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

Date: 5/3/21

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 5/3/21 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.

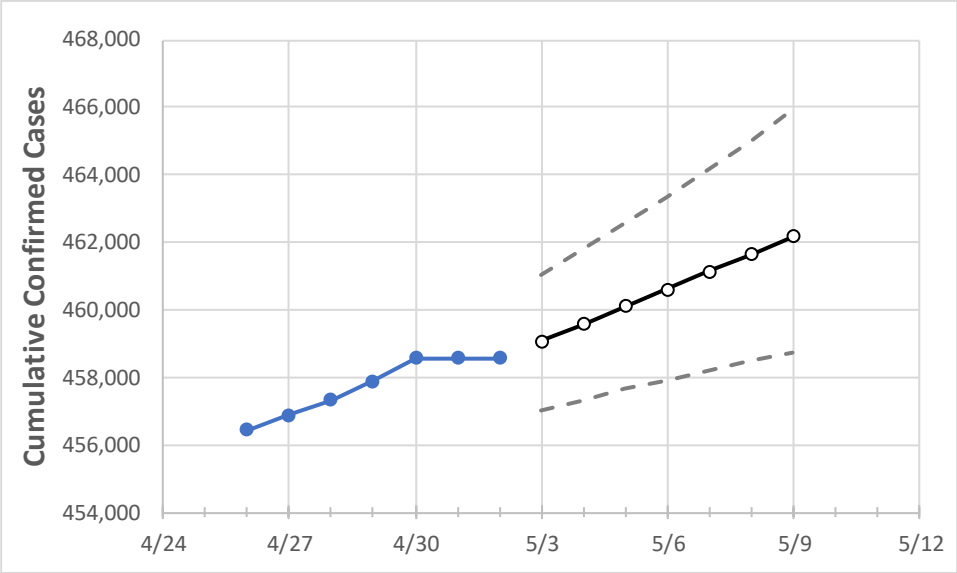
IEM's Modeling Lead

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Louisiana	457,896	458,581	458,581	458,581	459,073	459,569	460,093	460,600	461,124	461,646	462,181

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Ascension Parish	12,021	12,080	12,080	12,080	12,104	12,128	12,155	12,181	12,208	12,237	12,265
Bossier Parish	13,723	13,752	13,752	13,752	13,770	13,791	13,810	13,831	13,852	13,873	13,895
Caddo Parish	25,806	25,830	25,830	25,830	25,862	25,895	25,928	25,961	25,996	26,031	26,066
Calcasieu Parish	22,300	22,340	22,340	22,340	22,362	22,384	22,405	22,425	22,445	22,466	22,485
East Baton Rouge Parish	38,970	39,099	39,099	39,099	39,162	39,226	39,292	39,359	39,427	39,493	39,563
Jefferson Parish	45,853	45,903	45,903	45,903	45,935	45,968	46,002	46,035	46,071	46,106	46,142
Lafayette Parish	23,194	23,220	23,220	23,220	23,260	23,298	23,338	23,378	23,422	23,466	23,510
Lafourche Parish	9,507	9,514	9,514	9,514	9,523	9,532	9,542	9,552	9,562	9,572	9,583
Orleans Parish	29,845	29,878	29,878	29,878	29,902	29,926	29,951	29,976	30,003	30,029	30,055
Ouachita Parish	18,266	18,301	18,301	18,301	18,327	18,355	18,385	18,416	18,450	18,485	18,521
Rapides Parish	11,950	11,974	11,974	11,974	11,992	12,011	12,031	12,050	12,071	12,092	12,114
St. Bernard Parish	3,997	4,003	4,003	4,003	4,007	4,010	4,014	4,018	4,022	4,026	4,030
St. Charles Parish	5,376	5,373	5,373	5,373	5,378	5,384	5,389	5,395	5,401	5,407	5,413
St. James Parish	1,946	1,955	1,955	1,955	1,959	1,963	1,967	1,971	1,976	1,981	1,986
St. John the Baptist Parish	3,693	3,696	3,696	3,696	3,700	3,704	3,708	3,712	3,716	3,721	3,725
St. Tammany Parish	25,541	25,568	25,568	25,568	25,591	25,615	25,638	25,662	25,686	25,711	25,737

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:		
	4/29	4/30	5/1	5/2	5/4	5/6	5/8
Ascension Parish	12,021	12,080	12,080	12,080	12,128 (2,426) [582] {291}	12,181 (2,436) [585] {292}	12,237 (2,447) [587] {294}
Bossier Parish	13,723	13,752	13,752	13,752	13,791 (2,758) [662] {331}	13,831 (2,766) [664] {332}	13,873 (2,775) [666] {333}
Caddo Parish	25,806	25,830	25,830	25,830	25,895 (5,179) [1,243] {621}	25,961 (5,192) [1,246] {623}	26,031 (5,206) [1,249] {625}
Calcasieu Parish	22,300	22,340	22,340	22,340	22,384 (4,477) [1,074] {537}	22,425 (4,485) [1,076] {538}	22,466 (4,493) [1,078] {539}
East Baton Rouge Parish	38,970	39,099	39,099	39,099	39,226 (7,845) [1,883] {941}	39,359 (7,872) [1,889] {945}	39,493 (7,899) [1,896] {948}
Jefferson Parish	45,853	45,903	45,903	45,903	45,968 (9,194) [2,206] {1,103}	46,035 (9,207) [2,210] {1,105}	46,106 (9,221) [2,213] {1,107}
Lafayette Parish	23,194	23,220	23,220	23,220	23,298 (4,660) [1,118] {559}	23,378 (4,676) [1,122] {561}	23,466 (4,693) [1,126] {563}
Lafourche Parish	9,507	9,514	9,514	9,514	9,532 (1,906) [458] {229}	9,552 (1,910) [458] {229}	9,572 (1,914) [459] {230}
Orleans Parish	29,845	29,878	29,878	29,878	29,926 (5,985) [1,436] {718}	29,976 (5,995) [1,439] {719}	30,029 (6,006) [1,441] {721}
Ouachita Parish	18,266	18,301	18,301	18,301	18,355 (3,671) [881] {441}	18,416 (3,683) [884] {442}	18,485 (3,697) [887] {444}
Rapides Parish	11,950	11,974	11,974	11,974	12,011 (2,402) [577] {288}	12,050 (2,410) [578] {289}	12,092 (2,418) [580] {290}
St. Bernard Parish	3,997	4,003	4,003	4,003	4,010 (802) [192] {96}	4,018 (804) [193] {96}	4,026 (805) [193] {97}
St. Charles Parish	5,376	5,373	5,373	5,373	5,384 (1,077) [258] {129}	5,395 (1,079) [259] {129}	5,407 (1,081) [260] {130}
St. James Parish	1,946	1,955	1,955	1,955	1,963 (393) [94] {47}	1,971 (394) [95] {47}	1,981 (396) [95] {48}
St. John the Baptist Parish	3,693	3,696	3,696	3,696	3,704 (741) [178] {89}	3,712 (742) [178] {89}	3,721 (744) [179] {89}
St. Tammany Parish	25,541	25,568	25,568	25,568	25,615 (5,123) [1,229] {615}	25,662 (5,132) [1,232] {616}	25,711 (5,142) [1,234] {617}

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.