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

Date: 11/2/20

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 11/2/20 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.

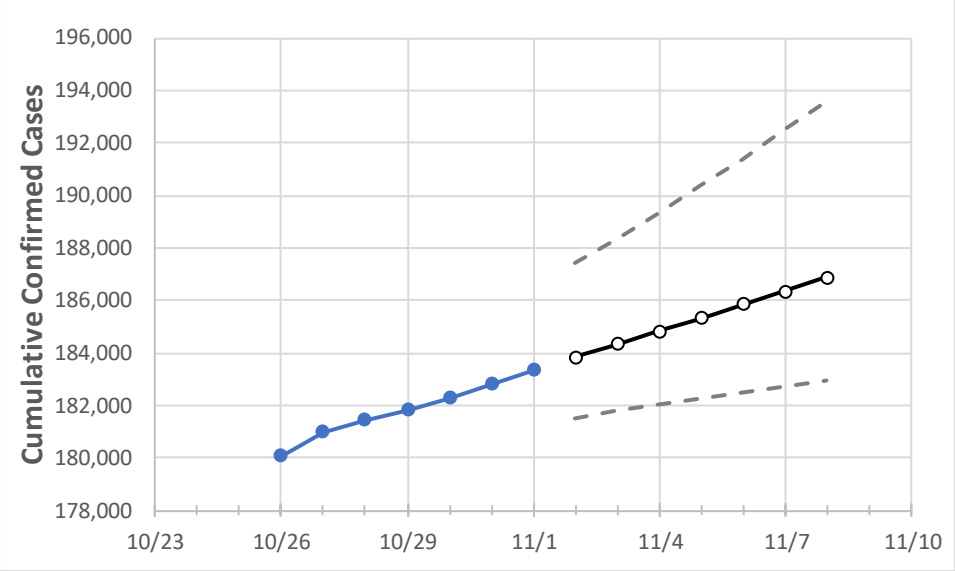
IEM's Modeling Lead

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:						
	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8
Louisiana	181,837	182,270	182,806	183,341	183,836	184,333	184,833	185,335	185,840	186,346	186,855

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 20%, and are often within 10%, of actual confirmed cases.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8
Ascension Parish	4,186	4,212	4,256	4,299	4,323	4,349	4,376	4,405	4,436	4,469	4,504
Bossier Parish	4,322	4,339	4,360	4,381	4,407	4,432	4,456	4,480	4,503	4,526	4,548
Caddo Parish	10,206	10,262	10,306	10,350	10,396	10,443	10,490	10,538	10,585	10,633	10,682
Calcasieu Parish	8,441	8,461	8,496	8,530	8,557	8,586	8,616	8,647	8,679	8,713	8,749
East Baton Rouge Parish	16,172	16,202	16,246	16,289	16,326	16,365	16,404	16,444	16,485	16,527	16,570
Jefferson Parish	18,757	18,785	18,826	18,866	18,902	18,938	18,974	19,010	19,046	19,083	19,119
Lafayette Parish	9,493	9,505	9,520	9,534	9,550	9,567	9,584	9,602	9,619	9,637	9,656
Lafourche Parish	3,909	3,907	3,916	3,925	3,931	3,937	3,943	3,949	3,954	3,960	3,966
Orleans Parish	13,514	13,536	13,553	13,569	13,587	13,605	13,622	13,640	13,656	13,673	13,689
Ouachita Parish	7,061	7,082	7,114	7,146	7,171	7,196	7,222	7,248	7,274	7,301	7,328
Rapides Parish	4,731	4,749	4,775	4,800	4,815	4,830	4,846	4,862	4,878	4,894	4,910
St. Bernard Parish	1,554	1,557	1,558	1,559	1,561	1,563	1,566	1,568	1,570	1,572	1,574
St. Charles Parish	1,954	1,964	1,965	1,965	1,968	1,971	1,974	1,976	1,979	1,982	1,984
St. James Parish	845	846	846	846	848	850	852	855	857	859	862
St. John the Baptist Parish	1,654	1,659	1,661	1,663	1,666	1,669	1,673	1,676	1,680	1,684	1,688
St. Tammany Parish	7,765	7,764	7,784	7,803	7,826	7,849	7,873	7,898	7,923	7,948	7,974

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:		
	10/29	10/30	10/31	11/1	11/3	11/5	11/7
Ascension Parish	4,186	4,212	4,256	4,299	4,349 (870) [209] {104}	4,405 (881) [211] {106}	4,469 (894) [215] {107}
Bossier Parish	4,322	4,339	4,360	4,381	4,432 (886) [213] {106}	4,480 (896) [215] {108}	4,526 (905) [217] {109}
Caddo Parish	10,206	10,262	10,306	10,350	10,443 (2,089) [501] {251}	10,538 (2,108) [506] {253}	10,633 (2,127) [510] {255}
Calcasieu Parish	8,441	8,461	8,496	8,530	8,586 (1,717) [412] {206}	8,647 (1,729) [415] {208}	8,713 (1,743) [418] {209}
East Baton Rouge Parish	16,172	16,202	16,246	16,289	16,365 (3,273) [786] {393}	16,444 (3,289) [789] {395}	16,527 (3,305) [793] {397}
Jefferson Parish	18,757	18,785	18,826	18,866	18,938 (3,788) [909] {455}	19,010 (3,802) [912] {456}	19,083 (3,817) [916] {458}
Lafayette Parish	9,493	9,505	9,520	9,534	9,567 (1,913) [459] {230}	9,602 (1,920) [461] {230}	9,637 (1,927) [463] {231}
Lafourche Parish	3,909	3,907	3,916	3,925	3,937 (787) [189] {94}	3,949 (790) [190] {95}	3,960 (792) [190] {95}
Orleans Parish	13,514	13,536	13,553	13,569	13,605 (2,721) [653] {327}	13,640 (2,728) [655] {327}	13,673 (2,735) [656] {328}
Ouachita Parish	7,061	7,082	7,114	7,146	7,196 (1,439) [345] {173}	7,248 (1,450) [348] {174}	7,301 (1,460) [350] {175}
Rapides Parish	4,731	4,749	4,775	4,800	4,830 (966) [232] {116}	4,862 (972) [233] {117}	4,894 (979) [235] {117}
St. Bernard Parish	1,554	1,557	1,558	1,559	1,563 (313) [75] {38}	1,568 (314) [75] {38}	1,572 (314) [75] {38}
St. Charles Parish	1,954	1,964	1,965	1,965	1,971 (394) [95] {47}	1,976 (395) [95] {47}	1,982 (396) [95] {48}
St. James Parish	845	846	846	846	850 (170) [41] {20}	855 (171) [41] {21}	859 (172) [41] {21}
St. John the Baptist Parish	1,654	1,659	1,661	1,663	1,669 (334) [80] {40}	1,676 (335) [80] {40}	1,684 (337) [81] {40}
St. Tammany Parish	7,765	7,764	7,784	7,803	7,849 (1,570) [377] {188}	7,898 (1,580) [379] {190}	7,948 (1,590) [382] {191}

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.