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

Date: 2/26/21

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 2/26/21 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.

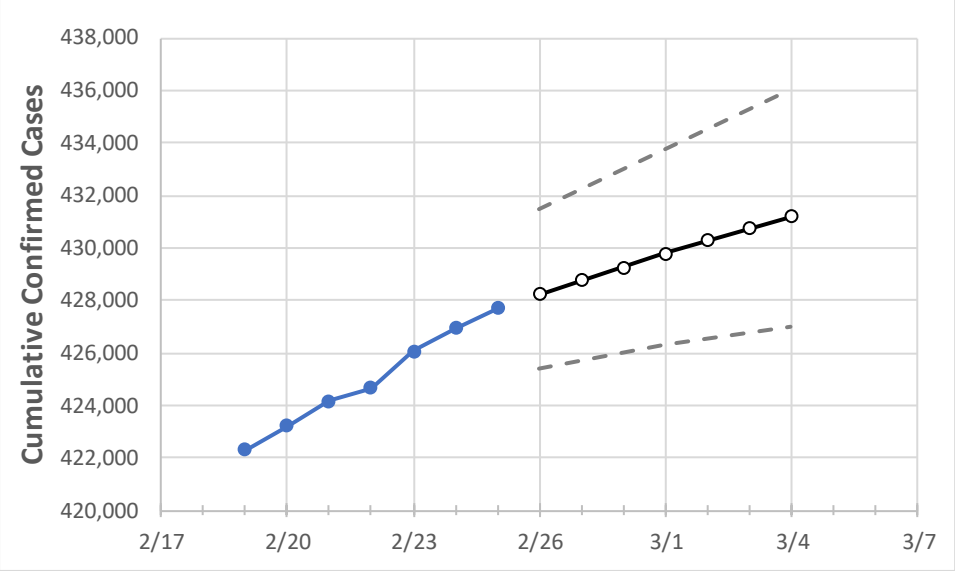
IEM's Modeling Lead

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Louisiana	424,644	426,048	426,925	427,689	428,225	428,756	429,272	429,776	430,278	430,741	431,199

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Ascension Parish	10,846	10,892	10,888	10,904	10,915	10,926	10,937	10,948	10,957	10,967	10,976
Bossier Parish	12,869	12,920	12,944	12,964	12,978	12,992	13,004	13,016	13,027	13,037	13,046
Caddo Parish	24,500	24,545	24,601	24,637	24,655	24,672	24,688	24,703	24,718	24,731	24,743
Calcasieu Parish	18,923	19,096	19,137	19,181	19,228	19,272	19,316	19,361	19,404	19,443	19,484
East Baton Rouge Parish	35,158	35,274	35,337	35,389	35,449	35,504	35,556	35,608	35,656	35,704	35,748
Jefferson Parish	43,419	43,520	43,602	43,678	43,733	43,784	43,834	43,880	43,924	43,967	44,012
Lafayette Parish	21,446	21,481	21,485	21,511	21,526	21,541	21,555	21,567	21,580	21,591	21,602
Lafourche Parish	8,996	9,053	9,068	9,085	9,101	9,116	9,131	9,145	9,159	9,173	9,187
Orleans Parish	28,075	28,164	28,259	28,341	28,390	28,437	28,485	28,530	28,573	28,617	28,659
Ouachita Parish	17,627	17,643	17,655	17,674	17,680	17,687	17,693	17,698	17,704	17,709	17,713
Rapides Parish	11,175	11,202	11,209	11,224	11,231	11,238	11,245	11,251	11,257	11,263	11,268
St. Bernard Parish	3,642	3,657	3,678	3,695	3,708	3,721	3,734	3,746	3,759	3,772	3,784
St. Charles Parish	5,052	5,049	5,060	5,066	5,075	5,084	5,092	5,100	5,108	5,116	5,123
St. James Parish	1,836	1,838	1,844	1,840	1,844	1,849	1,853	1,857	1,861	1,865	1,870
St. John the Baptist Parish	3,487	3,495	3,506	3,510	3,515	3,520	3,524	3,529	3,533	3,537	3,541
St. Tammany Parish	23,454	23,589	23,746	23,820	23,888	23,954	24,023	24,091	24,157	24,218	24,283

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:		
	2/22	2/23	2/24	2/25	2/27	3/1	3/3
Ascension Parish	10,846	10,892	10,888	10,904	10,926 (2,185) [524] {262}	10,948 (2,190) [525] {263}	10,967 (2,193) [526] {263}
Bossier Parish	12,869	12,920	12,944	12,964	12,992 (2,598) [624] {312}	13,016 (2,603) [625] {312}	13,037 (2,607) [626] {313}
Caddo Parish	24,500	24,545	24,601	24,637	24,672 (4,934) [1,184] {592}	24,703 (4,941) [1,186] {593}	24,731 (4,946) [1,187] {594}
Calcasieu Parish	18,923	19,096	19,137	19,181	19,272 (3,854) [925] {463}	19,361 (3,872) [929] {465}	19,443 (3,889) [933] {467}
East Baton Rouge Parish	35,158	35,274	35,337	35,389	35,504 (7,101) [1,704] {852}	35,608 (7,122) [1,709] {855}	35,704 (7,141) [1,714] {857}
Jefferson Parish	43,419	43,520	43,602	43,678	43,784 (8,757) [2,102] {1,051}	43,880 (8,776) [2,106] {1,053}	43,967 (8,793) [2,110] {1,055}
Lafayette Parish	21,446	21,481	21,485	21,511	21,541 (4,308) [1,034] {517}	21,567 (4,313) [1,035] {518}	21,591 (4,318) [1,036] {518}
Lafourche Parish	8,996	9,053	9,068	9,085	9,116 (1,823) [438] {219}	9,145 (1,829) [439] {219}	9,173 (1,835) [440] {220}
Orleans Parish	28,075	28,164	28,259	28,341	28,437 (5,687) [1,365] {682}	28,530 (5,706) [1,369] {685}	28,617 (5,723) [1,374] {687}
Ouachita Parish	17,627	17,643	17,655	17,674	17,687 (3,537) [849] {424}	17,698 (3,540) [850] {425}	17,709 (3,542) [850] {425}
Rapides Parish	11,175	11,202	11,209	11,224	11,238 (2,248) [539] {270}	11,251 (2,250) [540] {270}	11,263 (2,253) [541] {270}
St. Bernard Parish	3,642	3,657	3,678	3,695	3,721 (744) [179] {89}	3,746 (749) [180] {90}	3,772 (754) [181] {91}
St. Charles Parish	5,052	5,049	5,060	5,066	5,084 (1,017) [244] {122}	5,100 (1,020) [245] {122}	5,116 (1,023) [246] {123}
St. James Parish	1,836	1,838	1,844	1,840	1,849 (370) [89] {44}	1,857 (371) [89] {45}	1,865 (373) [90] {45}
St. John the Baptist Parish	3,487	3,495	3,506	3,510	3,520 (704) [169] {84}	3,529 (706) [169] {85}	3,537 (707) [170] {85}
St. Tammany Parish	23,454	23,589	23,746	23,820	23,954 (4,791) [1,150] {575}	24,091 (4,818) [1,156] {578}	24,218 (4,844) [1,162] {581}

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.