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

Date: 6/1/21

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 6/1/21 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.

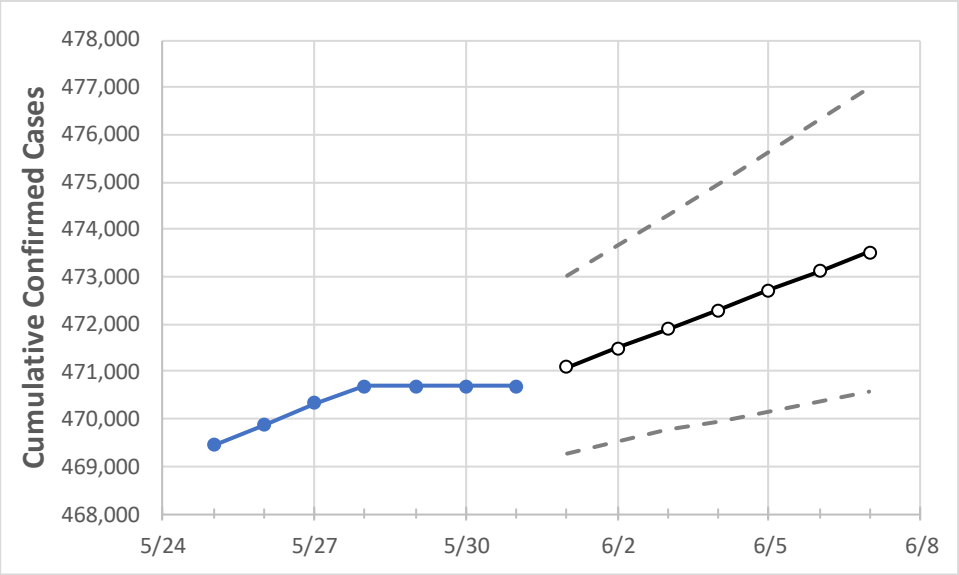
IEM's Modeling Lead

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Louisiana	470,685	470,685	470,685	470,685	471,091	471,497	471,898	472,305	472,711	473,117	473,512

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Ascension Parish	12,571	12,571	12,571	12,571	12,586	12,603	12,619	12,635	12,652	12,668	12,685
Bossier Parish	14,123	14,123	14,123	14,123	14,137	14,151	14,166	14,180	14,194	14,207	14,221
Caddo Parish	26,618	26,618	26,618	26,618	26,644	26,670	26,697	26,723	26,750	26,778	26,803
Calcasieu Parish	22,828	22,828	22,828	22,828	22,843	22,858	22,872	22,887	22,901	22,915	22,930
East Baton Rouge Parish	40,325	40,325	40,325	40,325	40,363	40,404	40,443	40,482	40,524	40,564	40,606
Jefferson Parish	46,761	46,761	46,761	46,761	46,786	46,810	46,834	46,858	46,884	46,908	46,931
Lafayette Parish	24,024	24,024	24,024	24,024	24,050	24,075	24,102	24,129	24,155	24,182	24,208
Lafourche Parish	9,808	9,808	9,808	9,808	9,819	9,831	9,842	9,854	9,865	9,878	9,889
Orleans Parish	30,558	30,558	30,558	30,558	30,578	30,598	30,618	30,639	30,659	30,680	30,699
Ouachita Parish	18,772	18,772	18,772	18,772	18,790	18,807	18,824	18,842	18,861	18,879	18,897
Rapides Parish	12,504	12,504	12,504	12,504	12,530	12,557	12,585	12,613	12,644	12,676	12,707
St. Bernard Parish	4,068	4,068	4,068	4,068	4,072	4,076	4,080	4,085	4,089	4,094	4,099
St. Charles Parish	5,523	5,523	5,523	5,523	5,529	5,536	5,542	5,550	5,556	5,564	5,571
St. James Parish	2,002	2,002	2,002	2,002	2,004	2,007	2,009	2,011	2,014	2,016	2,019
St. John the Baptist Parish	3,786	3,786	3,786	3,786	3,790	3,794	3,797	3,801	3,805	3,809	3,814
St. Tammany Parish	25,951	25,951	25,951	25,951	25,962	25,973	25,984	25,995	26,006	26,017	26,028

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:		
	5/28	5/29	5/30	5/31	6/2	6/4	6/6
Ascension Parish	12,571	12,571	12,571	12,571	12,603 (2,521) [605] {302}	12,635 (2,527) [606] {303}	12,668 (2,534) [608] {304}
Bossier Parish	14,123	14,123	14,123	14,123	14,151 (2,830) [679] {340}	14,180 (2,836) [681] {340}	14,207 (2,841) [682] {341}
Caddo Parish	26,618	26,618	26,618	26,618	26,670 (5,334) [1,280] {640}	26,723 (5,345) [1,283] {641}	26,778 (5,356) [1,285] {643}
Calcasieu Parish	22,828	22,828	22,828	22,828	22,858 (4,572) [1,097] {549}	22,887 (4,577) [1,099] {549}	22,915 (4,583) [1,100] {550}
East Baton Rouge Parish	40,325	40,325	40,325	40,325	40,404 (8,081) [1,939] {970}	40,482 (8,096) [1,943] {972}	40,564 (8,113) [1,947] {974}
Jefferson Parish	46,761	46,761	46,761	46,761	46,810 (9,362) [2,247] {1,123}	46,858 (9,372) [2,249] {1,125}	46,908 (9,382) [2,252] {1,126}
Lafayette Parish	24,024	24,024	24,024	24,024	24,075 (4,815) [1,156] {578}	24,129 (4,826) [1,158] {579}	24,182 (4,836) [1,161] {580}
Lafourche Parish	9,808	9,808	9,808	9,808	9,831 (1,966) [472] {236}	9,854 (1,971) [473] {236}	9,878 (1,976) [474] {237}
Orleans Parish	30,558	30,558	30,558	30,558	30,598 (6,120) [1,469] {734}	30,639 (6,128) [1,471] {735}	30,680 (6,136) [1,473] {736}
Ouachita Parish	18,772	18,772	18,772	18,772	18,807 (3,761) [903] {451}	18,842 (3,768) [904] {452}	18,879 (3,776) [906] {453}
Rapides Parish	12,504	12,504	12,504	12,504	12,557 (2,511) [603] {301}	12,613 (2,523) [605] {303}	12,676 (2,535) [608] {304}
St. Bernard Parish	4,068	4,068	4,068	4,068	4,076 (815) [196] {98}	4,085 (817) [196] {98}	4,094 (819) [197] {98}
St. Charles Parish	5,523	5,523	5,523	5,523	5,536 (1,107) [266] {133}	5,550 (1,110) [266] {133}	5,564 (1,113) [267] {134}
St. James Parish	2,002	2,002	2,002	2,002	2,007 (401) [96] {48}	2,011 (402) [97] {48}	2,016 (403) [97] {48}
St. John the Baptist Parish	3,786	3,786	3,786	3,786	3,794 (759) [182] {91}	3,801 (760) [182] {91}	3,809 (762) [183] {91}
St. Tammany Parish	25,951	25,951	25,951	25,951	25,973 (5,195) [1,247] {623}	25,995 (5,199) [1,248] {624}	26,017 (5,203) [1,249] {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.