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

Date: 1/13/21

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 1/13/21 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.

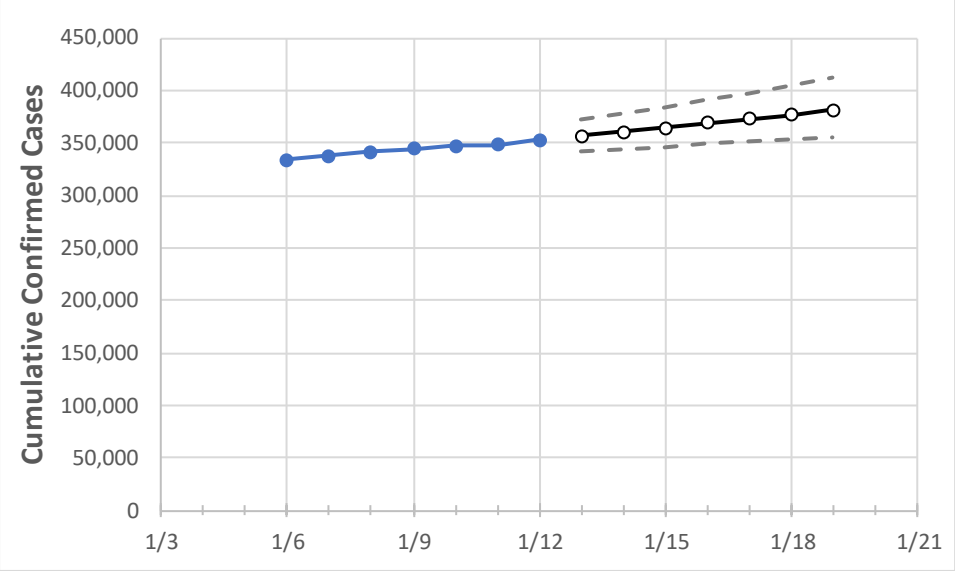
IEM's Modeling Lead

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:						
	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19
Louisiana	344,130	346,829	348,234	352,939	356,770	360,616	364,652	368,658	372,828	377,040	381,403

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:						
	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19
Ascension Parish	8,646	8,719	8,745	8,918	9,015	9,119	9,220	9,327	9,435	9,542	9,661
Bossier Parish	9,882	10,068	10,102	10,260	10,386	10,508	10,633	10,763	10,898	11,036	11,176
Caddo Parish	19,562	19,788	19,894	20,077	20,299	20,524	20,755	20,989	21,230	21,482	21,732
Calcasieu Parish	15,168	15,260	15,294	15,528	15,678	15,825	15,975	16,129	16,289	16,457	16,623
East Baton Rouge Parish	27,623	27,792	27,887	28,306	28,544	28,793	29,052	29,313	29,563	29,834	30,106
Jefferson Parish	34,814	35,137	35,379	35,823	36,260	36,698	37,146	37,607	38,075	38,555	39,039
Lafayette Parish	18,291	18,403	18,439	18,678	18,870	19,062	19,258	19,464	19,672	19,877	20,087
Lafourche Parish	6,832	6,871	6,952	7,087	7,176	7,266	7,361	7,463	7,567	7,676	7,786
Orleans Parish	22,927	23,117	23,252	23,531	23,805	24,081	24,359	24,651	24,949	25,254	25,569
Ouachita Parish	15,234	15,337	15,401	15,554	15,698	15,840	15,991	16,140	16,290	16,438	16,593
Rapides Parish	9,195	9,272	9,281	9,521	9,652	9,791	9,935	10,077	10,230	10,389	10,557
St. Bernard Parish	2,688	2,714	2,735	2,777	2,820	2,867	2,915	2,966	3,018	3,073	3,131
St. Charles Parish	4,008	4,049	4,078	4,130	4,176	4,224	4,271	4,321	4,371	4,421	4,472
St. James Parish	1,482	1,489	1,490	1,524	1,543	1,564	1,586	1,609	1,631	1,655	1,678
St. John the Baptist Parish	2,890	2,911	2,925	2,947	2,972	3,000	3,027	3,056	3,084	3,112	3,141
St. Tammany Parish	17,063	17,215	17,336	17,601	17,825	18,055	18,281	18,512	18,750	18,999	19,242

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:		
	1/9	1/10	1/11	1/12	1/14	1/16	1/18
Ascension Parish	8,646	8,719	8,745	8,918	9,119 (1,824) [438] {219}	9,327 (1,865) [448] {224}	9,542 (1,908) [458] {229}
Bossier Parish	9,882	10,068	10,102	10,260	10,508 (2,102) [504] {252}	10,763 (2,153) [517] {258}	11,036 (2,207) [530] {265}
Caddo Parish	19,562	19,788	19,894	20,077	20,524 (4,105) [985] {493}	20,989 (4,198) [1,007] {504}	21,482 (4,296) [1,031] {516}
Calcasieu Parish	15,168	15,260	15,294	15,528	15,825 (3,165) [760] {380}	16,129 (3,226) [774] {387}	16,457 (3,291) [790] {395}
East Baton Rouge Parish	27,623	27,792	27,887	28,306	28,793 (5,759) [1,382] {691}	29,313 (5,863) [1,407] {704}	29,834 (5,967) [1,432] {716}
Jefferson Parish	34,814	35,137	35,379	35,823	36,698 (7,340) [1,761] {881}	37,607 (7,521) [1,805] {903}	38,555 (7,711) [1,851] {925}
Lafayette Parish	18,291	18,403	18,439	18,678	19,062 (3,812) [915] {457}	19,464 (3,893) [934] {467}	19,877 (3,975) [954] {477}
Lafourche Parish	6,832	6,871	6,952	7,087	7,266 (1,453) [349] {174}	7,463 (1,493) [358] {179}	7,676 (1,535) [368] {184}
Orleans Parish	22,927	23,117	23,252	23,531	24,081 (4,816) [1,156] {578}	24,651 (4,930) [1,183] {592}	25,254 (5,051) [1,212] {606}
Ouachita Parish	15,234	15,337	15,401	15,554	15,840 (3,168) [760] {380}	16,140 (3,228) [775] {387}	16,438 (3,288) [789] {395}
Rapides Parish	9,195	9,272	9,281	9,521	9,791 (1,958) [470] {235}	10,077 (2,015) [484] {242}	10,389 (2,078) [499] {249}
St. Bernard Parish	2,688	2,714	2,735	2,777	2,867 (573) [138] {69}	2,966 (593) [142] {71}	3,073 (615) [147] {74}
St. Charles Parish	4,008	4,049	4,078	4,130	4,224 (845) [203] {101}	4,321 (864) [207] {104}	4,421 (884) [212] {106}
St. James Parish	1,482	1,489	1,490	1,524	1,564 (313) [75] {38}	1,609 (322) [77] {39}	1,655 (331) [79] {40}
St. John the Baptist Parish	2,890	2,911	2,925	2,947	3,000 (600) [144] {72}	3,056 (611) [147] {73}	3,112 (622) [149] {75}
St. Tammany Parish	17,063	17,215	17,336	17,601	18,055 (3,611) [867] {433}	18,512 (3,702) [889] {444}	18,999 (3,800) [912] {456}

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.