IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/22/22

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 <u>not</u> 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 3/22/22 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
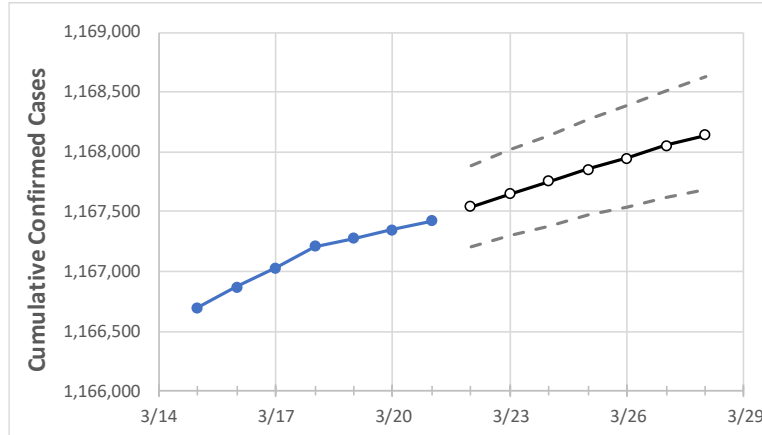
	Actual Confirmed Cases On:				Projected Cases For:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
Louisiana	1,167,207	1,167,278	1,167,350	1,167,421	1,167,540	1,167,647	1,167,751	1,167,851	1,167,948	1,168,051	1,168,138

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:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
Ascension Parish	33,087	33,088	33,088	33,088	33,090	33,092	33,093	33,095	33,096	33,098	33,099
Bossier Parish	35,294	35,297	35,299	35,302	35,305	35,309	35,312	35,315	35,318	35,321	35,324
Caddo Parish	63,287	63,289	63,291	63,293	63,297	63,300	63,303	63,306	63,309	63,312	63,315
Calcasieu Parish	51,712	51,713	51,714	51,715	51,719	51,724	51,728	51,732	51,736	51,739	51,743
East Baton Rouge Parish	105,288	105,296	105,303	105,311	105,322	105,331	105,341	105,350	105,359	105,368	105,377
Jefferson Parish	108,200	108,207	108,215	108,222	108,234	108,244	108,253	108,263	108,273	108,282	108,291
Lafayette Parish	59,270	59,271	59,273	59,274	59,279	59,283	59,288	59,292	59,296	59,300	59,303
Lafourche Parish	26,176	26,178	26,179	26,181	26,183	26,184	26,186	26,187	26,188	26,190	26,191
Orleans Parish	83,490	83,501	83,512	83,523	83,553	83,583	83,612	83,641	83,670	83,701	83,727
Ouachita Parish	47,263	47,267	47,272	47,276	47,280	47,284	47,287	47,291	47,294	47,297	47,300
Rapides Parish	30,876	30,877	30,878	30,879	30,881	30,884	30,886	30,888	30,890	30,892	30,895
St. Bernard Parish	10,694	10,696	10,697	10,699	10,700	10,702	10,703	10,704	10,705	10,706	10,708
St. Charles Parish	13,149	13,149	13,149	13,149	13,150	13,150	13,151	13,151	13,152	13,153	13,153
St. James Parish	5,456	5,456	5,456	5,456	5,456	5,457	5,457	5,457	5,457	5,457	5,457
St. John the Baptist Parish	10,013	10,014	10,014	10,015	10,016	10,017	10,017	10,018	10,019	10,019	10,020
St. Tammany Parish	68,114	68,118	68,121	68,125	68,130	68,135	68,139	68,143	68,148	68,152	68,156

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:		
	3/18	3/19	3/20	3/21	3/23	3/25	3/27
Ascension Parish	33,087	33,088	33,088	33,088	33,092 (6,618) [1,588] {794}	33,095 (6,619) [1,589] {794}	33,098 (6,620) [1,589] {794}
Bossier Parish	35,294	35,297	35,299	35,302	35,309 (7,062) [1,695] {847}	35,315 (7,063) [1,695] {848}	35,321 (7,064) [1,695] {848}
Caddo Parish	63,287	63,289	63,291	63,293	63,300 (12,660) [3,038] {1,519}	63,306 (12,661) [3,039] {1,519}	63,312 (12,662) [3,039] {1,519}
Calcasieu Parish	51,712	51,713	51,714	51,715	51,724 (10,345) [2,483] {1,241}	51,732 (10,346) [2,483] {1,242}	51,739 (10,348) [2,483] {1,242}
East Baton Rouge Parish	105,288	105,296	105,303	105,311	105,331 (21,066) [5,056] {2,528}	105,350 (21,070) [5,057] {2,528}	105,368 (21,074) [5,058] {2,529}
Jefferson Parish	108,200	108,207	108,215	108,222	108,244 (21,649) [5,196] {2,598}	108,263 (21,653) [5,197] {2,598}	108,282 (21,656) [5,198] {2,599}
Lafayette Parish	59,270	59,271	59,273	59,274	59,283 (11,857) [2,846] {1,423}	59,292 (11,858) [2,846] {1,423}	59,300 (11,860) [2,846] {1,423}
Lafourche Parish	26,176	26,178	26,179	26,181	26,184 (5,237) [1,257] {628}	26,187 (5,237) [1,257] {628}	26,190 (5,238) [1,257] {629}
Orleans Parish	83,490	83,501	83,512	83,523	83,583 (16,717) [4,012] {2,006}	83,641 (16,728) [4,015] {2,007}	83,701 (16,740) [4,018] {2,009}
Ouachita Parish	47,263	47,267	47,272	47,276	47,284 (9,457) [2,270] {1,135}	47,291 (9,458) [2,270] {1,135}	47,297 (9,459) [2,270] {1,135}
Rapides Parish	30,876	30,877	30,878	30,879	30,884 (6,177) [1,482] {741}	30,888 (6,178) [1,483] {741}	30,892 (6,178) [1,483] {741}
St. Bernard Parish	10,694	10,696	10,697	10,699	10,702 (2,140) [514] {257}	10,704 (2,141) [514] {257}	10,706 (2,141) [514] {257}
St. Charles Parish	13,149	13,149	13,149	13,149	13,150 (2,630) [631] {316}	13,151 (2,630) [631] {316}	13,153 (2,631) [631] {316}
St. James Parish	5,456	5,456	5,456	5,456	5,457 (1,091) [262] {131}	5,457 (1,091) [262] {131}	5,457 (1,091) [262] {131}
St. John the Baptist Parish	10,013	10,014	10,014	10,015	10,017 (2,003) [481] {240}	10,018 (2,004) [481] {240}	10,019 (2,004) [481] {240}
St. Tammany Parish	68,114	68,118	68,121	68,125	68,135 (13,627) [3,270] {1,635}	68,143 (13,629) [3,271] {1,635}	68,152 (13,630) [3,271] {1,636}

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.