IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/22/21

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 <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 6/22/21 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
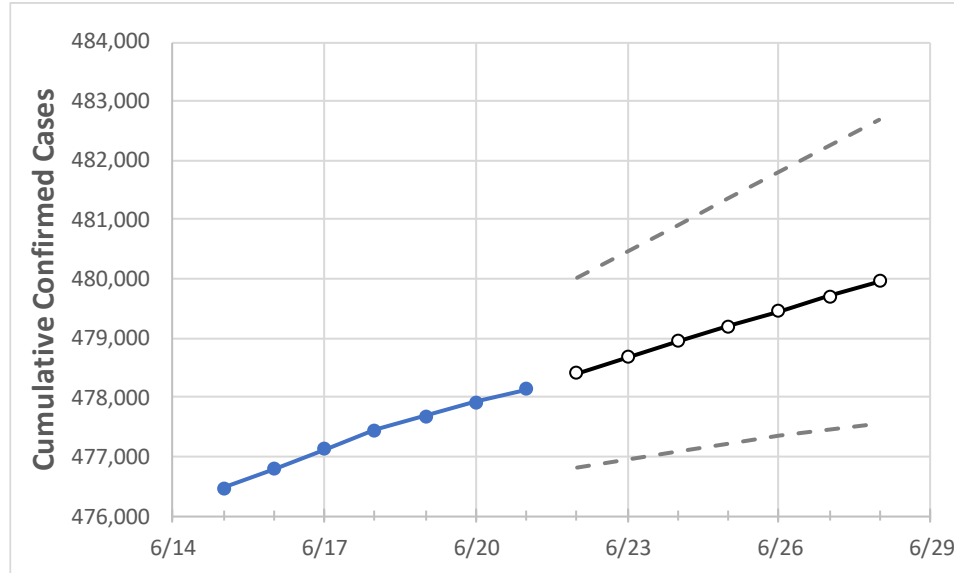
	Actual Confirmed Cases On:				Projected Cases For:						
	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28
Louisiana	477,453	477,682	477,910	478,139	478,403	478,675	478,944	479,200	479,457	479,715	479,960

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:						
	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28
Ascension Parish	12,788	12,795	12,802	12,809	12,818	12,826	12,834	12,843	12,851	12,859	12,867
Bossier Parish	14,375	14,379	14,384	14,388	14,395	14,402	14,409	14,416	14,423	14,429	14,436
Caddo Parish	27,089	27,102	27,114	27,127	27,146	27,164	27,182	27,200	27,218	27,235	27,253
Calcasieu Parish	23,069	23,087	23,104	23,122	23,140	23,158	23,178	23,197	23,216	23,235	23,256
East Baton Rouge Parish	40,737	40,766	40,794	40,823	40,844	40,865	40,887	40,909	40,930	40,951	40,972
Jefferson Parish	47,339	47,353	47,366	47,380	47,401	47,421	47,441	47,461	47,480	47,499	47,518
Lafayette Parish	24,352	24,365	24,379	24,392	24,404	24,416	24,428	24,440	24,452	24,464	24,475
Lafourche Parish	10,022	10,033	10,043	10,054	10,066	10,079	10,091	10,104	10,117	10,131	10,145
Orleans Parish	30,896	30,910	30,923	30,937	30,945	30,954	30,962	30,969	30,976	30,983	30,990
Ouachita Parish	18,967	18,974	18,980	18,987	18,998	19,008	19,019	19,029	19,040	19,051	19,062
Rapides Parish	12,666	12,670	12,674	12,678	12,684	12,690	12,695	12,700	12,705	12,710	12,715
St. Bernard Parish	4,118	4,119	4,121	4,122	4,124	4,126	4,128	4,130	4,132	4,134	4,136
St. Charles Parish	5,601	5,602	5,604	5,605	5,607	5,610	5,612	5,614	5,616	5,618	5,620
St. James Parish	2,029	2,028	2,028	2,027	2,029	2,031	2,034	2,036	2,038	2,041	2,043
St. John the Baptist Parish	3,852	3,854	3,855	3,857	3,860	3,864	3,868	3,871	3,875	3,879	3,882
St. Tammany Parish	26,224	26,237	26,249	26,262	26,274	26,285	26,296	26,307	26,319	26,330	26,341

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:		
	6/18	6/19	6/20	6/21	6/23	6/25	6/27
Ascension Parish	12,788	12,795	12,802	12,809	12,826 (2,565) [616] {308}	12,843 (2,569) [616] {308}	12,859 (2,572) [617] {309}
Bossier Parish	14,375	14,379	14,384	14,388	14,402 (2,880) [691] {346}	14,416 (2,883) [692] {346}	14,429 (2,886) [693] {346}
Caddo Parish	27,089	27,102	27,114	27,127	27,164 (5,433) [1,304] {652}	27,200 (5,440) [1,306] {653}	27,235 (5,447) [1,307] {654}
Calcasieu Parish	23,069	23,087	23,104	23,122	23,158 (4,632) [1,112] {556}	23,197 (4,639) [1,113] {557}	23,235 (4,647) [1,115] {558}
East Baton Rouge Parish	40,737	40,766	40,794	40,823	40,865 (8,173) [1,962] {981}	40,909 (8,182) [1,964] {982}	40,951 (8,190) [1,966] {983}
Jefferson Parish	47,339	47,353	47,366	47,380	47,421 (9,484) [2,276] {1,138}	47,461 (9,492) [2,278] {1,139}	47,499 (9,500) [2,280] {1,140}
Lafayette Parish	24,352	24,365	24,379	24,392	24,416 (4,883) [1,172] {586}	24,440 (4,888) [1,173] {587}	24,464 (4,893) [1,174] {587}
Lafourche Parish	10,022	10,033	10,043	10,054	10,079 (2,016) [484] {242}	10,104 (2,021) [485] {243}	10,131 (2,026) [486] {243}
Orleans Parish	30,896	30,910	30,923	30,937	30,954 (6,191) [1,486] {743}	30,969 (6,194) [1,487] {743}	30,983 (6,197) [1,487] {744}
Ouachita Parish	18,967	18,974	18,980	18,987	19,008 (3,802) [912] {456}	19,029 (3,806) [913] {457}	19,051 (3,810) [914] {457}
Rapides Parish	12,666	12,670	12,674	12,678	12,690 (2,538) [609] {305}	12,700 (2,540) [610] {305}	12,710 (2,542) [610] {305}
St. Bernard Parish	4,118	4,119	4,121	4,122	4,126 (825) [198] {99}	4,130 (826) [198] {99}	4,134 (827) [198] {99}
St. Charles Parish	5,601	5,602	5,604	5,605	5,610 (1,122) [269] {135}	5,614 (1,123) [269] {135}	5,618 (1,124) [270] {135}
St. James Parish	2,029	2,028	2,028	2,027	2,031 (406) [97] {49}	2,036 (407) [98] {49}	2,041 (408) [98] {49}
St. John the Baptist Parish	3,852	3,854	3,855	3,857	3,864 (773) [185] {93}	3,871 (774) [186] {93}	3,879 (776) [186] {93}
St. Tammany Parish	26,224	26,237	26,249	26,262	26,285 (5,257) [1,262] {631}	26,307 (5,261) [1,263] {631}	26,330 (5,266) [1,264] {632}

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.