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

Date: 5/19/21

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 5/19/21 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.

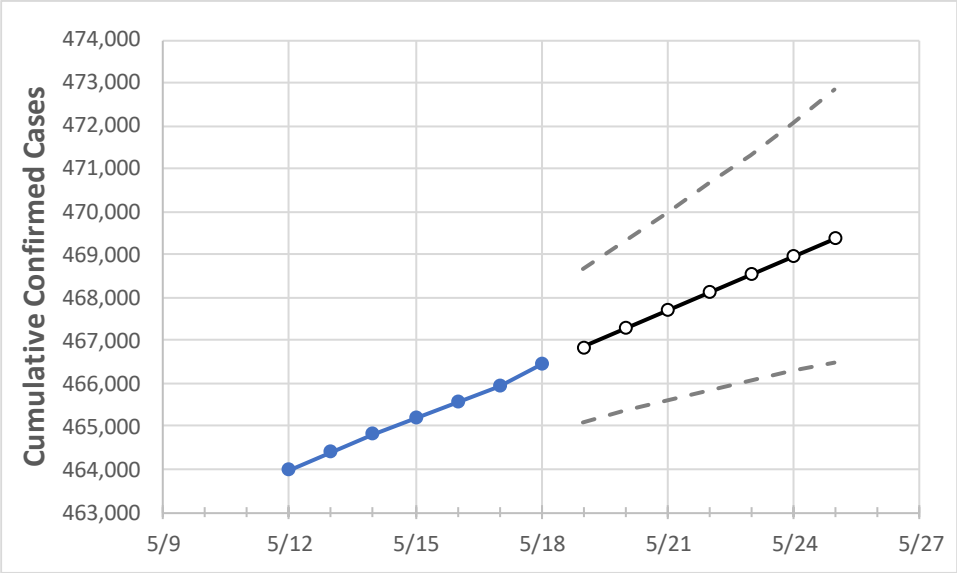
IEM's Modeling Lead

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:						
	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25
Louisiana	465,204	465,575	465,946	466,440	466,856	467,289	467,702	468,120	468,538	468,952	469,373

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:						
	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25
Ascension Parish	12,349	12,370	12,391	12,394	12,412	12,431	12,449	12,466	12,483	12,501	12,519
Bossier Parish	13,973	13,987	14,002	14,005	14,020	14,035	14,050	14,065	14,080	14,096	14,111
Caddo Parish	26,255	26,284	26,314	26,353	26,383	26,412	26,441	26,471	26,501	26,532	26,563
Calcasieu Parish	22,625	22,635	22,645	22,665	22,678	22,690	22,703	22,714	22,726	22,737	22,748
East Baton Rouge Parish	39,830	39,860	39,889	39,893	39,923	39,952	39,981	40,007	40,033	40,058	40,081
Jefferson Parish	46,375	46,412	46,450	46,479	46,515	46,550	46,587	46,624	46,662	46,701	46,740
Lafayette Parish	23,683	23,710	23,738	23,768	23,797	23,826	23,855	23,885	23,915	23,945	23,975
Lafourche Parish	9,677	9,680	9,684	9,703	9,713	9,724	9,736	9,747	9,759	9,770	9,782
Orleans Parish	30,265	30,291	30,317	30,331	30,362	30,394	30,427	30,461	30,494	30,529	30,566
Ouachita Parish	18,540	18,551	18,561	18,585	18,600	18,617	18,631	18,648	18,663	18,678	18,694
Rapides Parish	12,223	12,237	12,251	12,276	12,293	12,310	12,327	12,345	12,362	12,380	12,398
St. Bernard Parish	4,042	4,043	4,045	4,051	4,054	4,057	4,060	4,063	4,066	4,068	4,071
St. Charles Parish	5,456	5,461	5,467	5,470	5,476	5,482	5,489	5,496	5,502	5,509	5,516
St. James Parish	1,979	1,981	1,983	1,984	1,986	1,988	1,990	1,992	1,994	1,997	1,999
St. John the Baptist Parish	3,741	3,743	3,745	3,751	3,753	3,756	3,758	3,761	3,763	3,766	3,768
St. Tammany Parish	25,791	25,807	25,823	25,831	25,844	25,857	25,869	25,881	25,893	25,904	25,916

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:		
	5/15	5/16	5/17	5/18	5/20	5/22	5/24
Ascension Parish	12,349	12,370	12,391	12,394	12,431 (2,486) [597] {298}	12,466 (2,493) [598] {299}	12,501 (2,500) [600] {300}
Bossier Parish	13,973	13,987	14,002	14,005	14,035 (2,807) [674] {337}	14,065 (2,813) [675] {338}	14,096 (2,819) [677] {338}
Caddo Parish	26,255	26,284	26,314	26,353	26,412 (5,282) [1,268] {634}	26,471 (5,294) [1,271] {635}	26,532 (5,306) [1,274] {637}
Calcasieu Parish	22,625	22,635	22,645	22,665	22,690 (4,538) [1,089] {545}	22,714 (4,543) [1,090] {545}	22,737 (4,547) [1,091] {546}
East Baton Rouge Parish	39,830	39,860	39,889	39,893	39,952 (7,990) [1,918] {959}	40,007 (8,001) [1,920] {960}	40,058 (8,012) [1,923] {961}
Jefferson Parish	46,375	46,412	46,450	46,479	46,550 (9,310) [2,234] {1,117}	46,624 (9,325) [2,238] {1,119}	46,701 (9,340) [2,242] {1,121}
Lafayette Parish	23,683	23,710	23,738	23,768	23,826 (4,765) [1,144] {572}	23,885 (4,777) [1,146] {573}	23,945 (4,789) [1,149] {575}
Lafourche Parish	9,677	9,680	9,684	9,703	9,724 (1,945) [467] {233}	9,747 (1,949) [468] {234}	9,770 (1,954) [469] {234}
Orleans Parish	30,265	30,291	30,317	30,331	30,394 (6,079) [1,459] {729}	30,461 (6,092) [1,462] {731}	30,529 (6,106) [1,465] {733}
Ouachita Parish	18,540	18,551	18,561	18,585	18,617 (3,723) [894] {447}	18,648 (3,730) [895] {448}	18,678 (3,736) [897] {448}
Rapides Parish	12,223	12,237	12,251	12,276	12,310 (2,462) [591] {295}	12,345 (2,469) [593] {296}	12,380 (2,476) [594] {297}
St. Bernard Parish	4,042	4,043	4,045	4,051	4,057 (811) [195] {97}	4,063 (813) [195] {98}	4,068 (814) [195] {98}
St. Charles Parish	5,456	5,461	5,467	5,470	5,482 (1,096) [263] {132}	5,496 (1,099) [264] {132}	5,509 (1,102) [264] {132}
St. James Parish	1,979	1,981	1,983	1,984	1,988 (398) [95] {48}	1,992 (398) [96] {48}	1,997 (399) [96] {48}
St. John the Baptist Parish	3,741	3,743	3,745	3,751	3,756 (751) [180] {90}	3,761 (752) [181] {90}	3,766 (753) [181] {90}
St. Tammany Parish	25,791	25,807	25,823	25,831	25,857 (5,171) [1,241] {621}	25,881 (5,176) [1,242] {621}	25,904 (5,181) [1,243] {622}

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.