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

Date: 10/1/21

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 10/1/21 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.

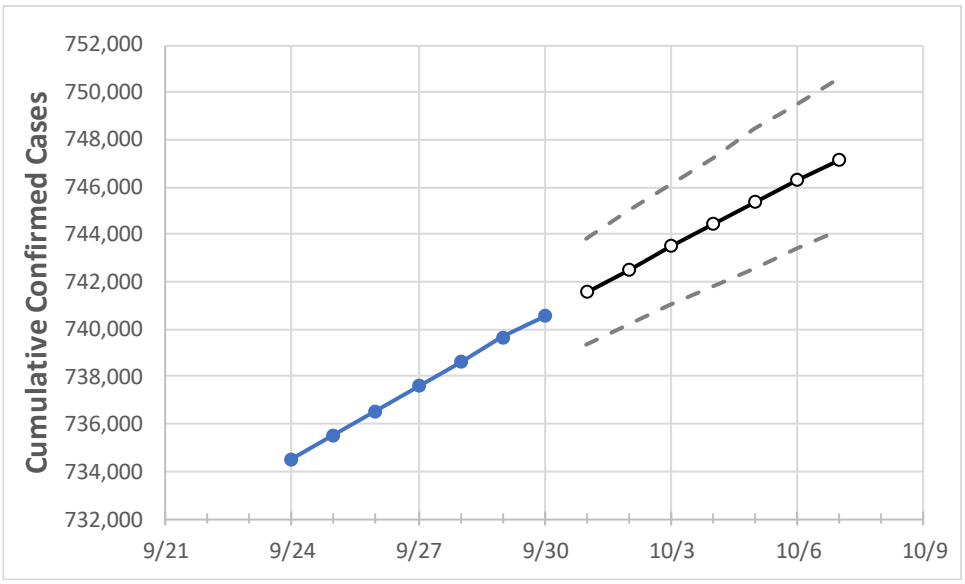
IEM's Modeling Lead

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
Louisiana	737,582	738,613	739,661	740,533	741,582	742,513	743,496	744,444	745,345	746,273	747,155

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
Ascension Parish	21,304	21,331	21,347	21,380	21,402	21,423	21,442	21,462	21,483	21,502	21,521
Bossier Parish	20,994	21,022	21,058	21,115	21,150	21,184	21,218	21,251	21,284	21,316	21,347
Caddo Parish	38,098	38,170	38,242	38,306	38,372	38,437	38,499	38,563	38,624	38,686	38,747
Calcasieu Parish	33,326	33,403	33,445	33,479	33,531	33,583	33,629	33,681	33,727	33,772	33,822
East Baton Rouge Parish	62,367	62,453	62,514	62,572	62,640	62,703	62,768	62,830	62,890	62,954	63,011
Jefferson Parish	68,273	68,333	68,382	68,449	68,509	68,569	68,627	68,684	68,738	68,793	68,847
Lafayette Parish	37,738	37,779	37,809	37,829	37,871	37,908	37,942	37,980	38,015	38,051	38,085
Lafourche Parish	17,486	17,513	17,530	17,540	17,563	17,585	17,609	17,629	17,651	17,672	17,692
Orleans Parish	45,721	45,765	45,810	45,849	45,906	45,962	46,015	46,071	46,124	46,177	46,228
Ouachita Parish	30,284	30,369	30,432	30,486	30,565	30,643	30,722	30,796	30,873	30,952	31,024
Rapides Parish	20,651	20,683	20,720	20,736	20,767	20,797	20,826	20,856	20,883	20,911	20,937
St. Bernard Parish	6,736	6,739	6,747	6,751	6,758	6,764	6,771	6,777	6,783	6,789	6,795
St. Charles Parish	8,699	8,705	8,709	8,714	8,721	8,729	8,736	8,743	8,750	8,756	8,763
St. James Parish	3,380	3,383	3,388	3,390	3,394	3,399	3,403	3,406	3,411	3,415	3,418
St. John the Baptist Parish	6,185	6,191	6,194	6,199	6,205	6,211	6,217	6,223	6,228	6,234	6,239
St. Tammany Parish	42,433	42,470	42,550	42,595	42,653	42,712	42,765	42,825	42,877	42,934	42,985

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:		
	9/27	9/28	9/29	9/30	10/2	10/4	10/6
Ascension Parish	21,304	21,331	21,347	21,380	21,423 (4,285) [1,028] {514}	21,462 (4,292) [1,030] {515}	21,502 (4,300) [1,032] {516}
Bossier Parish	20,994	21,022	21,058	21,115	21,184 (4,237) [1,017] {508}	21,251 (4,250) [1,020] {510}	21,316 (4,263) [1,023] {512}
Caddo Parish	38,098	38,170	38,242	38,306	38,437 (7,687) [1,845] {922}	38,563 (7,713) [1,851] {926}	38,686 (7,737) [1,857] {928}
Calcasieu Parish	33,326	33,403	33,445	33,479	33,583 (6,717) [1,612] {806}	33,681 (6,736) [1,617] {808}	33,772 (6,754) [1,621] {811}
East Baton Rouge Parish	62,367	62,453	62,514	62,572	62,703 (12,541) [3,010] {1,505}	62,830 (12,566) [3,016] {1,508}	62,954 (12,591) [3,022] {1,511}
Jefferson Parish	68,273	68,333	68,382	68,449	68,569 (13,714) [3,291] {1,646}	68,684 (13,737) [3,297] {1,648}	68,793 (13,759) [3,302] {1,651}
Lafayette Parish	37,738	37,779	37,809	37,829	37,908 (7,582) [1,820] {910}	37,980 (7,596) [1,823] {912}	38,051 (7,610) [1,826] {913}
Lafourche Parish	17,486	17,513	17,530	17,540	17,585 (3,517) [844] {422}	17,629 (3,526) [846] {423}	17,672 (3,534) [848] {424}
Orleans Parish	45,721	45,765	45,810	45,849	45,962 (9,192) [2,206] {1,103}	46,071 (9,214) [2,211] {1,106}	46,177 (9,235) [2,216] {1,108}
Ouachita Parish	30,284	30,369	30,432	30,486	30,643 (6,129) [1,471] {735}	30,796 (6,159) [1,478] {739}	30,952 (6,190) [1,486] {743}
Rapides Parish	20,651	20,683	20,720	20,736	20,797 (4,159) [998] {499}	20,856 (4,171) [1,001] {501}	20,911 (4,182) [1,004] {502}
St. Bernard Parish	6,736	6,739	6,747	6,751	6,764 (1,353) [325] {162}	6,777 (1,355) [325] {163}	6,789 (1,358) [326] {163}
St. Charles Parish	8,699	8,705	8,709	8,714	8,729 (1,746) [419] {209}	8,743 (1,749) [420] {210}	8,756 (1,751) [420] {210}
St. James Parish	3,380	3,383	3,388	3,390	3,399 (680) [163] {82}	3,406 (681) [164] {82}	3,415 (683) [164] {82}
St. John the Baptist Parish	6,185	6,191	6,194	6,199	6,211 (1,242) [298] {149}	6,223 (1,245) [299] {149}	6,234 (1,247) [299] {150}
St. Tammany Parish	42,433	42,470	42,550	42,595	42,712 (8,542) [2,050] {1,025}	42,825 (8,565) [2,056] {1,028}	42,934 (8,587) [2,061] {1,030}

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.