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

Date: 3/19/21

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 3/19/21 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.

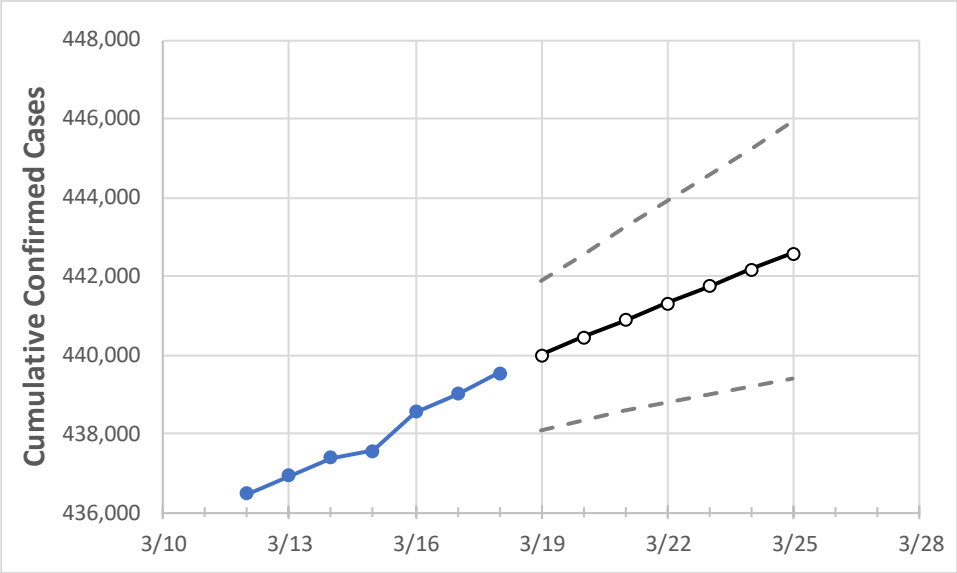
IEM's Modeling Lead

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Louisiana	437,565	438,557	439,002	439,543	439,993	440,441	440,874	441,309	441,731	442,170	442,569

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Ascension Parish	11,216	11,294	11,312	11,344	11,382	11,423	11,468	11,516	11,568	11,622	11,680
Bossier Parish	13,151	13,159	13,174	13,171	13,183	13,195	13,207	13,219	13,232	13,244	13,257
Caddo Parish	24,950	24,954	24,974	24,981	24,990	25,000	25,008	25,017	25,025	25,034	25,041
Calcasieu Parish	20,323	20,480	20,551	20,654	20,733	20,808	20,889	20,965	21,048	21,134	21,220
East Baton Rouge Parish	36,475	36,644	36,655	36,728	36,788	36,848	36,909	36,971	37,033	37,094	37,153
Jefferson Parish	44,561	44,608	44,644	44,664	44,692	44,719	44,745	44,771	44,796	44,820	44,842
Lafayette Parish	21,923	21,972	22,001	22,029	22,055	22,081	22,108	22,135	22,162	22,188	22,216
Lafourche Parish	9,275	9,295	9,305	9,305	9,313	9,320	9,328	9,335	9,342	9,348	9,355
Orleans Parish	28,924	28,970	28,989	29,021	29,047	29,072	29,098	29,123	29,147	29,172	29,196
Ouachita Parish	17,774	17,783	17,798	17,807	17,815	17,823	17,832	17,840	17,848	17,857	17,865
Rapides Parish	11,374	11,409	11,413	11,417	11,426	11,435	11,445	11,454	11,463	11,472	11,481
St. Bernard Parish	3,857	3,872	3,874	3,879	3,885	3,890	3,895	3,901	3,905	3,910	3,914
St. Charles Parish	5,208	5,225	5,235	5,232	5,241	5,250	5,260	5,270	5,279	5,289	5,299
St. James Parish	1,881	1,882	1,879	1,884	1,886	1,889	1,891	1,894	1,896	1,899	1,901
St. John the Baptist Parish	3,573	3,577	3,581	3,583	3,586	3,588	3,591	3,593	3,595	3,597	3,600
St. Tammany Parish	24,682	24,703	24,721	24,734	24,752	24,768	24,782	24,797	24,810	24,823	24,834

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:		
	3/15	3/16	3/17	3/18	3/20	3/22	3/24
Ascension Parish	11,216	11,294	11,312	11,344	11,423 (2,285) [548] {274}	11,516 (2,303) [553] {276}	11,622 (2,324) [558] {279}
Bossier Parish	13,151	13,159	13,174	13,171	13,195 (2,639) [633] {317}	13,219 (2,644) [635] {317}	13,244 (2,649) [636] {318}
Caddo Parish	24,950	24,954	24,974	24,981	25,000 (5,000) [1,200] {600}	25,017 (5,003) [1,201] {600}	25,034 (5,007) [1,202] {601}
Calcasieu Parish	20,323	20,480	20,551	20,654	20,808 (4,162) [999] {499}	20,965 (4,193) [1,006] {503}	21,134 (4,227) [1,014] {507}
East Baton Rouge Parish	36,475	36,644	36,655	36,728	36,848 (7,370) [1,769] {884}	36,971 (7,394) [1,775] {887}	37,094 (7,419) [1,781] {890}
Jefferson Parish	44,561	44,608	44,644	44,664	44,719 (8,944) [2,147] {1,073}	44,771 (8,954) [2,149] {1,075}	44,820 (8,964) [2,151] {1,076}
Lafayette Parish	21,923	21,972	22,001	22,029	22,081 (4,416) [1,060] {530}	22,135 (4,427) [1,062] {531}	22,188 (4,438) [1,065] {533}
Lafourche Parish	9,275	9,295	9,305	9,305	9,320 (1,864) [447] {224}	9,335 (1,867) [448] {224}	9,348 (1,870) [449] {224}
Orleans Parish	28,924	28,970	28,989	29,021	29,072 (5,814) [1,395] {698}	29,123 (5,825) [1,398] {699}	29,172 (5,834) [1,400] {700}
Ouachita Parish	17,774	17,783	17,798	17,807	17,823 (3,565) [856] {428}	17,840 (3,568) [856] {428}	17,857 (3,571) [857] {429}
Rapides Parish	11,374	11,409	11,413	11,417	11,435 (2,287) [549] {274}	11,454 (2,291) [550] {275}	11,472 (2,294) [551] {275}
St. Bernard Parish	3,857	3,872	3,874	3,879	3,890 (778) [187] {93}	3,901 (780) [187] {94}	3,910 (782) [188] {94}
St. Charles Parish	5,208	5,225	5,235	5,232	5,250 (1,050) [252] {126}	5,270 (1,054) [253] {126}	5,289 (1,058) [254] {127}
St. James Parish	1,881	1,882	1,879	1,884	1,889 (378) [91] {45}	1,894 (379) [91] {45}	1,899 (380) [91] {46}
St. John the Baptist Parish	3,573	3,577	3,581	3,583	3,588 (718) [172] {86}	3,593 (719) [172] {86}	3,597 (719) [173] {86}
St. Tammany Parish	24,682	24,703	24,721	24,734	24,768 (4,954) [1,189] {594}	24,797 (4,959) [1,190] {595}	24,823 (4,965) [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.