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

Date: 11/8/21

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 11/8/21 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.

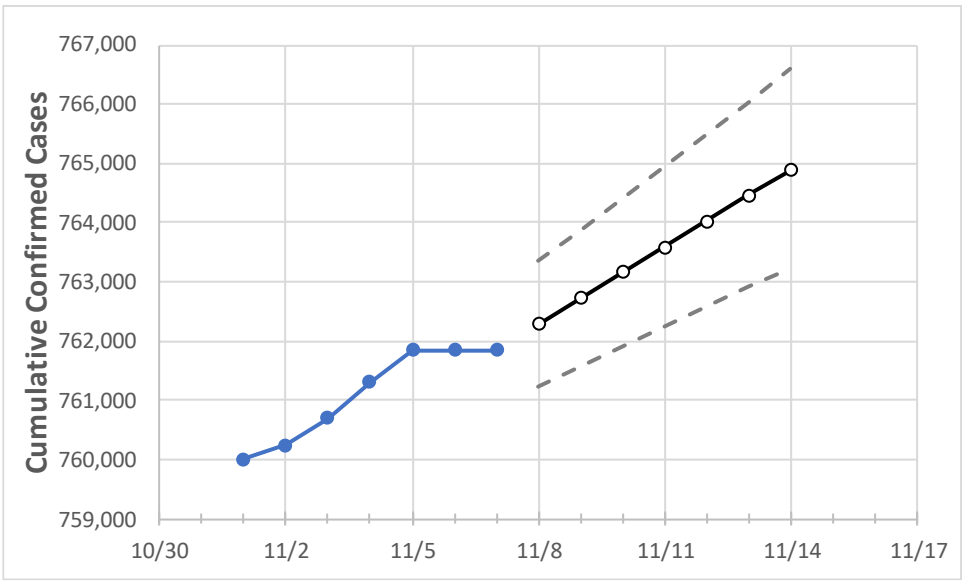
IEM's Modeling Lead

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:						
	11/4	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14
Louisiana	761,311	761,849	761,849	761,849	762,285	762,728	763,157	763,586	764,025	764,458	764,892

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:						
	11/4	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14
Ascension Parish	21,834	21,857	21,857	21,857	21,868	21,877	21,888	21,898	21,908	21,920	21,930
Bossier Parish	21,785	21,795	21,795	21,795	21,806	21,817	21,827	21,838	21,848	21,858	21,868
Caddo Parish	39,541	39,563	39,563	39,563	39,582	39,601	39,618	39,636	39,654	39,672	39,688
Calcasieu Parish	34,548	34,556	34,556	34,556	34,567	34,579	34,589	34,600	34,610	34,621	34,630
East Baton Rouge Parish	64,001	64,024	64,024	64,024	64,045	64,071	64,090	64,113	64,135	64,157	64,179
Jefferson Parish	69,660	69,813	69,813	69,813	69,850	69,888	69,927	69,962	70,001	70,042	70,080
Lafayette Parish	39,156	39,163	39,163	39,163	39,200	39,236	39,276	39,312	39,352	39,391	39,429
Lafourche Parish	17,979	17,987	17,987	17,987	18,001	18,015	18,030	18,043	18,060	18,074	18,089
Orleans Parish	46,916	46,989	46,989	46,989	47,013	47,039	47,064	47,090	47,116	47,142	47,166
Ouachita Parish	31,608	31,615	31,615	31,615	31,627	31,638	31,649	31,660	31,671	31,682	31,691
Rapides Parish	21,284	21,299	21,299	21,299	21,309	21,318	21,327	21,336	21,345	21,354	21,363
St. Bernard Parish	6,906	6,926	6,926	6,926	6,930	6,933	6,936	6,940	6,944	6,947	6,950
St. Charles Parish	8,896	8,904	8,904	8,904	8,908	8,911	8,914	8,918	8,921	8,925	8,928
St. James Parish	3,532	3,532	3,532	3,532	3,535	3,537	3,540	3,542	3,545	3,547	3,550
St. John the Baptist Parish	6,324	6,329	6,329	6,329	6,332	6,335	6,338	6,341	6,344	6,347	6,350
St. Tammany Parish	43,739	43,762	43,762	43,762	43,788	43,813	43,839	43,866	43,892	43,919	43,945

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:		
	11/4	11/5	11/6	11/7	11/9	11/11	11/13
Ascension Parish	21,834	21,857	21,857	21,857	21,877 (4,375) [1,050] {525}	21,898 (4,380) [1,051] {526}	21,920 (4,384) [1,052] {526}
Bossier Parish	21,785	21,795	21,795	21,795	21,817 (4,363) [1,047] {524}	21,838 (4,368) [1,048] {524}	21,858 (4,372) [1,049] {525}
Caddo Parish	39,541	39,563	39,563	39,563	39,601 (7,920) [1,901] {950}	39,636 (7,927) [1,903] {951}	39,672 (7,934) [1,904] {952}
Calcasieu Parish	34,548	34,556	34,556	34,556	34,579 (6,916) [1,660] {830}	34,600 (6,920) [1,661] {830}	34,621 (6,924) [1,662] {831}
East Baton Rouge Parish	64,001	64,024	64,024	64,024	64,071 (12,814) [3,075] {1,538}	64,113 (12,823) [3,077] {1,539}	64,157 (12,831) [3,080] {1,540}
Jefferson Parish	69,660	69,813	69,813	69,813	69,888 (13,978) [3,355] {1,677}	69,962 (13,992) [3,358] {1,679}	70,042 (14,008) [3,362] {1,681}
Lafayette Parish	39,156	39,163	39,163	39,163	39,236 (7,847) [1,883] {942}	39,312 (7,862) [1,887] {943}	39,391 (7,878) [1,891] {945}
Lafourche Parish	17,979	17,987	17,987	17,987	18,015 (3,603) [865] {432}	18,043 (3,609) [866] {433}	18,074 (3,615) [868] {434}
Orleans Parish	46,916	46,989	46,989	46,989	47,039 (9,408) [2,258] {1,129}	47,090 (9,418) [2,260] {1,130}	47,142 (9,428) [2,263] {1,131}
Ouachita Parish	31,608	31,615	31,615	31,615	31,638 (6,328) [1,519] {759}	31,660 (6,332) [1,520] {760}	31,682 (6,336) [1,521] {760}
Rapides Parish	21,284	21,299	21,299	21,299	21,318 (4,264) [1,023] {512}	21,336 (4,267) [1,024] {512}	21,354 (4,271) [1,025] {512}
St. Bernard Parish	6,906	6,926	6,926	6,926	6,933 (1,387) [333] {166}	6,940 (1,388) [333] {167}	6,947 (1,389) [333] {167}
St. Charles Parish	8,896	8,904	8,904	8,904	8,911 (1,782) [428] {214}	8,918 (1,784) [428] {214}	8,925 (1,785) [428] {214}
St. James Parish	3,532	3,532	3,532	3,532	3,537 (707) [170] {85}	3,542 (708) [170] {85}	3,547 (709) [170] {85}
St. John the Baptist Parish	6,324	6,329	6,329	6,329	6,335 (1,267) [304] {152}	6,341 (1,268) [304] {152}	6,347 (1,269) [305] {152}
St. Tammany Parish	43,739	43,762	43,762	43,762	43,813 (8,763) [2,103] {1,052}	43,866 (8,773) [2,106] {1,053}	43,919 (8,784) [2,108] {1,054}

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.