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

Date: 11/1/21

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 11/1/21 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.

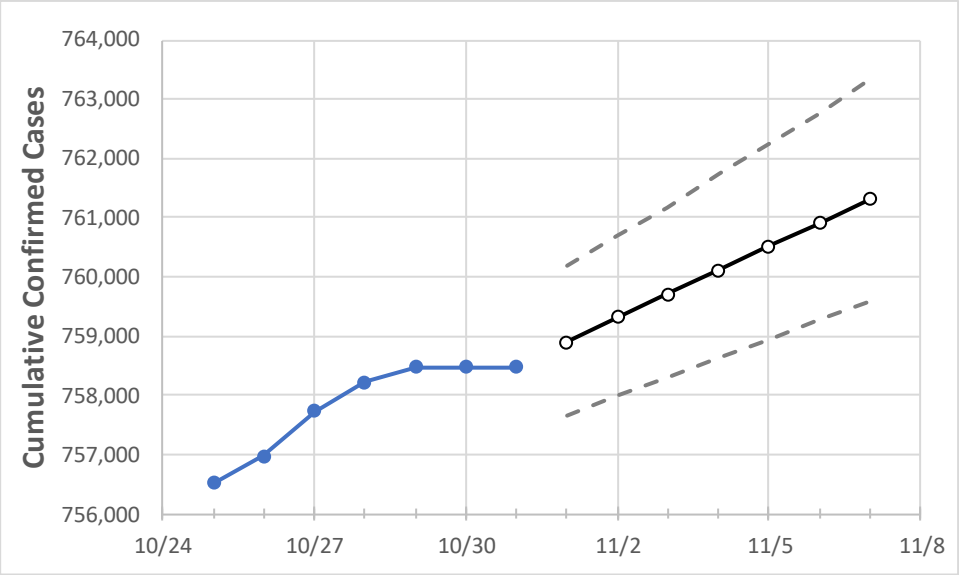
IEM's Modeling Lead

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:						
	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7
Louisiana	758,230	758,471	758,471	758,471	758,903	759,314	759,714	760,120	760,518	760,914	761,317

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:						
	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7
Ascension Parish	21,773	21,779	21,779	21,779	21,788	21,797	21,806	21,814	21,823	21,832	21,840
Bossier Parish	21,704	21,714	21,714	21,714	21,725	21,736	21,746	21,756	21,766	21,776	21,785
Caddo Parish	39,409	39,428	39,428	39,428	39,449	39,470	39,491	39,511	39,531	39,550	39,569
Calcasieu Parish	34,454	34,467	34,467	34,467	34,490	34,512	34,534	34,557	34,577	34,599	34,619
East Baton Rouge Parish	63,825	63,842	63,842	63,842	63,870	63,901	63,930	63,960	63,988	64,016	64,043
Jefferson Parish	69,492	69,518	69,518	69,518	69,544	69,570	69,595	69,620	69,644	69,669	69,693
Lafayette Parish	38,875	38,883	38,883	38,883	38,920	38,956	38,994	39,028	39,067	39,105	39,140
Lafourche Parish	17,884	17,887	17,887	17,887	17,896	17,905	17,913	17,921	17,930	17,939	17,946
Orleans Parish	46,772	46,796	46,796	46,796	46,822	46,847	46,872	46,898	46,923	46,948	46,973
Ouachita Parish	31,493	31,508	31,508	31,508	31,524	31,538	31,553	31,567	31,580	31,595	31,608
Rapides Parish	21,219	21,222	21,222	21,222	21,236	21,249	21,262	21,276	21,289	21,303	21,315
St. Bernard Parish	6,893	6,895	6,895	6,895	6,898	6,900	6,903	6,905	6,907	6,910	6,912
St. Charles Parish	8,869	8,872	8,872	8,872	8,875	8,879	8,882	8,885	8,888	8,891	8,894
St. James Parish	3,508	3,508	3,508	3,508	3,514	3,520	3,525	3,532	3,537	3,544	3,550
St. John the Baptist Parish	6,305	6,306	6,306	6,306	6,308	6,311	6,313	6,315	6,317	6,319	6,321
St. Tammany Parish	43,557	43,568	43,568	43,568	43,589	43,610	43,630	43,651	43,670	43,690	43,710

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:		
	10/28	10/29	10/30	10/31	11/2	11/4	11/6
Ascension Parish	21,773	21,779	21,779	21,779	21,797 (4,359) [1,046] {523}	21,814 (4,363) [1,047] {524}	21,832 (4,366) [1,048] {524}
Bossier Parish	21,704	21,714	21,714	21,714	21,736 (4,347) [1,043] {522}	21,756 (4,351) [1,044] {522}	21,776 (4,355) [1,045] {523}
Caddo Parish	39,409	39,428	39,428	39,428	39,470 (7,894) [1,895] {947}	39,511 (7,902) [1,897] {948}	39,550 (7,910) [1,898] {949}
Calcasieu Parish	34,454	34,467	34,467	34,467	34,512 (6,902) [1,657] {828}	34,557 (6,911) [1,659] {829}	34,599 (6,920) [1,661] {830}
East Baton Rouge Parish	63,825	63,842	63,842	63,842	63,901 (12,780) [3,067] {1,534}	63,960 (12,792) [3,070] {1,535}	64,016 (12,803) [3,073] {1,536}
Jefferson Parish	69,492	69,518	69,518	69,518	69,570 (13,914) [3,339] {1,670}	69,620 (13,924) [3,342] {1,671}	69,669 (13,934) [3,344] {1,672}
Lafayette Parish	38,875	38,883	38,883	38,883	38,956 (7,791) [1,870] {935}	39,028 (7,806) [1,873] {937}	39,105 (7,821) [1,877] {939}
Lafourche Parish	17,884	17,887	17,887	17,887	17,905 (3,581) [859] {430}	17,921 (3,584) [860] {430}	17,939 (3,588) [861] {431}
Orleans Parish	46,772	46,796	46,796	46,796	46,847 (9,369) [2,249] {1,124}	46,898 (9,380) [2,251] {1,126}	46,948 (9,390) [2,253] {1,127}
Ouachita Parish	31,493	31,508	31,508	31,508	31,538 (6,308) [1,514] {757}	31,567 (6,313) [1,515] {758}	31,595 (6,319) [1,517] {758}
Rapides Parish	21,219	21,222	21,222	21,222	21,249 (4,250) [1,020] {510}	21,276 (4,255) [1,021] {511}	21,303 (4,261) [1,023] {511}
St. Bernard Parish	6,893	6,895	6,895	6,895	6,900 (1,380) [331] {166}	6,905 (1,381) [331] {166}	6,910 (1,382) [332] {166}
St. Charles Parish	8,869	8,872	8,872	8,872	8,879 (1,776) [426] {213}	8,885 (1,777) [426] {213}	8,891 (1,778) [427] {213}
St. James Parish	3,508	3,508	3,508	3,508	3,520 (704) [169] {84}	3,532 (706) [170] {85}	3,544 (709) [170] {85}
St. John the Baptist Parish	6,305	6,306	6,306	6,306	6,311 (1,262) [303] {151}	6,315 (1,263) [303] {152}	6,319 (1,264) [303] {152}
St. Tammany Parish	43,557	43,568	43,568	43,568	43,610 (8,722) [2,093] {1,047}	43,651 (8,730) [2,095] {1,048}	43,690 (8,738) [2,097] {1,049}

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.