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

Date: 7/12/21

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 7/12/21 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.

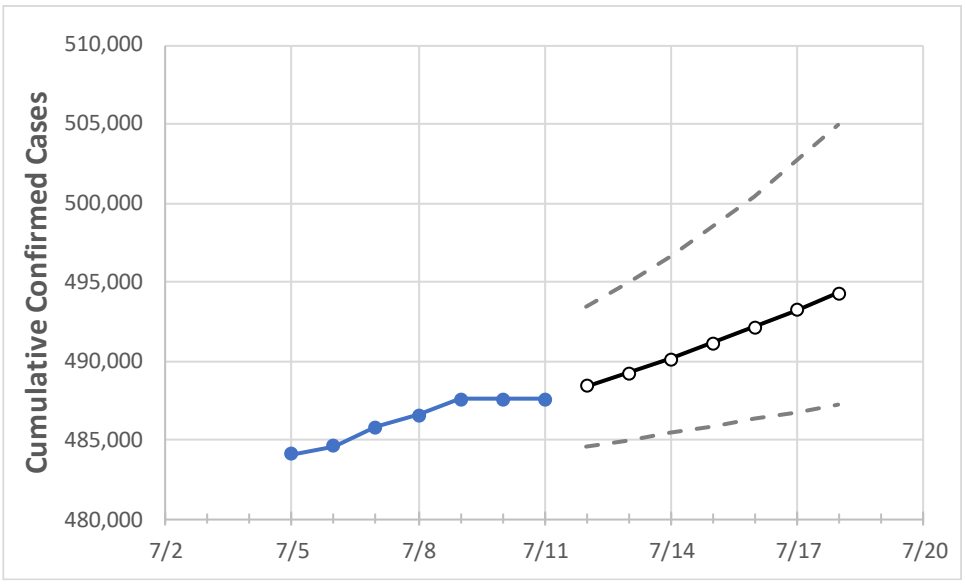
IEM's Modeling Lead

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:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Louisiana	486,589	487,558	487,558	487,558	488,385	489,236	490,126	491,102	492,142	493,195	494,271

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:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Ascension Parish	13,126	13,153	13,153	13,153	13,189	13,226	13,266	13,311	13,356	13,406	13,457
Bossier Parish	14,578	14,610	14,610	14,610	14,627	14,645	14,664	14,683	14,703	14,724	14,745
Caddo Parish	27,397	27,424	27,424	27,424	27,444	27,464	27,484	27,506	27,526	27,548	27,569
Calcasieu Parish	23,409	23,426	23,426	23,426	23,446	23,467	23,488	23,509	23,531	23,554	23,578
East Baton Rouge Parish	41,661	41,742	41,742	41,742	41,829	41,923	42,019	42,126	42,239	42,357	42,479
Jefferson Parish	47,940	47,995	47,995	47,995	48,054	48,114	48,179	48,245	48,317	48,391	48,468
Lafayette Parish	24,837	24,887	24,887	24,887	24,933	24,981	25,035	25,090	25,147	25,207	25,271
Lafourche Parish	10,371	10,396	10,396	10,396	10,421	10,447	10,474	10,501	10,529	10,557	10,588
Orleans Parish	31,340	31,373	31,373	31,373	31,416	31,461	31,509	31,560	31,615	31,673	31,734
Ouachita Parish	19,232	19,251	19,251	19,251	19,269	19,288	19,307	19,327	19,347	19,367	19,389
Rapides Parish	12,851	12,895	12,895	12,895	12,920	12,947	12,976	13,007	13,040	13,076	13,114
St. Bernard Parish	4,188	4,199	4,199	4,199	4,207	4,216	4,226	4,236	4,247	4,259	4,272
St. Charles Parish	5,740	5,758	5,758	5,758	5,778	5,799	5,822	5,847	5,874	5,902	5,934
St. James Parish	2,058	2,066	2,066	2,066	2,069	2,073	2,077	2,081	2,085	2,090	2,095
St. John the Baptist Parish	3,926	3,931	3,931	3,931	3,937	3,944	3,950	3,956	3,963	3,971	3,978
St. Tammany Parish	26,844	26,952	26,952	26,952	27,041	27,135	27,239	27,351	27,473	27,606	27,750

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:		
	7/8	7/9	7/10	7/11	7/13	7/15	7/17
Ascension Parish	13,126	13,153	13,153	13,153	13,226 (2,645) [635] {317}	13,311 (2,662) [639] {319}	13,406 (2,681) [643] {322}
Bossier Parish	14,578	14,610	14,610	14,610	14,645 (2,929) [703] {351}	14,683 (2,937) [705] {352}	14,724 (2,945) [707] {353}
Caddo Parish	27,397	27,424	27,424	27,424	27,464 (5,493) [1,318] {659}	27,506 (5,501) [1,320] {660}	27,548 (5,510) [1,322] {661}
Calcasieu Parish	23,409	23,426	23,426	23,426	23,467 (4,693) [1,126] {563}	23,509 (4,702) [1,128] {564}	23,554 (4,711) [1,131] {565}
East Baton Rouge Parish	41,661	41,742	41,742	41,742	41,923 (8,385) [2,012] {1,006}	42,126 (8,425) [2,022] {1,011}	42,357 (8,471) [2,033] {1,017}
Jefferson Parish	47,940	47,995	47,995	47,995	48,114 (9,623) [2,309] {1,155}	48,245 (9,649) [2,316] {1,158}	48,391 (9,678) [2,323] {1,161}
Lafayette Parish	24,837	24,887	24,887	24,887	24,981 (4,996) [1,199] {600}	25,090 (5,018) [1,204] {602}	25,207 (5,041) [1,210] {605}
Lafourche Parish	10,371	10,396	10,396	10,396	10,447 (2,089) [501] {251}	10,501 (2,100) [504] {252}	10,557 (2,111) [507] {253}
Orleans Parish	31,340	31,373	31,373	31,373	31,461 (6,292) [1,510] {755}	31,560 (6,312) [1,515] {757}	31,673 (6,335) [1,520] {760}
Ouachita Parish	19,232	19,251	19,251	19,251	19,288 (3,858) [926] {463}	19,327 (3,865) [928] {464}	19,367 (3,873) [930] {465}
Rapides Parish	12,851	12,895	12,895	12,895	12,947 (2,589) [621] {311}	13,007 (2,601) [624] {312}	13,076 (2,615) [628] {314}
St. Bernard Parish	4,188	4,199	4,199	4,199	4,216 (843) [202] {101}	4,236 (847) [203] {102}	4,259 (852) [204] {102}
St. Charles Parish	5,740	5,758	5,758	5,758	5,799 (1,160) [278] {139}	5,847 (1,169) [281] {140}	5,902 (1,180) [283] {142}
St. James Parish	2,058	2,066	2,066	2,066	2,073 (415) [100] {50}	2,081 (416) [100] {50}	2,090 (418) [100] {50}
St. John the Baptist Parish	3,926	3,931	3,931	3,931	3,944 (789) [189] {95}	3,956 (791) [190] {95}	3,971 (794) [191] {95}
St. Tammany Parish	26,844	26,952	26,952	26,952	27,135 (5,427) [1,302] {651}	27,351 (5,470) [1,313] {656}	27,606 (5,521) [1,325] {663}

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.