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

Date: 10/15/21

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 10/15/21 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.

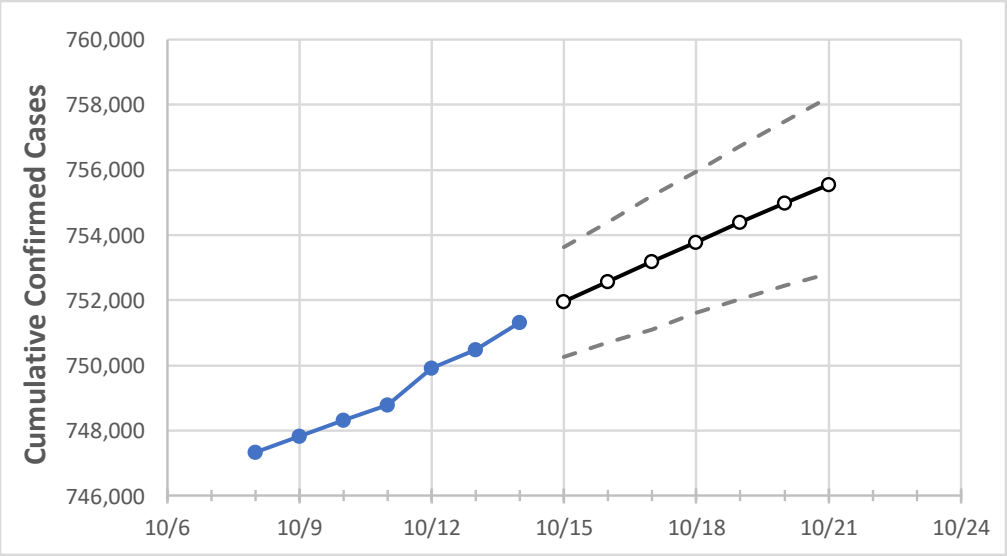
IEM's Modeling Lead

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Louisiana	748,793	749,922	750,473	751,315	751,950	752,580	753,173	753,770	754,382	754,973	755,541

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Ascension Parish	21,553	21,614	21,616	21,632	21,647	21,662	21,675	21,690	21,705	21,719	21,731
Bossier Parish	21,432	21,471	21,485	21,506	21,529	21,553	21,576	21,598	21,619	21,641	21,663
Caddo Parish	38,870	38,959	38,990	39,027	39,071	39,114	39,155	39,196	39,237	39,278	39,317
Calcasieu Parish	33,914	33,968	34,011	34,061	34,102	34,140	34,176	34,215	34,253	34,291	34,326
East Baton Rouge Parish	63,107	63,223	63,272	63,337	63,382	63,423	63,465	63,505	63,546	63,585	63,623
Jefferson Parish	68,939	68,976	69,014	69,076	69,113	69,148	69,183	69,217	69,251	69,284	69,316
Lafayette Parish	38,225	38,307	38,326	38,362	38,397	38,431	38,465	38,498	38,533	38,566	38,597
Lafourche Parish	17,691	17,713	17,725	17,749	17,763	17,777	17,792	17,806	17,819	17,834	17,847
Orleans Parish	46,274	46,313	46,343	46,382	46,416	46,449	46,481	46,514	46,545	46,578	46,608
Ouachita Parish	31,009	31,100	31,152	31,198	31,240	31,281	31,319	31,360	31,396	31,435	31,474
Rapides Parish	20,937	20,987	20,996	21,016	21,032	21,048	21,062	21,077	21,092	21,107	21,121
St. Bernard Parish	6,815	6,829	6,840	6,845	6,852	6,859	6,866	6,873	6,880	6,887	6,894
St. Charles Parish	8,784	8,796	8,800	8,806	8,812	8,819	8,825	8,832	8,838	8,845	8,851
St. James Parish	3,427	3,433	3,436	3,439	3,442	3,445	3,448	3,450	3,453	3,456	3,459
St. John the Baptist Parish	6,248	6,252	6,259	6,266	6,272	6,277	6,283	6,289	6,296	6,302	6,308
St. Tammany Parish	43,076	43,122	43,151	43,200	43,234	43,267	43,299	43,330	43,363	43,393	43,419

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:		
	10/11	10/12	10/13	10/14	10/16	10/18	10/20
Ascension Parish	21,553	21,614	21,616	21,632	21,662 (4,332) [1,040] {520}	21,690 (4,338) [1,041] {521}	21,719 (4,344) [1,043] {521}
Bossier Parish	21,432	21,471	21,485	21,506	21,553 (4,311) [1,035] {517}	21,598 (4,320) [1,037] {518}	21,641 (4,328) [1,039] {519}
Caddo Parish	38,870	38,959	38,990	39,027	39,114 (7,823) [1,877] {939}	39,196 (7,839) [1,881] {941}	39,278 (7,856) [1,885] {943}
Calcasieu Parish	33,914	33,968	34,011	34,061	34,140 (6,828) [1,639] {819}	34,215 (6,843) [1,642] {821}	34,291 (6,858) [1,646] {823}
East Baton Rouge Parish	63,107	63,223	63,272	63,337	63,423 (12,685) [3,044] {1,522}	63,505 (12,701) [3,048] {1,524}	63,585 (12,717) [3,052] {1,526}
Jefferson Parish	68,939	68,976	69,014	69,076	69,148 (13,830) [3,319] {1,660}	69,217 (13,843) [3,322] {1,661}	69,284 (13,857) [3,326] {1,663}
Lafayette Parish	38,225	38,307	38,326	38,362	38,431 (7,686) [1,845] {922}	38,498 (7,700) [1,848] {924}	38,566 (7,713) [1,851] {926}
Lafourche Parish	17,691	17,713	17,725	17,749	17,777 (3,555) [853] {427}	17,806 (3,561) [855] {427}	17,834 (3,567) [856] {428}
Orleans Parish	46,274	46,313	46,343	46,382	46,449 (9,290) [2,230] {1,115}	46,514 (9,303) [2,233] {1,116}	46,578 (9,316) [2,236] {1,118}
Ouachita Parish	31,009	31,100	31,152	31,198	31,281 (6,256) [1,501] {751}	31,360 (6,272) [1,505] {753}	31,435 (6,287) [1,509] {754}
Rapides Parish	20,937	20,987	20,996	21,016	21,048 (4,210) [1,010] {505}	21,077 (4,215) [1,012] {506}	21,107 (4,221) [1,013] {507}
St. Bernard Parish	6,815	6,829	6,840	6,845	6,859 (1,372) [329] {165}	6,873 (1,375) [330] {165}	6,887 (1,377) [331] {165}
St. Charles Parish	8,784	8,796	8,800	8,806	8,819 (1,764) [423] {212}	8,832 (1,766) [424] {212}	8,845 (1,769) [425] {212}
St. James Parish	3,427	3,433	3,436	3,439	3,445 (689) [165] {83}	3,450 (690) [166] {83}	3,456 (691) [166] {83}
St. John the Baptist Parish	6,248	6,252	6,259	6,266	6,277 (1,255) [301] {151}	6,289 (1,258) [302] {151}	6,302 (1,260) [303] {151}
St. Tammany Parish	43,076	43,122	43,151	43,200	43,267 (8,653) [2,077] {1,038}	43,330 (8,666) [2,080] {1,040}	43,393 (8,679) [2,083] {1,041}

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.