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

Date: 9/27/21

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 9/27/21 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.

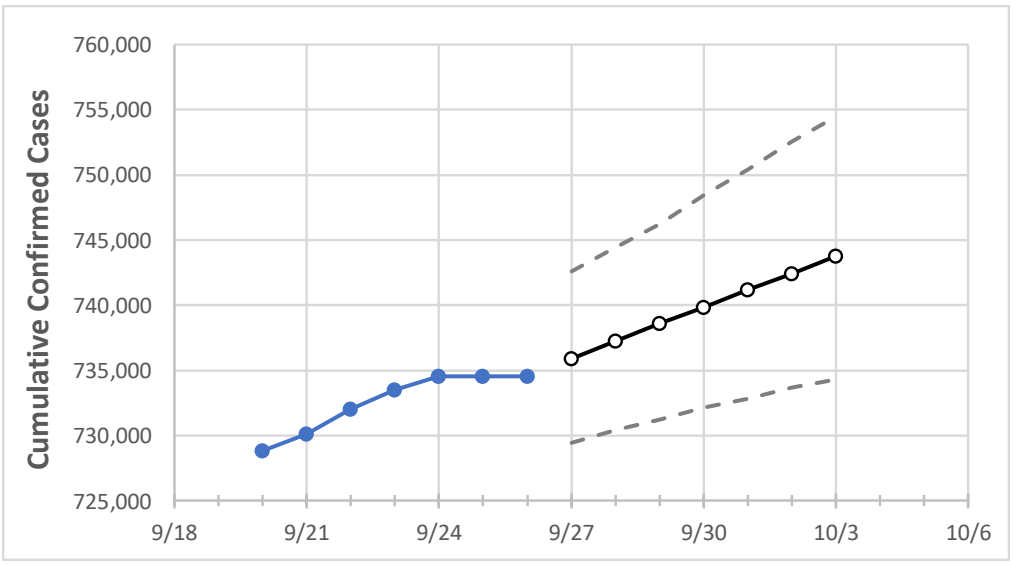
IEM's Modeling Lead

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Louisiana	733,522	734,524	734,524	734,524	735,914	737,245	738,601	739,824	741,179	742,402	743,788

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Ascension Parish	21,212	21,244	21,244	21,244	21,273	21,301	21,325	21,355	21,381	21,408	21,432
Bossier Parish	20,865	20,897	20,897	20,897	20,938	20,979	21,017	21,054	21,094	21,132	21,168
Caddo Parish	37,854	37,913	37,913	37,913	37,992	38,071	38,145	38,224	38,298	38,378	38,451
Calcasieu Parish	33,142	33,184	33,184	33,184	33,245	33,309	33,370	33,426	33,483	33,543	33,600
East Baton Rouge Parish	62,057	62,167	62,167	62,167	62,266	62,340	62,423	62,513	62,590	62,676	62,759
Jefferson Parish	68,040	68,099	68,099	68,099	68,195	68,291	68,388	68,480	68,575	68,665	68,763
Lafayette Parish	37,566	37,619	37,619	37,619	37,683	37,740	37,795	37,847	37,901	37,955	38,004
Lafourche Parish	17,408	17,435	17,435	17,435	17,469	17,507	17,541	17,578	17,612	17,647	17,684
Orleans Parish	45,530	45,585	45,585	45,585	45,671	45,767	45,851	45,945	46,037	46,136	46,223
Ouachita Parish	29,845	29,916	29,916	29,916	29,991	30,067	30,138	30,214	30,284	30,354	30,420
Rapides Parish	20,552	20,569	20,569	20,569	20,612	20,653	20,691	20,730	20,768	20,807	20,847
St. Bernard Parish	6,704	6,707	6,707	6,707	6,716	6,726	6,736	6,744	6,754	6,764	6,772
St. Charles Parish	8,665	8,671	8,671	8,671	8,681	8,692	8,702	8,712	8,723	8,733	8,743
St. James Parish	3,369	3,373	3,373	3,373	3,381	3,388	3,395	3,402	3,409	3,416	3,423
St. John the Baptist Parish	6,155	6,163	6,163	6,163	6,173	6,182	6,192	6,201	6,211	6,220	6,229
St. Tammany Parish	42,244	42,301	42,301	42,301	42,384	42,464	42,540	42,622	42,702	42,779	42,857

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:		
	9/23	9/24	9/25	9/26	9/28	9/30	10/2
Ascension Parish	21,212	21,244	21,244	21,244	21,301 (4,260) [1,022] {511}	21,355 (4,271) [1,025] {513}	21,408 (4,282) [1,028] {514}
Bossier Parish	20,865	20,897	20,897	20,897	20,979 (4,196) [1,007] {504}	21,054 (4,211) [1,011] {505}	21,132 (4,226) [1,014] {507}
Caddo Parish	37,854	37,913	37,913	37,913	38,071 (7,614) [1,827] {914}	38,224 (7,645) [1,835] {917}	38,378 (7,676) [1,842] {921}
Calcasieu Parish	33,142	33,184	33,184	33,184	33,309 (6,662) [1,599] {799}	33,426 (6,685) [1,604] {802}	33,543 (6,709) [1,610] {805}
East Baton Rouge Parish	62,057	62,167	62,167	62,167	62,340 (12,468) [2,992] {1,496}	62,513 (12,503) [3,001] {1,500}	62,676 (12,535) [3,008] {1,504}
Jefferson Parish	68,040	68,099	68,099	68,099	68,291 (13,658) [3,278] {1,639}	68,480 (13,696) [3,287] {1,644}	68,665 (13,733) [3,296] {1,648}
Lafayette Parish	37,566	37,619	37,619	37,619	37,740 (7,548) [1,812] {906}	37,847 (7,569) [1,817] {908}	37,955 (7,591) [1,822] {911}
Lafourche Parish	17,408	17,435	17,435	17,435	17,507 (3,501) [840] {420}	17,578 (3,516) [844] {422}	17,647 (3,529) [847] {424}
Orleans Parish	45,530	45,585	45,585	45,585	45,767 (9,153) [2,197] {1,098}	45,945 (9,189) [2,205] {1,103}	46,136 (9,227) [2,215] {1,107}
Ouachita Parish	29,845	29,916	29,916	29,916	30,067 (6,013) [1,443] {722}	30,214 (6,043) [1,450] {725}	30,354 (6,071) [1,457] {729}
Rapides Parish	20,552	20,569	20,569	20,569	20,653 (4,131) [991] {496}	20,730 (4,146) [995] {498}	20,807 (4,161) [999] {499}
St. Bernard Parish	6,704	6,707	6,707	6,707	6,726 (1,345) [323] {161}	6,744 (1,349) [324] {162}	6,764 (1,353) [325] {162}
St. Charles Parish	8,665	8,671	8,671	8,671	8,692 (1,738) [417] {209}	8,712 (1,742) [418] {209}	8,733 (1,747) [419] {210}
St. James Parish	3,369	3,373	3,373	3,373	3,388 (678) [163] {81}	3,402 (680) [163] {82}	3,416 (683) [164] {82}
St. John the Baptist Parish	6,155	6,163	6,163	6,163	6,182 (1,236) [297] {148}	6,201 (1,240) [298] {149}	6,220 (1,244) [299] {149}
St. Tammany Parish	42,244	42,301	42,301	42,301	42,464 (8,493) [2,038] {1,019}	42,622 (8,524) [2,046] {1,023}	42,779 (8,556) [2,053] {1,027}

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.