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

Date: 10/4/21

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 10/4/21 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.

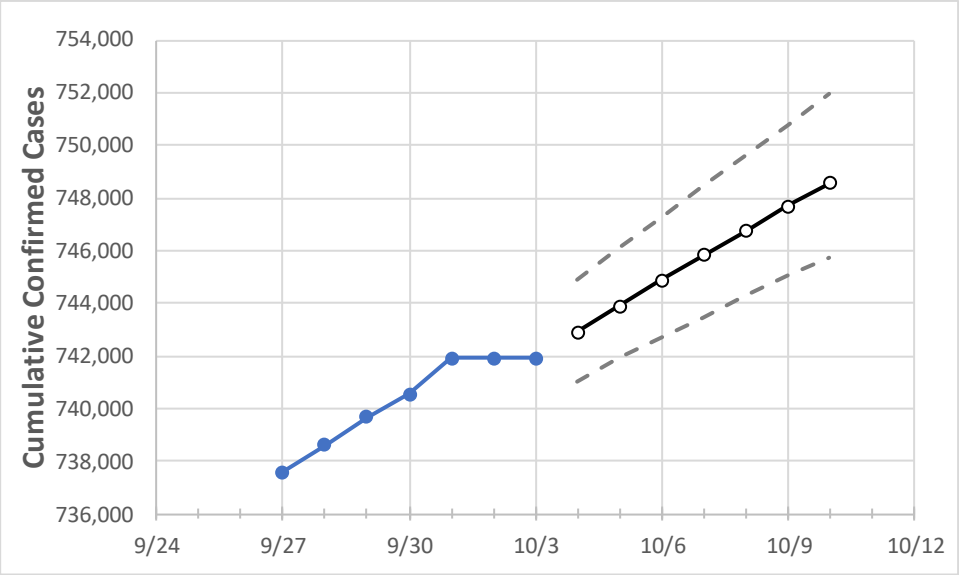
IEM's Modeling Lead

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:						
	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10
Louisiana	740,533	741,906	741,906	741,906	742,916	743,884	744,856	745,831	746,749	747,684	748,545

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:						
	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10
Ascension Parish	21,380	21,402	21,402	21,402	21,423	21,444	21,464	21,483	21,504	21,523	21,542
Bossier Parish	21,115	21,156	21,156	21,156	21,191	21,226	21,259	21,293	21,327	21,359	21,391
Caddo Parish	38,306	38,375	38,375	38,375	38,439	38,502	38,563	38,624	38,685	38,746	38,806
Calcasieu Parish	33,479	33,542	33,542	33,542	33,593	33,640	33,688	33,737	33,784	33,831	33,872
East Baton Rouge Parish	62,572	62,675	62,675	62,675	62,746	62,815	62,882	62,950	63,016	63,086	63,150
Jefferson Parish	68,449	68,523	68,523	68,523	68,580	68,635	68,691	68,745	68,798	68,851	68,901
Lafayette Parish	37,829	37,904	37,904	37,904	37,942	37,979	38,014	38,049	38,084	38,118	38,150
Lafourche Parish	17,540	17,554	17,554	17,554	17,574	17,594	17,613	17,631	17,650	17,668	17,685
Orleans Parish	45,849	45,912	45,912	45,912	45,962	46,012	46,059	46,105	46,151	46,198	46,242
Ouachita Parish	30,486	30,547	30,547	30,547	30,625	30,699	30,774	30,846	30,918	30,994	31,064
Rapides Parish	20,736	20,768	20,768	20,768	20,796	20,824	20,850	20,876	20,901	20,927	20,953
St. Bernard Parish	6,751	6,755	6,755	6,755	6,761	6,767	6,772	6,778	6,783	6,788	6,793
St. Charles Parish	8,714	8,722	8,722	8,722	8,729	8,735	8,742	8,748	8,754	8,760	8,766
St. James Parish	3,390	3,398	3,398	3,398	3,402	3,406	3,410	3,413	3,417	3,421	3,424
St. John the Baptist Parish	6,199	6,204	6,204	6,204	6,209	6,215	6,220	6,225	6,230	6,235	6,239
St. Tammany Parish	42,595	42,685	42,685	42,685	42,746	42,802	42,857	42,913	42,970	43,025	43,080

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:		
	9/30	10/1	10/2	10/3	10/5	10/7	10/9
Ascension Parish	21,380	21,402	21,402	21,402	21,444 (4,289) [1,029] {515}	21,483 (4,297) [1,031] {516}	21,523 (4,305) [1,033] {517}
Bossier Parish	21,115	21,156	21,156	21,156	21,226 (4,245) [1,019] {509}	21,293 (4,259) [1,022] {511}	21,359 (4,272) [1,025] {513}
Caddo Parish	38,306	38,375	38,375	38,375	38,502 (7,700) [1,848] {924}	38,624 (7,725) [1,854] {927}	38,746 (7,749) [1,860] {930}
Calcasieu Parish	33,479	33,542	33,542	33,542	33,640 (6,728) [1,615] {807}	33,737 (6,747) [1,619] {810}	33,831 (6,766) [1,624] {812}
East Baton Rouge Parish	62,572	62,675	62,675	62,675	62,815 (12,563) [3,015] {1,508}	62,950 (12,590) [3,022] {1,511}	63,086 (12,617) [3,028] {1,514}
Jefferson Parish	68,449	68,523	68,523	68,523	68,635 (13,727) [3,294] {1,647}	68,745 (13,749) [3,300] {1,650}	68,851 (13,770) [3,305] {1,652}
Lafayette Parish	37,829	37,904	37,904	37,904	37,979 (7,596) [1,823] {911}	38,049 (7,610) [1,826] {913}	38,118 (7,624) [1,830] {915}
Lafourche Parish	17,540	17,554	17,554	17,554	17,594 (3,519) [845] {422}	17,631 (3,526) [846] {423}	17,668 (3,534) [848] {424}
Orleans Parish	45,849	45,912	45,912	45,912	46,012 (9,202) [2,209] {1,104}	46,105 (9,221) [2,213] {1,107}	46,198 (9,240) [2,218] {1,109}
Ouachita Parish	30,486	30,547	30,547	30,547	30,699 (6,140) [1,474] {737}	30,846 (6,169) [1,481] {740}	30,994 (6,199) [1,488] {744}
Rapides Parish	20,736	20,768	20,768	20,768	20,824 (4,165) [1,000] {500}	20,876 (4,175) [1,002] {501}	20,927 (4,185) [1,005] {502}
St. Bernard Parish	6,751	6,755	6,755	6,755	6,767 (1,353) [325] {162}	6,778 (1,356) [325] {163}	6,788 (1,358) [326] {163}
St. Charles Parish	8,714	8,722	8,722	8,722	8,735 (1,747) [419] {210}	8,748 (1,750) [420] {210}	8,760 (1,752) [420] {210}
St. James Parish	3,390	3,398	3,398	3,398	3,406 (681) [163] {82}	3,413 (683) [164] {82}	3,421 (684) [164] {82}
St. John the Baptist Parish	6,199	6,204	6,204	6,204	6,215 (1,243) [298] {149}	6,225 (1,245) [299] {149}	6,235 (1,247) [299] {150}
St. Tammany Parish	42,595	42,685	42,685	42,685	42,802 (8,560) [2,054] {1,027}	42,913 (8,583) [2,060] {1,030}	43,025 (8,605) [2,065] {1,033}

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.