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

Date: 5/18/21

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 5/18/21 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.

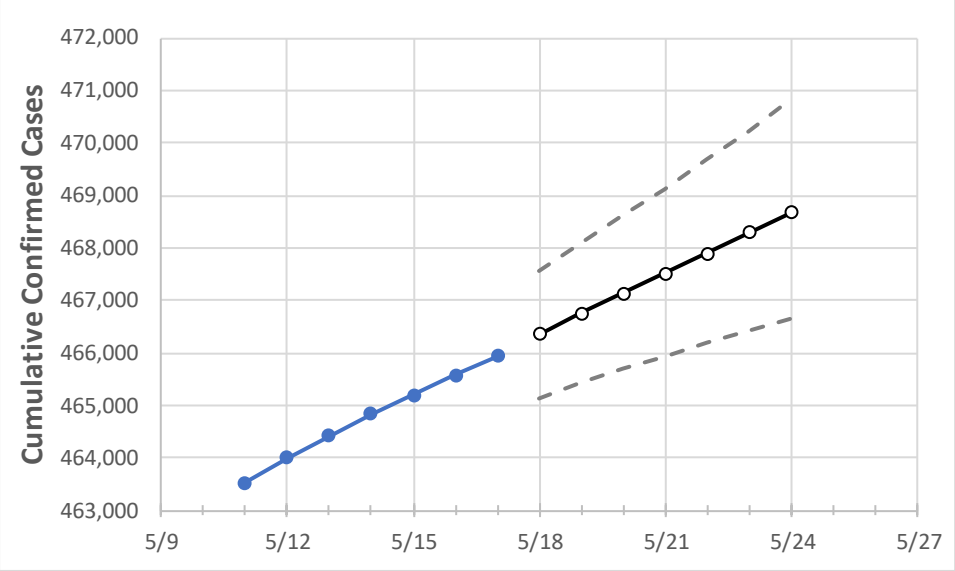
IEM's Modeling Lead

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:						
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24
Louisiana	464,833	465,204	465,575	465,946	466,356	466,751	467,136	467,520	467,898	468,289	468,671

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:						
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24
Ascension Parish	12,328	12,349	12,370	12,391	12,412	12,432	12,453	12,474	12,496	12,517	12,539
Bossier Parish	13,958	13,973	13,987	14,002	14,018	14,033	14,049	14,065	14,082	14,098	14,116
Caddo Parish	26,225	26,255	26,284	26,314	26,344	26,373	26,402	26,428	26,456	26,484	26,513
Calcasieu Parish	22,615	22,625	22,635	22,645	22,658	22,671	22,682	22,693	22,705	22,715	22,725
East Baton Rouge Parish	39,801	39,830	39,860	39,889	39,921	39,951	39,980	40,008	40,035	40,060	40,084
Jefferson Parish	46,337	46,375	46,412	46,450	46,485	46,521	46,557	46,595	46,632	46,671	46,708
Lafayette Parish	23,655	23,683	23,710	23,738	23,766	23,794	23,823	23,851	23,880	23,909	23,939
Lafourche Parish	9,673	9,677	9,680	9,684	9,692	9,701	9,709	9,718	9,726	9,735	9,744
Orleans Parish	30,239	30,265	30,291	30,317	30,349	30,381	30,414	30,448	30,483	30,518	30,554
Ouachita Parish	18,530	18,540	18,551	18,561	18,574	18,587	18,600	18,613	18,626	18,638	18,651
Rapides Parish	12,209	12,223	12,237	12,251	12,268	12,284	12,302	12,318	12,335	12,351	12,367
St. Bernard Parish	4,040	4,042	4,043	4,045	4,047	4,049	4,051	4,053	4,055	4,057	4,059
St. Charles Parish	5,450	5,456	5,461	5,467	5,474	5,480	5,487	5,494	5,501	5,509	5,516
St. James Parish	1,977	1,979	1,981	1,983	1,985	1,988	1,990	1,993	1,995	1,997	2,000
St. John the Baptist Parish	3,739	3,741	3,743	3,745	3,747	3,749	3,751	3,753	3,755	3,757	3,758
St. Tammany Parish	25,775	25,791	25,807	25,823	25,837	25,850	25,864	25,877	25,890	25,902	25,915

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:		
	5/14	5/15	5/16	5/17	5/19	5/21	5/23
Ascension Parish	12,328	12,349	12,370	12,391	12,432 (2,486) [597] {298}	12,474 (2,495) [599] {299}	12,517 (2,503) [601] {300}
Bossier Parish	13,958	13,973	13,987	14,002	14,033 (2,807) [674] {337}	14,065 (2,813) [675] {338}	14,098 (2,820) [677] {338}
Caddo Parish	26,225	26,255	26,284	26,314	26,373 (5,275) [1,266] {633}	26,428 (5,286) [1,269] {634}	26,484 (5,297) [1,271] {636}
Calcasieu Parish	22,615	22,625	22,635	22,645	22,671 (4,534) [1,088] {544}	22,693 (4,539) [1,089] {545}	22,715 (4,543) [1,090] {545}
East Baton Rouge Parish	39,801	39,830	39,860	39,889	39,951 (7,990) [1,918] {959}	40,008 (8,002) [1,920] {960}	40,060 (8,012) [1,923] {961}
Jefferson Parish	46,337	46,375	46,412	46,450	46,521 (9,304) [2,233] {1,116}	46,595 (9,319) [2,237] {1,118}	46,671 (9,334) [2,240] {1,120}
Lafayette Parish	23,655	23,683	23,710	23,738	23,794 (4,759) [1,142] {571}	23,851 (4,770) [1,145] {572}	23,909 (4,782) [1,148] {574}
Lafourche Parish	9,673	9,677	9,680	9,684	9,701 (1,940) [466] {233}	9,718 (1,944) [466] {233}	9,735 (1,947) [467] {234}
Orleans Parish	30,239	30,265	30,291	30,317	30,381 (6,076) [1,458] {729}	30,448 (6,090) [1,462] {731}	30,518 (6,104) [1,465] {732}
Ouachita Parish	18,530	18,540	18,551	18,561	18,587 (3,717) [892] {446}	18,613 (3,723) [893] {447}	18,638 (3,728) [895] {447}
Rapides Parish	12,209	12,223	12,237	12,251	12,284 (2,457) [590] {295}	12,318 (2,464) [591] {296}	12,351 (2,470) [593] {296}
St. Bernard Parish	4,040	4,042	4,043	4,045	4,049 (810) [194] {97}	4,053 (811) [195] {97}	4,057 (811) [195] {97}
St. Charles Parish	5,450	5,456	5,461	5,467	5,480 (1,096) [263] {132}	5,494 (1,099) [264] {132}	5,509 (1,102) [264] {132}
St. James Parish	1,977	1,979	1,981	1,983	1,988 (398) [95] {48}	1,993 (399) [96] {48}	1,997 (399) [96] {48}
St. John the Baptist Parish	3,739	3,741	3,743	3,745	3,749 (750) [180] {90}	3,753 (751) [180] {90}	3,757 (751) [180] {90}
St. Tammany Parish	25,775	25,791	25,807	25,823	25,850 (5,170) [1,241] {620}	25,877 (5,175) [1,242] {621}	25,902 (5,180) [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.