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

Date: 7/7/20

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

The projections shown in this document are based on data pulled in as of 7/7/20 11 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.

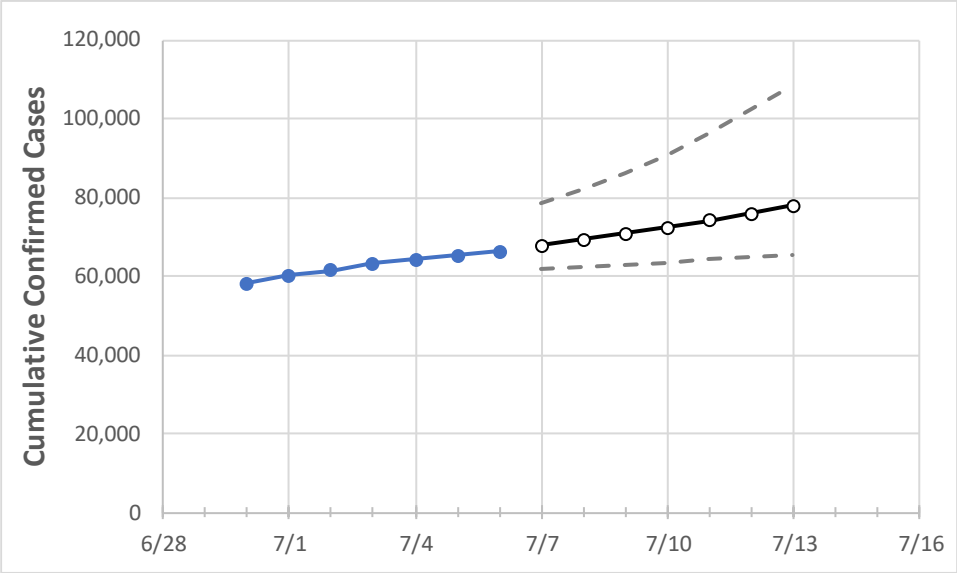
IEM's Modeling Lead

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Louisiana	63,289	64,257	65,225	66,327	67,750	69,240	70,801	72,437	74,152	75,949	77,833

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Ascension Parish	1,278	1,305	1,331	1,358	1,390	1,425	1,461	1,499	1,540	1,583	1,629
Bossier Parish	971	989	1,007	1,030	1,057	1,085	1,113	1,143	1,173	1,205	1,237
Caddo Parish	3,598	3,652	3,706	3,740	3,796	3,874	3,950	4,018	4,094	4,163	4,237
Calcasieu Parish	2,000	2,077	2,153	2,289	2,421	2,582	2,722	2,886	3,044	3,191	3,336
East Baton Rouge Parish	5,684	5,779	5,874	5,978	6,124	6,279	6,446	6,623	6,812	7,015	7,231
Jefferson Parish	9,874	9,949	10,024	10,097	10,198	10,301	10,406	10,515	10,626	10,740	10,857
Lafayette Parish	2,645	2,723	2,800	2,917	3,054	3,200	3,356	3,523	3,700	3,890	4,093
Lafourche Parish	1,248	1,266	1,284	1,304	1,337	1,361	1,387	1,413	1,439	1,465	1,492
Orleans Parish	8,031	8,069	8,107	8,143	8,199	8,258	8,320	8,385	8,453	8,524	8,599
Ouachita Parish	2,591	2,629	2,667	2,694	2,745	2,796	2,849	2,902	2,956	3,012	3,068
Rapides Parish	1,653	1,666	1,678	1,689	1,706	1,723	1,740	1,757	1,774	1,790	1,806
St. Bernard Parish	641	644	646	650	654	659	664	670	676	682	689
St. Charles Parish	789	793	796	802	809	817	825	833	842	851	861
St. James Parish	390	397	404	410	419	427	435	443	451	459	467
St. John the Baptist Parish	1,000	1,006	1,011	1,015	1,023	1,032	1,041	1,051	1,062	1,073	1,085
St. Tammany Parish	2,509	2,562	2,615	2,657	2,714	2,775	2,839	2,907	2,980	3,056	3,137

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:		
	7/3	7/4	7/5	7/6	7/8	7/10	7/12
Ascension Parish	1,278	1,305	1,331	1,358	1,425 (285) [68] {34}	1,499 (300) [72] {36}	1,583 (317) [76] {38}
Bossier Parish	971	989	1,007	1,030	1,085 (217) [52] {26}	1,143 (229) [55] {27}	1,205 (241) [58] {29}
Caddo Parish	3,598	3,652	3,706	3,740	3,874 (775) [186] {93}	4,018 (804) [193] {96}	4,163 (833) [200] {100}
Calcasieu Parish	2,000	2,077	2,153	2,289	2,582 (516) [124] {62}	2,886 (577) [139] {69}	3,191 (638) [153] {77}
East Baton Rouge Parish	5,684	5,779	5,874	5,978	6,279 (1,256) [301] {151}	6,623 (1,325) [318] {159}	7,015 (1,403) [337] {168}
Jefferson Parish	9,874	9,949	10,024	10,097	10,301 (2,060) [494] {247}	10,515 (2,103) [505] {252}	10,740 (2,148) [516] {258}
Lafayette Parish	2,645	2,723	2,800	2,917	3,200 (640) [154] {77}	3,523 (705) [169] {85}	3,890 (778) [187] {93}
Lafourche Parish	1,248	1,266	1,284	1,304	1,361 (272) [65] {33}	1,413 (283) [68] {34}	1,465 (293) [70] {35}
Orleans Parish	8,031	8,069	8,107	8,143	8,258 (1,652) [396] {198}	8,385 (1,677) [402] {201}	8,524 (1,705) [409] {205}
Ouachita Parish	2,591	2,629	2,667	2,694	2,796 (559) [134] {67}	2,902 (580) [139] {70}	3,012 (602) [145] {72}
Rapides Parish	1,653	1,666	1,678	1,689	1,723 (345) [83] {41}	1,757 (351) [84] {42}	1,790 (358) [86] {43}
St. Bernard Parish	641	644	646	650	659 (132) [32] {16}	670 (134) [32] {16}	682 (136) [33] {16}
St. Charles Parish	789	793	796	802	817 (163) [39] {20}	833 (167) [40] {20}	851 (170) [41] {20}
St. James Parish	390	397	404	410	427 (85) [20] {10}	443 (89) [21] {11}	459 (92) [22] {11}
St. John the Baptist Parish	1,000	1,006	1,011	1,015	1,032 (206) [50] {25}	1,051 (210) [50] {25}	1,073 (215) [52] {26}
St. Tammany Parish	2,509	2,562	2,615	2,657	2,775 (555) [133] {67}	2,907 (581) [140] {70}	3,056 (611) [147] {73}

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.