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

Date: 3/8/21

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 3/8/21 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.

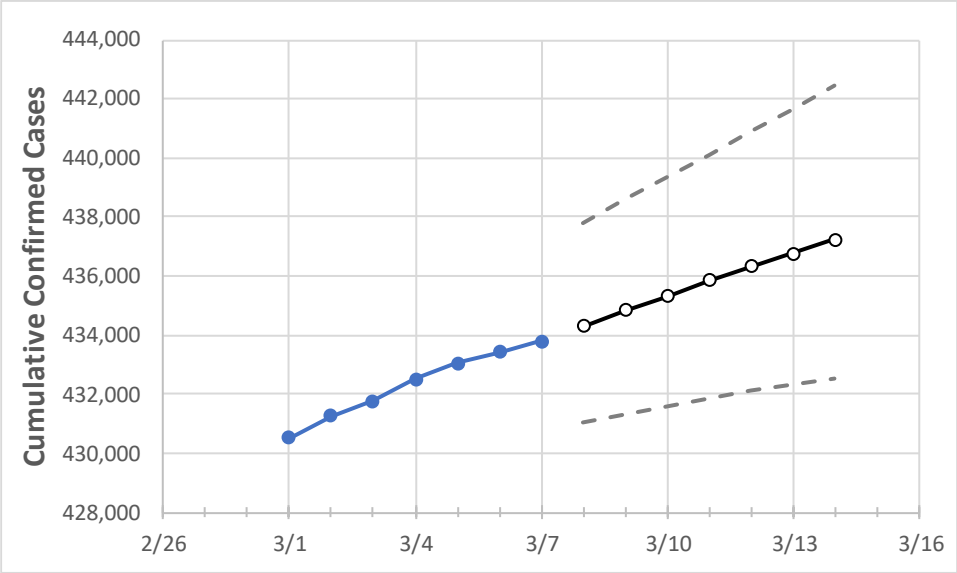
IEM's Modeling Lead

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Louisiana	432,527	433,045	433,415	433,785	434,313	434,830	435,324	435,838	436,313	436,768	437,224

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Ascension Parish	11,036	11,048	11,061	11,074	11,087	11,099	11,111	11,122	11,134	11,145	11,156
Bossier Parish	13,061	13,064	13,068	13,071	13,080	13,089	13,097	13,106	13,113	13,120	13,127
Caddo Parish	24,795	24,819	24,828	24,837	24,853	24,870	24,884	24,898	24,912	24,924	24,937
Calcasieu Parish	19,697	19,723	19,773	19,822	19,880	19,938	19,996	20,057	20,115	20,174	20,231
East Baton Rouge Parish	35,887	35,949	36,001	36,052	36,110	36,165	36,220	36,272	36,327	36,381	36,432
Jefferson Parish	44,128	44,184	44,205	44,226	44,271	44,315	44,358	44,399	44,439	44,479	44,517
Lafayette Parish	21,698	21,700	21,715	21,729	21,745	21,762	21,778	21,794	21,809	21,824	21,839
Lafourche Parish	9,193	9,203	9,209	9,215	9,227	9,238	9,249	9,260	9,270	9,280	9,290
Orleans Parish	28,624	28,655	28,683	28,710	28,746	28,782	28,816	28,850	28,883	28,914	28,944
Ouachita Parish	17,709	17,719	17,725	17,730	17,736	17,741	17,746	17,751	17,756	17,760	17,764
Rapides Parish	11,310	11,313	11,321	11,328	11,337	11,346	11,355	11,364	11,373	11,381	11,389
St. Bernard Parish	3,779	3,783	3,789	3,794	3,804	3,813	3,822	3,831	3,840	3,848	3,857
St. Charles Parish	5,144	5,150	5,154	5,158	5,165	5,172	5,179	5,185	5,191	5,198	5,204
St. James Parish	1,858	1,858	1,859	1,859	1,861	1,863	1,864	1,866	1,868	1,870	1,871
St. John the Baptist Parish	3,546	3,551	3,553	3,554	3,558	3,561	3,564	3,567	3,570	3,573	3,576
St. Tammany Parish	24,259	24,324	24,362	24,400	24,457	24,513	24,568	24,623	24,678	24,732	24,787

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:		
	3/4	3/5	3/6	3/7	3/9	3/11	3/13
Ascension Parish	11,036	11,048	11,061	11,074	11,099 (2,220) [533] {266}	11,122 (2,224) [534] {267}	11,145 (2,229) [535] {267}
Bossier Parish	13,061	13,064	13,068	13,071	13,089 (2,618) [628] {314}	13,106 (2,621) [629] {315}	13,120 (2,624) [630] {315}
Caddo Parish	24,795	24,819	24,828	24,837	24,870 (4,974) [1,194] {597}	24,898 (4,980) [1,195] {598}	24,924 (4,985) [1,196] {598}
Calcasieu Parish	19,697	19,723	19,773	19,822	19,938 (3,988) [957] {479}	20,057 (4,011) [963] {481}	20,174 (4,035) [968] {484}
East Baton Rouge Parish	35,887	35,949	36,001	36,052	36,165 (7,233) [1,736] {868}	36,272 (7,254) [1,741] {871}	36,381 (7,276) [1,746] {873}
Jefferson Parish	44,128	44,184	44,205	44,226	44,315 (8,863) [2,127] {1,064}	44,399 (8,880) [2,131] {1,066}	44,479 (8,896) [2,135] {1,067}
Lafayette Parish	21,698	21,700	21,715	21,729	21,762 (4,352) [1,045] {522}	21,794 (4,359) [1,046] {523}	21,824 (4,365) [1,048] {524}
Lafourche Parish	9,193	9,203	9,209	9,215	9,238 (1,848) [443] {222}	9,260 (1,852) [444] {222}	9,280 (1,856) [445] {223}
Orleans Parish	28,624	28,655	28,683	28,710	28,782 (5,756) [1,382] {691}	28,850 (5,770) [1,385] {692}	28,914 (5,783) [1,388] {694}
Ouachita Parish	17,709	17,719	17,725	17,730	17,741 (3,548) [852] {426}	17,751 (3,550) [852] {426}	17,760 (3,552) [852] {426}
Rapides Parish	11,310	11,313	11,321	11,328	11,346 (2,269) [545] {272}	11,364 (2,273) [545] {273}	11,381 (2,276) [546] {273}
St. Bernard Parish	3,779	3,783	3,789	3,794	3,813 (763) [183] {92}	3,831 (766) [184] {92}	3,848 (770) [185] {92}
St. Charles Parish	5,144	5,150	5,154	5,158	5,172 (1,034) [248] {124}	5,185 (1,037) [249] {124}	5,198 (1,040) [249] {125}
St. James Parish	1,858	1,858	1,859	1,859	1,863 (373) [89] {45}	1,866 (373) [90] {45}	1,870 (374) [90] {45}
St. John the Baptist Parish	3,546	3,551	3,553	3,554	3,561 (712) [171] {85}	3,567 (713) [171] {86}	3,573 (715) [171] {86}
St. Tammany Parish	24,259	24,324	24,362	24,400	24,513 (4,903) [1,177] {588}	24,623 (4,925) [1,182] {591}	24,732 (4,946) [1,187] {594}

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.