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

Date: 5/28/21

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 5/28/21 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.

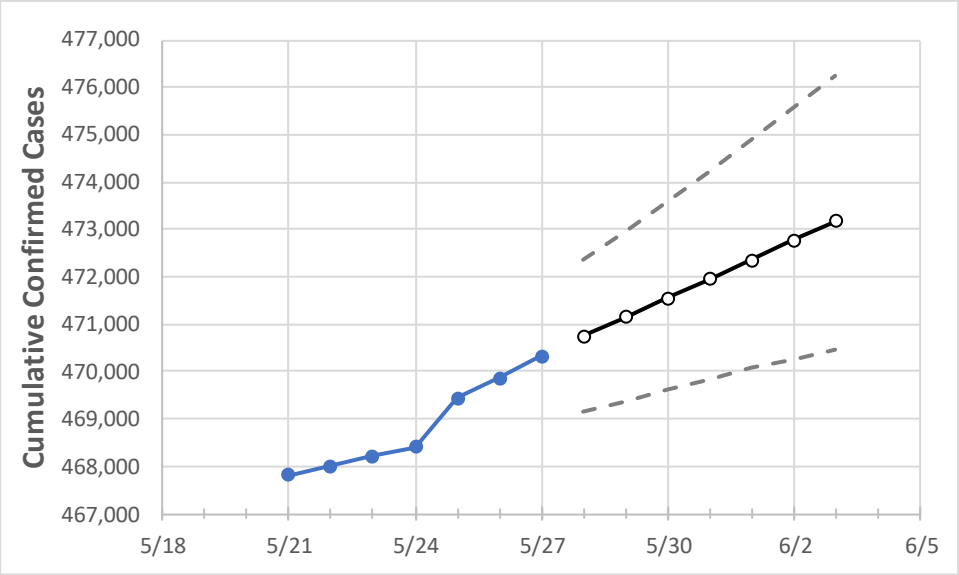
IEM's Modeling Lead

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Louisiana	468,402	469,445	469,864	470,331	470,744	471,141	471,540	471,944	472,350	472,767	473,179

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Ascension Parish	12,472	12,528	12,563	12,570	12,590	12,609	12,629	12,650	12,672	12,693	12,716
Bossier Parish	14,076	14,105	14,104	14,117	14,130	14,142	14,154	14,166	14,179	14,190	14,202
Caddo Parish	26,487	26,540	26,558	26,593	26,617	26,642	26,666	26,691	26,714	26,738	26,763
Calcasieu Parish	22,743	22,780	22,790	22,807	22,822	22,837	22,853	22,869	22,884	22,899	22,915
East Baton Rouge Parish	40,091	40,183	40,263	40,308	40,346	40,386	40,424	40,461	40,501	40,540	40,579
Jefferson Parish	46,610	46,670	46,690	46,714	46,737	46,760	46,783	46,806	46,828	46,850	46,873
Lafayette Parish	23,878	23,960	23,970	23,990	24,014	24,039	24,063	24,088	24,112	24,136	24,160
Lafourche Parish	9,756	9,786	9,795	9,805	9,817	9,830	9,841	9,854	9,868	9,881	9,896
Orleans Parish	30,443	30,488	30,510	30,525	30,544	30,562	30,580	30,596	30,613	30,630	30,646
Ouachita Parish	18,682	18,714	18,733	18,762	18,780	18,800	18,819	18,840	18,860	18,881	18,903
Rapides Parish	12,374	12,434	12,455	12,482	12,501	12,520	12,540	12,560	12,579	12,601	12,623
St. Bernard Parish	4,058	4,064	4,069	4,068	4,071	4,074	4,077	4,079	4,082	4,085	4,088
St. Charles Parish	5,488	5,502	5,503	5,513	5,518	5,523	5,528	5,533	5,538	5,543	5,549
St. James Parish	1,997	1,998	2,001	2,005	2,007	2,009	2,010	2,012	2,014	2,016	2,018
St. John the Baptist Parish	3,771	3,775	3,778	3,782	3,785	3,789	3,792	3,796	3,800	3,803	3,807
St. Tammany Parish	25,887	25,911	25,919	25,947	25,960	25,972	25,984	25,996	26,009	26,021	26,034

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:		
	5/24	5/25	5/26	5/27	5/29	5/31	6/2
Ascension Parish	12,472	12,528	12,563	12,570	12,609 (2,522) [605] {303}	12,650 (2,530) [607] {304}	12,693 (2,539) [609] {305}
Bossier Parish	14,076	14,105	14,104	14,117	14,142 (2,828) [679] {339}	14,166 (2,833) [680] {340}	14,190 (2,838) [681] {341}
Caddo Parish	26,487	26,540	26,558	26,593	26,642 (5,328) [1,279] {639}	26,691 (5,338) [1,281] {641}	26,738 (5,348) [1,283] {642}
Calcasieu Parish	22,743	22,780	22,790	22,807	22,837 (4,567) [1,096] {548}	22,869 (4,574) [1,098] {549}	22,899 (4,580) [1,099] {550}
East Baton Rouge Parish	40,091	40,183	40,263	40,308	40,386 (8,077) [1,939] {969}	40,461 (8,092) [1,942] {971}	40,540 (8,108) [1,946] {973}
Jefferson Parish	46,610	46,670	46,690	46,714	46,760 (9,352) [2,244] {1,122}	46,806 (9,361) [2,247] {1,123}	46,850 (9,370) [2,249] {1,124}
Lafayette Parish	23,878	23,960	23,970	23,990	24,039 (4,808) [1,154] {577}	24,088 (4,818) [1,156] {578}	24,136 (4,827) [1,159] {579}
Lafourche Parish	9,756	9,786	9,795	9,805	9,830 (1,966) [472] {236}	9,854 (1,971) [473] {237}	9,881 (1,976) [474] {237}
Orleans Parish	30,443	30,488	30,510	30,525	30,562 (6,112) [1,467] {733}	30,596 (6,119) [1,469] {734}	30,630 (6,126) [1,470] {735}
Ouachita Parish	18,682	18,714	18,733	18,762	18,800 (3,760) [902] {451}	18,840 (3,768) [904] {452}	18,881 (3,776) [906] {453}
Rapides Parish	12,374	12,434	12,455	12,482	12,520 (2,504) [601] {300}	12,560 (2,512) [603] {301}	12,601 (2,520) [605] {302}
St. Bernard Parish	4,058	4,064	4,069	4,068	4,074 (815) [196] {98}	4,079 (816) [196] {98}	4,085 (817) [196] {98}
St. Charles Parish	5,488	5,502	5,503	5,513	5,523 (1,105) [265] {133}	5,533 (1,107) [266] {133}	5,543 (1,109) [266] {133}
St. James Parish	1,997	1,998	2,001	2,005	2,009 (402) [96] {48}	2,012 (402) [97] {48}	2,016 (403) [97] {48}
St. John the Baptist Parish	3,771	3,775	3,778	3,782	3,789 (758) [182] {91}	3,796 (759) [182] {91}	3,803 (761) [183] {91}
St. Tammany Parish	25,887	25,911	25,919	25,947	25,972 (5,194) [1,247] {623}	25,996 (5,199) [1,248] {624}	26,021 (5,204) [1,249] {625}

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.