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

Date: 4/27/21

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 4/27/21 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.

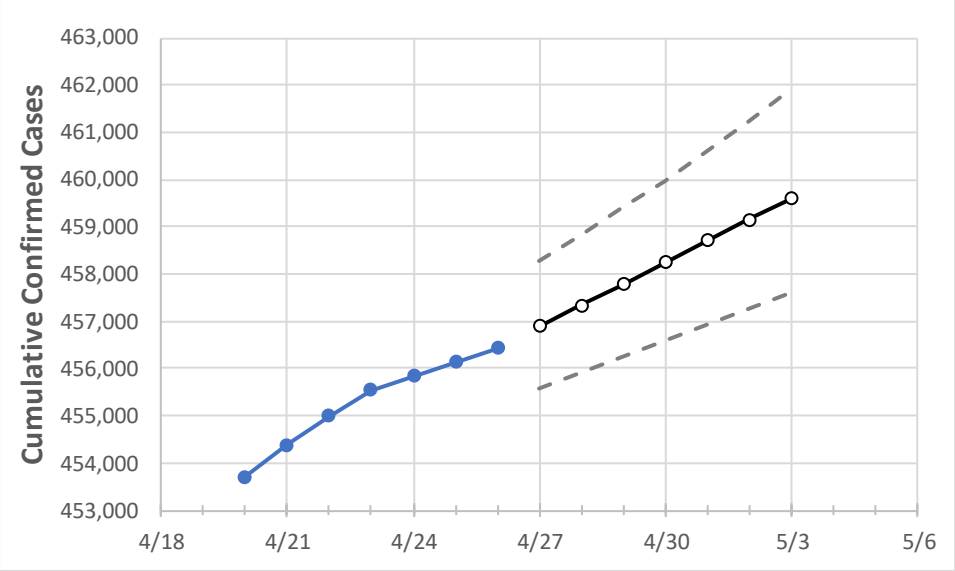
IEM's Modeling Lead

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:						
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3
Louisiana	455,541	455,838	456,135	456,432	456,887	457,333	457,789	458,242	458,702	459,160	459,597

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:						
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3
Ascension Parish	11,939	11,953	11,966	11,980	11,995	12,010	12,025	12,040	12,054	12,069	12,084
Bossier Parish	13,645	13,655	13,665	13,675	13,693	13,713	13,732	13,752	13,772	13,793	13,814
Caddo Parish	25,634	25,656	25,679	25,701	25,729	25,758	25,788	25,818	25,848	25,879	25,910
Calcasieu Parish	22,167	22,188	22,209	22,230	22,258	22,285	22,312	22,339	22,366	22,391	22,416
East Baton Rouge Parish	38,740	38,776	38,812	38,848	38,910	38,972	39,038	39,103	39,167	39,232	39,300
Jefferson Parish	45,695	45,719	45,742	45,766	45,795	45,825	45,856	45,886	45,917	45,947	45,978
Lafayette Parish	22,975	23,007	23,039	23,071	23,109	23,148	23,187	23,229	23,269	23,310	23,351
Lafourche Parish	9,474	9,479	9,484	9,489	9,495	9,502	9,508	9,515	9,522	9,528	9,536
Orleans Parish	29,721	29,739	29,757	29,775	29,793	29,812	29,830	29,848	29,866	29,885	29,904
Ouachita Parish	18,175	18,189	18,204	18,218	18,237	18,257	18,278	18,298	18,320	18,342	18,365
Rapides Parish	11,881	11,883	11,884	11,886	11,898	11,909	11,921	11,933	11,945	11,957	11,969
St. Bernard Parish	3,984	3,986	3,989	3,991	3,993	3,994	3,996	3,998	4,000	4,001	4,003
St. Charles Parish	5,353	5,356	5,358	5,361	5,364	5,367	5,371	5,374	5,377	5,380	5,383
St. James Parish	1,937	1,938	1,940	1,941	1,943	1,944	1,945	1,947	1,948	1,950	1,951
St. John the Baptist Parish	3,680	3,683	3,685	3,688	3,692	3,696	3,700	3,704	3,709	3,713	3,718
St. Tammany Parish	25,439	25,454	25,470	25,485	25,507	25,528	25,550	25,572	25,594	25,617	25,640

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:		
	4/23	4/24	4/25	4/26	4/28	4/30	5/2
Ascension Parish	11,939	11,953	11,966	11,980	12,010 (2,402) [576] {288}	12,040 (2,408) [578] {289}	12,069 (2,414) [579] {290}
Bossier Parish	13,645	13,655	13,665	13,675	13,713 (2,743) [658] {329}	13,752 (2,750) [660] {330}	13,793 (2,759) [662] {331}
Caddo Parish	25,634	25,656	25,679	25,701	25,758 (5,152) [1,236] {618}	25,818 (5,164) [1,239] {620}	25,879 (5,176) [1,242] {621}
Calcasieu Parish	22,167	22,188	22,209	22,230	22,285 (4,457) [1,070] {535}	22,339 (4,468) [1,072] {536}	22,391 (4,478) [1,075] {537}
East Baton Rouge Parish	38,740	38,776	38,812	38,848	38,972 (7,794) [1,871] {935}	39,103 (7,821) [1,877] {938}	39,232 (7,846) [1,883] {942}
Jefferson Parish	45,695	45,719	45,742	45,766	45,825 (9,165) [2,200] {1,100}	45,886 (9,177) [2,203] {1,101}	45,947 (9,189) [2,205] {1,103}
Lafayette Parish	22,975	23,007	23,039	23,071	23,148 (4,630) [1,111] {556}	23,229 (4,646) [1,115] {557}	23,310 (4,662) [1,119] {559}
Lafourche Parish	9,474	9,479	9,484	9,489	9,502 (1,900) [456] {228}	9,515 (1,903) [457] {228}	9,528 (1,906) [457] {229}
Orleans Parish	29,721	29,739	29,757	29,775	29,812 (5,962) [1,431] {715}	29,848 (5,970) [1,433] {716}	29,885 (5,977) [1,434] {717}
Ouachita Parish	18,175	18,189	18,204	18,218	18,257 (3,651) [876] {438}	18,298 (3,660) [878] {439}	18,342 (3,668) [880] {440}
Rapides Parish	11,881	11,883	11,884	11,886	11,909 (2,382) [572] {286}	11,933 (2,387) [573] {286}	11,957 (2,391) [574] {287}
St. Bernard Parish	3,984	3,986	3,989	3,991	3,994 (799) [192] {96}	3,998 (800) [192] {96}	4,001 (800) [192] {96}
St. Charles Parish	5,353	5,356	5,358	5,361	5,367 (1,073) [258] {129}	5,374 (1,075) [258] {129}	5,380 (1,076) [258] {129}
St. James Parish	1,937	1,938	1,940	1,941	1,944 (389) [93] {47}	1,947 (389) [93] {47}	1,950 (390) [94] {47}
St. John the Baptist Parish	3,680	3,683	3,685	3,688	3,696 (739) [177] {89}	3,704 (741) [178] {89}	3,713 (743) [178] {89}
St. Tammany Parish	25,439	25,454	25,470	25,485	25,528 (5,106) [1,225] {613}	25,572 (5,114) [1,227] {614}	25,617 (5,123) [1,230] {615}

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.