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

Date: 3/23/21

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 3/23/21 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.

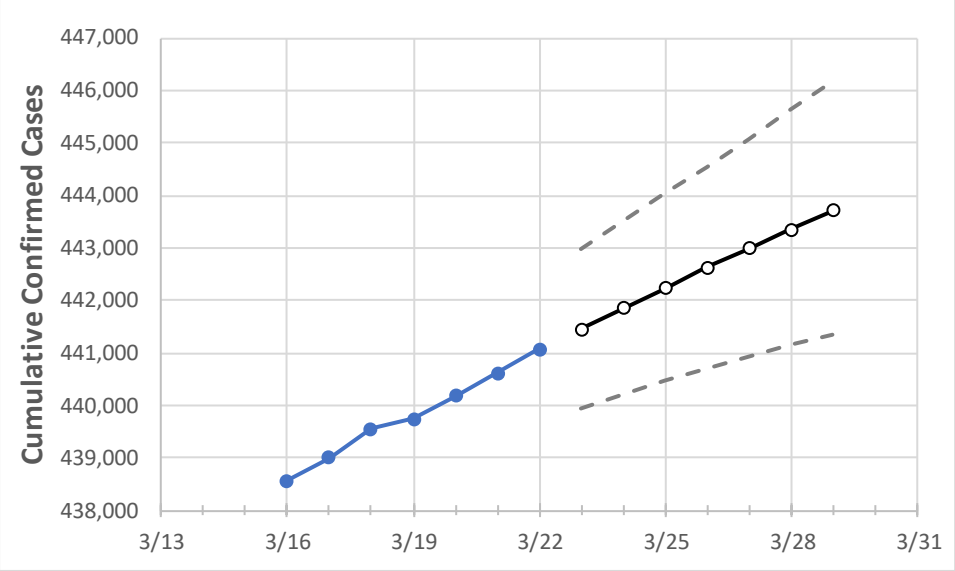
IEM's Modeling Lead

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:						
	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29
Louisiana	439,737	440,180	440,623	441,066	441,457	441,850	442,235	442,625	442,994	443,346	443,710

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:						
	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29
Ascension Parish	11,351	11,367	11,382	11,398	11,423	11,448	11,473	11,498	11,524	11,550	11,578
Bossier Parish	13,185	13,187	13,190	13,192	13,200	13,207	13,214	13,221	13,228	13,234	13,240
Caddo Parish	24,973	24,988	25,002	25,017	25,026	25,036	25,045	25,054	25,062	25,070	25,078
Calcasieu Parish	20,689	20,745	20,801	20,857	20,918	20,978	21,038	21,097	21,159	21,218	21,280
East Baton Rouge Parish	36,738	36,794	36,850	36,906	36,957	37,008	37,059	37,109	37,158	37,207	37,257
Jefferson Parish	44,684	44,715	44,746	44,777	44,804	44,830	44,854	44,878	44,901	44,923	44,945
Lafayette Parish	22,031	22,053	22,074	22,096	22,118	22,140	22,161	22,182	22,203	22,224	22,246
Lafourche Parish	9,309	9,310	9,312	9,313	9,317	9,321	9,325	9,329	9,332	9,336	9,339
Orleans Parish	29,025	29,037	29,049	29,061	29,077	29,092	29,107	29,121	29,135	29,149	29,161
Ouachita Parish	17,813	17,817	17,822	17,826	17,833	17,839	17,845	17,851	17,857	17,863	17,869
Rapides Parish	11,433	11,461	11,489	11,517	11,537	11,557	11,579	11,602	11,626	11,651	11,677
St. Bernard Parish	3,886	3,889	3,892	3,895	3,900	3,904	3,908	3,912	3,916	3,920	3,923
St. Charles Parish	5,237	5,240	5,244	5,247	5,253	5,258	5,264	5,270	5,275	5,280	5,286
St. James Parish	1,885	1,886	1,888	1,889	1,891	1,892	1,894	1,896	1,897	1,899	1,900
St. John the Baptist Parish	3,582	3,585	3,588	3,591	3,593	3,596	3,598	3,601	3,603	3,605	3,607
St. Tammany Parish	24,742	24,758	24,774	24,790	24,802	24,813	24,822	24,832	24,840	24,847	24,854

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:		
	3/19	3/20	3/21	3/22	3/24	3/26	3/28
Ascension Parish	11,351	11,367	11,382	11,398	11,448 (2,290) [549] {275}	11,498 (2,300) [552] {276}	11,550 (2,310) [554] {277}
Bossier Parish	13,185	13,187	13,190	13,192	13,207 (2,641) [634] {317}	13,221 (2,644) [635] {317}	13,234 (2,647) [635] {318}
Caddo Parish	24,973	24,988	25,002	25,017	25,036 (5,007) [1,202] {601}	25,054 (5,011) [1,203] {601}	25,070 (5,014) [1,203] {602}
Calcasieu Parish	20,689	20,745	20,801	20,857	20,978 (4,196) [1,007] {503}	21,097 (4,219) [1,013] {506}	21,218 (4,244) [1,018] {509}
East Baton Rouge Parish	36,738	36,794	36,850	36,906	37,008 (7,402) [1,776] {888}	37,109 (7,422) [1,781] {891}	37,207 (7,441) [1,786] {893}
Jefferson Parish	44,684	44,715	44,746	44,777	44,830 (8,966) [2,152] {1,076}	44,878 (8,976) [2,154] {1,077}	44,923 (8,985) [2,156] {1,078}
Lafayette Parish	22,031	22,053	22,074	22,096	22,140 (4,428) [1,063] {531}	22,182 (4,436) [1,065] {532}	22,224 (4,445) [1,067] {533}
Lafourche Parish	9,309	9,310	9,312	9,313	9,321 (1,864) [447] {224}	9,329 (1,866) [448] {224}	9,336 (1,867) [448] {224}
Orleans Parish	29,025	29,037	29,049	29,061	29,092 (5,818) [1,396] {698}	29,121 (5,824) [1,398] {699}	29,149 (5,830) [1,399] {700}
Ouachita Parish	17,813	17,817	17,822	17,826	17,839 (3,568) [856] {428}	17,851 (3,570) [857] {428}	17,863 (3,573) [857] {429}
Rapides Parish	11,433	11,461	11,489	11,517	11,557 (2,311) [555] {277}	11,602 (2,320) [557] {278}	11,651 (2,330) [559] {280}
St. Bernard Parish	3,886	3,889	3,892	3,895	3,904 (781) [187] {94}	3,912 (782) [188] {94}	3,920 (784) [188] {94}
St. Charles Parish	5,237	5,240	5,244	5,247	5,258 (1,052) [252] {126}	5,270 (1,054) [253] {126}	5,280 (1,056) [253] {127}
St. James Parish	1,885	1,886	1,888	1,889	1,892 (378) [91] {45}	1,896 (379) [91] {45}	1,899 (380) [91] {46}
St. John the Baptist Parish	3,582	3,585	3,588	3,591	3,596 (719) [173] {86}	3,601 (720) [173] {86}	3,605 (721) [173] {87}
St. Tammany Parish	24,742	24,758	24,774	24,790	24,813 (4,963) [1,191] {596}	24,832 (4,966) [1,192] {596}	24,847 (4,969) [1,193] {596}

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.