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

Date: 1/12/21

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 1/12/21 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.

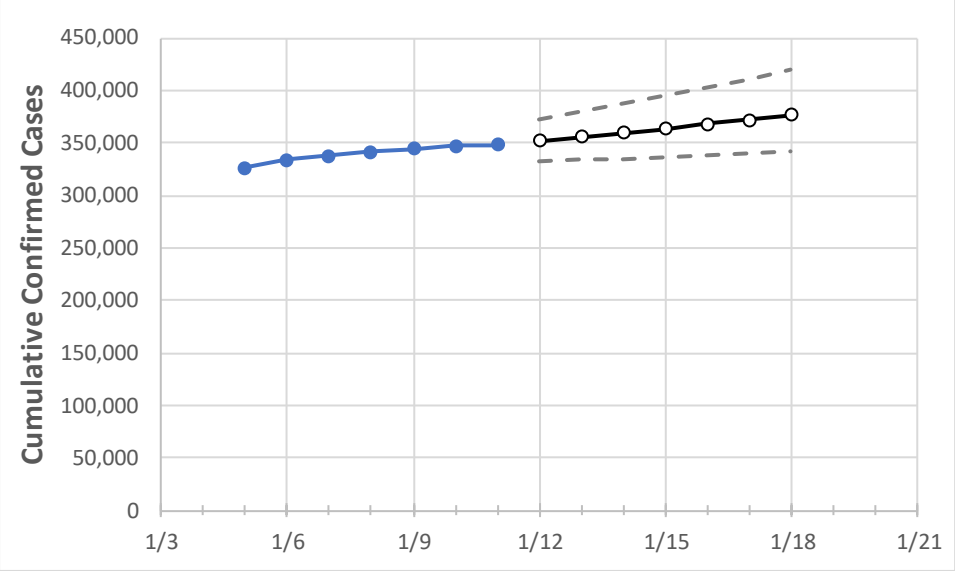
IEM's Modeling Lead

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:						
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18
Louisiana	341,431	344,130	346,829	348,234	352,083	355,830	359,722	363,806	367,925	372,198	376,507

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:						
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18
Ascension Parish	8,573	8,646	8,719	8,745	8,830	8,921	9,011	9,104	9,195	9,289	9,383
Bossier Parish	9,695	9,882	10,068	10,102	10,224	10,350	10,474	10,603	10,739	10,881	11,023
Caddo Parish	19,335	19,562	19,788	19,894	20,113	20,334	20,566	20,803	21,049	21,293	21,540
Calcasieu Parish	15,076	15,168	15,260	15,294	15,425	15,559	15,692	15,822	15,964	16,102	16,259
East Baton Rouge Parish	27,454	27,623	27,792	27,887	28,099	28,315	28,538	28,758	28,982	29,214	29,447
Jefferson Parish	34,491	34,814	35,137	35,379	35,804	36,231	36,670	37,112	37,561	38,031	38,513
Lafayette Parish	18,179	18,291	18,403	18,439	18,616	18,789	18,972	19,144	19,316	19,500	19,673
Lafourche Parish	6,792	6,832	6,871	6,952	7,031	7,113	7,196	7,279	7,364	7,457	7,555
Orleans Parish	22,737	22,927	23,117	23,252	23,520	23,796	24,081	24,373	24,672	24,977	25,280
Ouachita Parish	15,130	15,234	15,337	15,401	15,537	15,677	15,819	15,962	16,103	16,251	16,393
Rapides Parish	9,117	9,195	9,272	9,281	9,393	9,505	9,620	9,739	9,866	10,002	10,136
St. Bernard Parish	2,662	2,688	2,714	2,735	2,778	2,824	2,872	2,923	2,975	3,031	3,087
St. Charles Parish	3,967	4,008	4,049	4,078	4,124	4,170	4,217	4,264	4,312	4,361	4,411
St. James Parish	1,475	1,482	1,489	1,490	1,506	1,522	1,538	1,555	1,573	1,591	1,609
St. John the Baptist Parish	2,869	2,890	2,911	2,925	2,951	2,978	3,005	3,032	3,059	3,086	3,115
St. Tammany Parish	16,910	17,063	17,215	17,336	17,553	17,768	17,993	18,216	18,446	18,686	18,925

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:		
	1/8	1/9	1/10	1/11	1/13	1/15	1/17
Ascension Parish	8,573	8,646	8,719	8,745	8,921 (1,784) [428] {214}	9,104 (1,821) [437] {218}	9,289 (1,858) [446] {223}
Bossier Parish	9,695	9,882	10,068	10,102	10,350 (2,070) [497] {248}	10,603 (2,121) [509] {254}	10,881 (2,176) [522] {261}
Caddo Parish	19,335	19,562	19,788	19,894	20,334 (4,067) [976] {488}	20,803 (4,161) [999] {499}	21,293 (4,259) [1,022] {511}
Calcasieu Parish	15,076	15,168	15,260	15,294	15,559 (3,112) [747] {373}	15,822 (3,164) [759] {380}	16,102 (3,220) [773] {386}
East Baton Rouge Parish	27,454	27,623	27,792	27,887	28,315 (5,663) [1,359] {680}	28,758 (5,752) [1,380] {690}	29,214 (5,843) [1,402] {701}
Jefferson Parish	34,491	34,814	35,137	35,379	36,231 (7,246) [1,739] {870}	37,112 (7,422) [1,781] {891}	38,031 (7,606) [1,825] {913}
Lafayette Parish	18,179	18,291	18,403	18,439	18,789 (3,758) [902] {451}	19,144 (3,829) [919] {459}	19,500 (3,900) [936] {468}
Lafourche Parish	6,792	6,832	6,871	6,952	7,113 (1,423) [341] {171}	7,279 (1,456) [349] {175}	7,457 (1,491) [358] {179}
Orleans Parish	22,737	22,927	23,117	23,252	23,796 (4,759) [1,142] {571}	24,373 (4,875) [1,170] {585}	24,977 (4,995) [1,199] {599}
Ouachita Parish	15,130	15,234	15,337	15,401	15,677 (3,135) [752] {376}	15,962 (3,192) [766] {383}	16,251 (3,250) [780] {390}
Rapides Parish	9,117	9,195	9,272	9,281	9,505 (1,901) [456] {228}	9,739 (1,948) [467] {234}	10,002 (2,000) [480] {240}
St. Bernard Parish	2,662	2,688	2,714	2,735	2,824 (565) [136] {68}	2,923 (585) [140] {70}	3,031 (606) [145] {73}
St. Charles Parish	3,967	4,008	4,049	4,078	4,170 (834) [200] {100}	4,264 (853) [205] {102}	4,361 (872) [209] {105}
St. James Parish	1,475	1,482	1,489	1,490	1,522 (304) [73] {37}	1,555 (311) [75] {37}	1,591 (318) [76] {38}
St. John the Baptist Parish	2,869	2,890	2,911	2,925	2,978 (596) [143] {71}	3,032 (606) [146] {73}	3,086 (617) [148] {74}
St. Tammany Parish	16,910	17,063	17,215	17,336	17,768 (3,554) [853] {426}	18,216 (3,643) [874] {437}	18,686 (3,737) [897] {448}

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.