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

Date: 2/9/21

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 2/9/21 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.

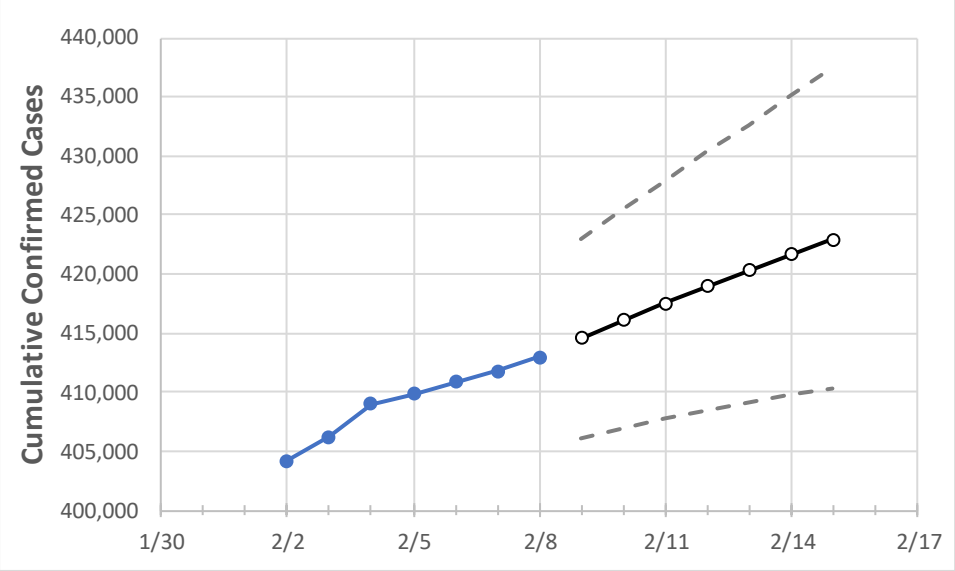
IEM's Modeling Lead

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:						
	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15
Louisiana	409,861	410,837	411,812	412,989	414,568	416,115	417,520	418,972	420,341	421,671	422,936

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:						
	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15
Ascension Parish	10,573	10,587	10,601	10,624	10,662	10,699	10,737	10,772	10,804	10,838	10,871
Bossier Parish	12,422	12,456	12,489	12,547	12,635	12,724	12,814	12,903	12,992	13,084	13,173
Caddo Parish	23,845	23,900	23,954	24,031	24,168	24,305	24,441	24,576	24,709	24,841	24,971
Calcasieu Parish	18,186	18,239	18,292	18,327	18,394	18,455	18,517	18,576	18,632	18,690	18,745
East Baton Rouge Parish	33,720	33,801	33,882	33,958	34,114	34,270	34,431	34,587	34,739	34,903	35,051
Jefferson Parish	41,893	41,999	42,104	42,213	42,344	42,466	42,585	42,698	42,807	42,909	43,005
Lafayette Parish	20,873	20,947	21,020	21,078	21,134	21,189	21,243	21,294	21,344	21,394	21,441
Lafourche Parish	8,554	8,583	8,611	8,655	8,700	8,742	8,783	8,822	8,861	8,901	8,939
Orleans Parish	27,060	27,109	27,158	27,245	27,331	27,416	27,496	27,575	27,649	27,719	27,788
Ouachita Parish	17,300	17,324	17,347	17,382	17,416	17,448	17,479	17,507	17,535	17,562	17,586
Rapides Parish	10,888	10,910	10,931	10,951	10,980	11,007	11,032	11,056	11,079	11,101	11,125
St. Bernard Parish	3,360	3,377	3,394	3,408	3,424	3,442	3,458	3,474	3,490	3,505	3,520
St. Charles Parish	4,859	4,869	4,878	4,901	4,914	4,926	4,938	4,949	4,959	4,969	4,979
St. James Parish	1,756	1,763	1,770	1,774	1,779	1,784	1,789	1,794	1,798	1,802	1,807
St. John the Baptist Parish	3,365	3,369	3,373	3,385	3,396	3,407	3,418	3,429	3,439	3,449	3,459
St. Tammany Parish	22,201	22,257	22,312	22,423	22,520	22,613	22,704	22,788	22,874	22,950	23,027

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:		
	2/5	2/6	2/7	2/8	2/10	2/12	2/14
Ascension Parish	10,573	10,587	10,601	10,624	10,699 (2,140) [514] {257}	10,772 (2,154) [517] {259}	10,838 (2,168) [520] {260}
Bossier Parish	12,422	12,456	12,489	12,547	12,724 (2,545) [611] {305}	12,903 (2,581) [619] {310}	13,084 (2,617) [628] {314}
Caddo Parish	23,845	23,900	23,954	24,031	24,305 (4,861) [1,167] {583}	24,576 (4,915) [1,180] {590}	24,841 (4,968) [1,192] {596}
Calcasieu Parish	18,186	18,239	18,292	18,327	18,455 (3,691) [886] {443}	18,576 (3,715) [892] {446}	18,690 (3,738) [897] {449}
East Baton Rouge Parish	33,720	33,801	33,882	33,958	34,270 (6,854) [1,645] {822}	34,587 (6,917) [1,660] {830}	34,903 (6,981) [1,675] {838}
Jefferson Parish	41,893	41,999	42,104	42,213	42,466 (8,493) [2,038] {1,019}	42,698 (8,540) [2,050] {1,025}	42,909 (8,582) [2,060] {1,030}
Lafayette Parish	20,873	20,947	21,020	21,078	21,189 (4,238) [1,017] {509}	21,294 (4,259) [1,022] {511}	21,394 (4,279) [1,027] {513}
Lafourche Parish	8,554	8,583	8,611	8,655	8,742 (1,748) [420] {210}	8,822 (1,764) [423] {212}	8,901 (1,780) [427] {214}
Orleans Parish	27,060	27,109	27,158	27,245	27,416 (5,483) [1,316] {658}	27,575 (5,515) [1,324] {662}	27,719 (5,544) [1,331] {665}
Ouachita Parish	17,300	17,324	17,347	17,382	17,448 (3,490) [838] {419}	17,507 (3,501) [840] {420}	17,562 (3,512) [843] {421}
Rapides Parish	10,888	10,910	10,931	10,951	11,007 (2,201) [528] {264}	11,056 (2,211) [531] {265}	11,101 (2,220) [533] {266}
St. Bernard Parish	3,360	3,377	3,394	3,408	3,442 (688) [165] {83}	3,474 (695) [167] {83}	3,505 (701) [168] {84}
St. Charles Parish	4,859	4,869	4,878	4,901	4,926 (985) [236] {118}	4,949 (990) [238] {119}	4,969 (994) [239] {119}
St. James Parish	1,756	1,763	1,770	1,774	1,784 (357) [86] {43}	1,794 (359) [86] {43}	1,802 (360) [87] {43}
St. John the Baptist Parish	3,365	3,369	3,373	3,385	3,407 (681) [164] {82}	3,429 (686) [165] {82}	3,449 (690) [166] {83}
St. Tammany Parish	22,201	22,257	22,312	22,423	22,613 (4,523) [1,085] {543}	22,788 (4,558) [1,094] {547}	22,950 (4,590) [1,102] {551}

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.