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

Date: 1/6/21

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 1/6/21 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.

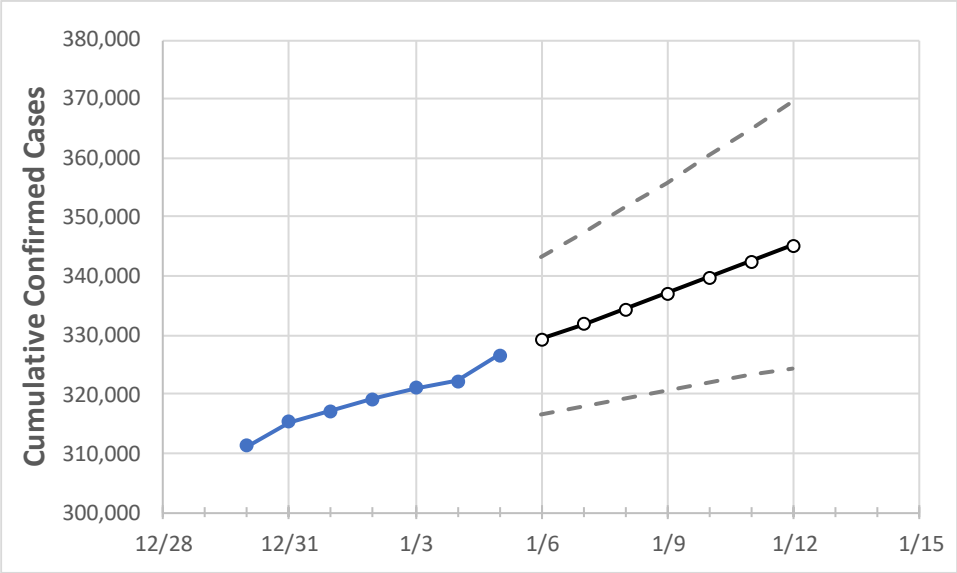
IEM's Modeling Lead

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:						
	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12
Louisiana	319,130	321,058	322,181	326,648	329,240	331,786	334,432	337,158	339,709	342,401	345,179

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:						
	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12
Ascension Parish	7,972	8,033	8,059	8,144	8,211	8,278	8,347	8,414	8,483	8,550	8,621
Bossier Parish	9,089	9,144	9,163	9,361	9,452	9,546	9,638	9,735	9,835	9,934	10,037
Caddo Parish	18,103	18,245	18,308	18,610	18,779	18,951	19,131	19,309	19,498	19,685	19,877
Calcasieu Parish	14,042	14,096	14,106	14,161	14,248	14,334	14,422	14,514	14,600	14,687	14,777
East Baton Rouge Parish	26,014	26,158	26,255	26,433	26,600	26,769	26,937	27,104	27,269	27,437	27,613
Jefferson Parish	32,083	32,375	32,601	33,091	33,412	33,744	34,089	34,425	34,774	35,115	35,468
Lafayette Parish	16,921	17,005	17,051	17,334	17,450	17,569	17,686	17,809	17,932	18,050	18,172
Lafourche Parish	6,329	6,369	6,388	6,485	6,531	6,579	6,628	6,679	6,727	6,776	6,826
Orleans Parish	21,169	21,364	21,521	21,802	22,015	22,241	22,471	22,705	22,950	23,206	23,457
Ouachita Parish	14,146	14,243	14,282	14,439	14,550	14,664	14,775	14,887	15,000	15,107	15,220
Rapides Parish	8,343	8,386	8,393	8,504	8,568	8,632	8,698	8,768	8,836	8,910	8,982
St. Bernard Parish	2,402	2,420	2,431	2,447	2,468	2,490	2,512	2,536	2,559	2,583	2,607
St. Charles Parish	3,708	3,743	3,771	3,806	3,843	3,880	3,917	3,955	3,992	4,031	4,070
St. James Parish	1,333	1,338	1,345	1,387	1,399	1,413	1,426	1,439	1,453	1,467	1,481
St. John the Baptist Parish	2,686	2,705	2,710	2,764	2,788	2,813	2,839	2,864	2,890	2,917	2,944
St. Tammany Parish	15,594	15,735	15,838	16,099	16,287	16,474	16,663	16,851	17,052	17,244	17,431

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:		
	1/2	1/3	1/4	1/5	1/7	1/9	1/11
Ascension Parish	7,972	8,033	8,059	8,144	8,278 (1,656) [397] {199}	8,414 (1,683) [404] {202}	8,550 (1,710) [410] {205}
Bossier Parish	9,089	9,144	9,163	9,361	9,546 (1,909) [458] {229}	9,735 (1,947) [467] {234}	9,934 (1,987) [477] {238}
Caddo Parish	18,103	18,245	18,308	18,610	18,951 (3,790) [910] {455}	19,309 (3,862) [927] {463}	19,685 (3,937) [945] {472}
Calcasieu Parish	14,042	14,096	14,106	14,161	14,334 (2,867) [688] {344}	14,514 (2,903) [697] {348}	14,687 (2,937) [705] {352}
East Baton Rouge Parish	26,014	26,158	26,255	26,433	26,769 (5,354) [1,285] {642}	27,104 (5,421) [1,301] {651}	27,437 (5,487) [1,317] {658}
Jefferson Parish	32,083	32,375	32,601	33,091	33,744 (6,749) [1,620] {810}	34,425 (6,885) [1,652] {826}	35,115 (7,023) [1,686] {843}
Lafayette Parish	16,921	17,005	17,051	17,334	17,569 (3,514) [843] {422}	17,809 (3,562) [855] {427}	18,050 (3,610) [866] {433}
Lafourche Parish	6,329	6,369	6,388	6,485	6,579 (1,316) [316] {158}	6,679 (1,336) [321] {160}	6,776 (1,355) [325] {163}
Orleans Parish	21,169	21,364	21,521	21,802	22,241 (4,448) [1,068] {534}	22,705 (4,541) [1,090] {545}	23,206 (4,641) [1,114] {557}
Ouachita Parish	14,146	14,243	14,282	14,439	14,664 (2,933) [704] {352}	14,887 (2,977) [715] {357}	15,107 (3,021) [725] {363}
Rapides Parish	8,343	8,386	8,393	8,504	8,632 (1,726) [414] {207}	8,768 (1,754) [421] {210}	8,910 (1,782) [428] {214}
St. Bernard Parish	2,402	2,420	2,431	2,447	2,490 (498) [120] {60}	2,536 (507) [122] {61}	2,583 (517) [124] {62}
St. Charles Parish	3,708	3,743	3,771	3,806	3,880 (776) [186] {93}	3,955 (791) [190] {95}	4,031 (806) [193] {97}
St. James Parish	1,333	1,338	1,345	1,387	1,413 (283) [68] {34}	1,439 (288) [69] {35}	1,467 (293) [70] {35}
St. John the Baptist Parish	2,686	2,705	2,710	2,764	2,813 (563) [135] {68}	2,864 (573) [137] {69}	2,917 (583) [140] {70}
St. Tammany Parish	15,594	15,735	15,838	16,099	16,474 (3,295) [791] {395}	16,851 (3,370) [809] {404}	17,244 (3,449) [828] {414}

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.