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

Date: 9/15/21

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 9/15/21 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.

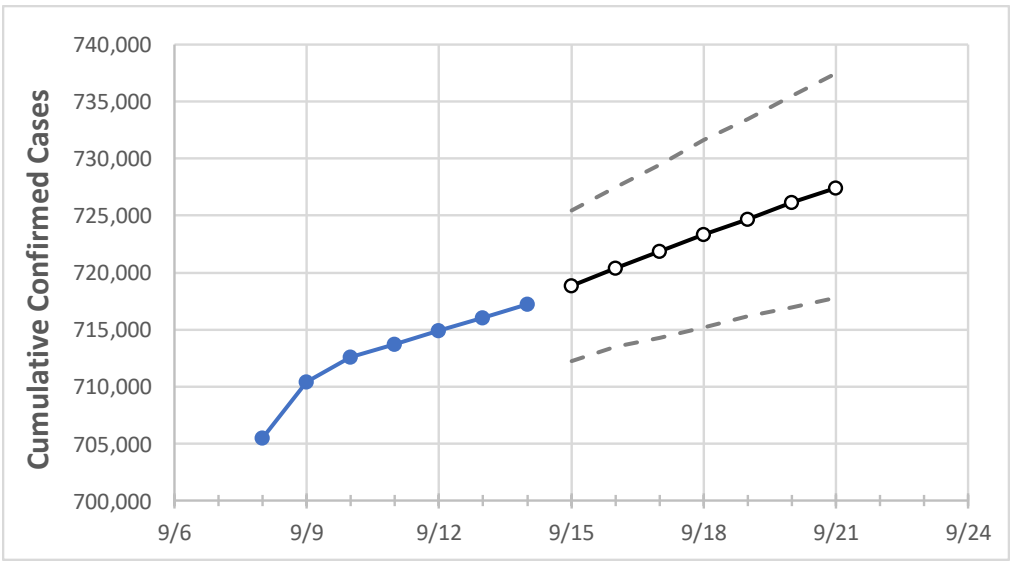
IEM's Modeling Lead

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Louisiana	713,737	714,899	716,062	717,224	718,868	720,414	721,866	723,315	724,661	726,124	727,422

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Ascension Parish	20,771	20,795	20,819	20,843	20,877	20,910	20,946	20,974	21,007	21,041	21,068
Bossier Parish	20,239	20,284	20,328	20,372	20,429	20,485	20,537	20,590	20,641	20,691	20,741
Caddo Parish	36,802	36,864	36,925	36,986	37,063	37,137	37,207	37,278	37,345	37,415	37,476
Calcasieu Parish	32,164	32,215	32,266	32,317	32,422	32,545	32,654	32,763	32,873	32,992	33,101
East Baton Rouge Parish	60,804	60,872	60,940	61,008	61,105	61,210	61,292	61,405	61,484	61,580	61,666
Jefferson Parish	66,836	66,907	66,979	67,050	67,094	67,139	67,180	67,218	67,256	67,292	67,324
Lafayette Parish	36,647	36,711	36,774	36,838	36,935	37,031	37,120	37,218	37,307	37,392	37,481
Lafourche Parish	16,952	16,970	16,989	17,007	17,029	17,057	17,077	17,097	17,122	17,144	17,164
Orleans Parish	44,514	44,563	44,613	44,662	44,698	44,734	44,768	44,803	44,834	44,866	44,893
Ouachita Parish	28,740	28,798	28,857	28,915	29,025	29,133	29,237	29,340	29,445	29,551	29,646
Rapides Parish	19,933	19,967	20,000	20,033	20,094	20,156	20,222	20,278	20,340	20,398	20,452
St. Bernard Parish	6,559	6,571	6,582	6,594	6,602	6,610	6,617	6,624	6,631	6,638	6,644
St. Charles Parish	8,518	8,528	8,539	8,549	8,558	8,566	8,573	8,582	8,589	8,596	8,603
St. James Parish	3,264	3,271	3,278	3,285	3,290	3,294	3,297	3,301	3,304	3,308	3,310
St. John the Baptist Parish	6,024	6,030	6,035	6,041	6,047	6,052	6,057	6,062	6,067	6,071	6,075
St. Tammany Parish	41,187	41,255	41,322	41,389	41,457	41,524	41,588	41,656	41,714	41,775	41,835

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:		
	9/11	9/12	9/13	9/14	9/16	9/18	9/20
Ascension Parish	20,771	20,795	20,819	20,843	20,910 (4,182) [1,004] {502}	20,974 (4,195) [1,007] {503}	21,041 (4,208) [1,010] {505}
Bossier Parish	20,239	20,284	20,328	20,372	20,485 (4,097) [983] {492}	20,590 (4,118) [988] {494}	20,691 (4,138) [993] {497}
Caddo Parish	36,802	36,864	36,925	36,986	37,137 (7,427) [1,783] {891}	37,278 (7,456) [1,789] {895}	37,415 (7,483) [1,796] {898}
Calcasieu Parish	32,164	32,215	32,266	32,317	32,545 (6,509) [1,562] {781}	32,763 (6,553) [1,573] {786}	32,992 (6,598) [1,584] {792}
East Baton Rouge Parish	60,804	60,872	60,940	61,008	61,210 (12,242) [2,938] {1,469}	61,405 (12,281) [2,947] {1,474}	61,580 (12,316) [2,956] {1,478}
Jefferson Parish	66,836	66,907	66,979	67,050	67,139 (13,428) [3,223] {1,611}	67,218 (13,444) [3,226] {1,613}	67,292 (13,458) [3,230] {1,615}
Lafayette Parish	36,647	36,711	36,774	36,838	37,031 (7,406) [1,778] {889}	37,218 (7,444) [1,786] {893}	37,392 (7,478) [1,795] {897}
Lafourche Parish	16,952	16,970	16,989	17,007	17,057 (3,411) [819] {409}	17,097 (3,419) [821] {410}	17,144 (3,429) [823] {411}
Orleans Parish	44,514	44,563	44,613	44,662	44,734 (8,947) [2,147] {1,074}	44,803 (8,961) [2,151] {1,075}	44,866 (8,973) [2,154] {1,077}
Ouachita Parish	28,740	28,798	28,857	28,915	29,133 (5,827) [1,398] {699}	29,340 (5,868) [1,408] {704}	29,551 (5,910) [1,418] {709}
Rapides Parish	19,933	19,967	20,000	20,033	20,156 (4,031) [968] {484}	20,278 (4,056) [973] {487}	20,398 (4,080) [979] {490}
St. Bernard Parish	6,559	6,571	6,582	6,594	6,610 (1,322) [317] {159}	6,624 (1,325) [318] {159}	6,638 (1,328) [319] {159}
St. Charles Parish	8,518	8,528	8,539	8,549	8,566 (1,713) [411] {206}	8,582 (1,716) [412] {206}	8,596 (1,719) [413] {206}
St. James Parish	3,264	3,271	3,278	3,285	3,294 (659) [158] {79}	3,301 (660) [158] {79}	3,308 (662) [159] {79}
St. John the Baptist Parish	6,024	6,030	6,035	6,041	6,052 (1,210) [290] {145}	6,062 (1,212) [291] {145}	6,071 (1,214) [291] {146}
St. Tammany Parish	41,187	41,255	41,322	41,389	41,524 (8,305) [1,993] {997}	41,656 (8,331) [1,999] {1,000}	41,775 (8,355) [2,005] {1,003}

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.