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

Date: 3/4/21

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 3/4/21 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.

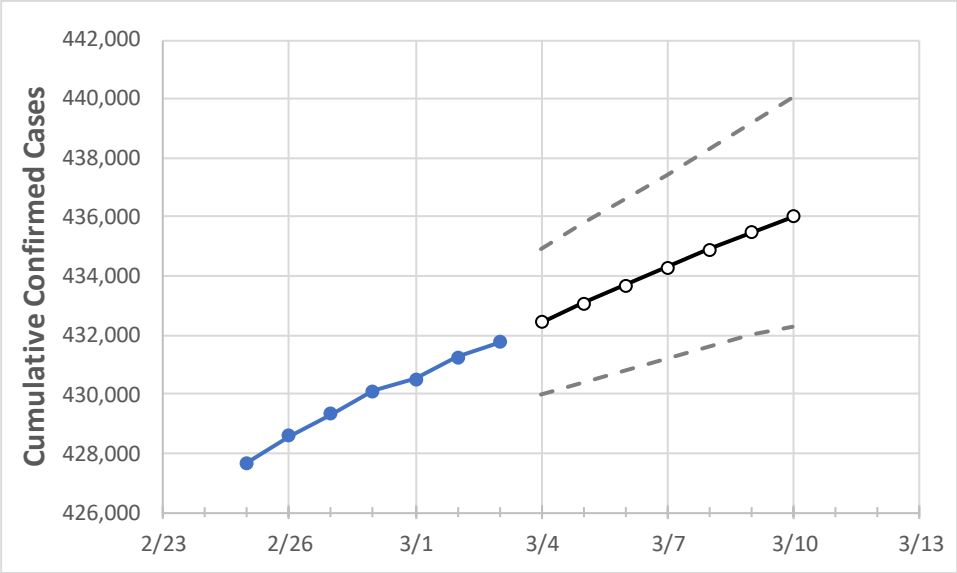
IEM's Modeling Lead

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Louisiana	430,100	430,504	431,271	431,771	432,429	433,072	433,689	434,295	434,903	435,477	436,025

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Ascension Parish	10,956	10,963	11,012	11,014	11,028	11,041	11,055	11,067	11,079	11,091	11,104
Bossier Parish	13,010	13,034	13,035	13,048	13,060	13,072	13,083	13,094	13,104	13,112	13,121
Caddo Parish	24,726	24,751	24,780	24,779	24,800	24,820	24,839	24,857	24,875	24,891	24,907
Calcasieu Parish	19,459	19,491	19,584	19,640	19,707	19,779	19,852	19,923	19,999	20,074	20,150
East Baton Rouge Parish	35,628	35,673	35,727	35,810	35,871	35,929	35,986	36,042	36,101	36,157	36,210
Jefferson Parish	43,898	43,936	44,014	44,057	44,110	44,163	44,213	44,263	44,309	44,354	44,401
Lafayette Parish	21,588	21,602	21,617	21,629	21,645	21,662	21,678	21,692	21,707	21,721	21,736
Lafourche Parish	9,124	9,128	9,155	9,181	9,196	9,212	9,227	9,242	9,256	9,270	9,284
Orleans Parish	28,462	28,501	28,565	28,581	28,626	28,669	28,712	28,753	28,793	28,833	28,874
Ouachita Parish	17,699	17,695	17,708	17,708	17,715	17,721	17,727	17,733	17,738	17,743	17,748
Rapides Parish	11,283	11,276	11,284	11,305	11,317	11,329	11,341	11,353	11,365	11,376	11,387
St. Bernard Parish	3,738	3,742	3,758	3,768	3,782	3,795	3,808	3,821	3,834	3,848	3,860
St. Charles Parish	5,107	5,122	5,127	5,133	5,142	5,150	5,159	5,167	5,175	5,183	5,191
St. James Parish	1,853	1,854	1,855	1,855	1,858	1,861	1,863	1,866	1,869	1,871	1,874
St. John the Baptist Parish	3,530	3,531	3,536	3,545	3,549	3,553	3,557	3,561	3,565	3,569	3,573
St. Tammany Parish	24,061	24,087	24,130	24,186	24,253	24,320	24,385	24,449	24,514	24,580	24,644

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:		
	2/28	3/1	3/2	3/3	3/5	3/7	3/9
Ascension Parish	10,956	10,963	11,012	11,014	11,041 (2,208) [530] {265}	11,067 (2,213) [531] {266}	11,091 (2,218) [532] {266}
Bossier Parish	13,010	13,034	13,035	13,048	13,072 (2,614) [627] {314}	13,094 (2,619) [628] {314}	13,112 (2,622) [629] {315}
Caddo Parish	24,726	24,751	24,780	24,779	24,820 (4,964) [1,191] {596}	24,857 (4,971) [1,193] {597}	24,891 (4,978) [1,195] {597}
Calcasieu Parish	19,459	19,491	19,584	19,640	19,779 (3,956) [949] {475}	19,923 (3,985) [956] {478}	20,074 (4,015) [964] {482}
East Baton Rouge Parish	35,628	35,673	35,727	35,810	35,929 (7,186) [1,725] {862}	36,042 (7,208) [1,730] {865}	36,157 (7,231) [1,736] {868}
Jefferson Parish	43,898	43,936	44,014	44,057	44,163 (8,833) [2,120] {1,060}	44,263 (8,853) [2,125] {1,062}	44,354 (8,871) [2,129] {1,064}
Lafayette Parish	21,588	21,602	21,617	21,629	21,662 (4,332) [1,040] {520}	21,692 (4,338) [1,041] {521}	21,721 (4,344) [1,043] {521}
Lafourche Parish	9,124	9,128	9,155	9,181	9,212 (1,842) [442] {221}	9,242 (1,848) [444] {222}	9,270 (1,854) [445] {222}
Orleans Parish	28,462	28,501	28,565	28,581	28,669 (5,734) [1,376] {688}	28,753 (5,751) [1,380] {690}	28,833 (5,767) [1,384] {692}
Ouachita Parish	17,699	17,695	17,708	17,708	17,721 (3,544) [851] {425}	17,733 (3,547) [851] {426}	17,743 (3,549) [852] {426}
Rapides Parish	11,283	11,276	11,284	11,305	11,329 (2,266) [544] {272}	11,353 (2,271) [545] {272}	11,376 (2,275) [546] {273}
St. Bernard Parish	3,738	3,742	3,758	3,768	3,795 (759) [182] {91}	3,821 (764) [183] {92}	3,848 (770) [185] {92}
St. Charles Parish	5,107	5,122	5,127	5,133	5,150 (1,030) [247] {124}	5,167 (1,033) [248] {124}	5,183 (1,037) [249] {124}
St. James Parish	1,853	1,854	1,855	1,855	1,861 (372) [89] {45}	1,866 (373) [90] {45}	1,871 (374) [90] {45}
St. John the Baptist Parish	3,530	3,531	3,536	3,545	3,553 (711) [171] {85}	3,561 (712) [171] {85}	3,569 (714) [171] {86}
St. Tammany Parish	24,061	24,087	24,130	24,186	24,320 (4,864) [1,167] {584}	24,449 (4,890) [1,174] {587}	24,580 (4,916) [1,180] {590}

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.