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

Date: 11/19/20

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 11/19/20 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.

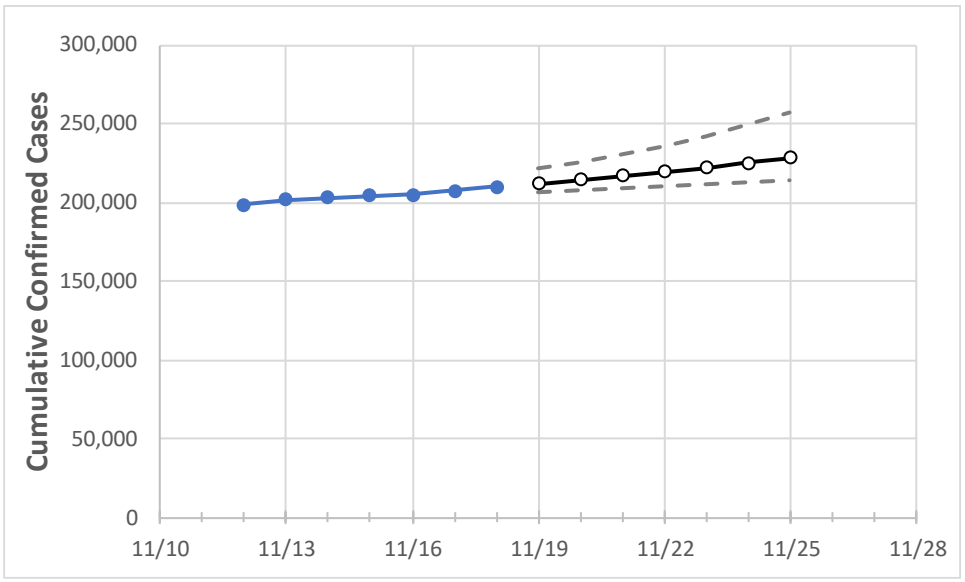
IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Louisiana	204,032	205,057	207,685	209,914	212,003	214,259	216,693	219,319	222,152	225,208	228,504

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Ascension Parish	4,895	4,994	5,068	5,173	5,292	5,428	5,582	5,757	5,956	6,182	6,438
Bossier Parish	5,100	5,193	5,295	5,424	5,537	5,659	5,793	5,937	6,095	6,265	6,451
Caddo Parish	11,478	11,580	11,705	11,799	11,923	12,054	12,191	12,335	12,485	12,644	12,810
Calcasieu Parish	9,326	9,542	9,664	9,743	9,874	10,023	10,190	10,379	10,592	10,833	11,103
East Baton Rouge Parish	17,674	17,952	18,125	18,329	18,545	18,787	19,059	19,362	19,703	20,083	20,509
Jefferson Parish	20,002	20,193	20,357	20,543	20,770	21,025	21,310	21,631	21,989	22,391	22,842
Lafayette Parish	10,329	10,434	10,680	10,782	10,951	11,145	11,369	11,625	11,921	12,260	12,650
Lafourche Parish	4,209	4,294	4,342	4,372	4,409	4,451	4,498	4,552	4,611	4,679	4,755
Orleans Parish	14,478	14,593	14,711	14,786	14,922	15,071	15,236	15,417	15,617	15,837	16,079
Ouachita Parish	8,249	8,375	8,473	8,617	8,810	9,029	9,275	9,554	9,869	10,225	10,626
Rapides Parish	5,411	5,573	5,699	5,780	5,891	6,020	6,171	6,345	6,547	6,782	7,054
St. Bernard Parish	1,659	1,676	1,688	1,697	1,706	1,716	1,727	1,739	1,752	1,765	1,780
St. Charles Parish	2,187	2,265	2,294	2,312	2,333	2,357	2,384	2,414	2,448	2,485	2,527
St. James Parish	893	901	920	922	929	936	944	954	965	977	990
St. John the Baptist Parish	1,792	1,810	1,816	1,829	1,840	1,852	1,864	1,878	1,892	1,908	1,924
St. Tammany Parish	8,693	8,931	9,020	9,193	9,359	9,549	9,766	10,014	10,296	10,618	10,986

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:		
	11/15	11/16	11/17	11/18	11/20	11/22	11/24
Ascension Parish	4,895	4,994	5,068	5,173	5,428 (1,086) [261] {130}	5,757 (1,151) [276] {138}	6,182 (1,236) [297] {148}
Bossier Parish	5,100	5,193	5,295	5,424	5,659 (1,132) [272] {136}	5,937 (1,187) [285] {142}	6,265 (1,253) [301] {150}
Caddo Parish	11,478	11,580	11,705	11,799	12,054 (2,411) [579] {289}	12,335 (2,467) [592] {296}	12,644 (2,529) [607] {303}
Calcasieu Parish	9,326	9,542	9,664	9,743	10,023 (2,005) [481] {241}	10,379 (2,076) [498] {249}	10,833 (2,167) [520] {260}
East Baton Rouge Parish	17,674	17,952	18,125	18,329	18,787 (3,757) [902] {451}	19,362 (3,872) [929] {465}	20,083 (4,017) [964] {482}
Jefferson Parish	20,002	20,193	20,357	20,543	21,025 (4,205) [1,009] {505}	21,631 (4,326) [1,038] {519}	22,391 (4,478) [1,075] {537}
Lafayette Parish	10,329	10,434	10,680	10,782	11,145 (2,229) [535] {267}	11,625 (2,325) [558] {279}	12,260 (2,452) [588] {294}
Lafourche Parish	4,209	4,294	4,342	4,372	4,451 (890) [214] {107}	4,552 (910) [218] {109}	4,679 (936) [225] {112}
Orleans Parish	14,478	14,593	14,711	14,786	15,071 (3,014) [723] {362}	15,417 (3,083) [740] {370}	15,837 (3,167) [760] {380}
Ouachita Parish	8,249	8,375	8,473	8,617	9,029 (1,806) [433] {217}	9,554 (1,911) [459] {229}	10,225 (2,045) [491] {245}
Rapides Parish	5,411	5,573	5,699	5,780	6,020 (1,204) [289] {144}	6,345 (1,269) [305] {152}	6,782 (1,356) [326] {163}
St. Bernard Parish	1,659	1,676	1,688	1,697	1,716 (343) [82] {41}	1,739 (348) [83] {42}	1,765 (353) [85] {42}
St. Charles Parish	2,187	2,265	2,294	2,312	2,357 (471) [113] {57}	2,414 (483) [116] {58}	2,485 (497) [119] {60}
St. James Parish	893	901	920	922	936 (187) [45] {22}	954 (191) [46] {23}	977 (195) [47] {23}
St. John the Baptist Parish	1,792	1,810	1,816	1,829	1,852 (370) [89] {44}	1,878 (376) [90] {45}	1,908 (382) [92] {46}
St. Tammany Parish	8,693	8,931	9,020	9,193	9,549 (1,910) [458] {229}	10,014 (2,003) [481] {240}	10,618 (2,124) [510] {255}

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.