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

Date: 3/30/21

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 3/30/21 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.

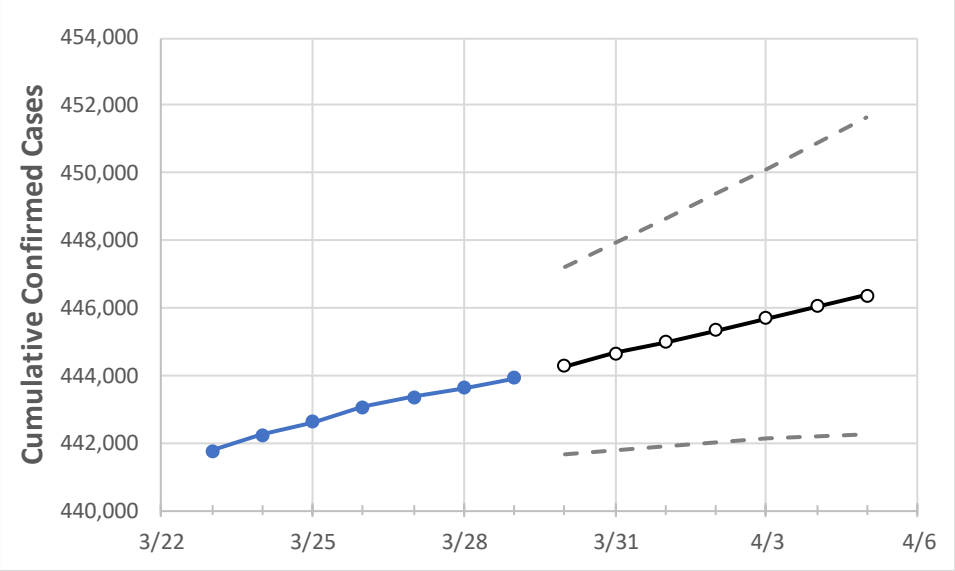
IEM's Modeling Lead

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:						
	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5
Louisiana	443,069	443,348	443,626	443,905	444,281	444,648	444,985	445,345	445,694	446,040	446,368

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:						
	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5
Ascension Parish	11,480	11,491	11,502	11,513	11,527	11,541	11,554	11,568	11,580	11,593	11,605
Bossier Parish	13,241	13,247	13,254	13,260	13,268	13,276	13,284	13,292	13,300	13,307	13,315
Caddo Parish	25,058	25,070	25,081	25,093	25,103	25,112	25,121	25,130	25,138	25,147	25,154
Calcasieu Parish	21,011	21,047	21,084	21,120	21,166	21,211	21,254	21,300	21,343	21,383	21,427
East Baton Rouge Parish	37,159	37,182	37,204	37,227	37,268	37,307	37,348	37,387	37,425	37,464	37,501
Jefferson Parish	44,932	44,949	44,966	44,983	45,008	45,032	45,056	45,079	45,101	45,123	45,144
Lafayette Parish	22,187	22,209	22,230	22,252	22,272	22,292	22,311	22,331	22,350	22,370	22,389
Lafourche Parish	9,345	9,348	9,350	9,353	9,356	9,359	9,362	9,365	9,368	9,371	9,374
Orleans Parish	29,147	29,162	29,178	29,193	29,206	29,218	29,231	29,243	29,254	29,265	29,276
Ouachita Parish	17,860	17,860	17,859	17,859	17,866	17,872	17,879	17,886	17,892	17,898	17,904
Rapides Parish	11,560	11,562	11,564	11,566	11,577	11,588	11,599	11,610	11,621	11,632	11,643
St. Bernard Parish	3,918	3,919	3,921	3,922	3,925	3,927	3,930	3,932	3,934	3,937	3,939
St. Charles Parish	5,270	5,274	5,277	5,281	5,285	5,290	5,294	5,298	5,303	5,308	5,312
St. James Parish	1,888	1,889	1,890	1,891	1,892	1,894	1,895	1,896	1,897	1,898	1,900
St. John the Baptist Parish	3,603	3,606	3,608	3,611	3,615	3,618	3,622	3,625	3,628	3,632	3,635
St. Tammany Parish	24,939	24,948	24,956	24,965	24,981	24,997	25,011	25,026	25,040	25,053	25,066

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:		
	3/26	3/27	3/28	3/29	3/31	4/2	4/4
Ascension Parish	11,480	11,491	11,502	11,513	11,541 (2,308) [554] {277}	11,568 (2,314) [555] {278}	11,593 (2,319) [556] {278}
Bossier Parish	13,241	13,247	13,254	13,260	13,276 (2,655) [637] {319}	13,292 (2,658) [638] {319}	13,307 (2,661) [639] {319}
Caddo Parish	25,058	25,070	25,081	25,093	25,112 (5,022) [1,205] {603}	25,130 (5,026) [1,206] {603}	25,147 (5,029) [1,207] {604}
Calcasieu Parish	21,011	21,047	21,084	21,120	21,211 (4,242) [1,018] {509}	21,300 (4,260) [1,022] {511}	21,383 (4,277) [1,026] {513}
East Baton Rouge Parish	37,159	37,182	37,204	37,227	37,307 (7,461) [1,791] {895}	37,387 (7,477) [1,795] {897}	37,464 (7,493) [1,798] {899}
Jefferson Parish	44,932	44,949	44,966	44,983	45,032 (9,006) [2,162] {1,081}	45,079 (9,016) [2,164] {1,082}	45,123 (9,025) [2,166] {1,083}
Lafayette Parish	22,187	22,209	22,230	22,252	22,292 (4,458) [1,070] {535}	22,331 (4,466) [1,072] {536}	22,370 (4,474) [1,074] {537}
Lafourche Parish	9,345	9,348	9,350	9,353	9,359 (1,872) [449] {225}	9,365 (1,873) [450] {225}	9,371 (1,874) [450] {225}
Orleans Parish	29,147	29,162	29,178	29,193	29,218 (5,844) [1,402] {701}	29,243 (5,849) [1,404] {702}	29,265 (5,853) [1,405] {702}
Ouachita Parish	17,860	17,860	17,859	17,859	17,872 (3,574) [858] {429}	17,886 (3,577) [859] {429}	17,898 (3,580) [859] {430}
Rapides Parish	11,560	11,562	11,564	11,566	11,588 (2,318) [556] {278}	11,610 (2,322) [557] {279}	11,632 (2,326) [558] {279}
St. Bernard Parish	3,918	3,919	3,921	3,922	3,927 (785) [189] {94}	3,932 (786) [189] {94}	3,937 (787) [189] {94}
St. Charles Parish	5,270	5,274	5,277	5,281	5,290 (1,058) [254] {127}	5,298 (1,060) [254] {127}	5,308 (1,062) [255] {127}
St. James Parish	1,888	1,889	1,890	1,891	1,894 (379) [91] {45}	1,896 (379) [91] {46}	1,898 (380) [91] {46}
St. John the Baptist Parish	3,603	3,606	3,608	3,611	3,618 (724) [174] {87}	3,625 (725) [174] {87}	3,632 (726) [174] {87}
St. Tammany Parish	24,939	24,948	24,956	24,965	24,997 (4,999) [1,200] {600}	25,026 (5,005) [1,201] {601}	25,053 (5,011) [1,203] {601}

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.