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

Date: 3/29/21

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 3/29/21 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.

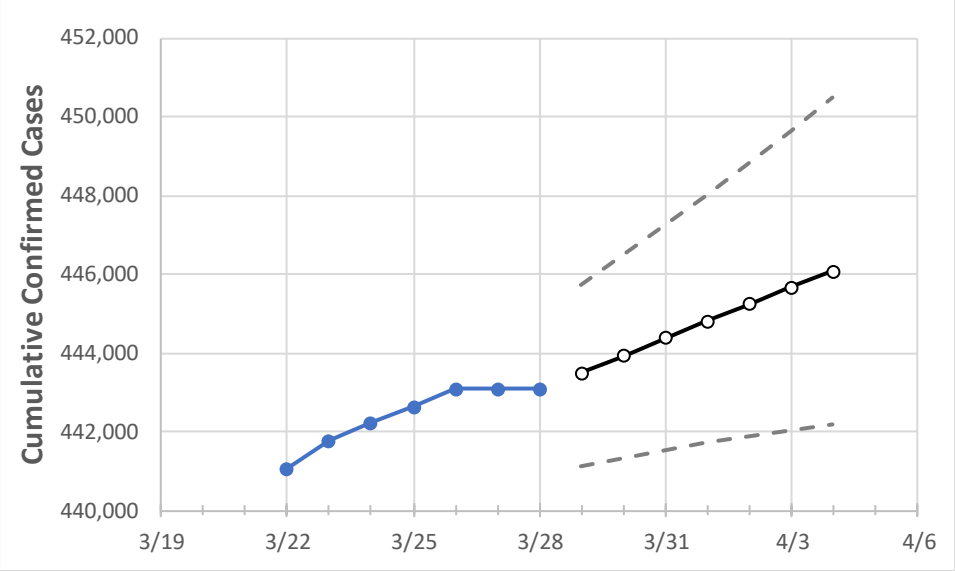
IEM's Modeling Lead

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Louisiana	442,620	443,069	443,069	443,069	443,494	443,925	444,360	444,804	445,231	445,661	446,074

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Ascension Parish	11,458	11,480	11,480	11,480	11,498	11,516	11,534	11,551	11,569	11,585	11,600
Bossier Parish	13,210	13,241	13,241	13,241	13,250	13,259	13,268	13,277	13,285	13,294	13,303
Caddo Parish	25,056	25,058	25,058	25,058	25,067	25,076	25,085	25,094	25,103	25,111	25,119
Calcasieu Parish	20,955	21,011	21,011	21,011	21,070	21,130	21,187	21,246	21,304	21,364	21,418
East Baton Rouge Parish	37,116	37,159	37,159	37,159	37,211	37,262	37,315	37,367	37,415	37,466	37,517
Jefferson Parish	44,896	44,932	44,932	44,932	44,961	44,990	45,018	45,045	45,072	45,099	45,127
Lafayette Parish	22,178	22,187	22,187	22,187	22,206	22,226	22,245	22,264	22,283	22,301	22,321
Lafourche Parish	9,338	9,345	9,345	9,345	9,349	9,353	9,356	9,360	9,364	9,367	9,370
Orleans Parish	29,113	29,147	29,147	29,147	29,160	29,172	29,184	29,196	29,207	29,218	29,228
Ouachita Parish	17,854	17,860	17,860	17,860	17,867	17,874	17,881	17,888	17,895	17,902	17,909
Rapides Parish	11,551	11,560	11,560	11,560	11,578	11,597	11,615	11,636	11,656	11,677	11,699
St. Bernard Parish	3,916	3,916	3,916	3,916	3,920	3,923	3,927	3,931	3,934	3,937	3,941
St. Charles Parish	5,268	5,270	5,270	5,270	5,276	5,282	5,287	5,293	5,299	5,304	5,310
St. James Parish	1,891	1,888	1,888	1,888	1,890	1,892	1,894	1,895	1,897	1,899	1,901
St. John the Baptist Parish	3,607	3,603	3,603	3,603	3,607	3,612	3,616	3,620	3,625	3,629	3,634
St. Tammany Parish	24,919	24,939	24,939	24,939	24,958	24,976	24,993	25,011	25,028	25,044	25,061

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:		
	3/25	3/26	3/27	3/28	3/30	4/1	4/3
Ascension Parish	11,458	11,480	11,480	11,480	11,516 (2,303) [553] {276}	11,551 (2,310) [554] {277}	11,585 (2,317) [556] {278}
Bossier Parish	13,210	13,241	13,241	13,241	13,259 (2,652) [636] {318}	13,277 (2,655) [637] {319}	13,294 (2,659) [638] {319}
Caddo Parish	25,056	25,058	25,058	25,058	25,076 (5,015) [1,204] {602}	25,094 (5,019) [1,205] {602}	25,111 (5,022) [1,205] {603}
Calcasieu Parish	20,955	21,011	21,011	21,011	21,130 (4,226) [1,014] {507}	21,246 (4,249) [1,020] {510}	21,364 (4,273) [1,025] {513}
East Baton Rouge Parish	37,116	37,159	37,159	37,159	37,262 (7,452) [1,789] {894}	37,367 (7,473) [1,794] {897}	37,466 (7,493) [1,798] {899}
Jefferson Parish	44,896	44,932	44,932	44,932	44,990 (8,998) [2,160] {1,080}	45,045 (9,009) [2,162] {1,081}	45,099 (9,020) [2,165] {1,082}
Lafayette Parish	22,178	22,187	22,187	22,187	22,226 (4,445) [1,067] {533}	22,264 (4,453) [1,069] {534}	22,301 (4,460) [1,070] {535}
Lafourche Parish	9,338	9,345	9,345	9,345	9,353 (1,871) [449] {224}	9,360 (1,872) [449] {225}	9,367 (1,873) [450] {225}
Orleans Parish	29,113	29,147	29,147	29,147	29,172 (5,834) [1,400] {700}	29,196 (5,839) [1,401] {701}	29,218 (5,844) [1,402] {701}
Ouachita Parish	17,854	17,860	17,860	17,860	17,874 (3,575) [858] {429}	17,888 (3,578) [859] {429}	17,902 (3,580) [859] {430}
Rapides Parish	11,551	11,560	11,560	11,560	11,597 (2,319) [557] {278}	11,636 (2,327) [559] {279}	11,677 (2,335) [560] {280}
St. Bernard Parish	3,916	3,916	3,916	3,916	3,923 (785) [188] {94}	3,931 (786) [189] {94}	3,937 (787) [189] {94}
St. Charles Parish	5,268	5,270	5,270	5,270	5,282 (1,056) [254] {127}	5,293 (1,059) [254] {127}	5,304 (1,061) [255] {127}
St. James Parish	1,891	1,888	1,888	1,888	1,892 (378) [91] {45}	1,895 (379) [91] {45}	1,899 (380) [91] {46}
St. John the Baptist Parish	3,607	3,603	3,603	3,603	3,612 (722) [173] {87}	3,620 (724) [174] {87}	3,629 (726) [174] {87}
St. Tammany Parish	24,919	24,939	24,939	24,939	24,976 (4,995) [1,199] {599}	25,011 (5,002) [1,201] {600}	25,044 (5,009) [1,202] {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.