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

Date: 4/20/21

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 4/20/21 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.

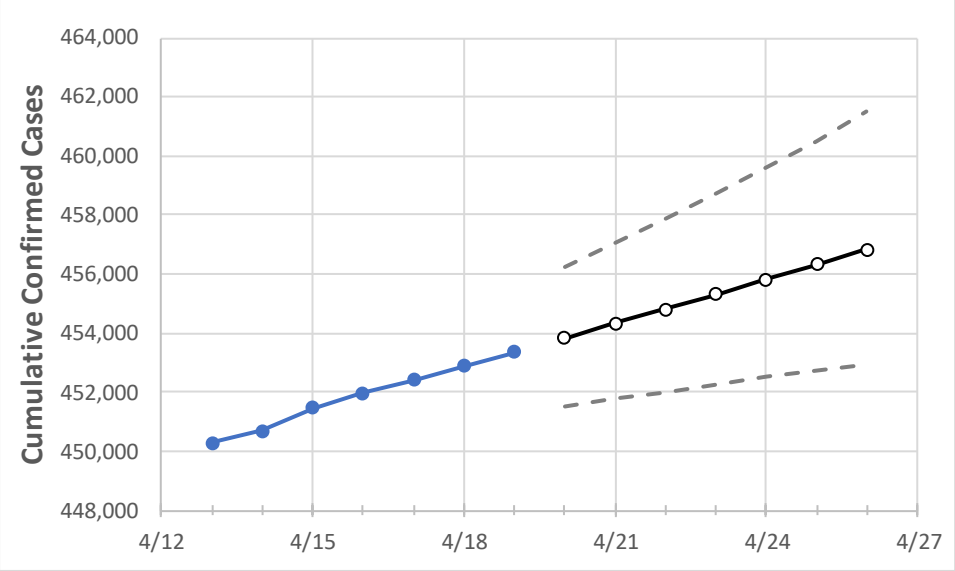
IEM's Modeling Lead

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:						
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
Louisiana	451,955	452,420	452,886	453,351	453,832	454,324	454,819	455,310	455,814	456,317	456,833

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:						
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
Ascension Parish	11,829	11,835	11,840	11,846	11,861	11,877	11,891	11,906	11,921	11,936	11,951
Bossier Parish	13,524	13,540	13,557	13,573	13,591	13,611	13,630	13,650	13,671	13,692	13,714
Caddo Parish	25,450	25,474	25,498	25,522	25,554	25,586	25,620	25,656	25,694	25,733	25,775
Calcasieu Parish	21,956	21,982	22,007	22,033	22,070	22,103	22,139	22,171	22,206	22,241	22,277
East Baton Rouge Parish	38,242	38,309	38,375	38,442	38,501	38,560	38,618	38,680	38,742	38,808	38,869
Jefferson Parish	45,493	45,512	45,530	45,549	45,579	45,608	45,637	45,667	45,696	45,726	45,756
Lafayette Parish	22,739	22,774	22,809	22,844	22,880	22,917	22,956	22,998	23,040	23,083	23,125
Lafourche Parish	9,436	9,439	9,443	9,446	9,450	9,453	9,457	9,461	9,464	9,468	9,472
Orleans Parish	29,584	29,600	29,617	29,633	29,650	29,668	29,685	29,702	29,718	29,735	29,751
Ouachita Parish	18,054	18,066	18,077	18,089	18,102	18,116	18,130	18,144	18,158	18,173	18,189
Rapides Parish	11,782	11,785	11,789	11,792	11,802	11,811	11,822	11,832	11,841	11,851	11,861
St. Bernard Parish	3,973	3,973	3,974	3,974	3,976	3,977	3,979	3,980	3,982	3,983	3,985
St. Charles Parish	5,333	5,334	5,336	5,337	5,340	5,343	5,345	5,348	5,350	5,353	5,355
St. James Parish	1,935	1,936	1,937	1,938	1,940	1,942	1,944	1,946	1,947	1,949	1,951
St. John the Baptist Parish	3,656	3,658	3,659	3,661	3,664	3,666	3,669	3,672	3,675	3,677	3,680
St. Tammany Parish	25,270	25,291	25,311	25,332	25,352	25,372	25,393	25,413	25,434	25,456	25,478

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:		
	4/16	4/17	4/18	4/19	4/21	4/23	4/25
Ascension Parish	11,829	11,835	11,840	11,846	11,877 (2,375) [570] {285}	11,906 (2,381) [572] {286}	11,936 (2,387) [573] {286}
Bossier Parish	13,524	13,540	13,557	13,573	13,611 (2,722) [653] {327}	13,650 (2,730) [655] {328}	13,692 (2,738) [657] {329}
Caddo Parish	25,450	25,474	25,498	25,522	25,586 (5,117) [1,228] {614}	25,656 (5,131) [1,231] {616}	25,733 (5,147) [1,235] {618}
Calcasieu Parish	21,956	21,982	22,007	22,033	22,103 (4,421) [1,061] {530}	22,171 (4,434) [1,064] {532}	22,241 (4,448) [1,068] {534}
East Baton Rouge Parish	38,242	38,309	38,375	38,442	38,560 (7,712) [1,851] {925}	38,680 (7,736) [1,857] {928}	38,808 (7,762) [1,863] {931}
Jefferson Parish	45,493	45,512	45,530	45,549	45,608 (9,122) [2,189] {1,095}	45,667 (9,133) [2,192] {1,096}	45,726 (9,145) [2,195] {1,097}
Lafayette Parish	22,739	22,774	22,809	22,844	22,917 (4,583) [1,100] {550}	22,998 (4,600) [1,104] {552}	23,083 (4,617) [1,108] {554}
Lafourche Parish	9,436	9,439	9,443	9,446	9,453 (1,891) [454] {227}	9,461 (1,892) [454] {227}	9,468 (1,894) [454] {227}
Orleans Parish	29,584	29,600	29,617	29,633	29,668 (5,934) [1,424] {712}	29,702 (5,940) [1,426] {713}	29,735 (5,947) [1,427] {714}
Ouachita Parish	18,054	18,066	18,077	18,089	18,116 (3,623) [870] {435}	18,144 (3,629) [871] {435}	18,173 (3,635) [872] {436}
Rapides Parish	11,782	11,785	11,789	11,792	11,811 (2,362) [567] {283}	11,832 (2,366) [568] {284}	11,851 (2,370) [569] {284}
St. Bernard Parish	3,973	3,973	3,974	3,974	3,977 (795) [191] {95}	3,980 (796) [191] {96}	3,983 (797) [191] {96}
St. Charles Parish	5,333	5,334	5,336	5,337	5,343 (1,069) [256] {128}	5,348 (1,070) [257] {128}	5,353 (1,071) [257] {128}
St. James Parish	1,935	1,936	1,937	1,938	1,942 (388) [93] {47}	1,946 (389) [93] {47}	1,949 (390) [94] {47}
St. John the Baptist Parish	3,656	3,658	3,659	3,661	3,666 (733) [176] {88}	3,672 (734) [176] {88}	3,677 (735) [177] {88}
St. Tammany Parish	25,270	25,291	25,311	25,332	25,372 (5,074) [1,218] {609}	25,413 (5,083) [1,220] {610}	25,456 (5,091) [1,222] {611}

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.