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

Date: 3/11/21

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 3/11/21 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.

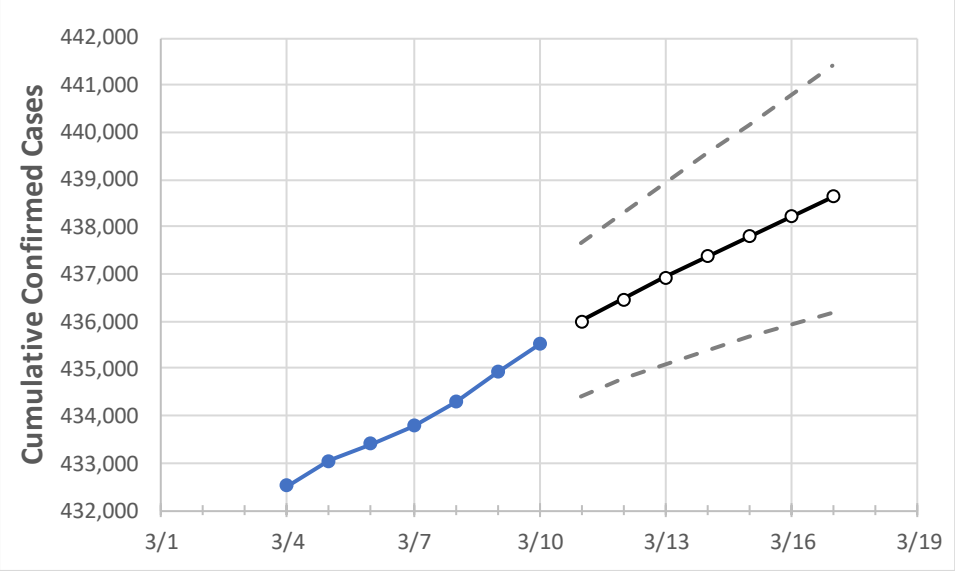
IEM's Modeling Lead

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:						
	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16	3/17
Louisiana	433,785	434,289	434,926	435,514	435,996	436,460	436,931	437,366	437,788	438,221	438,630

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:						
	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16	3/17
Ascension Parish	11,074	11,088	11,098	11,122	11,136	11,149	11,161	11,174	11,186	11,198	11,211
Bossier Parish	13,071	13,084	13,094	13,110	13,117	13,123	13,129	13,135	13,141	13,146	13,150
Caddo Parish	24,837	24,862	24,877	24,891	24,906	24,920	24,933	24,946	24,958	24,970	24,981
Calcasieu Parish	19,822	19,882	20,060	20,126	20,204	20,290	20,370	20,456	20,544	20,631	20,719
East Baton Rouge Parish	36,052	36,115	36,176	36,232	36,290	36,346	36,401	36,457	36,513	36,567	36,621
Jefferson Parish	44,226	44,282	44,305	44,364	44,405	44,446	44,485	44,523	44,560	44,595	44,628
Lafayette Parish	21,729	21,735	21,774	21,805	21,824	21,844	21,862	21,880	21,900	21,918	21,936
Lafourche Parish	9,215	9,233	9,235	9,250	9,259	9,267	9,276	9,283	9,290	9,298	9,305
Orleans Parish	28,710	28,744	28,782	28,802	28,829	28,854	28,879	28,902	28,926	28,948	28,968
Ouachita Parish	17,730	17,731	17,750	17,749	17,754	17,759	17,764	17,768	17,772	17,777	17,781
Rapides Parish	11,328	11,339	11,337	11,347	11,356	11,365	11,374	11,382	11,390	11,399	11,407
St. Bernard Parish	3,794	3,799	3,815	3,825	3,833	3,841	3,848	3,855	3,862	3,869	3,876
St. Charles Parish	5,158	5,160	5,173	5,175	5,181	5,188	5,194	5,199	5,205	5,211	5,216
St. James Parish	1,859	1,863	1,862	1,869	1,871	1,872	1,874	1,875	1,877	1,878	1,879
St. John the Baptist Parish	3,554	3,557	3,562	3,567	3,570	3,574	3,577	3,579	3,582	3,585	3,588
St. Tammany Parish	24,400	24,454	24,501	24,555	24,601	24,645	24,687	24,730	24,773	24,814	24,853

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:		
	3/7	3/8	3/9	3/10	3/12	3/14	3/16
Ascension Parish	11,074	11,088	11,098	11,122	11,149 (2,230) [535] {268}	11,174 (2,235) [536] {268}	11,198 (2,240) [538] {269}
Bossier Parish	13,071	13,084	13,094	13,110	13,123 (2,625) [630] {315}	13,135 (2,627) [630] {315}	13,146 (2,629) [631] {315}
Caddo Parish	24,837	24,862	24,877	24,891	24,920 (4,984) [1,196] {598}	24,946 (4,989) [1,197] {599}	24,970 (4,994) [1,199] {599}
Calcasieu Parish	19,822	19,882	20,060	20,126	20,290 (4,058) [974] {487}	20,456 (4,091) [982] {491}	20,631 (4,126) [990] {495}
East Baton Rouge Parish	36,052	36,115	36,176	36,232	36,346 (7,269) [1,745] {872}	36,457 (7,291) [1,750] {875}	36,567 (7,313) [1,755] {878}
Jefferson Parish	44,226	44,282	44,305	44,364	44,446 (8,889) [2,133] {1,067}	44,523 (8,905) [2,137] {1,069}	44,595 (8,919) [2,141] {1,070}
Lafayette Parish	21,729	21,735	21,774	21,805	21,844 (4,369) [1,049] {524}	21,880 (4,376) [1,050] {525}	21,918 (4,384) [1,052] {526}
Lafourche Parish	9,215	9,233	9,235	9,250	9,267 (1,853) [445] {222}	9,283 (1,857) [446] {223}	9,298 (1,860) [446] {223}
Orleans Parish	28,710	28,744	28,782	28,802	28,854 (5,771) [1,385] {693}	28,902 (5,780) [1,387] {694}	28,948 (5,790) [1,390] {695}
Ouachita Parish	17,730	17,731	17,750	17,749	17,759 (3,552) [852] {426}	17,768 (3,554) [853] {426}	17,777 (3,555) [853] {427}
Rapides Parish	11,328	11,339	11,337	11,347	11,365 (2,273) [546] {273}	11,382 (2,276) [546] {273}	11,399 (2,280) [547] {274}
St. Bernard Parish	3,794	3,799	3,815	3,825	3,841 (768) [184] {92}	3,855 (771) [185] {93}	3,869 (774) [186] {93}
St. Charles Parish	5,158	5,160	5,173	5,175	5,188 (1,038) [249] {125}	5,199 (1,040) [250] {125}	5,211 (1,042) [250] {125}
St. James Parish	1,859	1,863	1,862	1,869	1,872 (374) [90] {45}	1,875 (375) [90] {45}	1,878 (376) [90] {45}
St. John the Baptist Parish	3,554	3,557	3,562	3,567	3,574 (715) [172] {86}	3,579 (716) [172] {86}	3,585 (717) [172] {86}
St. Tammany Parish	24,400	24,454	24,501	24,555	24,645 (4,929) [1,183] {591}	24,730 (4,946) [1,187] {594}	24,814 (4,963) [1,191] {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.