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

Date: 4/6/21

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 4/6/21 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.

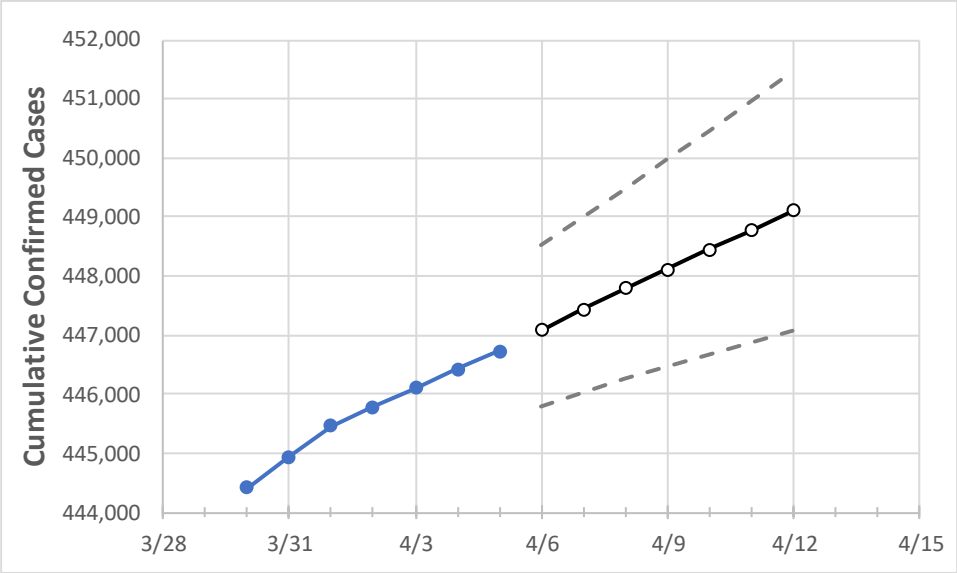
IEM's Modeling Lead

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:						
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12
Louisiana	445,786	446,103	446,420	446,737	447,091	447,437	447,784	448,118	448,451	448,778	449,107

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:						
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12
Ascension Parish	11,586	11,595	11,603	11,611	11,623	11,635	11,647	11,659	11,670	11,682	11,693
Bossier Parish	13,282	13,289	13,297	13,304	13,312	13,320	13,328	13,336	13,343	13,351	13,358
Caddo Parish	25,167	25,176	25,186	25,195	25,207	25,217	25,228	25,239	25,250	25,261	25,271
Calcasieu Parish	21,326	21,364	21,403	21,441	21,482	21,524	21,564	21,604	21,642	21,681	21,718
East Baton Rouge Parish	37,475	37,511	37,546	37,581	37,623	37,665	37,706	37,745	37,785	37,826	37,865
Jefferson Parish	45,086	45,110	45,133	45,157	45,179	45,200	45,221	45,242	45,262	45,282	45,301
Lafayette Parish	22,350	22,370	22,389	22,409	22,429	22,449	22,470	22,491	22,512	22,532	22,552
Lafourche Parish	9,367	9,372	9,376	9,381	9,384	9,388	9,391	9,394	9,397	9,399	9,402
Orleans Parish	29,320	29,339	29,358	29,377	29,398	29,418	29,438	29,458	29,478	29,498	29,517
Ouachita Parish	17,911	17,917	17,922	17,928	17,936	17,945	17,953	17,962	17,971	17,980	17,988
Rapides Parish	11,608	11,620	11,633	11,645	11,654	11,664	11,673	11,683	11,692	11,702	11,711
St. Bernard Parish	3,937	3,939	3,940	3,941	3,943	3,945	3,948	3,949	3,951	3,953	3,955
St. Charles Parish	5,297	5,299	5,302	5,304	5,308	5,312	5,316	5,320	5,324	5,328	5,331
St. James Parish	1,902	1,905	1,909	1,912	1,914	1,917	1,919	1,921	1,924	1,926	1,929
St. John the Baptist Parish	3,617	3,619	3,621	3,623	3,626	3,629	3,631	3,634	3,637	3,640	3,642
St. Tammany Parish	25,055	25,064	25,072	25,081	25,094	25,107	25,120	25,132	25,144	25,155	25,166

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:		
	4/2	4/3	4/4	4/5	4/7	4/9	4/11
Ascension Parish	11,586	11,595	11,603	11,611	11,635 (2,327) [558] {279}	11,659 (2,332) [560] {280}	11,682 (2,336) [561] {280}
Bossier Parish	13,282	13,289	13,297	13,304	13,320 (2,664) [639] {320}	13,336 (2,667) [640] {320}	13,351 (2,670) [641] {320}
Caddo Parish	25,167	25,176	25,186	25,195	25,217 (5,043) [1,210] {605}	25,239 (5,048) [1,211] {606}	25,261 (5,052) [1,213] {606}
Calcasieu Parish	21,326	21,364	21,403	21,441	21,524 (4,305) [1,033] {517}	21,604 (4,321) [1,037] {519}	21,681 (4,336) [1,041] {520}
East Baton Rouge Parish	37,475	37,511	37,546	37,581	37,665 (7,533) [1,808] {904}	37,745 (7,549) [1,812] {906}	37,826 (7,565) [1,816] {908}
Jefferson Parish	45,086	45,110	45,133	45,157	45,200 (9,040) [2,170] {1,085}	45,242 (9,048) [2,172] {1,086}	45,282 (9,056) [2,174] {1,087}
Lafayette Parish	22,350	22,370	22,389	22,409	22,449 (4,490) [1,078] {539}	22,491 (4,498) [1,080] {540}	22,532 (4,506) [1,082] {541}
Lafourche Parish	9,367	9,372	9,376	9,381	9,388 (1,878) [451] {225}	9,394 (1,879) [451] {225}	9,399 (1,880) [451] {226}
Orleans Parish	29,320	29,339	29,358	29,377	29,418 (5,884) [1,412] {706}	29,458 (5,892) [1,414] {707}	29,498 (5,900) [1,416] {708}
Ouachita Parish	17,911	17,917	17,922	17,928	17,945 (3,589) [861] {431}	17,962 (3,592) [862] {431}	17,980 (3,596) [863] {432}
Rapides Parish	11,608	11,620	11,633	11,645	11,664 (2,333) [560] {280}	11,683 (2,337) [561] {280}	11,702 (2,340) [562] {281}
St. Bernard Parish	3,937	3,939	3,940	3,941	3,945 (789) [189] {95}	3,949 (790) [190] {95}	3,953 (791) [190] {95}
St. Charles Parish	5,297	5,299	5,302	5,304	5,312 (1,062) [255] {127}	5,320 (1,064) [255] {128}	5,328 (1,066) [256] {128}
St. James Parish	1,902	1,905	1,909	1,912	1,917 (383) [92] {46}	1,921 (384) [92] {46}	1,926 (385) [92] {46}
St. John the Baptist Parish	3,617	3,619	3,621	3,623	3,629 (726) [174] {87}	3,634 (727) [174] {87}	3,640 (728) [175] {87}
St. Tammany Parish	25,055	25,064	25,072	25,081	25,107 (5,021) [1,205] {603}	25,132 (5,026) [1,206] {603}	25,155 (5,031) [1,207] {604}

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.