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

Date: 4/12/21

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 4/12/21 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.

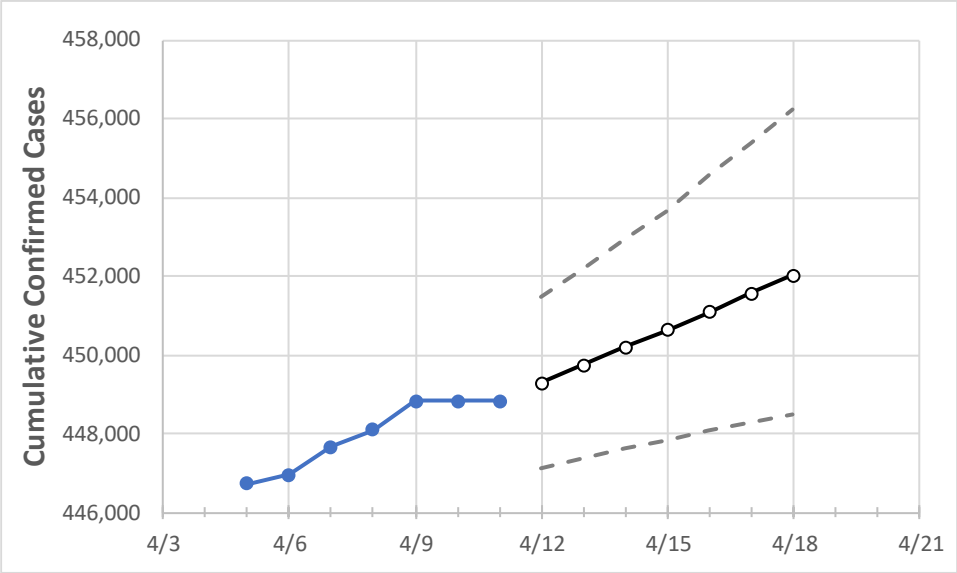
IEM's Modeling Lead

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:						
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
Louisiana	448,104	448,838	448,838	448,838	449,284	449,733	450,183	450,629	451,081	451,551	452,010

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:						
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
Ascension Parish	11,677	11,704	11,704	11,704	11,719	11,734	11,749	11,764	11,779	11,794	11,810
Bossier Parish	13,400	13,415	13,415	13,415	13,444	13,476	13,510	13,546	13,585	13,627	13,673
Caddo Parish	25,269	25,278	25,278	25,278	25,294	25,310	25,326	25,343	25,360	25,376	25,393
Calcasieu Parish	21,564	21,664	21,664	21,664	21,716	21,769	21,824	21,879	21,933	21,987	22,039
East Baton Rouge Parish	37,716	37,871	37,871	37,871	37,931	37,992	38,053	38,115	38,179	38,243	38,307
Jefferson Parish	45,236	45,279	45,279	45,279	45,302	45,326	45,349	45,374	45,397	45,420	45,443
Lafayette Parish	22,458	22,524	22,524	22,524	22,551	22,578	22,606	22,633	22,661	22,691	22,722
Lafourche Parish	9,401	9,404	9,404	9,404	9,408	9,412	9,415	9,419	9,423	9,426	9,430
Orleans Parish	29,438	29,458	29,458	29,458	29,480	29,502	29,524	29,548	29,571	29,594	29,617
Ouachita Parish	17,947	17,968	17,968	17,968	17,980	17,992	18,005	18,018	18,031	18,044	18,058
Rapides Parish	11,689	11,704	11,704	11,704	11,719	11,734	11,750	11,765	11,781	11,798	11,816
St. Bernard Parish	3,957	3,964	3,964	3,964	3,967	3,970	3,973	3,976	3,979	3,983	3,986
St. Charles Parish	5,317	5,316	5,316	5,316	5,320	5,325	5,329	5,333	5,337	5,341	5,345
St. James Parish	1,919	1,922	1,922	1,922	1,926	1,931	1,937	1,942	1,947	1,953	1,960
St. John the Baptist Parish	3,631	3,630	3,630	3,630	3,633	3,635	3,638	3,640	3,643	3,646	3,648
St. Tammany Parish	25,131	25,155	25,155	25,155	25,167	25,180	25,191	25,203	25,215	25,226	25,236

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:		
	4/8	4/9	4/10	4/11	4/13	4/15	4/17
Ascension Parish	11,677	11,704	11,704	11,704	11,734 (2,347) [563] {282}	11,764 (2,353) [565] {282}	11,794 (2,359) [566] {283}
Bossier Parish	13,400	13,415	13,415	13,415	13,476 (2,695) [647] {323}	13,546 (2,709) [650] {325}	13,627 (2,725) [654] {327}
Caddo Parish	25,269	25,278	25,278	25,278	25,310 (5,062) [1,215] {607}	25,343 (5,069) [1,216] {608}	25,376 (5,075) [1,218] {609}
Calcasieu Parish	21,564	21,664	21,664	21,664	21,769 (4,354) [1,045] {522}	21,879 (4,376) [1,050] {525}	21,987 (4,397) [1,055] {528}
East Baton Rouge Parish	37,716	37,871	37,871	37,871	37,992 (7,598) [1,824] {912}	38,115 (7,623) [1,830] {915}	38,243 (7,649) [1,836] {918}
Jefferson Parish	45,236	45,279	45,279	45,279	45,326 (9,065) [2,176] {1,088}	45,374 (9,075) [2,178] {1,089}	45,420 (9,084) [2,180] {1,090}
Lafayette Parish	22,458	22,524	22,524	22,524	22,578 (4,516) [1,084] {542}	22,633 (4,527) [1,086] {543}	22,691 (4,538) [1,089] {545}
Lafourche Parish	9,401	9,404	9,404	9,404	9,412 (1,882) [452] {226}	9,419 (1,884) [452] {226}	9,426 (1,885) [452] {226}
Orleans Parish	29,438	29,458	29,458	29,458	29,502 (5,900) [1,416] {708}	29,548 (5,910) [1,418] {709}	29,594 (5,919) [1,421] {710}
Ouachita Parish	17,947	17,968	17,968	17,968	17,992 (3,598) [864] {432}	18,018 (3,604) [865] {432}	18,044 (3,609) [866] {433}
Rapides Parish	11,689	11,704	11,704	11,704	11,734 (2,347) [563] {282}	11,765 (2,353) [565] {282}	11,798 (2,360) [566] {283}
St. Bernard Parish	3,957	3,964	3,964	3,964	3,970 (794) [191] {95}	3,976 (795) [191] {95}	3,983 (797) [191] {96}
St. Charles Parish	5,317	5,316	5,316	5,316	5,325 (1,065) [256] {128}	5,333 (1,067) [256] {128}	5,341 (1,068) [256] {128}
St. James Parish	1,919	1,922	1,922	1,922	1,931 (386) [93] {46}	1,942 (388) [93] {47}	1,953 (391) [94] {47}
St. John the Baptist Parish	3,631	3,630	3,630	3,630	3,635 (727) [174] {87}	3,640 (728) [175] {87}	3,646 (729) [175] {87}
St. Tammany Parish	25,131	25,155	25,155	25,155	25,180 (5,036) [1,209] {604}	25,203 (5,041) [1,210] {605}	25,226 (5,045) [1,211] {605}

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.