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

Date: 4/8/21

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 4/8/21 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.

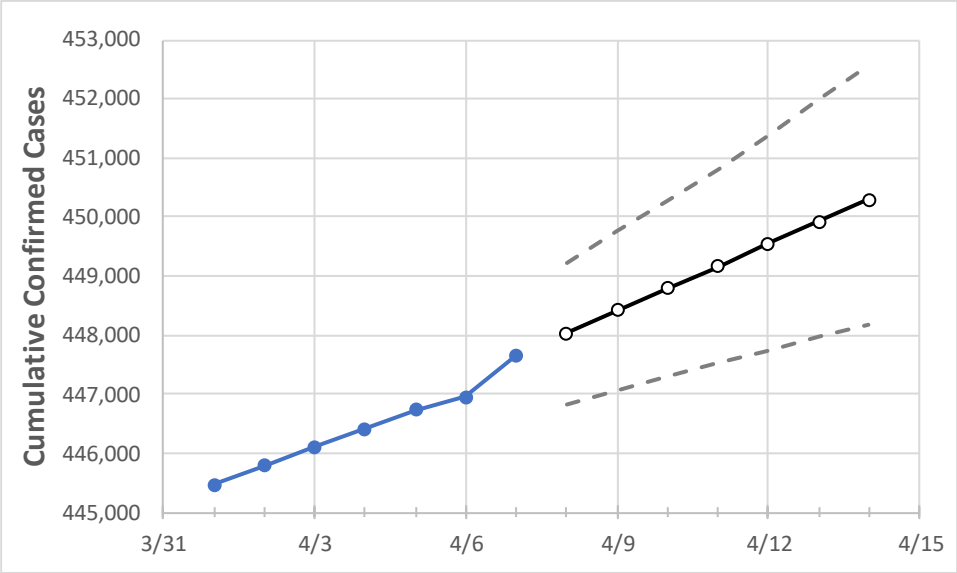
IEM's Modeling Lead

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Louisiana	446,420	446,737	446,955	447,655	448,037	448,415	448,791	449,170	449,546	449,922	450,297

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Ascension Parish	11,603	11,611	11,617	11,649	11,661	11,674	11,685	11,697	11,707	11,719	11,730
Bossier Parish	13,297	13,304	13,303	13,385	13,408	13,433	13,459	13,489	13,518	13,553	13,586
Caddo Parish	25,186	25,195	25,209	25,246	25,262	25,279	25,296	25,314	25,332	25,350	25,369
Calcasieu Parish	21,403	21,441	21,477	21,512	21,551	21,588	21,625	21,663	21,699	21,734	21,768
East Baton Rouge Parish	37,546	37,581	37,641	37,701	37,746	37,792	37,836	37,882	37,928	37,973	38,018
Jefferson Parish	45,133	45,157	45,173	45,196	45,214	45,233	45,251	45,269	45,286	45,303	45,319
Lafayette Parish	22,389	22,409	22,416	22,448	22,469	22,490	22,511	22,531	22,552	22,574	22,597
Lafourche Parish	9,376	9,381	9,391	9,400	9,405	9,410	9,415	9,420	9,425	9,431	9,436
Orleans Parish	29,358	29,377	29,388	29,396	29,416	29,435	29,455	29,473	29,493	29,511	29,530
Ouachita Parish	17,922	17,928	17,924	17,945	17,954	17,963	17,971	17,981	17,990	17,999	18,009
Rapides Parish	11,633	11,645	11,656	11,681	11,695	11,710	11,725	11,742	11,760	11,778	11,797
St. Bernard Parish	3,940	3,941	3,948	3,955	3,957	3,959	3,962	3,964	3,965	3,967	3,969
St. Charles Parish	5,302	5,304	5,306	5,318	5,321	5,325	5,328	5,331	5,334	5,337	5,339
St. James Parish	1,909	1,912	1,907	1,915	1,919	1,924	1,928	1,933	1,938	1,944	1,950
St. John the Baptist Parish	3,621	3,623	3,625	3,626	3,628	3,631	3,633	3,635	3,637	3,639	3,641
St. Tammany Parish	25,072	25,081	25,097	25,111	25,122	25,133	25,144	25,155	25,165	25,174	25,184

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:		
	4/4	4/5	4/6	4/7	4/9	4/11	4/13
Ascension Parish	11,603	11,611	11,617	11,649	11,674 (2,335) [560] {280}	11,697 (2,339) [561] {281}	11,719 (2,344) [563] {281}
Bossier Parish	13,297	13,304	13,303	13,385	13,433 (2,687) [645] {322}	13,489 (2,698) [647] {324}	13,553 (2,711) [651] {325}
Caddo Parish	25,186	25,195	25,209	25,246	25,279 (5,056) [1,213] {607}	25,314 (5,063) [1,215] {608}	25,350 (5,070) [1,217] {608}
Calcasieu Parish	21,403	21,441	21,477	21,512	21,588 (4,318) [1,036] {518}	21,663 (4,333) [1,040] {520}	21,734 (4,347) [1,043] {522}
East Baton Rouge Parish	37,546	37,581	37,641	37,701	37,792 (7,558) [1,814] {907}	37,882 (7,576) [1,818] {909}	37,973 (7,595) [1,823] {911}
Jefferson Parish	45,133	45,157	45,173	45,196	45,233 (9,047) [2,171] {1,086}	45,269 (9,054) [2,173] {1,086}	45,303 (9,061) [2,175] {1,087}
Lafayette Parish	22,389	22,409	22,416	22,448	22,490 (4,498) [1,080] {540}	22,531 (4,506) [1,081] {541}	22,574 (4,515) [1,084] {542}
Lafourche Parish	9,376	9,381	9,391	9,400	9,410 (1,882) [452] {226}	9,420 (1,884) [452] {226}	9,431 (1,886) [453] {226}
Orleans Parish	29,358	29,377	29,388	29,396	29,435 (5,887) [1,413] {706}	29,473 (5,895) [1,415] {707}	29,511 (5,902) [1,417] {708}
Ouachita Parish	17,922	17,928	17,924	17,945	17,963 (3,593) [862] {431}	17,981 (3,596) [863] {432}	17,999 (3,600) [864] {432}
Rapides Parish	11,633	11,645	11,656	11,681	11,710 (2,342) [562] {281}	11,742 (2,348) [564] {282}	11,778 (2,356) [565] {283}
St. Bernard Parish	3,940	3,941	3,948	3,955	3,959 (792) [190] {95}	3,964 (793) [190] {95}	3,967 (793) [190] {95}
St. Charles Parish	5,302	5,304	5,306	5,318	5,325 (1,065) [256] {128}	5,331 (1,066) [256] {128}	5,337 (1,067) [256] {128}
St. James Parish	1,909	1,912	1,907	1,915	1,924 (385) [92] {46}	1,933 (387) [93] {46}	1,944 (389) [93] {47}
St. John the Baptist Parish	3,621	3,623	3,625	3,626	3,631 (726) [174] {87}	3,635 (727) [174] {87}	3,639 (728) [175] {87}
St. Tammany Parish	25,072	25,081	25,097	25,111	25,133 (5,027) [1,206] {603}	25,155 (5,031) [1,207] {604}	25,174 (5,035) [1,208] {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.