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

Date: 9/22/21

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 9/22/21 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.

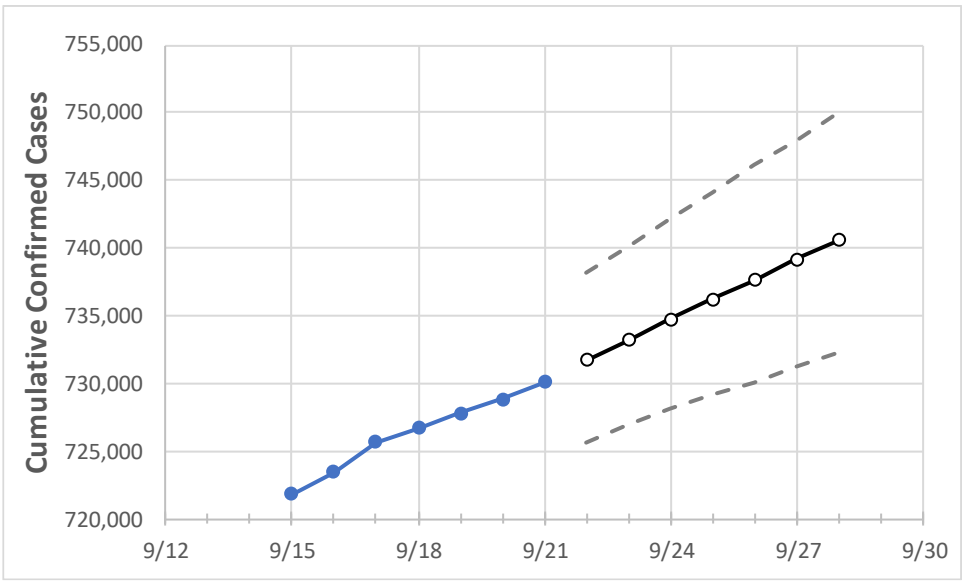
IEM's Modeling Lead

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:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Louisiana	726,702	727,766	728,831	730,099	731,701	733,195	734,778	736,211	737,659	739,160	740,547

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:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Ascension Parish	21,089	21,107	21,124	21,150	21,186	21,222	21,256	21,293	21,326	21,363	21,396
Bossier Parish	20,639	20,675	20,710	20,759	20,808	20,855	20,900	20,946	20,990	21,036	21,078
Caddo Parish	37,444	37,514	37,585	37,668	37,748	37,826	37,900	37,971	38,046	38,123	38,194
Calcasieu Parish	32,783	32,835	32,888	32,917	33,020	33,108	33,203	33,304	33,396	33,503	33,591
East Baton Rouge Parish	61,681	61,729	61,776	61,874	61,975	62,088	62,185	62,273	62,373	62,480	62,561
Jefferson Parish	67,615	67,695	67,774	67,871	67,949	68,021	68,089	68,160	68,228	68,299	68,361
Lafayette Parish	37,294	37,342	37,391	37,440	37,522	37,615	37,687	37,773	37,855	37,935	38,020
Lafourche Parish	17,245	17,272	17,299	17,313	17,345	17,378	17,411	17,443	17,472	17,508	17,539
Orleans Parish	45,132	45,213	45,294	45,386	45,452	45,519	45,582	45,645	45,711	45,775	45,836
Ouachita Parish	29,461	29,529	29,598	29,668	29,772	29,867	29,971	30,064	30,159	30,259	30,348
Rapides Parish	20,325	20,358	20,391	20,420	20,477	20,531	20,588	20,642	20,695	20,744	20,795
St. Bernard Parish	6,668	6,674	6,679	6,683	6,692	6,701	6,709	6,717	6,725	6,733	6,741
St. Charles Parish	8,616	8,628	8,640	8,647	8,658	8,668	8,678	8,688	8,698	8,708	8,717
St. James Parish	3,337	3,343	3,348	3,353	3,359	3,365	3,371	3,376	3,382	3,387	3,392
St. John the Baptist Parish	6,112	6,119	6,127	6,138	6,147	6,154	6,162	6,168	6,177	6,185	6,191
St. Tammany Parish	41,840	41,893	41,946	42,019	42,090	42,158	42,227	42,288	42,360	42,424	42,486

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:		
	9/18	9/19	9/20	9/21	9/23	9/25	9/27
Ascension Parish	21,089	21,107	21,124	21,150	21,222 (4,244) [1,019] {509}	21,293 (4,259) [1,022] {511}	21,363 (4,273) [1,025] {513}
Bossier Parish	20,639	20,675	20,710	20,759	20,855 (4,171) [1,001] {501}	20,946 (4,189) [1,005] {503}	21,036 (4,207) [1,010] {505}
Caddo Parish	37,444	37,514	37,585	37,668	37,826 (7,565) [1,816] {908}	37,971 (7,594) [1,823] {911}	38,123 (7,625) [1,830] {915}
Calcasieu Parish	32,783	32,835	32,888	32,917	33,108 (6,622) [1,589] {795}	33,304 (6,661) [1,599] {799}	33,503 (6,701) [1,608] {804}
East Baton Rouge Parish	61,681	61,729	61,776	61,874	62,088 (12,418) [2,980] {1,490}	62,273 (12,455) [2,989] {1,495}	62,480 (12,496) [2,999] {1,500}
Jefferson Parish	67,615	67,695	67,774	67,871	68,021 (13,604) [3,265] {1,632}	68,160 (13,632) [3,272] {1,636}	68,299 (13,660) [3,278] {1,639}
Lafayette Parish	37,294	37,342	37,391	37,440	37,615 (7,523) [1,806] {903}	37,773 (7,555) [1,813] {907}	37,935 (7,587) [1,821] {910}
Lafourche Parish	17,245	17,272	17,299	17,313	17,378 (3,476) [834] {417}	17,443 (3,489) [837] {419}	17,508 (3,502) [840] {420}
Orleans Parish	45,132	45,213	45,294	45,386	45,519 (9,104) [2,185] {1,092}	45,645 (9,129) [2,191] {1,095}	45,775 (9,155) [2,197] {1,099}
Ouachita Parish	29,461	29,529	29,598	29,668	29,867 (5,973) [1,434] {717}	30,064 (6,013) [1,443] {722}	30,259 (6,052) [1,452] {726}
Rapides Parish	20,325	20,358	20,391	20,420	20,531 (4,106) [986] {493}	20,642 (4,128) [991] {495}	20,744 (4,149) [996] {498}
St. Bernard Parish	6,668	6,674	6,679	6,683	6,701 (1,340) [322] {161}	6,717 (1,343) [322] {161}	6,733 (1,347) [323] {162}
St. Charles Parish	8,616	8,628	8,640	8,647	8,668 (1,734) [416] {208}	8,688 (1,738) [417] {209}	8,708 (1,742) [418] {209}
St. James Parish	3,337	3,343	3,348	3,353	3,365 (673) [162] {81}	3,376 (675) [162] {81}	3,387 (677) [163] {81}
St. John the Baptist Parish	6,112	6,119	6,127	6,138	6,154 (1,231) [295] {148}	6,168 (1,234) [296] {148}	6,185 (1,237) [297] {148}
St. Tammany Parish	41,840	41,893	41,946	42,019	42,158 (8,432) [2,024] {1,012}	42,288 (8,458) [2,030] {1,015}	42,424 (8,485) [2,036] {1,018}

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.