IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/22/21

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 2/22/21 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
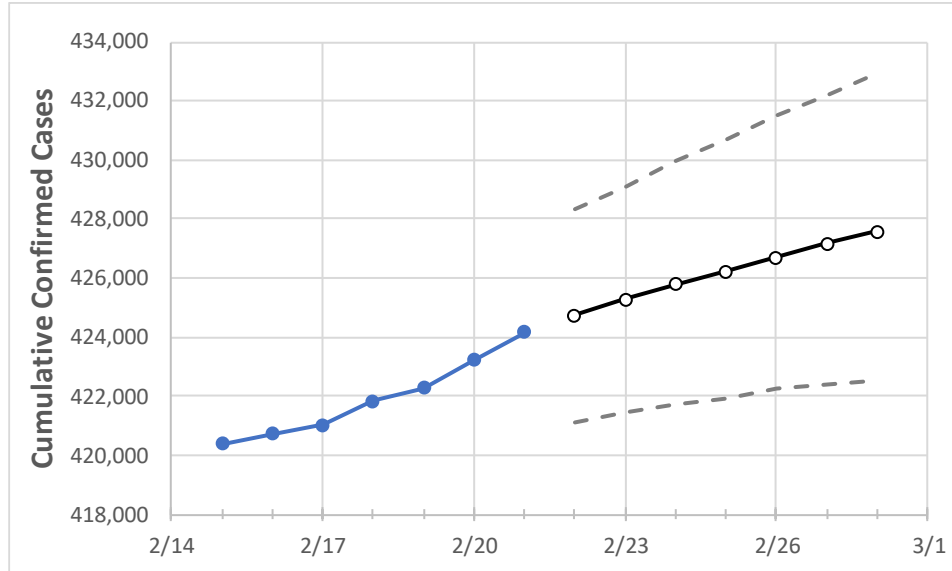
	Actual Confirmed Cases On:				Projected Cases For:						
	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28
Louisiana	421,846	422,287	423,232	424,176	424,754	425,276	425,780	426,236	426,715	427,166	427,584

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:						
	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28
Ascension Parish	10,783	10,812	10,828	10,843	10,853	10,863	10,871	10,880	10,888	10,896	10,902
Bossier Parish	12,842	12,852	12,867	12,881	12,898	12,913	12,927	12,939	12,951	12,961	12,971
Caddo Parish	24,407	24,410	24,449	24,488	24,509	24,529	24,547	24,562	24,578	24,592	24,604
Calcasieu Parish	18,748	18,778	18,849	18,919	18,960	18,999	19,037	19,075	19,111	19,146	19,181
East Baton Rouge Parish	34,795	34,823	34,976	35,128	35,191	35,253	35,311	35,364	35,421	35,473	35,520
Jefferson Parish	43,172	43,233	43,304	43,375	43,433	43,490	43,543	43,591	43,636	43,682	43,726
Lafayette Parish	21,344	21,355	21,387	21,418	21,436	21,453	21,469	21,484	21,498	21,511	21,524
Lafourche Parish	8,915	8,921	8,953	8,985	9,003	9,019	9,033	9,049	9,063	9,076	9,090
Orleans Parish	27,875	27,942	27,993	28,044	28,085	28,124	28,159	28,196	28,229	28,257	28,288
Ouachita Parish	17,590	17,592	17,602	17,612	17,624	17,635	17,646	17,655	17,664	17,672	17,681
Rapides Parish	11,131	11,140	11,157	11,174	11,184	11,195	11,204	11,213	11,221	11,229	11,236
St. Bernard Parish	3,564	3,571	3,600	3,628	3,642	3,656	3,670	3,683	3,696	3,709	3,723
St. Charles Parish	5,011	5,023	5,035	5,047	5,058	5,068	5,079	5,089	5,100	5,110	5,119
St. James Parish	1,821	1,817	1,823	1,828	1,832	1,837	1,841	1,845	1,849	1,853	1,857
St. John the Baptist Parish	3,466	3,478	3,482	3,485	3,490	3,495	3,500	3,505	3,509	3,514	3,518
St. Tammany Parish	23,182	23,223	23,316	23,409	23,468	23,524	23,580	23,633	23,686	23,738	23,785

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:		
	2/18	2/19	2/20	2/21	2/23	2/25	2/27
Ascension Parish	10,783	10,812	10,828	10,843	10,863 (2,173) [521] {261}	10,880 (2,176) [522] {261}	10,896 (2,179) [523] {261}
Bossier Parish	12,842	12,852	12,867	12,881	12,913 (2,583) [620] {310}	12,939 (2,588) [621] {311}	12,961 (2,592) [622] {311}
Caddo Parish	24,407	24,410	24,449	24,488	24,529 (4,906) [1,177] {589}	24,562 (4,912) [1,179] {589}	24,592 (4,918) [1,180] {590}
Calcasieu Parish	18,748	18,778	18,849	18,919	18,999 (3,800) [912] {456}	19,075 (3,815) [916] {458}	19,146 (3,829) [919] {460}
East Baton Rouge Parish	34,795	34,823	34,976	35,128	35,253 (7,051) [1,692] {846}	35,364 (7,073) [1,697] {849}	35,473 (7,095) [1,703] {851}
Jefferson Parish	43,172	43,233	43,304	43,375	43,490 (8,698) [2,087] {1,044}	43,591 (8,718) [2,092] {1,046}	43,682 (8,736) [2,097] {1,048}
Lafayette Parish	21,344	21,355	21,387	21,418	21,453 (4,291) [1,030] {515}	21,484 (4,297) [1,031] {516}	21,511 (4,302) [1,033] {516}
Lafourche Parish	8,915	8,921	8,953	8,985	9,019 (1,804) [433] {216}	9,049 (1,810) [434] {217}	9,076 (1,815) [436] {218}
Orleans Parish	27,875	27,942	27,993	28,044	28,124 (5,625) [1,350] {675}	28,196 (5,639) [1,353] {677}	28,257 (5,651) [1,356] {678}
Ouachita Parish	17,590	17,592	17,602	17,612	17,635 (3,527) [846] {423}	17,655 (3,531) [847] {424}	17,672 (3,534) [848] {424}
Rapides Parish	11,131	11,140	11,157	11,174	11,195 (2,239) [537] {269}	11,213 (2,243) [538] {269}	11,229 (2,246) [539] {269}
St. Bernard Parish	3,564	3,571	3,600	3,628	3,656 (731) [175] {88}	3,683 (737) [177] {88}	3,709 (742) [178] {89}
St. Charles Parish	5,011	5,023	5,035	5,047	5,068 (1,014) [243] {122}	5,089 (1,018) [244] {122}	5,110 (1,022) [245] {123}
St. James Parish	1,821	1,817	1,823	1,828	1,837 (367) [88] {44}	1,845 (369) [89] {44}	1,853 (371) [89] {44}
St. John the Baptist Parish	3,466	3,478	3,482	3,485	3,495 (699) [168] {84}	3,505 (701) [168] {84}	3,514 (703) [169] {84}
St. Tammany Parish	23,182	23,223	23,316	23,409	23,524 (4,705) [1,129] {565}	23,633 (4,727) [1,134] {567}	23,738 (4,748) [1,139] {570}

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.