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

Date: 6/24/21

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 6/24/21 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.

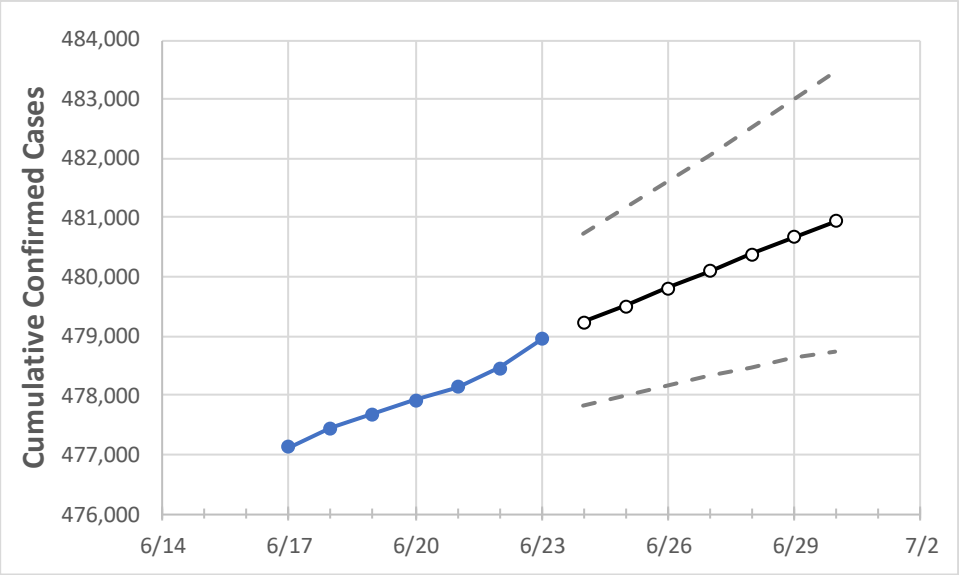
IEM's Modeling Lead

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:						
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30
Louisiana	477,910	478,139	478,464	478,946	479,229	479,513	479,804	480,100	480,391	480,666	480,943

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:						
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30
Ascension Parish	12,802	12,809	12,812	12,832	12,841	12,849	12,858	12,866	12,875	12,883	12,892
Bossier Parish	14,384	14,388	14,400	14,403	14,411	14,418	14,425	14,432	14,439	14,446	14,452
Caddo Parish	27,114	27,127	27,136	27,161	27,178	27,195	27,211	27,228	27,243	27,259	27,275
Calcasieu Parish	23,104	23,122	23,131	23,154	23,172	23,189	23,208	23,228	23,247	23,266	23,287
East Baton Rouge Parish	40,794	40,823	40,835	40,886	40,909	40,932	40,954	40,977	41,001	41,023	41,047
Jefferson Parish	47,366	47,380	47,401	47,423	47,443	47,462	47,480	47,499	47,517	47,535	47,552
Lafayette Parish	24,379	24,392	24,418	24,441	24,457	24,472	24,487	24,503	24,519	24,535	24,551
Lafourche Parish	10,043	10,054	10,078	10,105	10,121	10,138	10,156	10,174	10,193	10,211	10,232
Orleans Parish	30,923	30,937	30,951	30,967	30,976	30,985	30,993	31,001	31,009	31,017	31,025
Ouachita Parish	18,980	18,987	18,998	19,013	19,023	19,034	19,045	19,055	19,066	19,077	19,089
Rapides Parish	12,674	12,678	12,681	12,697	12,704	12,710	12,716	12,722	12,728	12,735	12,740
St. Bernard Parish	4,121	4,122	4,124	4,127	4,129	4,131	4,133	4,135	4,137	4,139	4,141
St. Charles Parish	5,604	5,605	5,612	5,613	5,615	5,618	5,620	5,622	5,625	5,627	5,629
St. James Parish	2,028	2,027	2,029	2,030	2,032	2,033	2,035	2,037	2,038	2,040	2,042
St. John the Baptist Parish	3,855	3,857	3,864	3,865	3,868	3,872	3,876	3,879	3,883	3,886	3,890
St. Tammany Parish	26,249	26,262	26,293	26,312	26,328	26,343	26,360	26,377	26,393	26,410	26,427

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:		
	6/20	6/21	6/22	6/23	6/25	6/27	6/29
Ascension Parish	12,802	12,809	12,812	12,832	12,849 (2,570) [617] {308}	12,866 (2,573) [618] {309}	12,883 (2,577) [618] {309}
Bossier Parish	14,384	14,388	14,400	14,403	14,418 (2,884) [692] {346}	14,432 (2,886) [693] {346}	14,446 (2,889) [693] {347}
Caddo Parish	27,114	27,127	27,136	27,161	27,195 (5,439) [1,305] {653}	27,228 (5,446) [1,307] {653}	27,259 (5,452) [1,308] {654}
Calcasieu Parish	23,104	23,122	23,131	23,154	23,189 (4,638) [1,113] {557}	23,228 (4,646) [1,115] {557}	23,266 (4,653) [1,117] {558}
East Baton Rouge Parish	40,794	40,823	40,835	40,886	40,932 (8,186) [1,965] {982}	40,977 (8,195) [1,967] {983}	41,023 (8,205) [1,969] {985}
Jefferson Parish	47,366	47,380	47,401	47,423	47,462 (9,492) [2,278] {1,139}	47,499 (9,500) [2,280] {1,140}	47,535 (9,507) [2,282] {1,141}
Lafayette Parish	24,379	24,392	24,418	24,441	24,472 (4,894) [1,175] {587}	24,503 (4,901) [1,176] {588}	24,535 (4,907) [1,178] {589}
Lafourche Parish	10,043	10,054	10,078	10,105	10,138 (2,028) [487] {243}	10,174 (2,035) [488] {244}	10,211 (2,042) [490] {245}
Orleans Parish	30,923	30,937	30,951	30,967	30,985 (6,197) [1,487] {744}	31,001 (6,200) [1,488] {744}	31,017 (6,203) [1,489] {744}
Ouachita Parish	18,980	18,987	18,998	19,013	19,034 (3,807) [914] {457}	19,055 (3,811) [915] {457}	19,077 (3,815) [916] {458}
Rapides Parish	12,674	12,678	12,681	12,697	12,710 (2,542) [610] {305}	12,722 (2,544) [611] {305}	12,735 (2,547) [611] {306}
St. Bernard Parish	4,121	4,122	4,124	4,127	4,131 (826) [198] {99}	4,135 (827) [198] {99}	4,139 (828) [199] {99}
St. Charles Parish	5,604	5,605	5,612	5,613	5,618 (1,124) [270] {135}	5,622 (1,124) [270] {135}	5,627 (1,125) [270] {135}
St. James Parish	2,028	2,027	2,029	2,030	2,033 (407) [98] {49}	2,037 (407) [98] {49}	2,040 (408) [98] {49}
St. John the Baptist Parish	3,855	3,857	3,864	3,865	3,872 (774) [186] {93}	3,879 (776) [186] {93}	3,886 (777) [187] {93}
St. Tammany Parish	26,249	26,262	26,293	26,312	26,343 (5,269) [1,264] {632}	26,377 (5,275) [1,266] {633}	26,410 (5,282) [1,268] {634}

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.