IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/27/21

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 <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 5/27/21 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
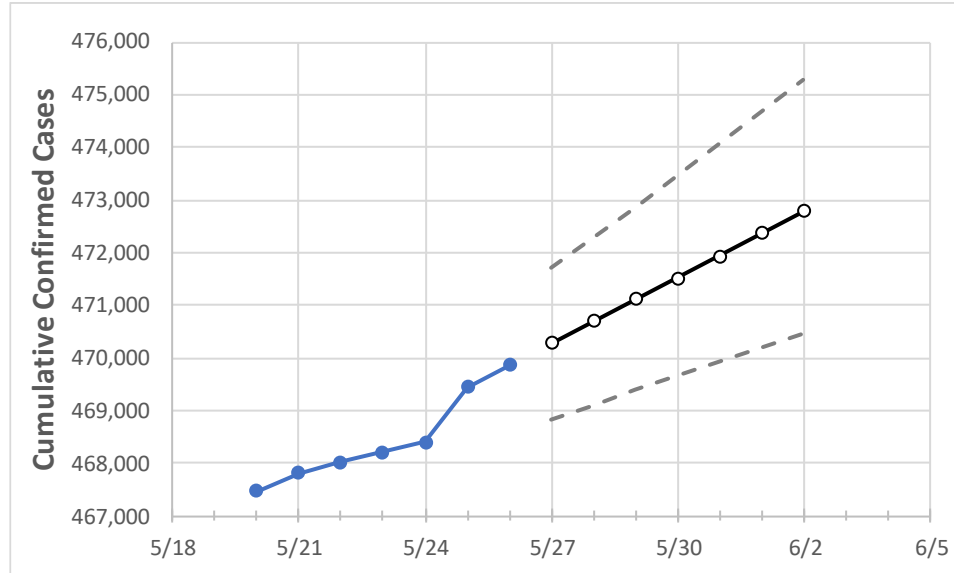
	Actual Confirmed Cases On:				Projected Cases For:						
	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2
Louisiana	468,206	468,402	469,445	469,864	470,280	470,697	471,110	471,522	471,934	472,369	472,785

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:						
	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2
Ascension Parish	12,462	12,472	12,528	12,563	12,583	12,604	12,625	12,646	12,668	12,691	12,715
Bossier Parish	14,070	14,076	14,105	14,104	14,120	14,136	14,153	14,169	14,185	14,202	14,220
Caddo Parish	26,471	26,487	26,540	26,558	26,584	26,611	26,636	26,661	26,687	26,715	26,744
Calcasieu Parish	22,732	22,743	22,780	22,790	22,803	22,817	22,830	22,843	22,856	22,869	22,881
East Baton Rouge Parish	40,077	40,091	40,183	40,263	40,302	40,341	40,380	40,418	40,459	40,499	40,538
Jefferson Parish	46,600	46,610	46,670	46,690	46,718	46,746	46,775	46,802	46,828	46,856	46,883
Lafayette Parish	23,870	23,878	23,960	23,970	23,995	24,019	24,043	24,068	24,093	24,118	24,142
Lafourche Parish	9,746	9,756	9,786	9,795	9,807	9,819	9,832	9,845	9,859	9,873	9,887
Orleans Parish	30,429	30,443	30,488	30,510	30,533	30,556	30,579	30,603	30,627	30,652	30,676
Ouachita Parish	18,677	18,682	18,714	18,733	18,751	18,768	18,786	18,804	18,822	18,840	18,858
Rapides Parish	12,369	12,374	12,434	12,455	12,475	12,495	12,513	12,533	12,554	12,575	12,596
St. Bernard Parish	4,057	4,058	4,064	4,069	4,072	4,075	4,078	4,081	4,084	4,087	4,091
St. Charles Parish	5,485	5,488	5,502	5,503	5,508	5,513	5,518	5,523	5,528	5,533	5,538
St. James Parish	1,996	1,997	1,998	2,001	2,003	2,005	2,007	2,009	2,010	2,012	2,014
St. John the Baptist Parish	3,769	3,771	3,775	3,778	3,781	3,784	3,787	3,790	3,794	3,797	3,800
St. Tammany Parish	25,880	25,887	25,911	25,919	25,929	25,940	25,950	25,960	25,970	25,980	25,990

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:		
	5/23	5/24	5/25	5/26	5/28	5/30	6/1
Ascension Parish	12,462	12,472	12,528	12,563	12,604 (2,521) [605] {302}	12,646 (2,529) [607] {304}	12,691 (2,538) [609] {305}
Bossier Parish	14,070	14,076	14,105	14,104	14,136 (2,827) [679] {339}	14,169 (2,834) [680] {340}	14,202 (2,840) [682] {341}
Caddo Parish	26,471	26,487	26,540	26,558	26,611 (5,322) [1,277] {639}	26,661 (5,332) [1,280] {640}	26,715 (5,343) [1,282] {641}
Calcasieu Parish	22,732	22,743	22,780	22,790	22,817 (4,563) [1,095] {548}	22,843 (4,569) [1,096] {548}	22,869 (4,574) [1,098] {549}
East Baton Rouge Parish	40,077	40,091	40,183	40,263	40,341 (8,068) [1,936] {968}	40,418 (8,084) [1,940] {970}	40,499 (8,100) [1,944] {972}
Jefferson Parish	46,600	46,610	46,670	46,690	46,746 (9,349) [2,244] {1,122}	46,802 (9,360) [2,246] {1,123}	46,856 (9,371) [2,249] {1,125}
Lafayette Parish	23,870	23,878	23,960	23,970	24,019 (4,804) [1,153] {576}	24,068 (4,814) [1,155] {578}	24,118 (4,824) [1,158] {579}
Lafourche Parish	9,746	9,756	9,786	9,795	9,819 (1,964) [471] {236}	9,845 (1,969) [473] {236}	9,873 (1,975) [474] {237}
Orleans Parish	30,429	30,443	30,488	30,510	30,556 (6,111) [1,467] {733}	30,603 (6,121) [1,469] {734}	30,652 (6,130) [1,471] {736}
Ouachita Parish	18,677	18,682	18,714	18,733	18,768 (3,754) [901] {450}	18,804 (3,761) [903] {451}	18,840 (3,768) [904] {452}
Rapides Parish	12,369	12,374	12,434	12,455	12,495 (2,499) [600] {300}	12,533 (2,507) [602] {301}	12,575 (2,515) [604] {302}
St. Bernard Parish	4,057	4,058	4,064	4,069	4,075 (815) [196] {98}	4,081 (816) [196] {98}	4,087 (817) [196] {98}
St. Charles Parish	5,485	5,488	5,502	5,503	5,513 (1,103) [265] {132}	5,523 (1,105) [265] {133}	5,533 (1,107) [266] {133}
St. James Parish	1,996	1,997	1,998	2,001	2,005 (401) [96] {48}	2,009 (402) [96] {48}	2,012 (402) [97] {48}
St. John the Baptist Parish	3,769	3,771	3,775	3,778	3,784 (757) [182] {91}	3,790 (758) [182] {91}	3,797 (759) [182] {91}
St. Tammany Parish	25,880	25,887	25,911	25,919	25,940 (5,188) [1,245] {623}	25,960 (5,192) [1,246] {623}	25,980 (5,196) [1,247] {624}

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.