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

Date: 2/4/21

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 2/4/21 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.

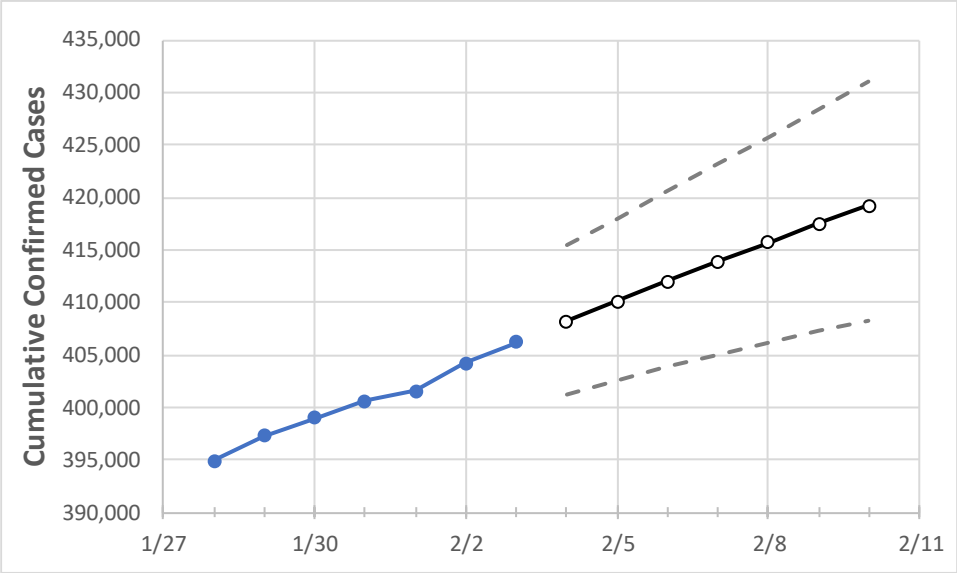
IEM's Modeling Lead

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:						
	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10
Louisiana	400,626	401,591	404,194	406,235	408,185	410,067	412,012	413,888	415,694	417,476	419,234

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:						
	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10
Ascension Parish	10,307	10,325	10,407	10,458	10,509	10,559	10,607	10,657	10,705	10,753	10,800
Bossier Parish	11,833	11,865	11,985	12,105	12,194	12,282	12,371	12,461	12,552	12,639	12,732
Caddo Parish	22,883	22,924	23,029	23,126	23,231	23,333	23,431	23,528	23,621	23,715	23,804
Calcasieu Parish	17,786	17,809	18,004	18,094	18,203	18,313	18,420	18,522	18,631	18,739	18,846
East Baton Rouge Parish	32,644	32,718	32,992	33,174	33,343	33,507	33,672	33,835	34,002	34,170	34,330
Jefferson Parish	41,155	41,278	41,512	41,691	41,887	42,081	42,271	42,453	42,634	42,812	42,983
Lafayette Parish	20,605	20,679	20,703	20,784	20,857	20,929	20,999	21,064	21,127	21,194	21,254
Lafourche Parish	8,303	8,322	8,412	8,475	8,535	8,595	8,658	8,720	8,781	8,844	8,904
Orleans Parish	26,458	26,540	26,760	26,883	27,003	27,118	27,233	27,349	27,462	27,571	27,677
Ouachita Parish	17,074	17,104	17,159	17,222	17,273	17,323	17,371	17,420	17,465	17,508	17,551
Rapides Parish	10,710	10,728	10,804	10,834	10,882	10,929	10,975	11,023	11,068	11,111	11,155
St. Bernard Parish	3,270	3,282	3,312	3,332	3,354	3,374	3,395	3,415	3,435	3,455	3,475
St. Charles Parish	4,782	4,788	4,814	4,837	4,855	4,874	4,891	4,909	4,926	4,943	4,959
St. James Parish	1,724	1,738	1,741	1,748	1,754	1,760	1,767	1,773	1,778	1,783	1,788
St. John the Baptist Parish	3,287	3,297	3,322	3,355	3,373	3,391	3,409	3,427	3,445	3,464	3,482
St. Tammany Parish	21,620	21,688	21,805	22,029	22,176	22,319	22,458	22,594	22,736	22,866	23,006

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:		
	1/31	2/1	2/2	2/3	2/5	2/7	2/9
Ascension Parish	10,307	10,325	10,407	10,458	10,559 (2,112) [507] {253}	10,657 (2,131) [512] {256}	10,753 (2,151) [516] {258}
Bossier Parish	11,833	11,865	11,985	12,105	12,282 (2,456) [590] {295}	12,461 (2,492) [598] {299}	12,639 (2,528) [607] {303}
Caddo Parish	22,883	22,924	23,029	23,126	23,333 (4,667) [1,120] {560}	23,528 (4,706) [1,129] {565}	23,715 (4,743) [1,138] {569}
Calcasieu Parish	17,786	17,809	18,004	18,094	18,313 (3,663) [879] {440}	18,522 (3,704) [889] {445}	18,739 (3,748) [899] {450}
East Baton Rouge Parish	32,644	32,718	32,992	33,174	33,507 (6,701) [1,608] {804}	33,835 (6,767) [1,624] {812}	34,170 (6,834) [1,640] {820}
Jefferson Parish	41,155	41,278	41,512	41,691	42,081 (8,416) [2,020] {1,010}	42,453 (8,491) [2,038] {1,019}	42,812 (8,562) [2,055] {1,027}
Lafayette Parish	20,605	20,679	20,703	20,784	20,929 (4,186) [1,005] {502}	21,064 (4,213) [1,011] {506}	21,194 (4,239) [1,017] {509}
Lafourche Parish	8,303	8,322	8,412	8,475	8,595 (1,719) [413] {206}	8,720 (1,744) [419] {209}	8,844 (1,769) [425] {212}
Orleans Parish	26,458	26,540	26,760	26,883	27,118 (5,424) [1,302] {651}	27,349 (5,470) [1,313] {656}	27,571 (5,514) [1,323] {662}
Ouachita Parish	17,074	17,104	17,159	17,222	17,323 (3,465) [832] {416}	17,420 (3,484) [836] {418}	17,508 (3,502) [840] {420}
Rapides Parish	10,710	10,728	10,804	10,834	10,929 (2,186) [525] {262}	11,023 (2,205) [529] {265}	11,111 (2,222) [533] {267}
St. Bernard Parish	3,270	3,282	3,312	3,332	3,374 (675) [162] {81}	3,415 (683) [164] {82}	3,455 (691) [166] {83}
St. Charles Parish	4,782	4,788	4,814	4,837	4,874 (975) [234] {117}	4,909 (982) [236] {118}	4,943 (989) [237] {119}
St. James Parish	1,724	1,738	1,741	1,748	1,760 (352) [84] {42}	1,773 (355) [85] {43}	1,783 (357) [86] {43}
St. John the Baptist Parish	3,287	3,297	3,322	3,355	3,391 (678) [163] {81}	3,427 (685) [165] {82}	3,464 (693) [166] {83}
St. Tammany Parish	21,620	21,688	21,805	22,029	22,319 (4,464) [1,071] {536}	22,594 (4,519) [1,085] {542}	22,866 (4,573) [1,098] {549}

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.