	13,687	13,704	13,722	13,739	13,757	13,774	13,792	13,809
Caddo Parish	25,656	25,679	25,701	25,725	25,752	25,780	25,807	25,834	25,862	25,891	25,919
Calcasieu Parish	22,188	22,209	22,230	22,263	22,287	22,310	22,333	22,354	22,376	22,397	22,417
East Baton Rouge Parish	38,776	38,812	38,848	38,902	38,962	39,022	39,080	39,141	39,202	39,263	39,319
Jefferson Parish	45,719	45,742	45,766	45,803	45,833	45,865	45,897	45,929	45,960	45,992	46,026
Lafayette Parish	23,007	23,039	23,071	23,106	23,142	23,178	23,215	23,253	23,291	23,329	23,369
Lafourche Parish	9,479	9,484	9,489	9,495	9,502	9,508	9,515	9,523	9,530	9,538	9,546
Orleans Parish	29,739	29,757	29,775	29,807	29,827	29,848	29,869	29,891	29,912	29,933	29,955
Ouachita Parish	18,189	18,204	18,218	18,215	18,234	18,255	18,276	18,298	18,321	18,344	18,367
Rapides Parish	11,883	11,884	11,886	11,899	11,910	11,921	11,931	11,942	11,953	11,963	11,974
St. Bernard Parish	3,986	3,989	3,991	3,997	3,999	4,001	4,003	4,005	4,007	4,009	4,011
St. Charles Parish	5,356	5,358	5,361	5,360	5,363	5,366	5,369	5,372	5,375	5,378	5,382
St. James Parish	1,938	1,940	1,941	1,939	1,940	1,942	1,943	1,944	1,945	1,947	1,948
St. John the Baptist Parish	3,683	3,685	3,688	3,689	3,693	3,696	3,700	3,703	3,707	3,711	3,715
St. Tammany Parish	25,454	25,470	25,485	25,511	25,536	25,562	25,588	25,615	25,643	25,671	25,701

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:		
	4/24	4/25	4/26	4/27	4/29	5/1	5/3
Ascension Parish	11,953	11,966	11,980	11,992	12,021 (2,404) [577] {289}	12,049 (2,410) [578] {289}	12,077 (2,415) [580] {290}
Bossier Parish	13,655	13,665	13,675	13,687	13,722 (2,744) [659] {329}	13,757 (2,751) [660] {330}	13,792 (2,758) [662] {331}
Caddo Parish	25,656	25,679	25,701	25,725	25,780 (5,156) [1,237] {619}	25,834 (5,167) [1,240] {620}	25,891 (5,178) [1,243] {621}
Calcasieu Parish	22,188	22,209	22,230	22,263	22,310 (4,462) [1,071] {535}	22,354 (4,471) [1,073] {537}	22,397 (4,479) [1,075] {538}
East Baton Rouge Parish	38,776	38,812	38,848	38,902	39,022 (7,804) [1,873] {937}	39,141 (7,828) [1,879] {939}	39,263 (7,853) [1,885] {942}
Jefferson Parish	45,719	45,742	45,766	45,803	45,865 (9,173) [2,202] {1,101}	45,929 (9,186) [2,205] {1,102}	45,992 (9,198) [2,208] {1,104}
Lafayette Parish	23,007	23,039	23,071	23,106	23,178 (4,636) [1,113] {556}	23,253 (4,651) [1,116] {558}	23,329 (4,666) [1,120] {560}
Lafourche Parish	9,479	9,484	9,489	9,495	9,508 (1,902) [456] {228}	9,523 (1,905) [457] {229}	9,538 (1,908) [458] {229}
Orleans Parish	29,739	29,757	29,775	29,807	29,848 (5,970) [1,433] {716}	29,891 (5,978) [1,435] {717}	29,933 (5,987) [1,437] {718}
Ouachita Parish	18,189	18,204	18,218	18,215	18,255 (3,651) [876] {438}	18,298 (3,660) [878] {439}	18,344 (3,669) [881] {440}
Rapides Parish	11,883	11,884	11,886	11,899	11,921 (2,384) [572] {286}	11,942 (2,388) [573] {287}	11,963 (2,393) [574] {287}
St. Bernard Parish	3,986	3,989	3,991	3,997	4,001 (800) [192] {96}	4,005 (801) [192] {96}	4,009 (802) [192] {96}
St. Charles Parish	5,356	5,358	5,361	5,360	5,366 (1,073) [258] {129}	5,372 (1,074) [258] {129}	5,378 (1,076) [258] {129}
St. James Parish	1,938	1,940	1,941	1,939	1,942 (388) [93] {47}	1,944 (389) [93] {47}	1,947 (389) [93] {47}
St. John the Baptist Parish	3,683	3,685	3,688	3,689	3,696 (739) [177] {89}	3,703 (741) [178] {89}	3,711 (742) [178] {89}
St. Tammany Parish	25,454	25,470	25,485	25,511	25,562 (5,112) [1,227] {613}	25,615 (5,123) [1,230] {615}	25,671 (5,134) [1,232] {616}

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.