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

Date: 9/8/21

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 9/8/21 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.

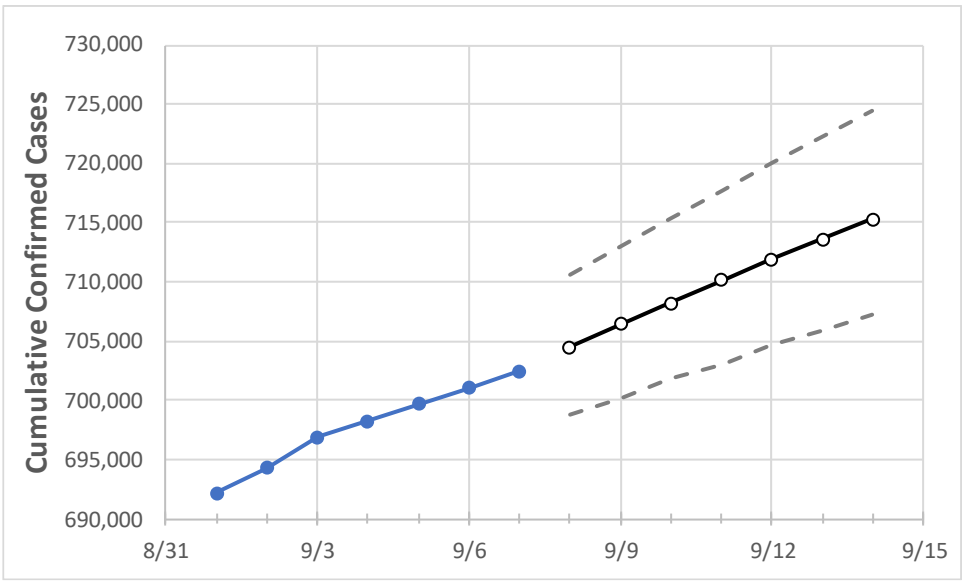
IEM's Modeling Lead

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:						
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Louisiana	698,283	699,666	701,049	702,432	704,481	706,463	708,235	710,125	711,879	713,595	715,266

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:						
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Ascension Parish	20,363	20,394	20,424	20,454	20,498	20,548	20,587	20,628	20,668	20,711	20,741
Bossier Parish	19,717	19,795	19,874	19,952	20,038	20,126	20,206	20,288	20,375	20,453	20,533
Caddo Parish	36,087	36,172	36,257	36,342	36,438	36,533	36,623	36,712	36,798	36,882	36,961
Calcasieu Parish	31,005	31,070	31,136	31,201	31,297	31,403	31,495	31,585	31,675	31,766	31,857
East Baton Rouge Parish	59,665	59,735	59,806	59,876	60,019	60,147	60,270	60,390	60,502	60,622	60,722
Jefferson Parish	66,299	66,351	66,402	66,454	66,571	66,682	66,793	66,893	67,001	67,095	67,191
Lafayette Parish	35,758	35,846	35,935	36,023	36,121	36,214	36,301	36,390	36,474	36,561	36,638
Lafourche Parish	16,630	16,645	16,659	16,673	16,710	16,741	16,769	16,801	16,826	16,855	16,886
Orleans Parish	44,077	44,117	44,156	44,196	44,281	44,362	44,441	44,515	44,590	44,661	44,731
Ouachita Parish	27,739	27,833	27,926	28,019	28,143	28,264	28,379	28,493	28,605	28,717	28,824
Rapides Parish	19,305	19,348	19,391	19,434	19,513	19,586	19,665	19,739	19,806	19,882	19,951
St. Bernard Parish	6,484	6,493	6,501	6,509	6,525	6,540	6,555	6,570	6,583	6,597	6,609
St. Charles Parish	8,419	8,430	8,440	8,451	8,465	8,479	8,492	8,504	8,516	8,528	8,538
St. James Parish	3,223	3,228	3,234	3,239	3,258	3,276	3,293	3,311	3,327	3,345	3,361
St. John the Baptist Parish	5,952	5,959	5,966	5,973	5,990	6,006	6,022	6,036	6,051	6,066	6,079
St. Tammany Parish	40,478	40,566	40,653	40,740	40,839	40,927	41,011	41,092	41,174	41,254	41,324

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:		
	9/4	9/5	9/6	9/7	9/9	9/11	9/13
Ascension Parish	20,363	20,394	20,424	20,454	20,548 (4,110) [986] {493}	20,628 (4,126) [990] {495}	20,711 (4,142) [994] {497}
Bossier Parish	19,717	19,795	19,874	19,952	20,126 (4,025) [966] {483}	20,288 (4,058) [974] {487}	20,453 (4,091) [982] {491}
Caddo Parish	36,087	36,172	36,257	36,342	36,533 (7,307) [1,754] {877}	36,712 (7,342) [1,762] {881}	36,882 (7,376) [1,770] {885}
Calcasieu Parish	31,005	31,070	31,136	31,201	31,403 (6,281) [1,507] {754}	31,585 (6,317) [1,516] {758}	31,766 (6,353) [1,525] {762}
East Baton Rouge Parish	59,665	59,735	59,806	59,876	60,147 (12,029) [2,887] {1,444}	60,390 (12,078) [2,899] {1,449}	60,622 (12,124) [2,910] {1,455}
Jefferson Parish	66,299	66,351	66,402	66,454	66,682 (13,336) [3,201] {1,600}	66,893 (13,379) [3,211] {1,605}	67,095 (13,419) [3,221] {1,610}
Lafayette Parish	35,758	35,846	35,935	36,023	36,214 (7,243) [1,738] {869}	36,390 (7,278) [1,747] {873}	36,561 (7,312) [1,755] {877}
Lafourche Parish	16,630	16,645	16,659	16,673	16,741 (3,348) [804] {402}	16,801 (3,360) [806] {403}	16,855 (3,371) [809] {405}
Orleans Parish	44,077	44,117	44,156	44,196	44,362 (8,872) [2,129] {1,065}	44,515 (8,903) [2,137] {1,068}	44,661 (8,932) [2,144] {1,072}
Ouachita Parish	27,739	27,833	27,926	28,019	28,264 (5,653) [1,357] {678}	28,493 (5,699) [1,368] {684}	28,717 (5,743) [1,378] {689}
Rapides Parish	19,305	19,348	19,391	19,434	19,586 (3,917) [940] {470}	19,739 (3,948) [947] {474}	19,882 (3,976) [954] {477}
St. Bernard Parish	6,484	6,493	6,501	6,509	6,540 (1,308) [314] {157}	6,570 (1,314) [315] {158}	6,597 (1,319) [317] {158}
St. Charles Parish	8,419	8,430	8,440	8,451	8,479 (1,696) [407] {203}	8,504 (1,701) [408] {204}	8,528 (1,706) [409] {205}
St. James Parish	3,223	3,228	3,234	3,239	3,276 (655) [157] {79}	3,311 (662) [159] {79}	3,345 (669) [161] {80}
St. John the Baptist Parish	5,952	5,959	5,966	5,973	6,006 (1,201) [288] {144}	6,036 (1,207) [290] {145}	6,066 (1,213) [291] {146}
St. Tammany Parish	40,478	40,566	40,653	40,740	40,927 (8,185) [1,964] {982}	41,092 (8,218) [1,972] {986}	41,254 (8,251) [1,980] {990}

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.