IEM's AI Modeling: Short-term COVID-19 Projections
Date: 4/2/21

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 <u>not</u> 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 4/2/21 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
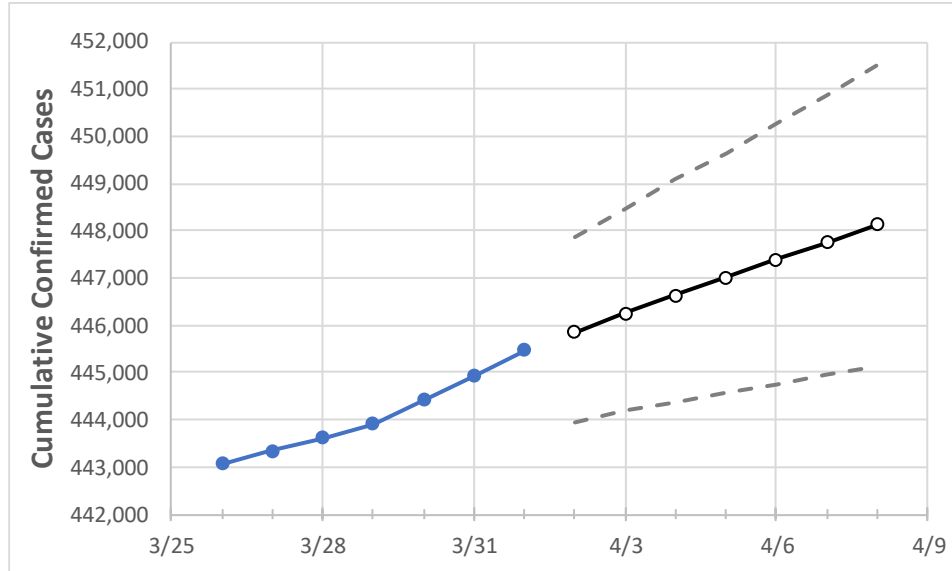
	Actual Confirmed Cases On:				Projected Cases For:						
	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8
Louisiana	443,905	444,414	444,933	445,469	445,864	446,257	446,639	447,014	447,387	447,752	448,127

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:						
	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8
Ascension Parish	11,513	11,536	11,541	11,578	11,593	11,608	11,623	11,638	11,652	11,666	11,681
Bossier Parish	13,260	13,270	13,276	13,274	13,282	13,290	13,297	13,305	13,313	13,320	13,328
Caddo Parish	25,093	25,107	25,146	25,157	25,169	25,182	25,195	25,208	25,221	25,233	25,246
Calcasieu Parish	21,120	21,161	21,220	21,287	21,332	21,376	21,420	21,464	21,508	21,553	21,601
East Baton Rouge Parish	37,227	37,279	37,339	37,440	37,486	37,532	37,579	37,624	37,669	37,715	37,760
Jefferson Parish	44,983	45,007	45,036	45,062	45,085	45,108	45,131	45,152	45,174	45,196	45,216
Lafayette Parish	22,252	22,268	22,277	22,330	22,350	22,371	22,392	22,414	22,435	22,455	22,476
Lafourche Parish	9,353	9,358	9,361	9,362	9,365	9,368	9,371	9,374	9,376	9,379	9,381
Orleans Parish	29,193	29,234	29,264	29,301	29,320	29,338	29,357	29,375	29,392	29,411	29,428
Ouachita Parish	17,859	17,880	17,896	17,905	17,915	17,925	17,935	17,946	17,956	17,967	17,978
Rapides Parish	11,566	11,573	11,580	11,595	11,605	11,615	11,625	11,635	11,644	11,654	11,664
St. Bernard Parish	3,922	3,930	3,933	3,936	3,939	3,942	3,944	3,947	3,949	3,952	3,954
St. Charles Parish	5,281	5,288	5,297	5,294	5,300	5,305	5,311	5,316	5,321	5,326	5,332
St. James Parish	1,891	1,895	1,896	1,898	1,899	1,901	1,902	1,904	1,905	1,907	1,908
St. John the Baptist Parish	3,611	3,613	3,621	3,615	3,619	3,622	3,626	3,630	3,633	3,637	3,641
St. Tammany Parish	24,965	24,997	25,028	25,046	25,063	25,079	25,095	25,110	25,126	25,140	25,155

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:		
	3/29	3/30	3/31	4/1	4/3	4/5	4/7
Ascension Parish	11,513	11,536	11,541	11,578	11,608 (2,322) [557] {279}	11,638 (2,328) [559] {279}	11,666 (2,333) [560] {280}
Bossier Parish	13,260	13,270	13,276	13,274	13,290 (2,658) [638] {319}	13,305 (2,661) [639] {319}	13,320 (2,664) [639] {320}
Caddo Parish	25,093	25,107	25,146	25,157	25,182 (5,036) [1,209] {604}	25,208 (5,042) [1,210] {605}	25,233 (5,047) [1,211] {606}
Calcasieu Parish	21,120	21,161	21,220	21,287	21,376 (4,275) [1,026] {513}	21,464 (4,293) [1,030] {515}	21,553 (4,311) [1,035] {517}
East Baton Rouge Parish	37,227	37,279	37,339	37,440	37,532 (7,506) [1,802] {901}	37,624 (7,525) [1,806] {903}	37,715 (7,543) [1,810] {905}
Jefferson Parish	44,983	45,007	45,036	45,062	45,108 (9,022) [2,165] {1,083}	45,152 (9,030) [2,167] {1,084}	45,196 (9,039) [2,169] {1,085}
Lafayette Parish	22,252	22,268	22,277	22,330	22,371 (4,474) [1,074] {537}	22,414 (4,483) [1,076] {538}	22,455 (4,491) [1,078] {539}
Lafourche Parish	9,353	9,358	9,361	9,362	9,368 (1,874) [450] {225}	9,374 (1,875) [450] {225}	9,379 (1,876) [450] {225}
Orleans Parish	29,193	29,234	29,264	29,301	29,338 (5,868) [1,408] {704}	29,375 (5,875) [1,410] {705}	29,411 (5,882) [1,412] {706}
Ouachita Parish	17,859	17,880	17,896	17,905	17,925 (3,585) [860] {430}	17,946 (3,589) [861] {431}	17,967 (3,593) [862] {431}
Rapides Parish	11,566	11,573	11,580	11,595	11,615 (2,323) [558] {279}	11,635 (2,327) [558] {279}	11,654 (2,331) [559] {280}
St. Bernard Parish	3,922	3,930	3,933	3,936	3,942 (788) [189] {95}	3,947 (789) [189] {95}	3,952 (790) [190] {95}
St. Charles Parish	5,281	5,288	5,297	5,294	5,305 (1,061) [255] {127}	5,316 (1,063) [255] {128}	5,326 (1,065) [256] {128}
St. James Parish	1,891	1,895	1,896	1,898	1,901 (380) [91] {46}	1,904 (381) [91] {46}	1,907 (381) [92] {46}
St. John the Baptist Parish	3,611	3,613	3,621	3,615	3,622 (724) [174] {87}	3,630 (726) [174] {87}	3,637 (727) [175] {87}
St. Tammany Parish	24,965	24,997	25,028	25,046	25,079 (5,016) [1,204] {602}	25,110 (5,022) [1,205] {603}	25,140 (5,028) [1,207] {603}

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.