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

Date: 5/25/21

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 5/25/21 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.

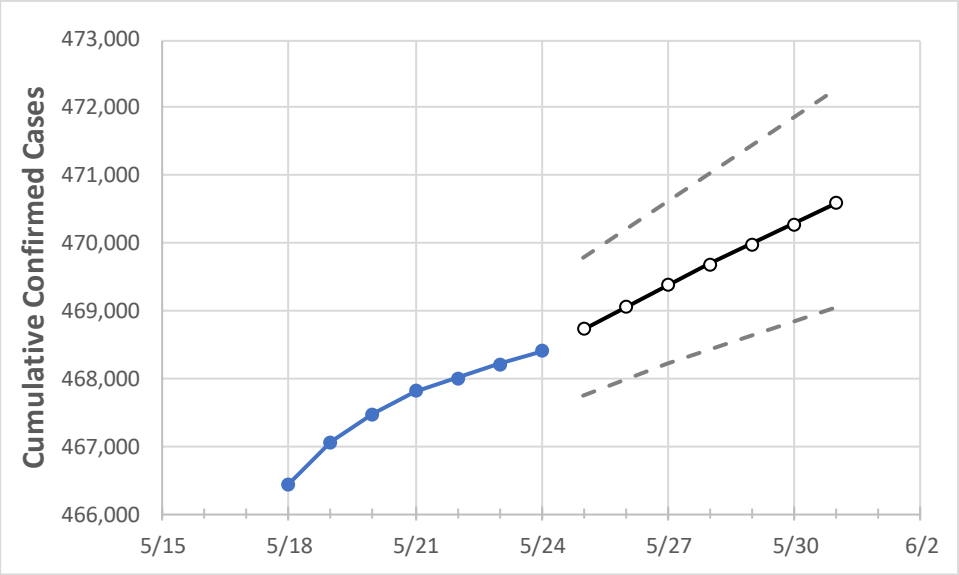
IEM's Modeling Lead

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Louisiana	467,815	468,011	468,206	468,402	468,731	469,059	469,378	469,683	469,989	470,283	470,583

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Ascension Parish	12,442	12,452	12,462	12,472	12,485	12,499	12,512	12,525	12,538	12,551	12,563
Bossier Parish	14,059	14,065	14,070	14,076	14,090	14,103	14,117	14,130	14,144	14,158	14,173
Caddo Parish	26,440	26,456	26,471	26,487	26,512	26,536	26,562	26,586	26,612	26,636	26,661
Calcasieu Parish	22,710	22,721	22,732	22,743	22,754	22,765	22,775	22,785	22,794	22,803	22,813
East Baton Rouge Parish	40,049	40,063	40,077	40,091	40,117	40,141	40,165	40,189	40,212	40,233	40,253
Jefferson Parish	46,579	46,589	46,600	46,610	46,637	46,664	46,690	46,716	46,742	46,768	46,793
Lafayette Parish	23,853	23,861	23,870	23,878	23,899	23,920	23,940	23,960	23,981	24,000	24,019
Lafourche Parish	9,726	9,736	9,746	9,756	9,765	9,774	9,784	9,793	9,803	9,813	9,822
Orleans Parish	30,401	30,415	30,429	30,443	30,465	30,487	30,509	30,532	30,554	30,577	30,599
Ouachita Parish	18,667	18,672	18,677	18,682	18,698	18,713	18,728	18,743	18,758	18,773	18,789
Rapides Parish	12,358	12,363	12,369	12,374	12,390	12,405	12,421	12,437	12,452	12,468	12,484
St. Bernard Parish	4,054	4,055	4,057	4,058	4,060	4,062	4,064	4,066	4,068	4,070	4,073
St. Charles Parish	5,479	5,482	5,485	5,488	5,492	5,496	5,500	5,504	5,508	5,513	5,517
St. James Parish	1,993	1,994	1,996	1,997	1,999	2,001	2,003	2,005	2,007	2,009	2,011
St. John the Baptist Parish	3,764	3,766	3,769	3,771	3,774	3,777	3,780	3,783	3,786	3,789	3,793
St. Tammany Parish	25,865	25,872	25,880	25,887	25,897	25,907	25,917	25,927	25,937	25,946	25,956

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:		
	5/21	5/22	5/23	5/24	5/26	5/28	5/30
Ascension Parish	12,442	12,452	12,462	12,472	12,499 (2,500) [600] {300}	12,525 (2,505) [601] {301}	12,551 (2,510) [602] {301}
Bossier Parish	14,059	14,065	14,070	14,076	14,103 (2,821) [677] {338}	14,130 (2,826) [678] {339}	14,158 (2,832) [680] {340}
Caddo Parish	26,440	26,456	26,471	26,487	26,536 (5,307) [1,274] {637}	26,586 (5,317) [1,276] {638}	26,636 (5,327) [1,279] {639}
Calcasieu Parish	22,710	22,721	22,732	22,743	22,765 (4,553) [1,093] {546}	22,785 (4,557) [1,094] {547}	22,803 (4,561) [1,095] {547}
East Baton Rouge Parish	40,049	40,063	40,077	40,091	40,141 (8,028) [1,927] {963}	40,189 (8,038) [1,929] {965}	40,233 (8,047) [1,931] {966}
Jefferson Parish	46,579	46,589	46,600	46,610	46,664 (9,333) [2,240] {1,120}	46,716 (9,343) [2,242] {1,121}	46,768 (9,354) [2,245] {1,122}
Lafayette Parish	23,853	23,861	23,870	23,878	23,920 (4,784) [1,148] {574}	23,960 (4,792) [1,150] {575}	24,000 (4,800) [1,152] {576}
Lafourche Parish	9,726	9,736	9,746	9,756	9,774 (1,955) [469] {235}	9,793 (1,959) [470] {235}	9,813 (1,963) [471] {236}
Orleans Parish	30,401	30,415	30,429	30,443	30,487 (6,097) [1,463] {732}	30,532 (6,106) [1,466] {733}	30,577 (6,115) [1,468] {734}
Ouachita Parish	18,667	18,672	18,677	18,682	18,713 (3,743) [898] {449}	18,743 (3,749) [900] {450}	18,773 (3,755) [901] {451}
Rapides Parish	12,358	12,363	12,369	12,374	12,405 (2,481) [595] {298}	12,437 (2,487) [597] {298}	12,468 (2,494) [598] {299}
St. Bernard Parish	4,054	4,055	4,057	4,058	4,062 (812) [195] {97}	4,066 (813) [195] {98}	4,070 (814) [195] {98}
St. Charles Parish	5,479	5,482	5,485	5,488	5,496 (1,099) [264] {132}	5,504 (1,101) [264] {132}	5,513 (1,103) [265] {132}
St. James Parish	1,993	1,994	1,996	1,997	2,001 (400) [96] {48}	2,005 (401) [96] {48}	2,009 (402) [96] {48}
St. John the Baptist Parish	3,764	3,766	3,769	3,771	3,777 (755) [181] {91}	3,783 (757) [182] {91}	3,789 (758) [182] {91}
St. Tammany Parish	25,865	25,872	25,880	25,887	25,907 (5,181) [1,244] {622}	25,927 (5,185) [1,245] {622}	25,946 (5,189) [1,245] {623}

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.