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

Date: 5/4/21

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 5/4/21 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.

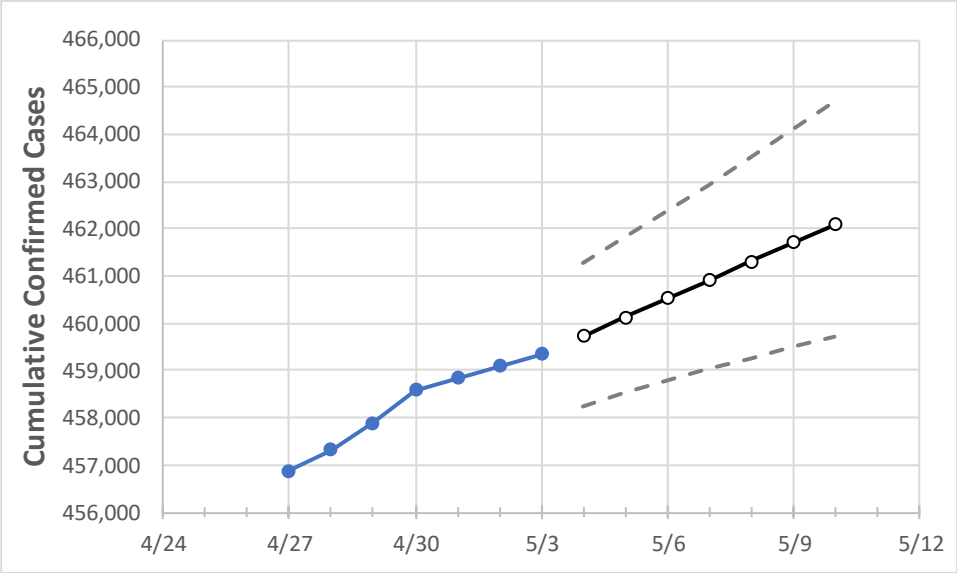
IEM's Modeling Lead

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:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Louisiana	458,581	458,834	459,087	459,340	459,732	460,125	460,523	460,916	461,309	461,705	462,089

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:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Ascension Parish	12,080	12,086	12,091	12,097	12,113	12,128	12,143	12,159	12,174	12,188	12,204
Bossier Parish	13,752	13,763	13,774	13,785	13,801	13,818	13,834	13,851	13,868	13,886	13,904
Caddo Parish	25,830	25,844	25,857	25,871	25,895	25,920	25,945	25,970	25,994	26,018	26,043
Calcasieu Parish	22,340	22,351	22,361	22,372	22,389	22,408	22,425	22,441	22,457	22,473	22,489
East Baton Rouge Parish	39,099	39,122	39,145	39,168	39,214	39,259	39,305	39,349	39,396	39,441	39,483
Jefferson Parish	45,903	45,927	45,950	45,974	46,003	46,033	46,065	46,096	46,127	46,158	46,190
Lafayette Parish	23,220	23,239	23,259	23,278	23,308	23,339	23,370	23,400	23,432	23,463	23,495
Lafourche Parish	9,514	9,527	9,539	9,552	9,563	9,575	9,587	9,600	9,614	9,628	9,643
Orleans Parish	29,878	29,891	29,903	29,916	29,936	29,956	29,975	29,995	30,015	30,034	30,053
Ouachita Parish	18,301	18,305	18,309	18,313	18,330	18,346	18,364	18,381	18,398	18,415	18,434
Rapides Parish	11,974	11,982	11,991	11,999	12,013	12,028	12,043	12,057	12,071	12,086	12,101
St. Bernard Parish	4,003	4,005	4,007	4,009	4,012	4,015	4,018	4,021	4,024	4,027	4,029
St. Charles Parish	5,373	5,379	5,386	5,392	5,397	5,403	5,409	5,414	5,420	5,426	5,432
St. James Parish	1,955	1,954	1,953	1,952	1,956	1,961	1,966	1,971	1,977	1,983	1,989
St. John the Baptist Parish	3,696	3,699	3,702	3,705	3,709	3,712	3,716	3,719	3,723	3,727	3,731
St. Tammany Parish	25,568	25,577	25,585	25,594	25,612	25,629	25,647	25,666	25,683	25,701	25,717

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:		
	4/30	5/1	5/2	5/3	5/5	5/7	5/9
Ascension Parish	12,080	12,086	12,091	12,097	12,128 (2,426) [582] {291}	12,159 (2,432) [584] {292}	12,188 (2,438) [585] {293}
Bossier Parish	13,752	13,763	13,774	13,785	13,818 (2,764) [663] {332}	13,851 (2,770) [665] {332}	13,886 (2,777) [667] {333}
Caddo Parish	25,830	25,844	25,857	25,871	25,920 (5,184) [1,244] {622}	25,970 (5,194) [1,247] {623}	26,018 (5,204) [1,249] {624}
Calcasieu Parish	22,340	22,351	22,361	22,372	22,408 (4,482) [1,076] {538}	22,441 (4,488) [1,077] {539}	22,473 (4,495) [1,079] {539}
East Baton Rouge Parish	39,099	39,122	39,145	39,168	39,259 (7,852) [1,884] {942}	39,349 (7,870) [1,889] {944}	39,441 (7,888) [1,893] {947}
Jefferson Parish	45,903	45,927	45,950	45,974	46,033 (9,207) [2,210] {1,105}	46,096 (9,219) [2,213] {1,106}	46,158 (9,232) [2,216] {1,108}
Lafayette Parish	23,220	23,239	23,259	23,278	23,339 (4,668) [1,120] {560}	23,400 (4,680) [1,123] {562}	23,463 (4,693) [1,126] {563}
Lafourche Parish	9,514	9,527	9,539	9,552	9,575 (1,915) [460] {230}	9,600 (1,920) [461] {230}	9,628 (1,926) [462] {231}
Orleans Parish	29,878	29,891	29,903	29,916	29,956 (5,991) [1,438] {719}	29,995 (5,999) [1,440] {720}	30,034 (6,007) [1,442] {721}
Ouachita Parish	18,301	18,305	18,309	18,313	18,346 (3,669) [881] {440}	18,381 (3,676) [882] {441}	18,415 (3,683) [884] {442}
Rapides Parish	11,974	11,982	11,991	11,999	12,028 (2,406) [577] {289}	12,057 (2,411) [579] {289}	12,086 (2,417) [580] {290}
St. Bernard Parish	4,003	4,005	4,007	4,009	4,015 (803) [193] {96}	4,021 (804) [193] {96}	4,027 (805) [193] {97}
St. Charles Parish	5,373	5,379	5,386	5,392	5,403 (1,081) [259] {130}	5,414 (1,083) [260] {130}	5,426 (1,085) [260] {130}
St. James Parish	1,955	1,954	1,953	1,952	1,961 (392) [94] {47}	1,971 (394) [95] {47}	1,983 (397) [95] {48}
St. John the Baptist Parish	3,696	3,699	3,702	3,705	3,712 (742) [178] {89}	3,719 (744) [179] {89}	3,727 (745) [179] {89}
St. Tammany Parish	25,568	25,577	25,585	25,594	25,629 (5,126) [1,230] {615}	25,666 (5,133) [1,232] {616}	25,701 (5,140) [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.