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

Date: 11/24/20

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 11/24/20 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.

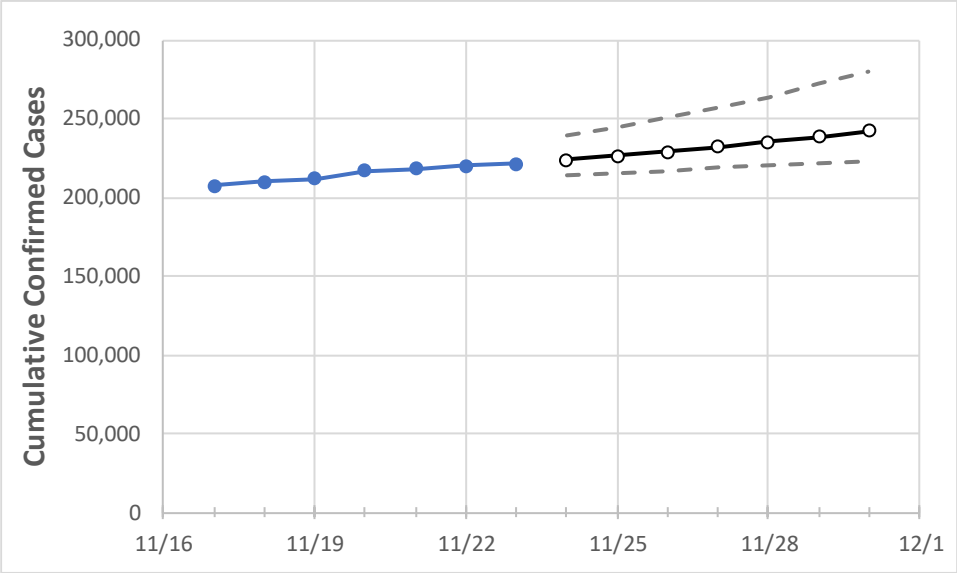
IEM's Modeling Lead

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Louisiana	216,709	218,451	220,192	221,160	223,637	226,265	229,051	232,005	235,138	238,459	241,980

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 20%, and are often within 10%, of actual confirmed cases.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Ascension Parish	5,325	5,357	5,388	5,406	5,477	5,552	5,628	5,708	5,791	5,876	5,965
Bossier Parish	5,774	5,837	5,900	5,916	6,026	6,141	6,263	6,392	6,528	6,671	6,822
Caddo Parish	12,329	12,448	12,566	12,602	12,744	12,891	13,045	13,204	13,371	13,544	13,724
Calcasieu Parish	9,924	9,978	10,032	10,058	10,176	10,303	10,440	10,588	10,747	10,918	11,103
East Baton Rouge Parish	18,764	18,898	19,031	19,135	19,367	19,619	19,893	20,191	20,515	20,866	21,248
Jefferson Parish	20,927	21,059	21,190	21,281	21,516	21,769	22,042	22,335	22,650	22,990	23,355
Lafayette Parish	11,146	11,272	11,398	11,464	11,672	11,901	12,156	12,437	12,749	13,094	13,475
Lafourche Parish	4,455	4,481	4,507	4,521	4,573	4,629	4,692	4,760	4,835	4,917	5,007
Orleans Parish	14,978	15,050	15,121	15,174	15,305	15,445	15,593	15,752	15,920	16,099	16,290
Ouachita Parish	9,267	9,365	9,463	9,515	9,719	9,942	10,185	10,450	10,738	11,052	11,393
Rapides Parish	5,948	5,972	5,996	6,019	6,110	6,209	6,315	6,430	6,554	6,688	6,832
St. Bernard Parish	1,715	1,723	1,731	1,745	1,759	1,774	1,790	1,808	1,827	1,847	1,869
St. Charles Parish	2,391	2,407	2,423	2,445	2,476	2,511	2,549	2,592	2,639	2,690	2,748
St. James Parish	934	941	947	951	959	968	978	989	1,001	1,014	1,028
St. John the Baptist Parish	1,873	1,883	1,892	1,903	1,919	1,935	1,952	1,970	1,990	2,010	2,031
St. Tammany Parish	9,514	9,593	9,672	9,730	9,910	10,108	10,326	10,566	10,829	11,118	11,436

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:		
	11/20	11/21	11/22	11/23	11/25	11/27	11/29
Ascension Parish	5,325	5,357	5,388	5,406	5,552 (1,110) [266] {133}	5,708 (1,142) [274] {137}	5,876 (1,175) [282] {141}
Bossier Parish	5,774	5,837	5,900	5,916	6,141 (1,228) [295] {147}	6,392 (1,278) [307] {153}	6,671 (1,334) [320] {160}
Caddo Parish	12,329	12,448	12,566	12,602	12,891 (2,578) [619] {309}	13,204 (2,641) [634] {317}	13,544 (2,709) [650] {325}
Calcasieu Parish	9,924	9,978	10,032	10,058	10,303 (2,061) [495] {247}	10,588 (2,118) [508] {254}	10,918 (2,184) [524] {262}
East Baton Rouge Parish	18,764	18,898	19,031	19,135	19,619 (3,924) [942] {471}	20,191 (4,038) [969] {485}	20,866 (4,173) [1,002] {501}
Jefferson Parish	20,927	21,059	21,190	21,281	21,769 (4,354) [1,045] {522}	22,335 (4,467) [1,072] {536}	22,990 (4,598) [1,104] {552}
Lafayette Parish	11,146	11,272	11,398	11,464	11,901 (2,380) [571] {286}	12,437 (2,487) [597] {298}	13,094 (2,619) [629] {314}
Lafourche Parish	4,455	4,481	4,507	4,521	4,629 (926) [222] {111}	4,760 (952) [228] {114}	4,917 (983) [236] {118}
Orleans Parish	14,978	15,050	15,121	15,174	15,445 (3,089) [741] {371}	15,752 (3,150) [756] {378}	16,099 (3,220) [773] {386}
Ouachita Parish	9,267	9,365	9,463	9,515	9,942 (1,988) [477] {239}	10,450 (2,090) [502] {251}	11,052 (2,210) [530] {265}
Rapides Parish	5,948	5,972	5,996	6,019	6,209 (1,242) [298] {149}	6,430 (1,286) [309] {154}	6,688 (1,338) [321] {161}
St. Bernard Parish	1,715	1,723	1,731	1,745	1,774 (355) [85] {43}	1,808 (362) [87] {43}	1,847 (369) [89] {44}
St. Charles Parish	2,391	2,407	2,423	2,445	2,511 (502) [121] {60}	2,592 (518) [124] {62}	2,690 (538) [129] {65}
St. James Parish	934	941	947	951	968 (194) [46] {23}	989 (198) [47] {24}	1,014 (203) [49] {24}
St. John the Baptist Parish	1,873	1,883	1,892	1,903	1,935 (387) [93] {46}	1,970 (394) [95] {47}	2,010 (402) [96] {48}
St. Tammany Parish	9,514	9,593	9,672	9,730	10,108 (2,022) [485] {243}	10,566 (2,113) [507] {254}	11,118 (2,224) [534] {267}

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.